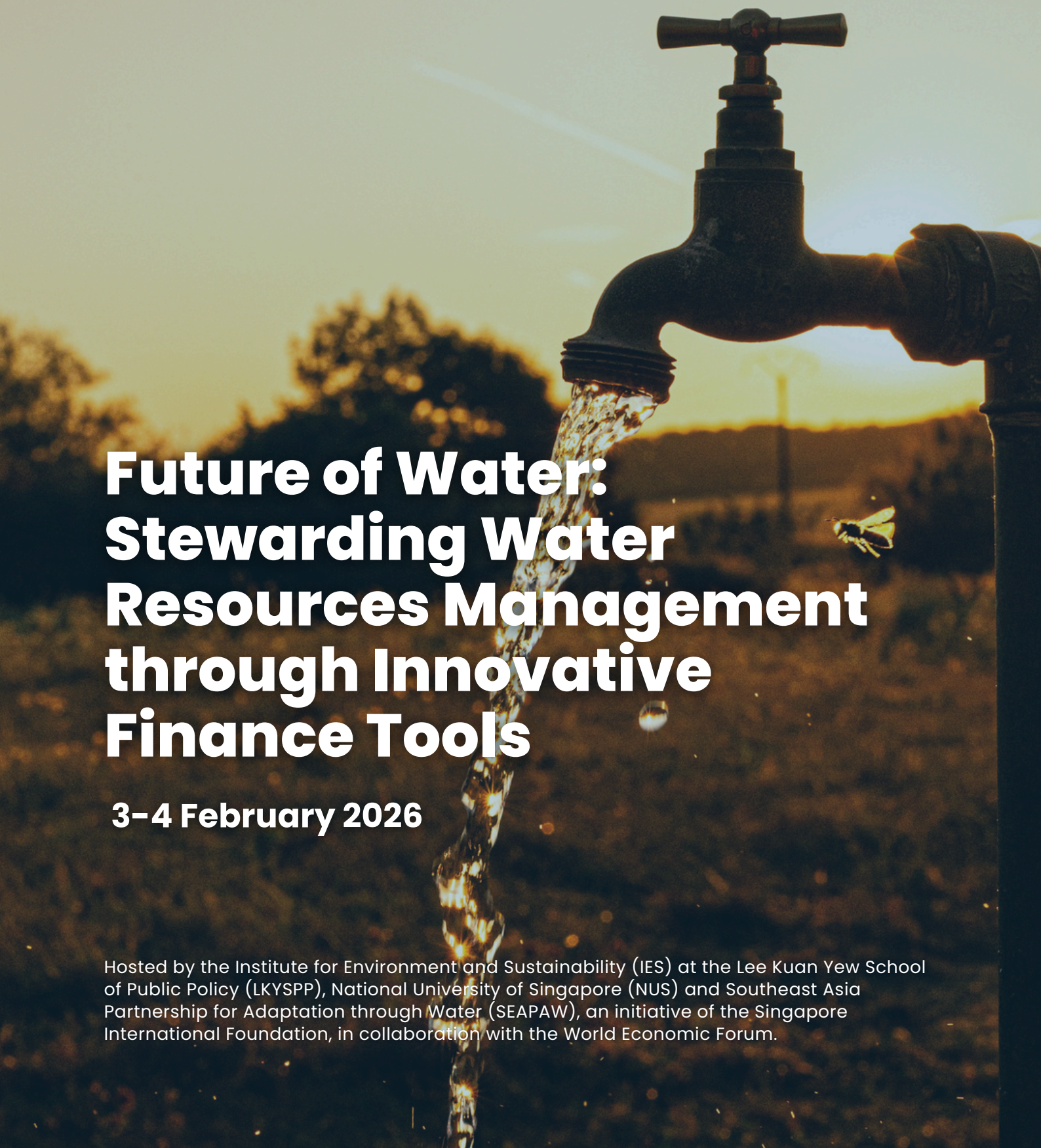
Lee Kuan Yew School of Public Policy

IES Institute for Environment and Sustainability

SEAPAW

Workshop Proceedings Report



Future of Water: Stewarding Water Resources Management through Innovative Finance Tools

3-4 February 2026

Hosted by the Institute for Environment and Sustainability (IES) at the Lee Kuan Yew School of Public Policy (LKYSPP), National University of Singapore (NUS) and Southeast Asia Partnership for Adaptation through Water (SEAPAW), an initiative of the Singapore International Foundation, in collaboration with the World Economic Forum.

