Working Group on Numerical Experimentation – WGNE

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WGNE Systematic Error Survey to contribute to the WMO EW4All initiative

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New WMO strategic plan 2024-2027
Long-term Goals and Strategic Objectives

Goal 1: Better serve societal needs: delivering, authoritative, accessible, user-oriented and fit-for-purpose information and services

Objective 1.1

Early warnings on weather, climate, water and other environmental extreme events

Objective 1.3

Hydrological services and enabling access to and use of numerical analysis

Goal 2: Enhance Earth system observations and predictions: Strengthening the technical foundation for the future

Objective 2.3

Earth system prediction products at all temporal and spatial scales from WIPPS

New WMO strategic plan 2024-2027
Long-term Goals and Strategic Objectives

Goal 3: Advance targeted research: Leveraging leadership in science to improve understanding of the Earth system for enhanced services

Objective 3.2

Enhance the science-for-service value cycle ensuring scientific and technological advances improve predictive capabilities and analysis

Goal 4: Close the capacity gap on weather, climate, hydrological and related environmental services: Enhancing service delivery capacity of developing countries to ensure availability of essential information and services needed by governments, economic sectors and citizens

Objective 4.1

Address the needs of developing countries to enable them to provide and utilize essential weather, climate, hydrological and related environmental services
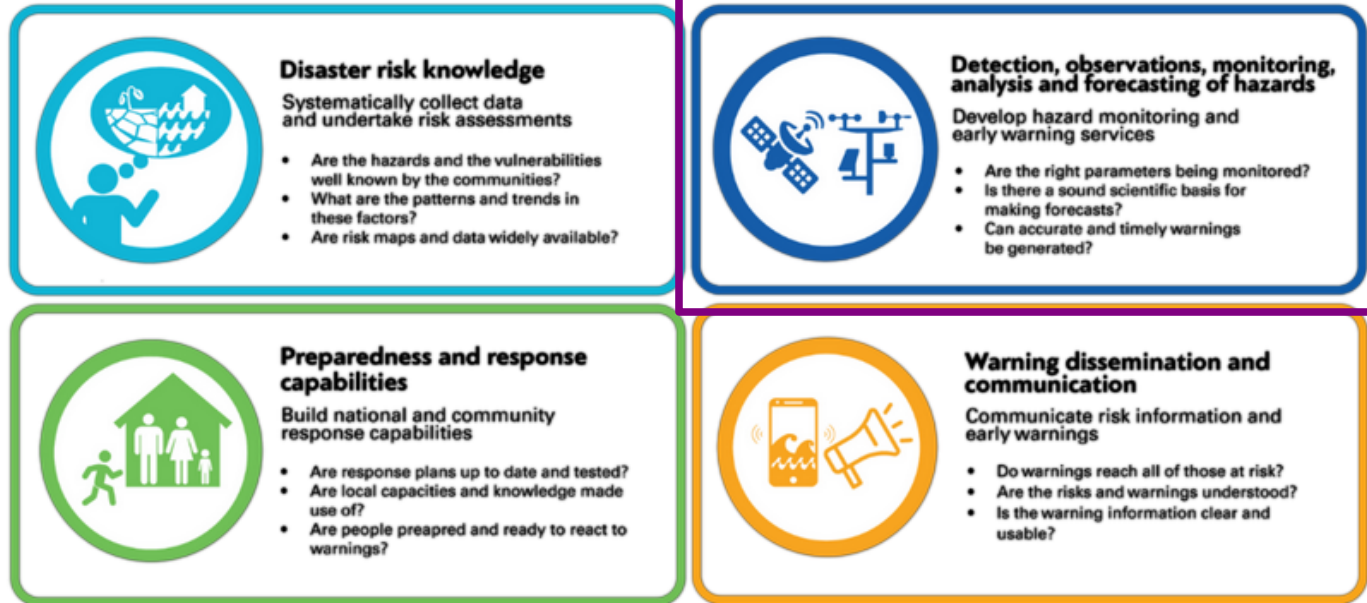
UN Early Warning for All Initiative

EW4All Initiative

Early Warnings for All

The EW4All initiative is a groundbreaking effort to ensure that everyone on Earth is protected from hazardous weather, water, or climate events through life-saving early warning systems <u>by the end of 2027</u>.

