Table	Subject	Preliminary key elements provided by note-takers
1	The role of national delegates to support building the global observing system for climate	- **Systematic Observations (SO) and SOFF**: Raise awareness on the importance of systematic observation and the Systematic Observations Financing Facility (SOFF) to support decision-making. - **Sustainability:** Ensure long-term financial and technical support for weather and climate observation, incl. maintenance and upgrades, building on existing infrastructure rather than one-off projects. Welcome SOFF as a mechanism that provides such long-term funding for countries' compliance with the internationally agreed Global Basic Observing Network. Welcome scale and speed with which SOFF has become operational - **Capacity Building**: Ensure systematic strengthening of national observing capacity, beyond one-off projects. - **Data:** Extend SOFF to other domains such as ocean. Maximize complementarity between satellites and in-situ observation. Support assessment of local socio-economic benefits of observation data generated by countries - **Attribution**: Strengthen relevant observations to support fast-track attribution studies of extreme events
2	Why we need a truly global observing system	- Observations should be considered to be a global public good. - Significant gaps in the global observing system remain regionally (e.g., across Africa), spatially (e.g., ocean, high latitudes, planetary boundary layers), and conceptually (e.g., local and traditional knowledge). - Improvements in observation are essential for mitigation, adaptation, and early warning systems—particularly to track the efficiency of actions taken and better prepare for, learn from and attribute worsening extreme events. - SOFF is a critical tool for overcoming obstacles in improving global coverage
3	Global climate indicators – from the global observing system to knowledge transfer at the science-policy nexus – what can we further do?	- Indicators must be developed as a way to support a narrative. The current set mixes impact indicators (II) and global climate (GC) ones. Impact indicators may benefit from a bottom-up assessment and must be regional in scope. Global climate indicators should be expanded to include new metrics such as energy imbalance and fluxes, which have been put forward by the participants. - Need for a stronger science policy dialogue to guide the global adaptation agenda and the development of specific adaptation indicators.

		- CO_2 concentrations currently monitored, but what matters are GHG emissions at a regional level and fluxes from ocean and the biosphere (e.g., forests, permafrost) into atmosphere (and their connection to biodiversity). - In order to be useful, indicators need to be authoritative and built on trust (e.g., a role for national data to validate global estimates). Multilateral approach is key to enhance ownership, support national implementation and increase usability. - Challenging to take full advantage of these indicators at a science-policy interface. Greater efforts are needed to improve communication of the causal chain linking physical drivers to impacts (e.g., emission —> concentration —> forcing —> temperature —> impacts).
4	Role of observations in support of national reporting	- Inventories and observations provide different information for source attribution and resolution (spatial and temporal). - Better communication and collaboration needed between inventory compilers, atmospheric scientists and IPCC. - Improved data access required, including reduced latency, public access and transparency.
5	What are the information needs for the 2nd Global Stocktake (GST2)?	- Strengthen observations and data in order to forecast system response to different GHG projections. - Observations to understand system response to overshoot. - Better measure the sinks of GHG, reconciling top-down and bottom-up. - Identify adaptation and resilience metrics. - Ensure observation standards, quality assurance and quality control - Involvement of youth including via education and citizen science. - Create a database of climate success stories
6	Public-private sector partnerships in GHG observations	- Constraints related to funding and institutional arrangements hinder partnerships, particularly in critical areas like climate technology. - Effective collaboration demands trust-building, community involvement, and addressing data and innovation disparities. - Success requires focusing on profitability and regulatory support
7	Understanding Tipping points and observation needs	- Need for more research, observation and modelling to increase the understanding of tipping points, to define and monitor early warning indicators (of passing a tipping point) and quantify socio-economic impacts of tipping points.

