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WMO OMM
World Meteorological Organization
Organisation météorologique mondiale
Organización Meteorológica Mundial
Всемирная метеорологическая организация
المنظمة العالمية للأرصاد الجوية
世界气象组织

Secrétariat
7 bis, avenue de la Paix – Case postale 2300
CH 1211 Genève 2 – Suisse
Tél.: +41 (0) 22 730 81 11
Fax: +41 (0) 22 730 81 81
wmo@wmo.int – public.wmo.int

Call for Contributions to the COP30 Presidency Roadmap on the Transition Away from Fossil Fuels in a Just, Orderly and Equitable Manner

Submission from WMO

Pursuant to paragraph 28.d of Decision 1/CMA.5, *Outcome of the first Global Stocktake,* which called on Parties to contribute, in a nationally determined manner, taking into account the Paris Agreement and their different national circumstances, pathways and approaches, to the global effort to transitioning away from fossil fuels in energy systems, in a just, orderly and equitable manner, WMO is pleased to provide the following inputs to the COP30 Presidency Roadmap on the Transition Away from Fossil Fuels in a Just, Orderly and Equitable Manner.

(a) What are the most critical barriers — whether physical, economic, financial, institutional, technological or social— preventing a transition away from fossil fuels?

The physical climate system itself presents both urgency for and constraints on an orderly energy transition. WMO's State of the Global Climate report 2025 confirms that 2015-2025 are the hottest 11-years on record, and that 2025 was the second or third hottest year on record, at about 1.43 °C above the 1850-1900 average.[1] Due to the increasing physical climate changes and impacts at all levels, the window for an orderly transition is narrowing rapidly.

Against this backdrop, WMO identifies the following barriers as most critical:

Observational and data infrastructure gaps

- Insufficient observational infrastructure in many developing countries limits the ability to assess renewable energy resource potential (solar, wind and hydro) and to plan climate-resilient energy systems with confidence.

- Climate variability and change directly affect the reliability of renewable energy supply, including droughts reducing hydropower availability, shifts in wind patterns, and changes in cloud cover affecting solar generation. Without adequate meteorological services, these risks cannot be quantified or managed.

- Developing countries currently receive less than one-fifth of global clean energy investment, in part because the absence of country-specific, long-term climate projections and renewable resource assessments increases perceived investment risk and raises the cost of capital for clean energy projects.[2]

Institutional and capacity constraints

- Underinvestment in meteorological infrastructure (observation networks, forecasting capacity, and climate services) creates systemic risk that is often invisible to energy

[1] WMO (2025), State of the Global Climate 2025, WMO-No. 1342. Available at https://library.wmo.int/idurl/4/69807.
[2] IEA (2021), Financing Clean Energy Transitions in Emerging and Developing Economies. Available at https://www.iea.org/reports/financing-clean-energy-transitions-in-emerging-and-developing-economies

planners. Without reliable weather and climate information, it is not possible to de-risk renewable investments, insure infrastructure, or design efficient grid dispatch systems.

- National Meteorological and Hydrological Services (NMHSs) in least developed countries (LDCs) and small island developing states (SIDS) are frequently under-resourced and are not in a position to provide the energy sector with the actionable services it requires, amplifying all other barriers.

- The significant disparity in forecasting capabilities among WMO Members translates directly into a disparity of opportunity, limiting the ability of the developing world to assess renewable energy potential, attract investment, and plan an effective transition away from fossil fuels. Closing this gap requires scaling up global observation networks and forecasting capacity as the backbone that transform raw data into the climate intelligence on which energy transition decisions depend.

Physical and climate systemic risks

- The increasing frequency and intensity of extreme weather events, such as floods, heatwaves, tropical cyclones and wildfires, damages energy infrastructure and disrupts supply chains, raising the cost and risk of transition investment in climate-vulnerable regions.

(b) What potential levers, whether economic, financial, institutional, social or technological, exist for accelerating the implementation of the transitioning away commitment?

Weather, water and climate services represent a high-leverage, cost-effective enabler of the energy transition. WMO and its network of NMHSs provide, or are positioned to support, the following levers:

Climate intelligence for renewable energy planning

- Renewable energy resource assessments: Long-term climate datasets and projections enable countries and investors to site, plan, and finance renewable energy infrastructure with confidence.[3]

- Climate-informed energy demand planning: Climate predictions and projections underpin energy demand modelling that accounts for heatwave-driven cooling loads, changes in heating degree days, and seasonal demand shifts – which are essential inputs for grid planning and investment decisions.

- Subseasonal-to-seasonal forecasting: These services help grid operators manage the intermittency inherent in high-penetration renewable systems, improving dispatch efficiency and reducing the need for fossil fuel backup generation.

Enabling infrastructure and accountability

- Closing observational data gaps: WMO's Systematic Observations Financing Facility (SOFF) mobilizes resources to close critical gaps in weather and climate observation networks, particularly in LDCs and SIDS. Investment in observations through SOFF yields high returns: it enables climate-resilient renewable siting, reduces financing risk premiums, and supports the accountability frameworks that underpin transition finance.

[3] WMO-IRENA Renewable Energy Reports (2022, 2023, 2024). Available at https://wmo.int/publication-series/wmo-irena-renewable-energy-reports.

