PANEL I

(Order of interaction will be extempore i.e. at the time of #Discussion)*

16:00 – 17:00	**The Water Quality–Quantity Nexus — Toward Integrated Hydrological Futures**
Moderator: Manish Kumar (TEC)	Panelists: Saugata Datta (UTSA); Aldo I. Ramírez (TEC); Jürgen Mahlknecht (TEC); Vijay P. Singh (Texas A&M)
Key Discussions	Are quality and quantity truly two sides of the same coin when it comes to water? If so, is now the time to address both together? If we focus on one, will the other issue be neglected, or could concentrating on one actually benefit the other? How is climate change reshaping this relationship?

🔷 **Round 1 – Expert Lens on Hydrological Extremes and Water Quality Quantity Nexus**

Panellist	Key Question / Theme
Prof. Vijay P. Singh	How do hydrological extremes such as floods and droughts influence the balance between available water quantity and deteriorating quality in changing climatic conditions?
Prof. Aldo I. Ramírez	What role do regional hydrological models and digital twin frameworks play in coupling surface–groundwater interactions to predict both water quality and quantity changes in data-scarce basins?
Prof. Saugata Datta	How can integrated hydrogeochemical approaches link subsurface water quality with groundwater quantity under stressors such as over-extraction and contamination?
Prof. Jürgen Mahlknecht	From a sustainability perspective, how can water balance assessments and isotopic tracers act as early-warning indicators for aquifer depletion and ecosystem stress?

🔷 **Round 2 – Technology and Integration for Safeguarding the Hydrological Future**

Prof. Vijay P. Singh:
How can **hydrological modeling** contribute to safeguarding hydrological futures under increasing climatic and anthropogenic stress?

Prof. Aldo I. Ramírez:
How can **digital twin frameworks** enhance predictive capacity and adaptive governance for hydrological systems?

Prof. Jürgen Mahlknecht:
How can **transboundary aquifer management** promote equitable access and prevent shared groundwater contamination?

Prof. Saugata Datta:
How can understanding **multi-contaminant co-occurrence** improve strategies for groundwater protection and remediation?

🔷 **Round 3 – The Way Forward: Future Research, Policy, and Community Needs**

Each expert may highlight **three future needs**, focusing on:

- **Research directions** (new tools, coupled models, tracer innovations)
- **Policy or management approaches** (governance, cross-border collaboration)
- **Community and communication aspects** (education, participatory hydrology, One Health linkages)

🔷 **(If time allows) Rapid Fire Round – Extempore Reflections**

Short, spontaneous reflections on:

- One *hydrological innovation* that excites you most for the next decade.
- One *critical barrier* we must overcome for water security.
- One *word or phrase* that defines a "hydrologically safe future."