INTRODUCTION

The global water crisis is no longer a distant risk but an emerging reality. Recent work by the Global Commission on the Economics of Water and warnings of a new era of "global water bankruptcy" highlighted by the United Nations University Institute for Water, Environment and Health (UNU-INWEH) report, underscore growing concerns of an impending global water shortage. Decades of resource mismanagement, coupled with increasing climate volatility, have placed unprecedented strain on water systems worldwide. (GCEW, 2024; Madani, 2026; Madani et al., 2026; Mazzucato et al., 2023).

Against this backdrop, interest in Water Credits is accelerating. Rising demand, tightening regulation, and increasing investor attention to water-related risks are pushing governments and firms to explore new instruments capable of managing scarce water resources at scale. At the same time, the limitations of existing policy tools—such as water tariffs, publicly funded infrastructure, and usage restrictions—are becoming more apparent. These approaches, while essential, are often too blunt or fragmented to address the complex, interconnected challenges of water scarcity, pollution, and overuse.

Water Credits have therefore emerged as a potential policy innovation . By combining market-based incentives with the ecological realities of water systems, they can better align water demand with sustainable supply. However, unlike carbon markets, water crediting remains conceptually unsettled and methodologically immature. Foundational issues—ranging from definitions and measurement to governance and equity—are still evolving.

Beyond their technical function, Water Credits were also discussed as a potential organising concept, a way to create a clearer rallying point for water stewardship, similar to how net zero has helped align action and capital around carbon. Participants noted, however, that any such rallying point must reflect water's local, basin-specific nature and cannot rely on simple offset-style logic.

An exploratory workshop was timely as many key questions remain unresolved:

- What exactly should be credited (e.g., absolute versus intensity-based use, potable versus reclaimed water);
- At what spatial and institutional scales systems should operate (e.g., basin, national, or transboundary levels);
- How benefits should be measured and verified; who bears risks; and how equity can be safeguarded.

Without structured dialogue across disciplines and sectors, premature standardisation risks locking in weak designs, while excessive caution may delay necessary experimentation.

This workshop created a neutral platform for policymakers, researchers, industry actors, and civil society to critically examine these issues. Held under Chatham House rules to encourage open exchange, discussions over two days moved from problem framing to governance challenges across scales, to potential linkages with carbon markets, and finally to practical pathways through case studies and sandbox approaches across sectors. The workshop contributes to broader regional and global conversations on environmental markets, blended finance, and the institutional foundations required for credible and effective water stewardship.

