THE CONVENTION ON PLANETARY HYDROLOGICAL SECURITY AND CRYOSPHERE STABILITY

Executive Summary

The Governance Challenge

The cryosphere—the interconnected system of glaciers, ice sheets, snow, permafrost, sea ice, river and lake ice, and other forms of frozen water—is a fundamental component of the Earth system and of the global hydrological cycle. Cryospheric systems store vast quantities of freshwater, regulate the timing and distribution of runoff, influence climate and ecosystems, and support water resources, livelihoods, infrastructure, and human well-being far beyond the regions in which frozen water is physically located. Changes in the cryosphere can therefore generate consequences that extend across watersheds, ecosystems, economic systems, and national boundaries.

Despite this importance, international governance of the cryosphere remains fragmented across multiple legal and institutional regimes. Existing international environmental, water, climate, biodiversity, disaster-risk-reduction, and sustainable-development frameworks address important dimensions of cryospheric change, but they do not constitute a single, comprehensive framework specifically designed to protect the cryosphere and maintain the hydrological systems that depend upon it.

The United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement address climate change and its drivers, impacts, adaptation, resilience, and mitigation, thereby addressing fundamental causes and consequences of cryosphere loss. The Convention on Biological Diversity (CBD) and the Kunming–Montreal Global Biodiversity Framework address biodiversity and ecosystem conservation, restoration, and resilience, including ecosystems affected by cryospheric change. The United Nations Convention to Combat Desertification (UNCCD) addresses land degradation, drought, desertification, and land–water resilience, including their consequences for drylands and vulnerable communities. International water instruments address transboundary water cooperation, while the Sendai Framework for Disaster Risk Reduction addresses disaster-risk governance and preparedness. These instruments are highly relevant to cryosphere protection, but each operates principally within its own mandate.

Consequently, the governance of the cryosphere is distributed rather than integrated. A glacier may simultaneously be a component of the climate system, a freshwater reservoir, a habitat-supporting ecosystem, a source of transboundary river flow, a hazard factor, and a foundation of downstream livelihoods. Yet the international legal and institutional responsibilities associated with these different dimensions are generally addressed through separate frameworks, institutions, reporting processes, scientific systems, and financing mechanisms.

This fragmentation creates a governance gap at the intersection of cryosphere stability and planetary hydrological security. In particular, there remains a need for stronger international coordination concerning the relationships among cryospheric storage, headwaters, groundwater, rivers, lakes, wetlands, downstream ecosystems, water security, disaster risk, adaptation, and human security. The gap is therefore not simply an absence of existing law; it is an absence of a coherent legal architecture capable of treating the cryosphere and its hydrological consequences as one interconnected system.

The proposed Convention on Planetary Hydrological Security and Cryosphere Stability (CPHSCS) is intended to address this gap by complementing—not replacing—the existing international environmental and water regime. It would provide a dedicated framework for integrating scientific observation, monitoring, data-sharing, early warning, prevention, adaptation, ecosystem protection and restoration, resilient water management, international cooperation, capacity-building, financing, and participation around the common objective of maintaining cryosphere stability and planetary hydrological security.

The governance challenge is therefore not to create another isolated environmental regime, but to establish the missing connective legal architecture through which existing climate, biodiversity, desertification, water, disaster-risk-reduction, and sustainable-development frameworks can work together around the cryosphere–hydrology nexus.

This is the governance gap that CPHSCS is designed to fill.

The Proposed Convention

The Convention on Planetary Hydrological Security and Cryosphere Stability is proposed as a dedicated international legal instrument to address the governance gap at the intersection of cryosphere stability and planetary hydrological security. It is conceived as a complementary and mutually reinforcing instrument within the existing international environmental and water governance architecture, with particular relevance to the objectives of the United Nations Convention to Combat Desertification, while strengthening cooperation across the three Rio Conventions and other applicable international frameworks.

The Convention would provide a common legal framework for the conservation, protection, monitoring, sustainable management, and resilience of cryospheric systems, including glaciers, ice sheets, snow, permafrost, sea ice, river and lake ice, and their associated hydrological systems, taking into account differences in national circumstances and the distinct characteristics of these systems. It would focus particularly on the relationships between cryospheric change and freshwater availability, hydrological continuity, ecosystem integrity, land degradation, disaster risk, climate resilience, livelihoods, infrastructure, and human security.

