Reflecting on COP29: Paving the way for Earth Intelligence and COP30

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The outcomes of the 29th Conference of the Parties (COP29) to the UN Framework Convention on Climate Change (UNFCCC), held in Baku Azerbaijan, have generally been met with a mixture of cautious optimism and significant criticism. Often described as "Finance COP" due to its focus on renewing collective climate finance, the key agreement that came out of over 2 weeks of intense negotiations was tripling finance to developing countries, from of $100 billion to $300 billion annually by 2035. For developing countries, who had been arguing to provide $1.3 trillion per year, this was way insufficient to finance the urgent actions required to combat climate change and support vulnerable nations.

Overshadowed by the result of the US Presidential Election and imminent US withdrawal from the Paris Agreement, negotiations were difficult with divergent and polarized views. Countries could not agree on key issues, including on how the outcomes of last year's global stocktake should be taken forward and deferred the decision to COP30, scheduled for November 10-21, 2025, in Belém, Brazil. Many other agenda items also failed to reach an agreement with or even without procedural conclusions.

Meanwhile, the Baku conference yielded a few positive results, including on operationalization of the Fund for responding to Loss and Damage as well as on technical considerations of Earth observations (EO). One of a limited number of agenda items that successfully produced substantive conclusion was Research and Systematic Observation (RSO) in which both EO and Early Warnings for All (EW4All) initiative have been discussed and highlighted. In fact, COP29 was an important milestone where the EO community began promoting the concept of 'Earth Intelligence', including through GEO's continuous contributions to EW4All.

Let us look back at what has happened before and during the COP29, take stock of what the policymakers think of EO and start considering what the GEO community can do towards COP30 and beyond.

Systematic observations for EW4All under the Paris Agreement

The EW4All initiative aims to ensure that everyone on Earth is covered by an early warning system by the end of 2027. Since it was launched by the UN Secretary-General in 2022, EW4All has become the central effort of climate adaptation under the Paris Agreement.

Article 7 of the Paris Agreement emphasizes the importance of improving scientific knowledge on climate, research, systematic observations of the climate system and early warning systems, with the view to guide climate services and support decision-making. Article 8 of the Paris Agreement mentions early warning system as an area of cooperation and facilitation to enhance understanding, action and support with respect to loss and damage. Subsequently decisions made in 2022 and 2023 positioned the EW4All---supported by systematic observation---to be a priority in climate adaptation, included in the outcome of the first global stocktake[1] as well as the global goal on adaptation.[2]

As these decisions originate from the discussed and negotiations that took place under the agenda item on Research and Systematic Observation (RSO), EW4All implementations under Paris Agreement have always been associated with EO, which is regarded as the essential ingredient for actionable climate information services and early warning systems. Without systematic observation of the Earth, it is not possible to effectively support vulnerable populations in the world, such as those in small island developing states and least developed countries, facing devastating impacts of climate change with intensifying and more frequent storms, droughts and other hazards.

Having in mine these interlinkages among the Paris Agreement, EW4All and Earth observations, GEO partnered with the UNFCCC Technology Executive Committee (TEC), which is mandated to analyze issues and provide policy recommendations on climate technology development and transfer.

Launch of the TEC-GEO Policy Brief on EW4All at Earth Information Day, COP29

[1] The CMA5 under the outcome of the first global stocktake (1/CMA.5) on *B. Adaptation*, acknowledged the need to enhance coordination of activities by the systematic observation in relation to strengthening the implementation of adaptation actions and recognizing the limited access to early warning and climate information services (para 49), repeated the same language from 1/CMA.4 para 48 (FCCC/PA/CMA/2023/16/Add.1 para 50).

[2] The CMA5 under the United Arab Emirates Framework for Global Climate Resilience which guides the achievement of the global goal on adaptation (2/CMA.5), includes a target (of the EW4All initiative) on "impact, vulnerability and risk assessment" that stipulates: "by 2027 all Parties have established multi-hazard early warning systems, climate information services for risk reduction and systematic observation to support improved climate-related data, information and services" (para 10(a) and 64 (a)).

Through 1.5 years of intensive collaboration, the GEO and the TEC developed a joint policy brief titled "Realising Early Warnings for All: Innovation and Technology in Support of Risk-Informed Climate Resilience Policy and Action," which was launched at Earth Information Day (EID) on the first day of COP29 in the second largest plenary room with full of audience.

The policy brief highlighted the essential role of climate technology policies and scalable fit-for-purpose technology solutions, most of which leverage EO, for improving climate information and disaster risk knowledge and consequently the effectiveness of the Multi-hazard Early Warning Systems (MHEWS). In essence, the policy brief recommends scaling up EO-based risk knowledge and technology solutions---which the GEO community calls the 'Earth Intelligence' ---for achieving the ambitious target of the EW4All initiative.

In fact, out of 21 illustrative examples of the EO-based risk knowledge and technology solutions described in the policy brief, 9 come from GEO Work Programme activities and 7 showcasing achievements of GEO Participating Organizations (POs) and member countries. New efforts, including the Global Ecosystem Atlas, were also described in the brief as an innovative case of public-private partnership where GEO collaborated with planet labs, Esri and the government of Maldives on the GEO-Maldives Ecosystem Mapping Accelerator. In addition to the GEO Secretariat team, over 40 GEO experts and community members, largely drawn from GEO's Climate and Disaster Risk Reductions Working Groups and POs, provided information, comments and technical validations to ensure the robustness of the policy brief.