OBJECTIVES OF THE WORKSHOP

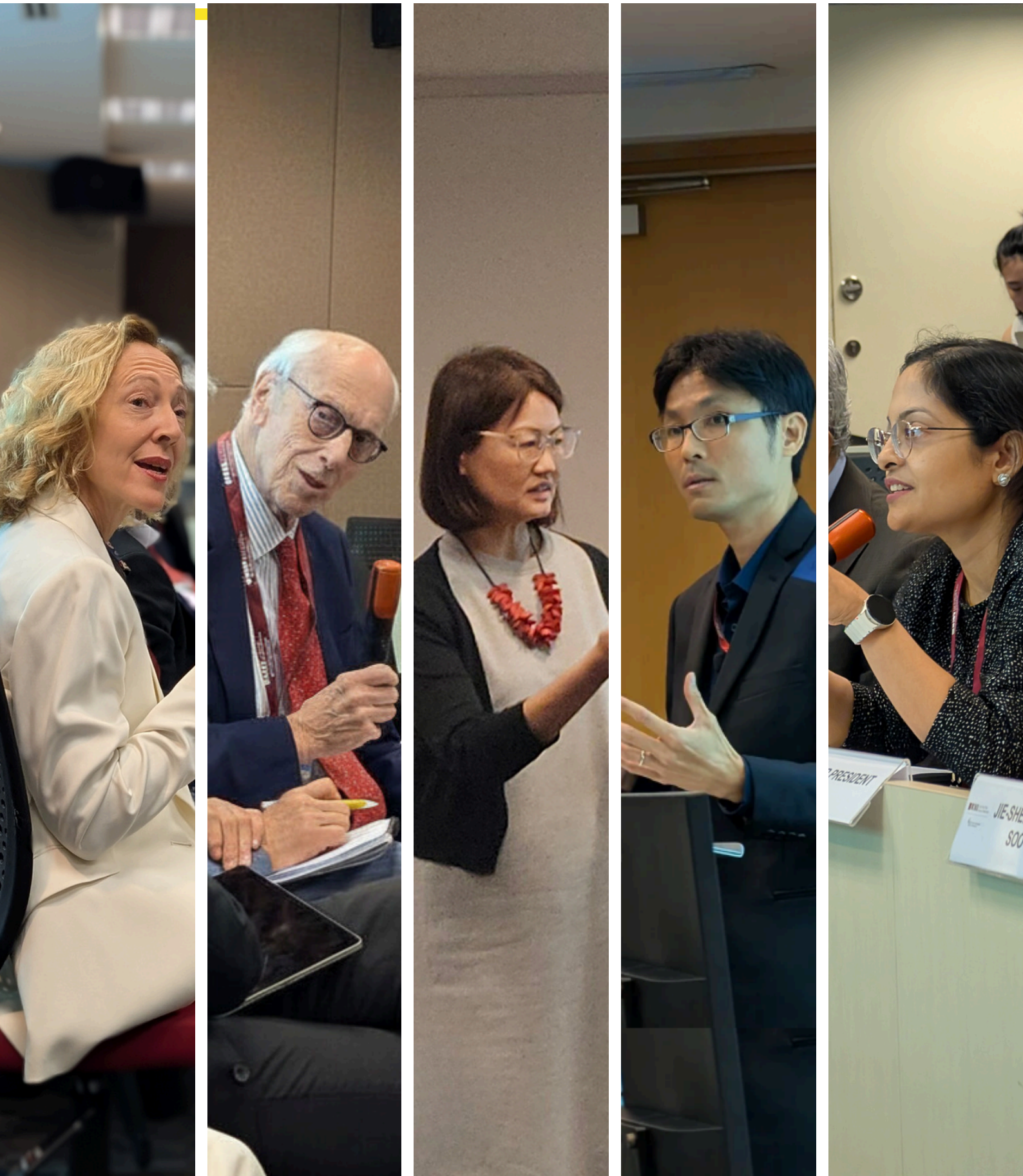
1. It aimed to surface conceptual, governance, and implementation challenges that remain unresolved in Water Credits. Participants interrogated definitions of additionality, attribution, permanence, and leakage in contexts where hydrological outcomes are deeply local and politically mediated.

2. The workshop compared Water Credits with existing instruments such as tariffs, abstraction charges, pollution fees, and tradable permits. This comparative lens helped distinguish when crediting might add value and when conventional regulation or pricing may be more effective.

3. Discussions sought to identify conditions under which pilot projects may be appropriate, including institutional readiness, data infrastructure, stakeholder legitimacy, and safeguards for communities and ecosystems.

4. Participants mapped questions requiring further research, particularly around measurement, reporting, and verification (MRV), interoperability with other markets, and the political economy of implementation.

SUMMARY OF PANEL DISCUSSIONS



01. Pricing Water Right: From Tariffs to credits for an Efficient Finance Tool

This panel examined how traditional pricing mechanisms—such as tariffs, conservation taxes, and wastewater charges—compare with emerging ideas like Water Credits as instruments to finance sustainable water resources management. Speakers underscored that water pricing has two central functions: managing demand and generating revenue for financing infrastructure, water treatment, and service provision.