At its core, CPHSCS would recognize that cryosphere stability cannot be separated from the stability of the water systems connected to it. Changes in frozen water storage can alter the timing, quantity, quality, and reliability of downstream water resources and can generate cascading effects across headwaters, rivers, lakes, wetlands, groundwater systems, rangelands, agricultural landscapes, ecosystems, and communities. The Convention would therefore establish an integrated cryosphere–hydrology–ecosystem–land–climate–human security approach, linking upstream observation and protection with downstream resilience and sustainable water management.

The Convention would further establish a framework for international scientific cooperation, observation and monitoring, interoperable data-sharing, early warning, risk assessment, prevention, adaptation, ecosystem-based approaches, resilient water management, capacity-building, technology transfer, financing, and meaningful participation of Indigenous Peoples, local communities, pastoralists, women, youth, and other relevant stakeholders. Its implementation would build upon and strengthen existing institutions, scientific networks, legal instruments, and international processes rather than unnecessarily duplicating them.

CPHSCS would consequently serve as a connective legal architecture: linking cryospheric science with hydrological governance; upstream cryosphere protection with downstream water security; climate action with adaptation; biodiversity conservation with ecosystem resilience; land restoration with water retention; disaster-risk reduction with early warning; and environmental protection with human security and peace.

The proposed Convention would thus seek to establish a long-term international framework through which the protection of frozen water, the continuity and integrity of the planetary water cycle, and the resilience of people and ecosystems dependent upon that cycle are treated as interconnected objectives of international cooperation, for the benefit of present and future generations.

The Crisis: Why Action Is Urgent

The scientific evidence is unequivocal. The cryosphere is undergoing rapid and accelerating transformation. The 2023–2024 global glacier mass balance recorded the largest ice loss since 1950. Permafrost is thawing at unprecedented rates, releasing greenhouse gases and destabilizing landscapes. Sea ice is declining, reducing the planet's albedo and accelerating warming. The implications extend far beyond Polar Regions:

- Water Security: Approximately 70% of the world's freshwater is stored as snow and ice. Almost 2 billion people depend on mountain water for food security. As glaciers retreat, the timing and availability of water change: peak flows shift from summer to spring, reducing water availability during the dry season when it is most needed .
- Desertification: The loss of the cryosphere directly accelerates desertification through feedback loops such as reduced water availability, permafrost thaw, and increased dust storms. Dust from degraded drylands darkens ice, accelerating melt—a feedback loop driving both desertification and cryosphere loss.
- Human Security: The events in Nepal on 26 August 2026, where a catastrophic glacier collapse left hundreds dead, underscore the profound human dimension of cryosphere-related hazards. Strengthened international observation, data sharing, and early-warning capacity could enable communities and authorities to anticipate such hazards, act earlier, and save lives.
- Economic Costs: Permafrost-related damage to infrastructure in Alaska alone could cost $37–51 billion by mid-century. The total global cost of sea-level rise by 2100 is estimated to be in the trillions of dollars under high emissions scenarios.

Key Provisions

The CPHSCS would establish:

Provision	Description
Comprehensive Legal Framework	For the conservation, protection, and sustainable management of the cryosphere
Global Cryosphere Monitoring Network	Integrating satellite, ground-based, and local observations
Cryosphere–Dryland Observation Network (CDON)	A global monitoring and early-warning platform for cryosphere-related hazards
Dedicated Financial Mechanism	A cryosphere protection trust fund to support implementation

Scientific Advisory Committee	To provide authoritative scientific advice to the Conference of the Parties
National Cryosphere Protection Plans	Through which States translate international commitments into national action
Transboundary Cooperation Framework	For cryosphere-dependent water systems
Compliance and Dispute Resolution	Mechanisms to ensure accountability

The 0.01% Solutions Flagship Programme

Alongside the Convention, the 0.01% Solutions provides a practical, scalable implementation mechanism. The programme proposes to capture and retain approximately 0.01% of annual global rainfall—approximately 52 billion cubic metres of water—through a distributed network of one million ponds, small water-retention structures, restored wetlands, recharge areas, and Green Ring ecosystems.

The programme is conceived as a distributed pond systems and ecosystem-restoration network rather than a single infrastructure project. Individual interventions would be adapted to local hydrological, ecological, and socio-economic conditions while contributing to a broader, landscape-scale system in which water retention, ecosystem restoration, and community stewardship reinforce one another.