		- Need for a defining framework regarding tipping points: Definition, timescales, irreversibility, duration, rate of change, variables, complexity of drivers. - The concept of tipping points is policy relevant for informing mitigation pathways as well as planning for adaptation, resilience, and addressing loss and damage. - It's challenging to communicate the risk, uncertainty, definition, and socio-economic impact of tipping points to the public and policy makers – narratives are needed.
8	Cryosphere, mountains, and adaptation	- Key risks associated with climate change in mountains and the cryosphere are increasing worldwide (e.g., natural hazards and disasters, threatened water security, species loss and ecosystems services, loss of cultural and intangible values). Yet there are observation gaps in the systematic tracking of implementation and effectiveness of adaptation action to address these key risks, which also affect regions further downstream. - Mountains and the cryosphere are globally distributed, with vast regional differences in monitoring capacities, data and information gaps e.g., permafrost and Glacial Lake Outburst Floods (GLOFs), and in sustaining long-term observation records across all cryospheric components (snow, permafrost, and ice). Prospects to support intra- and interregional exchange and foster capacity sharing and development need improving, including resources to support technical and institutional capacities for data sharing and governance. - Opportunities exist in complementing conventional instrument-based numerical observations with community-based observations, including Indigenous knowledge and local knowledge, thereby providing a (more) comprehensive, culturally relevant, and qualified knowledge basis to track impacts associated with climate change, inform adaptation action, and improve resilience. - Improve methods to combine in-situ, satellite-based and other remotely-sensed data, provided there are agreed data protocols and standards to facilitate this exchange at the relevant spatial-temporal scales – including along elevational gradients.
9	Building observations and understanding of ocean acidification and deoxygenation	- Consideration of ocean and climate change remains underrepresented in the GCOS/UNFCCC, particularly ocean acidification and deoxygenation, both direct results of increased CO_2 concentrations in the atmosphere, and therefore also the ocean. Ocean acidification and deoxygenation are being recognized as GCOS climate indicators, SDG indicators and Global Biodiversity indicators.

		Communication and engagement among scientists and policymakers could result in opportunities for ocean climate action. - Global estimates of loss of oxygen and increase of ocean acidification exist, but to be able to use them in informing adaptation and mitigation strategies, observations need to be increased. Many countries are not able to track these ocean changes due to technical/human capacities constraints. Need to support capacity development and knowledge transfer in these fields. - Ocean acidification and deoxygenation data and information should be included in a holistic approach for climate resilient development. Actions in coastal areas such as wastewater treatment and efficient use of fertilizers can reduce coastal deoxygenation and acidification. - The ocean should not be seen as dumping ground for CO_2. Cost benefit risk/rewards analysis must include impacts of CO_2 disposal on ecosystems via acidification and deoxygenation. - Increase awareness of the World Ocean Assessment.
10	Observations for disaster risk reduction (DRR)	- Address gaps in data to target fast and slow onset events. - Funding to strengthen national observations networks. - Data interoperability, standardization, homogenization and quality control. - Training, capacity development and guidance for working with models, scenarios and observations. - Data, guidance and framework for assessing and monitoring impacts e.g., with national inventories of impacts, and to develop impact-based forecasts. - Build understanding and trust in climate information, and how uncertainties are communicated. - Improve coordination amongst national agencies involved in forecasts, civil protection and decision makers around data-driven information related to DRR. - Improve coordination amongst international organizations and initiatives working in countries on DRR.
11	Indigenous knowledge and data	- **Recognition and Integration of Indigenous Knowledge Systems**: Indigenous Peoples are not just vulnerable groups but also custodians of invaluable knowledge systems, shaped by generations of interaction with nature. Mainstream climate research and policy must shift from viewing Indigenous Peoples solely through a lens of vulnerability to recognizing and integrating their

		deep-rooted wisdom, values, and insights in understanding and addressing climate change. - **Enhancing Inclusive Engagement and Methodologies**: To bridge existing gaps, it's crucial to develop inclusive policy frameworks and research methodologies that respect and integrate Indigenous knowledge alongside scientific methods. This involves not only acknowledging the diversity within Indigenous communities but also ensuring their active participation in all stages of climate policy development and research. Adopting culturally sensitive approaches and fostering environments for collaborative knowledge production are key to this transformation. - **Overcoming Linguistic and Resource Barriers**: Addressing the linguistic barriers and resource constraints faced by Indigenous communities is essential for their meaningful involvement in climate research and policy. Ensuring that Indigenous knowledge is not lost in translation and providing capacity-building opportunities will empower these communities to contribute effectively. Moreover, shifting the narrative from vulnerability to a focus on the strengths and leadership roles of Indigenous Peoples in climate action is vital for a more balanced and holistic approach.
12	Community engagement in contributing to systematic observation (ACE/Youth)	- **Empowering Citizen Participation**: Highlighting the importance of engaging citizens in systematic observation through education, accessible tools, and community involvement. - **Standardizing Data Collection and Formats**: Emphasizing the need for uniform data metrics and formats to streamline citizen-contributed observations for consistency and ease of use. - **Enhancing Communication and Inclusivity**: Focusing on effective communication strategies and inclusivity to ensure diverse groups are informed and can participate in systematic observation. - **Youth Engagement and Education**: Underlining the significant role of youth in systematic observation and the integration of climate and environmental education at all educational levels into the curricula. - **Utilizing technology and social media**: Exploring the use of advanced technologies, including AI, and the power of social media, as tools to facilitate and amplify citizen-driven systematic observation.