Pricing water effectively can shape behaviour, signal its scarcity value, while underpin systems viability. As such, tariff design reflects policy priorities—conservation, equity, or financial sustainability—and involves inherent trade-offs between efficiency, fairness, environmental goals, and political feasibility.

Cost recovery is politically sensitive because water has human rights, cultural, and environmental dimensions. While operational costs may be recoverable, full cost recovery can create distributional impacts, requiring a holistic view that accounts for public health, ecosystem benefits, and existing cross-subsidies (e.g., through property taxes).

Public legitimacy emerged as critical. Water prices are more easily accepted when rates are perceived as fair relative to service quality, and the tangible costs of provision and procurement along with revenue use are communicated transparently. These aspects are closely linked to trust in public institutions. Participants stressed that tariff reforms should be gradual, incremental, and indexed to inflation, rather than abrupt adjustments.

The panel also highlighted that water quantity must be capped and managed effectively, particularly in the face of climate change and declining supplies. Pricing alone cannot guarantee equity unless minimal usage is assured, and sustainability cannot be ensured unless extraction limits are capped or with deliberate restoration.

Participants also observed potential missed opportunities. Additional tariff components—such as wastewater or reuse charges—could strengthen revenue bases. However, simply pricing wastewater may not drive systemic change. More integrated approaches to stormwater management,

wastewater circularity, and reuse could deliver better outcomes.

In this context, Water Credits were discussed as a potentially innovative and complementary tool. Rather than relying solely on government-managed wastewater services, credits could incentivise industrial users to cap usage, improve water use efficiency, and invest in stewardship activities. However, credits cannot substitute for strong institutions, clear water rights, and credible monitoring systems. They must build upon sound tariff structures and governance foundations.

Key Insights

- **Pricing works best with clear objectives.** Tariff design must align with policy goals—whether conservation, equity, or financial sustainability.
- **Trust and transparency are foundational.** Acceptance depends on fairness, service quality, and clear communication of costs.
- **Equity constraints shape cost recovery.** Full cost recovery is often neither politically nor socially viable without broader fiscal instruments.
- **Credits as a substitute for political constraints**. While raising tariffs is the most efficient way to signal scarcity, political realities often cap water prices far below their true value. Water Credits can function as a "shadow price"—allowing corporations to pay a premium that reflects water's true cost, without requiring governments to impose unpopular tariff hikes on the general population.

Tensions Highlighted

- **Efficiency vs. equity:** Treating water purely as an economic good conflict with its social and cultural dimensions. Higher prices can drive conservation but risk burdening vulnerable groups.
- **Regulation vs. market incentives:** A key tension emerged between enthusiasm for innovation and caution against treating markets as shortcuts to difficult reforms. While Water Credits offer flexibility, they cannot substitute for strong governance and clear extraction limits.

Overall, the panel concluded that innovative policy tools such as Water Credits may enhance existing systems, but only when built upon well-designed, trusted, and equitable tariff frameworks.

02. Local to Transboundary: Scaling Up Water Governance

Panel 2 examined how water governance challenges evolve as management scales from local aquifers and watersheds to river basins and transboundary systems. Speakers highlighted that water (despite its hydrological inter-connections) is inherently geographically constrained: hydrological boundaries rarely align with political jurisdictions, making coordination both technically and politically complex.

At the local level, governance arrangements can be more adaptive and responsive, with clearer attribution between action and outcome. However, as scale increases, competing interests, upstream–downstream asymmetries, and differing national priorities complicate decision-making. Transboundary rivers require sustained diplomacy, trust-building, and institutional continuity- one most important aspect being data-sharing and response coordination at the river basin scale.

Participants stressed that scaling up is not simply a matter of expanding geographic coverage. It requires aligning legal frameworks, data systems, financing mechanisms, and enforcement capacity across jurisdictions. Fragmented authority can lead to policy incoherence, regulatory gaps, and uneven accountability.