Strategic Alignment with the United Nations Global Policy, Legal, and Scientific Roadmap

The CPHSCS builds upon, complements, and seeks to connect the substantial body of international legal, scientific, policy, and institutional work already undertaken concerning glaciers, cryosphere change, climate change, water security, biodiversity, land degradation, disaster-risk reduction, ecosystem resilience, and sustainable development. The proposed Convention is therefore not intended to replace existing international instruments, but to provide a dedicated and connective framework through which their relevant objectives can be strengthened around the cryosphere–hydrology nexus.

1. United Nations General Assembly Recognition of the Cryosphere

United Nations General Assembly resolution 77/158, adopted in December 2022, proclaimed 2025 as the International Year of Glaciers' Preservation and established 21 March as World Day for Glaciers. This marked an important recognition by the international community that glacier preservation constitutes a matter of global concern rather than a narrowly regional environmental issue.

United Nations General Assembly resolution 78/321, adopted in August 2024, proclaimed 2025–2034 as the Decade of Action for Cryospheric Sciences, establishing an international framework for advancing cryospheric scientific research, observation, monitoring, international scientific cooperation, knowledge-sharing, and resilience. CPHSCS would provide a complementary legal and institutional pathway through which scientific knowledge generated during the Decade can be translated into coordinated international policy and preventive action.

2. The Paris Agreement and the Global Climate Response

CPHSCS is aligned with the UNFCCC and the Paris Agreement, including their objectives concerning mitigation, adaptation, climate resilience, climate-related risk, technology, finance, capacity-building, and international cooperation.

The Convention would recognize that reducing greenhouse-gas emissions remains indispensable to limiting long-term cryosphere loss, while also addressing the consequences of cryospheric change that are already occurring. In this respect, CPHSCS would complement the climate regime by connecting cryosphere protection, hydrological stability, adaptation, ecosystem resilience, disaster-risk reduction, and water security.

The Convention would also remain consistent with the Paris Agreement's Article 6 framework, while ensuring that any potential use of mitigation outcomes generated through eligible water-retention, ecosystem-restoration, or landscape-resilience activities is subject to the applicable authorization, accounting, reporting, environmental-integrity, and corresponding-adjustment requirements.

3. The Three Rio Conventions and the Emerging Synergies Architecture

CPHSCS is designed to operate alongside the three Rio Conventions:

- the UNFCCC, addressing climate change;
- the CBD, addressing biodiversity and ecosystem integrity; and
- the UNCCD, addressing desertification, land degradation, and drought.

The Belém Joint Statement on the Rio Conventions, adopted in November 2025 in connection with the UNFCCC COP30 process, provides an important policy basis for strengthened synergies, policy coherence, integrated approaches, coordinated action, cooperation, and engagement of non-State actors among the three Rio Conventions.

CPHSCS would build upon this direction by addressing a critical connecting system—the cryosphere and its hydrological consequences—through which climate change, biodiversity loss, land degradation, water insecurity, and human vulnerability frequently interact.

4. UNCCD and the Post-COP17 Land–Water–Cryosphere Connection

The proposed Convention has particular strategic relevance to the UNCCD, because cryosphere loss can have consequences for downstream in drylands, rangelands, river basins, and water-stressed regions.

This relationship was especially relevant to UNCCD COP17 in Ulaanbaatar, Mongolia, held from 17–28 August 2026, whose programme addressed rangelands and pastoralists, drought, land degradation, migration, sustainable infrastructure, knowledge-sharing, technology transfer, and cooperation across the Rio Conventions. The official COP17 documentation also included work on relationships with other conventions and international organizations.

CPHSCS therefore provides a potential upstream complement to the UNCCD's downstream land and drought agenda: protecting the cryosphere and hydrological systems that help sustain the water, ecosystems, rangelands, and communities upon which dryland resilience depends.

5. The Dushanbe Water and Glacier Process

The Dushanbe Water Process, including the High-Level International Conferences on the International Decade for Action —Water for Sustainable Development,‖ and the Dushanbe Glaciers Declaration of May 2025, provide an important political and scientific foundation for strengthening international cooperation on glaciers, water security, monitoring, climate adaptation, and resilience.

CPHSCS would build upon this trajectory by connecting glacier and cryosphere preservation with the broader continuum of headwaters, rivers, groundwater, wetlands, downstream ecosystems, and communities.

6. The United Nations Water Agenda

CPHSCS is directly aligned with Sustainable Development Goal 6 and the international water agenda. The 2026 United Nations Water Conference to Accelerate the Implementation of Sustainable Development Goal 6 will be co-hosted by the United Arab Emirates and Senegal in Abu Dhabi from 8–10 December 2026. Its mandate includes strengthening international cooperation, mobilizing investment, and advancing innovative approaches to water security.