SOFF merits recognition in transition finance architectures as foundational enabling infrastructure.

- Greenhouse gas monitoring and accountability: WMO's Global Atmosphere Watch (GAW) network and the Integrated Global Greenhouse Gas Information System (IG3IS) provide independent, science-based verification of emission trajectories, complementing self-reported national inventories and providing a credible accountability layer for Roadmap milestones.

- Early warning systems for resilient energy infrastructure: The transition to renewable energy transforms, but does not eliminate, energy systems' exposure to weather and climate risk. In December 2025, WMO and the China Meteorological Administration published Best Practices on Early Warning Systems for the Energy Sector and Electricity Industry, demonstrating how NMHSs can deliver actionable, impact-based early warnings for storms, floods, icing, wind variability and power shortages.[4] Integrating these services into national energy planning and grid operations directly accelerates the transition.

- The WMO Weather, Climate and Water Intelligence Commons is designed to safeguard the critical public backbone of weather forecasting by pooling public, philanthropic, and private resources to ensure that data flows freely, systems remain interoperable, and innovation reaches those who need it most. Built on the foundation of the WMO Unified Data Policy, which committed Members to openly share core Earth system data, and the Global Basic Observing Network, which mandated consistent global observation coverage, the WMO Commons reinforces a system of cooperation in which no Member is left behind, ensuring that advanced data sharing capabilities are accessible to all nations.

Economic case for meteorological investment

- Cross-border trade in renewable electricity, underpinned by robust meteorological services, has the potential to reduce the overall cost of the net-zero energy transition by up to USD 3 trillion.[5] This underscores the economic case for investing in the enabling meteorological infrastructure that WMO provides.

(c) What country, regional or sector roadmap experiences, best practices, and lessons learned can be shared?

- WMO–IRENA joint renewable energy and climate reviews (2022, 2023, 2024): This review series provides a replicable model for translating global climate data into actionable renewable energy resource intelligence, enabling country and regional planners to understand how climate variability and change affect solar, wind and hydropower potential. The 2024 review demonstrated that climate variability is simultaneously a risk and an opportunity for the energy transition, and provides a framework for integrating climate intelligence into national energy planning.[6]

- Energy sector early warning: lessons from the WMO–CMA publication (2025): This publication presents Chinese operational experience in delivering targeted, impact-based warnings for the electricity sector, with case studies illustrating practical

[4] WMO (2025), Best Practices on Early Warning Systems for the Energy Sector and Electricity Industry: Case Studies from China. Available at https://library.wmo.int/idurl/4/69701.
[5] TransitionZero (2024), Cables To Change The World. Available at https://www.transitionzero.org/insights/cables-to-change-the-world.
[6] WMO-IRENA (2025), 2024 Year in Review: Climate-driven Global Renewable Energy Resources and Energy Demand. Available at https://library.wmo.int/idurl/4/69760.

pathways for storm, flood, icing, and wind variability warnings tailored to grid operators and infrastructure managers.[7]

- Joint WMO-WTO publication issued alongside COP29 Presidency initiatives on Green Energy Zones and Corridors: this cross-institutional publication links climate services to trade and finance policy, and includes compelling regional interconnection case studies: the Caspian Sea–EU Green Energy Corridor, the Lao PDR–Thailand–Malaysia–Singapore Power Integration Project, and African power pools, all underpinned by WMO meteorological services.[8]

- National Renewable Energy Atlases (NRAs): WMO has developed comprehensive technical guidelines to support countries in producing high-resolution national atlases for wind, solar, and hydropower.[9] The initiative aims to strengthen countries' capacity to assess renewable energy potential, improve long-term energy planning, and support progress toward net-zero emissions and Sustainable Development Goal 7. Pilot implementation is under way in Chile, Costa Rica, the Islamic Republic of Iran, and Malawi.

- SOFF: WMO's experience with SOFF and with bilateral capacity-building through regional collaboration centres demonstrates that targeted investment in observational infrastructure and NMHS capacity can, within a short time frame, unlock the climate intelligence needed to support renewable energy planning in under-served countries. Early results from SOFF-supported countries show rapid improvements in data availability and service delivery.

(d) How can a just, orderly and equitable transition best reflect the diverse realities of countries at different stages of development and with different degrees of dependence on fossil fuels?

Equity in the transition is inseparable from equity in access to the science that enables it. Countries are not in a position to plan an orderly transition away from fossil fuels without reliable, country-specific climate information and services. WMO is committed to continuing to produce and share this information.

WMO is committed to active engagement throughout the Roadmap process by providing authoritative scientific input to the high-level dialogues as required.

[7] WMO (2025), Best Practices on Early Warning Systems for the Energy Sector and Electricity Industry: Case Studies from China. Available at https://library.wmo.int/idurl/4/69701.
[8] WMO and WTO (2024), Supporting the renewable electricity transition through trade: Unlocking re-globalization opportunities via interconnection. Available at https://library.wmo.int/idurl/4/69077.
[9] WMO (2026), National Renewable Energy Atlases for Wind, Solar and Hydropower – WMO Implementation Guidelines: *Guidance for National Meteorological and Hydrological Services on Developing High-resolution Wind, Solar and Hydropower Atlases using Simulation, Observational and Climate Projection Data.* Available at https://library.wmo.int/idurl/4/69779.