An interesting analogy being discussed was that river basin coordination agreements are more in form of 'divorce agreements', rather than 'cooperation agreements' where focus is on resource sharing rather than fair, equitable resource management and benefits sharing.

The discussion also explored how innovative instruments, including Water Credits, would need to account for these multi-level governance realities. One such work-in-progress example from China being the 'state' coordinated ecological compensation mechanism undertaking fiscal transfer agreements for benefits enjoyed downstream owing to conservation practices upstream. However, one caution being highlighted was that what works at sub-basin level may not translate easily to regional or cross-border contexts.

Key Insights

- **Hydrological interdependence rarely aligns with political boundaries.** Effective governance must bridge mismatches between natural water systems and administrative boundaries.
- **Scaling-up increases transaction costs.** Coordination, monitoring, and enforcement become more complex as more actors and jurisdictions are involved.
- **Upstream–downstream dynamics matter**. Benefit-sharing and burden-sharing arrangements are central to legitimacy.
- **Institutional capacity determines feasibility.** Clear mandates, stable agreements, and shared data platforms are prerequisites for scaling any market-based tool. In the absence of these, informal cooperation mechanisms may matter as much as formal treaties.

Tensions Highlighted

- **Local flexibility vs. basin-wide coherence:** Small-scale, informal cooperation arrangements may be more agile, but basin-level governance is necessary to avoid fragmented outcomes.
- **National sovereignty vs. collective management:** Transboundary cooperation requires balancing domestic priorities with shared resource stewardship. A vision easier said than done, specifically with given lack of political alignment and uneven benefit sharing owing to upstream-downstream asymmetries.
- **Innovation vs. institutional readiness:** Introducing (innovative) crediting mechanisms across jurisdictions may be attractive, but governance gaps can undermine credibility.

Overall, the panel concluded that scaling water governance demands institutional alignment and political commitment, and these requirements increase exponentially as boundaries expand from local to regional. Any financial innovation, including Water Credits, must be carefully calibrated to the hydrological and geopolitical realities of the basin in question.

03. Linking Water Conservation Credits to Carbon Markets (Part I & II)

Carbon markets provide useful institutional scaffolding (MRV approaches, registries, verification culture, investor familiarity) that could accelerate experimentation in water finance. However, panellists repeatedly cautioned that **water is not carbon:** it is local, time-varying, and governance-dependent, making simple "carbon-like" crediting (fungible units, standard baselines, tradable offsets) is risky and potentially misleading.

The dominant recommendation was to prioritise credible accounting and claims (often framed as "water benefit accounting/certification") before scaling any tradable "Water Credit" market.

Panels 3 and 4 explored whether water conservation credits could be linked to existing carbon market infrastructure, and what risks and opportunities such alignment might present. Speakers examined whether established carbon systems—registries, standards, verification protocols, and investor networks—could help accelerate the development of credible water finance mechanisms.

Speakers acknowledged that carbon markets offer useful institutional templates. Decades of experience have produced relatively mature methodologies for MRV, as well as established channels for mobilising private capital. Leveraging this infrastructure could reduce transaction costs and help Water Credits gain market recognition more quickly.

However, strong caution was expressed against directly transplanting carbon logic into water systems. Unlike carbon, which is globally fungible, water is highly local. Hydrological outcomes depend on basin-specific conditions, seasonal variability, and socio-political arrangements. A litre of water saved upstream has different implications depending on location and timing. As such, additionality, baselines, permanence, and leakage are far more context dependent.

Speakers also highlighted reputational and integrity risks. If methodologies are weak or outcomes overstated, confidence in both water and carbon markets could be undermined. Robust safeguards, conservative accounting, and transparency in governance are therefore essential.

The discussions further emphasised the importance of demand. Corporates facing water-related operational and supply-chain risks may have strong incentives to invest in stewardship. However, clarity is

needed on whether demand would be voluntary, compliance-driven, or embedded within broader ESG frameworks.