The Convention would provide a complementary upstream dimension to this agenda by addressing how changes in glaciers, snow, permafrost, and other cryospheric systems affect the quantity, timing, quality, continuity, and reliability of freshwater resources.

It would also contribute to the longer-term implementation and review processes associated with the International Decade for Action —Water for Sustainable Development‖ 2018–2028.

7. Transboundary Water Law

CPHSCS would complement the Convention on the Protection and Use of Transboundary Watercourses and International Lakes and the United Nations Convention on the Law of the Non-Navigational Uses of International Watercourses.

These instruments provide important principles concerning equitable and reasonable utilization, prevention of significant harm, cooperation, information exchange, and transboundary water management. CPHSCS would extend the conceptual connection upstream by recognizing that the stability of many transboundary water systems is influenced by cryospheric storage and change in headwater and mountain regions.

8. Sendai Framework for Disaster Risk Reduction

CPHSCS is also aligned with the Sendai Framework for Disaster Risk Reduction 2015–2030, particularly its emphasis on understanding disaster risk, strengthening disaster-risk governance, investing in resilience, and improving preparedness and early warning.

Cryosphere-related hazards—including glacial lake outburst floods, glacier instability, landslides, permafrost-related hazards, extreme runoff, and changing seasonal hydrology—should increasingly be incorporated into integrated disaster-risk assessment and early-warning systems.

This creates a direct bridge between cryosphere observation and preventive disaster-risk governance.

9. Convention on Biological Diversity and the Kunming–Montreal Global Biodiversity Framework

CPHSCS complements the Convention on Biological Diversity and the Kunming–Montreal Global Biodiversity Framework (KM-GBF) by recognizing that cryospheric stability is essential to many mountain, freshwater, wetland, rangeland, and downstream ecosystems.

The Convention would support conservation, restoration, connectivity, ecological integrity, and resilience of ecosystems dependent upon cryosphere-fed water systems and would contribute to the broader international objective of conserving and restoring terrestrial and inland-water ecosystems.

The relationship is particularly important because water security and biodiversity security cannot be treated as separate systems where freshwater ecosystems depend upon cryospheric storage and seasonal runoff.

10. Ramsar Convention and Water-Dependent Ecosystems

CPHSCS would complement the Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention) by recognizing wetlands, lakes, floodplains, peatlands, and other water-dependent ecosystems as components of planetary hydrological security.

Such ecosystems can store, filter, regulate, and gradually release water while supporting biodiversity, livelihoods, climate resilience, and downstream communities.

11. Agenda 21 and Sustainable Mountain Development

CPHSCS also builds upon Agenda 21, particularly Chapter 13 concerning the management of fragile ecosystems and sustainable mountain development.

This provides an important historical foundation for treating mountains not simply as geographically isolated environments but as critical sources and regulators of freshwater, biodiversity, livelihoods, and downstream ecological stability.

CPHSCS updates this principle for the twenty-first century by connecting mountain cryosphere stability with planetary hydrological security.

12. International Year of Rangelands and Pastoralists 2026

The International Year of Rangelands and Pastoralists 2026 provides an additional connection between cryosphere protection, water security, rangeland resilience, pastoral livelihoods, traditional knowledge, and sustainable land management.

This is particularly significant for Mongolia and other dryland and mountain–steppe regions where pastoral communities depend upon highly variable combinations of snow, glacier-fed water, rainfall, groundwater, springs, rivers, lakes, and seasonal pasture conditions.

CPHSCS therefore recognizes pastoral and local communities not merely as beneficiaries of hydrological security, but as knowledge holders, land stewards, participants, and implementation partners.

13. Science, Observation, and the Decade of Cryospheric Sciences

The Decade of Action for Cryospheric Sciences 2025–2034 provides the scientific foundation for a CPHSCS observation and knowledge architecture.

The proposed Convention could complement this work through international cooperation on:

- glacier and ice-sheet observation;
- snow and permafrost monitoring;
- cryosphere inventories;
- hydrological monitoring;
- groundwater and headwater observation;
- satellite and remote-sensing systems;
- interoperable data standards;
- transboundary information exchange;
- early-warning systems;
- cryosphere–hydrology modelling;
- scientific capacity-building; and
- translation of scientific evidence into preventive policy.