The Early Warnings for All initiative is built around four key pillars:

Disaster risk knowledge

Systematically collect data and undertake risk assessments

- Are the hazards and the vulnerabilities well known by the communities?
- What are the patterns and trends in these factors?
- Are risk maps and data widely available?

Detection, observations, monitoring, analysis and forecasting of hazards

Develop hazard monitoring and early warning services

- Are the right parameters being monitored?
- Is there a sound scientific basis for making forecasts?
- Can accurate and timely warnings be generated?

Preparedness and response capabilities

Build national and community response capabilities

- Are response plans up to date and tested?
- Are local capacities and knowledge made use of?
- Are people preapred and ready to react to warnings?

Warning dissemination and communication

Communicate risk information and early warnings

- Do warnings reach all of those at risk?
- Are the risks and warnings understood?
- Is the warning information clear and usable?

WMO IMO-WMO

EW4All Initiative: Approach to identify priority hazards

For the short-term activities of INFCOM, the six hazards were identified, mainly based on the hazards that were most frequently identified as "priority hazards" by the 30 countries*.
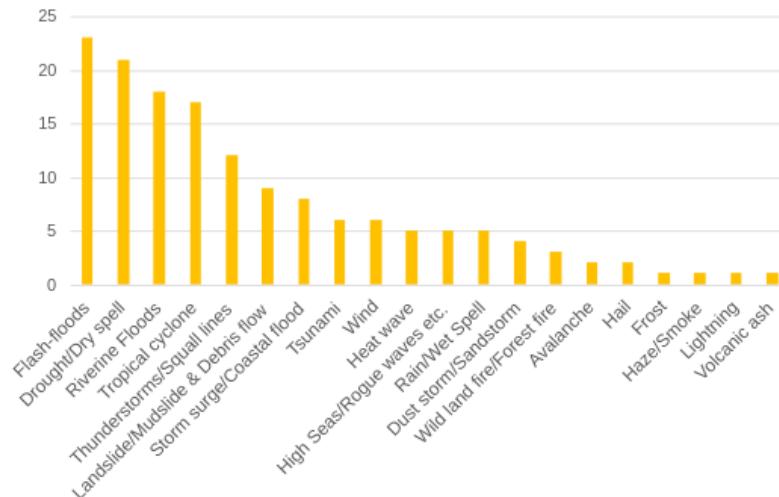
- **Flash-floods**
- **Drought/Dry spell**
- **Riverine Floods**
- **Tropical cyclone**
- **Thunderstorms/Squall lines**
- **Heatwave**

List of hazard types: defined by the implementation plan of the WMO Catalogue of Hazardous Events.

* List of the 30 countries can be found at:
https://public.wmo.int/en/media/press-release/early-warnings-all-initiative-scaled-action-ground

Number of countries that identified the hazard as one of 5 priorities

Does your organization forecast one or more of the following hazards?

Yes

No

Modeling Centres	Flashfloods	Drought-dry spell	Riverine floods	Tropical Cyclones	Thunderstorms / Squall lines	Heatwave
ECCC	No	No	No	Yes	Yes	Yes
CPTEC			No			
DWD	Yes	No	No	No	Yes	Yes
IITM	-	Yes	-	Yes	Yes	Yes
INMET	No	Yes	Yes	No	Yes	Yes
KMA	Yes	Yes	Yes	Yes	Yes	Yes
NCEP	Yes	Yes	Yes	Yes	Yes	Yes
Total	4	5	3	5	7	7

Modeling Centres	Flashfloods		
DWD	localized warnings: a few hours ahead; pre-warnings and watches up to five days ahead		
KMA	general hazard forecast: 3-5 days		
CPTEC NCEP	7 days		
Modeling Centres	**Riverine floods**		
INMET	one week		
KMA	general hazard forecast: 3-5 days		
NCEP	one week		

What is the timescale for which the hazard forecast is produced? If there is more than one, please indicate each of them