Across both panels, participants agreed that Water Credits should not be treated as a simple add-on to carbon offsets. Instead, they may be layered within broader sustainability strategies while retaining distinct standards that reflect water's unique hydrological, social, and geopolitical characteristics.

Key Insights

- **Carbon infrastructure offers useful lessons- especially at the early stage.** Existing carbon systems provide tested templates for MRV discipline, registries, transaction processes, and capital mobilisation, leveraging which could reduce start-up costs and speed learning cycles.

- **Water is not fungible; methodologies must be basin- and time-specific.** A litre saved (or replenished) has different implications depending on basin scarcity, season, water quality, and upstream/downstream dynamics. Baselines, additionality, leakage, and permanence are therefore more context-dependent than in carbon markets.

- **Integrity is paramount; under-estimated or over-stated claims can undermine market confidence and trust broadly.** Conservative baselines, transparency, and strong verification are critical to credibility.

- **"Water benefit accounting/certification" could serve as a pathway toward full-fledged Water Credits.** Approaches like Volumetric Water Benefit Accounting (VWBA) were discussed as a structured way to quantify, attribute, verify, and communicate water quantity (or quality) benefits without prematurely treating them as tradeable credits.

- **Demand is conditional on clarity.** While firms exposed to water risk are eager to invest, their demand is currently constrained by a lack of clear disclosure frameworks and regulatory guidance. They are hesitant to purchase credits without assurance that these investments will be recognised for compliance or reporting purposes.

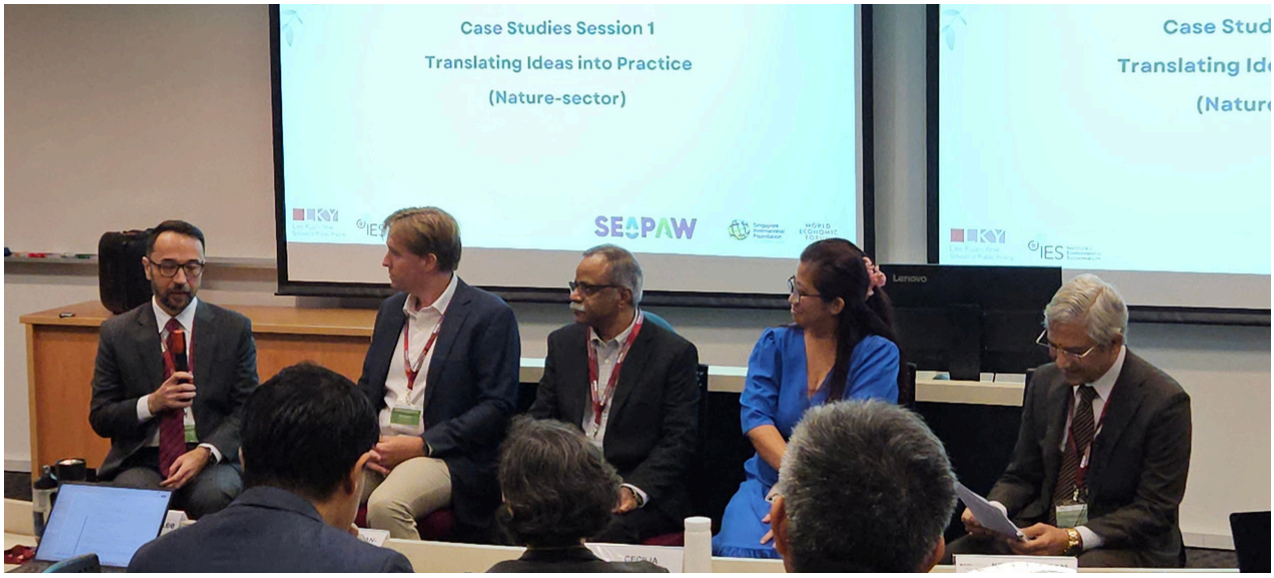
- **Existing climate mitigation projects with water outcomes are plausible entry points for Water Credits.** Projects where carbon is the creditable commodity, but water outcomes are meaningful co-benefits were viewed as a pragmatic entry point (e.g., agriculture methane reductions with water/energy savings; wastewater methane capture). However, such co-benefits are only described qualitatively at present.