In this respect, science would become an operational pillar of the Convention rather than merely a background justification for it.

14. Disaster Risk, Human Security, and Preventive Action

The Convention would connect cryosphere science with the broader international architecture for disaster-risk reduction, human security, food security, energy security, infrastructure resilience, public health, and peace.

The central premise is that cryosphere change can create cascading risks rather than isolated environmental impacts. A change in glacier or snow storage can alter runoff; altered runoff can affect agriculture and ecosystems; water scarcity or flooding can affect livelihoods and infrastructure; and prolonged resource stress can contribute to displacement, economic instability, and conflict risks.

CPHSCS would therefore approach cryosphere stability as a component of preventive resilience and international cooperation.

15. Financing, Technology, and Implementation

The Convention would complement existing international financing and implementation mechanisms—including climate, biodiversity, land, adaptation, water, and development finance—while seeking to improve their coordination around integrated cryosphere–hydrology interventions.

The proposed Cryosphere Protection Trust Fund and other financing mechanisms could support scientific observation, capacity-building, technology transfer, adaptation, ecosystem restoration, early warning, resilient water infrastructure, and implementation in developing and climate-vulnerable countries.

Any market-based or Article 6-related financing would remain subject to the applicable international rules and would be additional to, rather than a substitute for, public and international climate and development finance.

16. The 2026–2028 Opportunity Window

The present period creates an unusual convergence of international processes:

2025 established the International Year of Glaciers' Preservation and the beginning of the Decade of Action for Cryospheric Sciences; 2026 brings together UNCCD COP17 in Mongolia and the UN Water Conference; and 2028 marks the planned comprehensive review associated with the International Decade for Action ―Water for Sustainable Development.‖ The 2026 Water Conference is officially scheduled for 8–10 December in Abu Dhabi.

This sequence provides an opportunity to move from recognition → science → coordination → legal architecture → implementation.

17. The Strategic Role of CPHSCS

Against this background, CPHSCS is proposed not as a competing environmental treaty, but as a missing connective instrument within the existing international system.

Its strategic contribution would be to connect:

Cryosphere → Water → Ecosystems → Land → Livelihoods → Resilience → Human Security → Peace.

The Convention would translate the growing scientific recognition of cryosphere change into a coherent framework for international cooperation, observation, prevention, adaptation, ecosystem protection, hydrological resilience, financing, and long-term planetary security.

Complementarity and Institutional Non-Duplication

The Convention on Planetary Hydrological Security and Cryosphere Stability (CPHSCS) is not intended to replace, duplicate, or undermine existing international institutions, conventions, scientific bodies, programmes, or financing mechanisms. Rather, it is designed to complement, connect, and strengthen existing international frameworks by addressing the cryosphere and its hydrological functions as an interconnected planetary system requiring dedicated international coordination.

The CPHSCS is designed to complement:

- The Rio Conventions—the UNFCCC, the CBD, and the UNCCD—by addressing the cryosphere as a distinct Earth-system component whose stability is fundamental to climate resilience, biodiversity, water security, land restoration, drought resilience, and sustainable development;
- The Convention on the Protection and Use of Transboundary Watercourses and International Lakes (1992) and the United Nations Convention on the Law of the Non-Navigational Uses of International Watercourses (1997)—by providing an upstream layer of cooperation concerning glaciers, snow, permafrost, mountain headwaters, groundwater recharge, and other cryosphere-dependent systems, and their downstream hydrological connections;
- The Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention)—by addressing the cryospheric and upstream hydrological systems that sustain wetlands, rivers, lakes, floodplains, peatlands, and other freshwater ecosystems;