Modeling Centres	Drought-dry spell
CPTEC	3 months
IITM	2-4 weeks
INMET	3-5 months
KMA	(1) general hazard forecast: 2-3 days / (2) hazard warning : flexible. No regul.
NCEP	seasonal

Modeling Centres	Heatwave
CPTEC	7 days / 4 weeks
ECCC	Short-range / Long-Range
DWD	1-2 weeks
IITM	2-4 weeks
INMET	5 a 7 dias
KMA	(1) general hazard forecast: 2-3days / (2) hazard warning : flexible. No regul.
NCEP	day 6-10, day 8-14, week 3-4

Modeling Centres	Tropical Cyclones
CPTEC	7 days
ECCC	Short-range/ Long-Range
IITM	2-4 weeks
KMA	(1) general hazard forecast: 2-3days / (2) hazard warning : flexible. No regul.
NCEP	5 days

Modeling Centres	Thunderstorms / Squall lines
CPTEC	7 days
ECCC	Nowcasting/ Short-range/ Long-Range
DWD	localized warnings: a few hours ahead; pre-warnings and watches up to five days ahead
IITM	Nowcasting (Hours)
INMET	1 a 3 horas
KMA	(1) general hazard forecast: 2-3days / (2) hazard warning : flexible. No regul.
NCEP	day 1, 2, 3, 4-8

Modeling Centres	Thunderstorms / Squall lines
ECCC	A Convection Parameterization for Low-CAPE Environments. Monthly Weather Review, 148(12), 4917-4941
DWD	**Regional scale:** development of the SINFONY system (www.dwd.de/sinfony), providing seamless probabilistic forecasts for precipiation, radar reflectivity and convective cell objects from 0-12 h lead time. It uses Nowcasting ensemble methods (reflectivity, precipitation, convective cell objects) to bridge the quality gap between the most recent observation and the most recent (but usually "old" in terms of init time) NWP-model. To make this NWP-model as recent as possible, we developed a new regional ICON Rapid Update Cycle with hourly forecast inits (ready 35' after the nominal init time), with advanced 2-moment cloud microphysics and improved assimilation of radar- and all-sky VIS and IR satellite data. This ICON-RUC is operational since July 2024. **Global scale:** improvements of the ensemble data assimilation system, use of more and more satellite data, tuning of model physics, new diagnostics like the Lightning Potential Index.
IITM	Mohan et al., (2021), Evaluating different lightning parameterization schemes to simulate lightning flash counts over Maharashtra, India, *Atmospheric Research*, 255: 105532, June 2021, DOI:10.1016/j.atmosres.2021.105532, 1-22 Gayatri et al., (2022), Evaluation and Usefulness of Lightning Forecasts Made with Lightning Parameterization Schemes Coupled with the WRF Model, Weather and Forecasting, 37, May 2022, DOI:10.1175/WAF-D-21-0080.1, 709–726
CPTEC	Convection and cold pool parametrizations (Freitas et al., 2024)
KMA	Yes (no paper)

DWD - Spatial verification of forecasted precipitation amounts. evaluation of issued warnings for Flashfloods

Spatial verification of forecasted precipitation amounts, reflectivity and convective cell objects and evaluation of issued warnings for thunderstorms/squall lines

KMA - Comparison of predicted water level with actual water level for flashfloods and riverinefloods; comparison of forecast field with analysis field for other hazards

DWD - Aviation forecasts: volcanic ash, turbulence Nuclear accidents: global dispersion modeling

ECCC - Winter-season hazards: blizzard, snowfall, freezing rain, wind chill etc

IITM - Cold waves, heavy rainfall events

KMA – Strong winds, cold waves, high sea waves

	Thunderstorms/Squall lines	
	DWD	**ECC**
Prediction timescale	NWP	NWP
Type of Data Assimilation	Ensemble-Variational (3D-Var + LETKF); valid for all	LETKF
Type of modeling system	Probabilistic	Probabilistic
Coupling if any (ocean, sea ice, chemistry etc)		Ocean/Ice

Interested to contribute? Email me!

Thanks!