Tensions Highlighted

- **Speed vs. suitability:** Leveraging carbon systems could fast-track development, but risks oversimplifying water's complexity in defining and measuring its co-benefits.
- **Standardisation vs. context specificity:** Markets favour standard units, while hydrology demands local calibration.
- **Innovation vs. reputational risk:** Rapid market expansion without strong safeguards could undermine long-run trust.
- **Voluntary vs. regulatory drivers:** Uncertainty remains over whether Water Credits will rely primarily on voluntary corporate action or future compliance mechanisms.
- **Offsetting narratives vs real system improvements.** Concerns were raised about "replenishment/harvesting" claims: who owns the water, whether recharge is hydrologically real, and whether benefits are displaced (including across basins).

Overall, the panels concluded that linkages with carbon markets may provide institutional scaffolding, but Water Credits must evolve as a distinct instrument, carefully designed around basin realities and governance capacity.

04. Case Study Sessions [Day 2]



The Day 2 case study sessions grounded earlier discussions in real-world applications across agriculture, nature-based solutions, data centres, and water treatment. Speakers showcased emerging pilots and operational examples to test how water-related interventions can be measured, financed, and scaled.

Across sectors, case studies demonstrated that while technical solutions for improving water efficiency and quality already exist, the challenge lies in standardising measurement, aligning incentives, and ensuring long-term accountability.

In agriculture, Alternate Wetting and Drying (AWD) in rice cultivation emerged as a leading candidate for early crediting. Case studies from Vietnam and India demonstrated that this technique can deliver a "triple win": reducing water use by ~30%, lowering methane emissions by ~50%, and cutting energy costs for pumping. Because AWD generates verified carbon assets (methane avoidance), it offers a pragmatic pathway to “stack” water conservation benefits onto established Carbon Credit methodologies. In ecosystem-based projects, such as watershed restoration, benefits included improved water quality, flood regulation, and biodiversity gains. Industrial cases highlighted advances in water recycling, reuse, and efficiency, driven increasingly by corporate risk management and sustainability commitments. Meanwhile, water treatment projects explored how pollution reduction and reuse outcomes could be quantified.

Faecal Sludge Management (FSM) was highlighted as a critical but overlooked opportunity in developing Asia. By treating waste from septic tanks that would otherwise be dumped into waterways, FSM projects generate measurable "pollution avoidance" benefits. Panellists argued these should be creditable not just for water quality improvements, but also for the reduction of methane emissions from unmanaged waste.

Across this diversity of cases, a common thread emerged: most projects deliver **multiple co-benefits**—water, carbon, livelihoods, and ecosystem services—making single-metric valuation "wasteful". However, monetising multiple benefits require multiple sets of rigorous MRV standards that are challenging to implement.

Key Insights

- **Technology is not the main bottleneck; financing and incentives are.** Proven interventions in agriculture, industry, and ecosystems are frequently limited by insufficient funding, unclear value capture, and weak policy signals for wider adoption.

- **Measurement is improving but with uneven consistency.** Advances in monitoring (e.g., digital tools, remote sensing) are promising, yet methodological consistency remains limited across contexts. Baseline setting remains contentious, particularly under climate variability. Long-term monitoring is often expensive but indispensable.

- **Co-benefits are central.** Benefits often span water, carbon, and livelihoods, challenging single-metric systems. Multiple co-benefits raise both opportunities (stacked value) and challenges (attribution and accounting).

- **Private sector interest is growing.** Companies are increasingly motivated by operational and supply-chain water risks, creating a latent demand for credible water-related investment vehicles. While firms currently track water metrics primarily for internal risk management or compliance disclosure, there is a growing appetite to translate these metrics into tradable or recognisable assets. However, a central tension remains-standardisation is necessary to unlock large-scale investment and enable collaboration, yet methodologies must remain flexible enough to respect local political frameworks, governance practices, and site-specific hydrology. Furthermore, the capacity for independent verification varies significantly across regions, creating a bottleneck for global scalability.