As the GEO Secretariat Director explained in her presentation at EID, "the GEO, as an established intergovernmental organization, advancing the use of EO data to deliver transformative 'Earth Intelligence' solutions, brought its innovative use cases and extensive network of scientists and technical experts from public and private sectors, to ensure the robustness of the policy brief." When the TEC chair presented the contents of policy brief, he highlighted TEC's recommendations to the COP, encouraging Parties, international organzations and stakeholders to "leverage the global community of scientific expert and innovators, including GEO" to scale up innovation and fit-for-purpose technology solutions for enhancing risk-informed climate resilience policies and actions and implementation of the EW4All. As they presented at the opening, their core messages set overall tone of the EID as a mandated official event to inform negotiations.

Also, during the EID, two GEO Secretariat representatives served as a moderator and a rapporteur for a breakout discussion on overarching theme of the event: "Advancing technologies, innovation and digital transformation for Earth observation." The breakout discussion was substantiated by expert presenters, including Director of the Copernicus Atmosphere Monitoring Service and the ITU focal point of the EW4All, who also leads of EW4All Artificial Intelligence (AI) subgroup in which GEO has been actively participating. NOAA also presented the roles of AI and machine learning in EO.

RSO conclusions with "GEO language"

After a week-long negotiation with inputs from EID, the RSO conclusion was successfully adopted, well-reflecting the EID breakout discussion and the language of the TEC-GEO policy brief.

The conclusion started off by "recogniz(ing) the vital importance of robust Earth observation systems…as well as the role of related innovation and technologies, for…adaptation action…and early warning systems." GEO was specifically mentioned in the context of the policy brief, which was "noted with appreciation."

Directly reflecting the EID breakout discussion as well as the policy brief, the RSO conclusion "acknowledged the advancements in digital technologies and innovative systems for Earth observations, prediction and assessment, including early warning systems, such as through artificial intelligence, machine learning and other novel methods, and noted gaps in the development and deployment of solutions that can be scaled up."

These points on widening global disparity in EO technology and innovation are followed by a paragraph that mirrored the language of the TEC-GEO policy brief: "encourage the Parties and relevant organizations to continue to establish and support open data-sharing and to develop openly available, reliable, fit-for-purpose and accessible data products." This para essentially validates the GEO community's ongoing efforts in promoting open EO data and knowledge as well as the GEO community's continuous effort in the EO technology advancement including the use of AI to analyze EO big data. This paragraph also echoes GEO's post 2025 strategy to promote co-creation of 'Earth Intelligence' to address gaps in technology development and deployment.

Way Forward to COP30

This RSO conclusion from Baku indicates that the Parties to the Convention highly value what GEO has been doing over the past decade and what GEO envisions to do in the next decade: co-developing and delivering 'Earth Intelligence' solutions. As the Post 2025 Strategy Implementation Plan is scheduled to be adopted at GEO Global Forum in May this year, it would be important for the GEO community, especially its Members and relevant POs to coordinate and collaborate and seek for official endorsement of the SIP in the RSO conclusion in Belem, in a similar way that the GEO's previous implementation plan was recognized back in 2004.[3] It would also be useful for the Members and POs to coordinate on

[3] The 20th session of the Subsidiary Body for Scientific and Technological Advice (SBSTA) (FCCC/SBSTA/2004/6) in para 97 "noted the progress made by the ad hoc Group on Earth Observations

having a paragraph in the RSO conclusion to request GEO to make a regular reporting of the progress of the SIP implementation.

In doing so, GEO should clearly articulate how GEO's 'Earth Intelligence' solutions contribute to the key elements of Paris Agreement. For example, the Global Heat Resilience Service is positioned to be a key contribution to the EW4All, noting a new collaboration among GEO, WMO and GCOS through the iClimateAction project, funded by the European Union. Furthermore, considering that COP30, hosted by Brazil, is expected to highlight the role of nature-based solutions, the GEO Ecosystem Atlas can be presented with its potential to contribute to loss and damage assessments.[4]

With encouraging RSO conclusions that came out of Baku last year, an early discussion by the GEO Executive Committee would be useful to plan for COP30. Strategic direction provided by the GEO governance body can facilitate and ensure coordination among GEO members and key POs, such as WMO and GCOS, so that GEO can receive another formal recognition and endorsement of its strategic plan to deliver 'Earth Intelligence' solutions and a request for regular reporting.

(GEO) to develop a 10-year implementation plan for a global Earth observation system of systems (GEOSS). It welcomed the collaboration between GCOS and GEO in developing their respective implementation plans and urged both bodies to integrate them to the extent possible. The SBSTA emphasized the need to treat global climate monitoring as a priority within GEOSS."

[4] Ecosystems such as mangroves and coral reefs protect people and land from climate-related disasters by providing ecosystem services, for example, dampening winds and storms, breaking waves, and reducing coastal erosions as well as providing carbon sinks. The Atlas' aim of mapping ecosystem types supports countries know the precise location of ecosystems that are most susceptible to climate change impacts and help assess where such important ecosystem services with values in economic and non-economic terms are getting lost.