Tensions Highlighted

- **Rigor vs. feasibility:** High-quality MRV systems are costly and complex, potentially limiting participation, especially for smaller actors.

- **Standardisation vs. context:** Comparable metrics are needed for markets, but water outcomes are highly site-specific.

- **Global targets vs. Local impact:** A critical disconnect emerged between corporates' "Water Positive" goals—often aggregated at a global level—and the local nature of water scarcity. While tech majors presented impressive global water replenishment figures, questions were raised on the validity of using these "credits" to offset consumption in water-stressed, land-scarce locations like Singapore. This highlights a risk that global crediting mechanisms may provide reputational cover for corporations without addressing the specific hydrological deficits where actual operations occur.

- **Single benefit vs. integrated valuation:** Focusing only on water risks undervaluing projects but integrating multiple benefits greatly complicates verification and pricing.

- **Water-Energy trade-off:** A strict focus on water reduction can have unintended carbon consequences. Data centre operators noted that in tropical climates like Singapore, switching from water-cooled to air-cooled systems to "save water" can spike energy consumption by up to 10%. This underscores the need for integrated metrics that account for the carbon cost of water conservation, rather than pursuing water efficiency in isolation.

OVERARCHING INSIGHTS

Turning shadow values into financial gains

There is abundant evidence quantifying the economic value of water quantity and quality. Yet these values often remain implicit in models rather than embedded in transactions. Without credible pathways to translate them into cash flows, underinvestment is likely to persist. Credit mechanisms are attractive precisely because they promise to bridge this gap, but doing so requires institutional credibility, not just methodology.

Institutions before instruments

A consistent refrain across the workshop was that markets cannot outrun governance. Where rights are unclear, monitoring weak, or enforcement contested, Water Credits risk becoming symbolic. At the same time, while strong institutions are a prerequisite for credible markets, regulation alone often lacks the agility to drive rapid innovation or price in complex externalities. Even in well-governed contexts, market-based instruments like Water Credits can offer distinct advantages: they can incentivise efficiency beyond statutory minimums, mobilise private capital for high-tech solutions (e.g., industrial reuse or AI-driven leak detection) that public budgets may not cover, and provide a mechanism for valuing co-benefits that traditional tariffs ignore.

MRV is political as well as technical

While measurement technologies are improving, choices about baselines, boundaries, and beneficiaries embed normative judgments. Transparency can mitigate disputes but cannot eliminate them. Building legitimacy will require participatory processes alongside technical rigor.

Start small, learn fast

Given uncertainties, many participants favoured piloting within defined contexts, coupled with strong evaluation frameworks. Success depends less on perfection at launch and more on the ability to adapt while maintaining trust.

FUTURE DIRECTIONS

a) Moving from Certificates to Credits
While water certificates offer a feasible starting point, what policy and regulatory frameworks are needed to transition these into rigorous, tradable Water Credits, ensuring they drive local hydrological improvements rather than just providing "global offset" branding for corporations?

b) The role of governments
Given the hesitation by private sector in moving beyond small-scale pilots, what role must governments play in signalling policy shifts, and as "anchor buyers" (similar to Singapore's approach with Carbon Credits) to signal demand and underwrite the initial risk of pilot Water Credit projects?

c) Interoperability of standards
With various sectors (rice, data centres, semiconductors) developing their own efficiency metrics, how can a unified "Water Assessment Protocol" be designed that is rigorous enough for investors but flexible enough for a variety of users?

d) Capturing co-benefits
Since Water Credits is likely to rely on existing climate mitigation projects for easier market entry, how can MRV be streamlined to capture these values without making transaction costs prohibitive?

NEXT STEPS

Participants were highly supportive of continued dialogue across sectors and regions. Suggested actions included a workshop proceedings report, a policy brief and/or whitepaper to consolidate existing knowledge on Water Credits and act as a "playbook" for developing Water Credits pilots.

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