- The Sendai Framework for Disaster Risk Reduction 2015–2030—by strengthening the integration of cryosphere-related hazards, changing hydrological conditions, risk assessment, monitoring, early-warning systems, preparedness, and preventive action into existing disaster-risk-reduction frameworks;
- The 2030 Agenda for Sustainable Development and the Sustainable Development Goals — by supporting implementation of, in particular, SDG 6 on clean water and sanitation, SDG 13 on climate action, SDG 15 on life on land, SDG 16 on peace, justice and strong institutions, and SDG 17 on partnerships, through strengthened planetary hydrological security;
- The United Nations Decade of Action for Cryospheric Sciences 2025–2034—by providing a complementary legal and policy framework through which scientific observation, monitoring, assessment, data-sharing, research, and knowledge can be translated into coordinated international action, without duplicating existing scientific programmes;
- UNESCO and its International Hydrological Programme, together with relevant international hydrological and cryospheric research initiatives—by building upon existing scientific knowledge, observation networks, hydrological assessments, research cooperation, and technical expertise rather than establishing parallel scientific systems;
- The World Meteorological Organization and the Global Cryosphere Watch and related observing and early-warning systems—by strengthening the policy and legal mechanisms through which cryosphere, climate, meteorological, and hydrological observations can support risk assessment, early warning, adaptation, and preventive decision-making;
- The United Nations system's work on mountains, glaciers, freshwater, and sustainable development, including relevant initiatives concerning mountain ecosystems and communities—by connecting the protection of high-altitude cryospheric systems with downstream water security, ecosystem resilience, livelihoods, and sustainable development;
- The UNCCD Peace Forest Initiative (PFI)—by strengthening the water, cryosphere, and hydrological dimensions of ecosystem restoration, sustainable land management, peacebuilding, and conflict prevention, recognizing that resilient water systems contribute to resilient livelihoods and human security;
- Existing international climate, adaptation, biodiversity, land, water, and development financing mechanisms—by facilitating greater coordination and complementarity of financial resources for cryosphere observation, adaptation, water resilience, ecosystem restoration, disaster-risk reduction, and sustainable development, without establishing competing financing obligations or mechanisms unless a demonstrated financing gap requires otherwise;
- International scientific assessment and observation systems, including satellite observation, glacier inventories, snow and permafrost monitoring, hydrological networks, and relevant national and international research institutions—by promoting interoperability, data exchange, common methodologies, and the use of existing scientific infrastructure in support of Convention implementation.

The CPHSCS shall further promote institutional interoperability and reporting coherence. Where relevant information, monitoring systems, assessments, indicators, or reports already exist under another international agreement or institution, the Parties should seek, where appropriate and consistent with applicable rules, to use, reference, or interoperate with those systems rather than establish parallel requirements.

The Convention shall also respect the mandates, competencies, sovereignty, and legal obligations of States and existing international organizations. Nothing in the CPHSCS shall be interpreted as modifying, replacing, or diminishing rights and obligations arising under existing international agreements, including international climate, biodiversity, desertification, water, wetlands, disaster-risk-reduction, and human-rights frameworks.

The guiding principle shall be:

> Complement where possible, connect where necessary, strengthen where gaps exist, and avoid duplication wherever existing institutions can effectively perform the required function.

The CPHSCS therefore seeks to establish not another isolated environmental regime, but a legal connecting architecture linking cryosphere stability with the existing international systems governing climate, water, biodiversity, land, disaster risk, science, development, and peace.

Its distinctive contribution is to address the governance space between frozen water and liquid water, upstream and downstream systems, mountains and drylands, environmental stability and human security, thereby enabling existing international frameworks to operate with greater coherence in response to interconnected planetary hydrological risks.

The Cryosphere–Dryland Observation Network (CDON)

At the heart of the proposed Convention is the Cryosphere–Dryland Observation Network (CDON)—a proposed global, interoperable monitoring, information-sharing, risk-assessment, forecasting, and early-warning architecture designed to strengthen the capacity of States and communities to detect, communicate, prepare for, and respond to cryosphere-related hazards and cascading hydrological risks across national boundaries.

The need for such architecture is demonstrated by recent events in the Himalayas. The August 2026 Nepal–China disaster showed that a cryosphere-related hazard may develop as a rapidly cascading sequence rather than as a conventional glacial lake outburst flood: a glacial collapse can generate an ice-and-rock avalanche, which can transform into a debris flow and major downstream flooding, affecting communities, infrastructure, rivers, hydropower facilities, transport corridors, and border areas far from the original source. USGS analysis indicates that the 26 August 2026 event travelled approximately 100 kilometres downstream and crossed the Nepal–China transboundary system.

CDON shall therefore address the entire hazard chain, from cryospheric change at the source to downstream consequences, rather than monitoring individual hazards in isolation.

CDON would strengthen transboundary observation, assessment, forecasting, communication, and early warning concerning:

- Glacier instability, fracture, collapse, and ice avalanches;
- Glacial lake outburst floods (GLOFs), including cascading GLOFs;
- Rapidly evolving and previously unrecognized glacial lakes, regardless of size;
- Snowpack accumulation, melt, and rapid snowmelt events;
- Permafrost thaw and associated slope instability;
- Rockfalls, landslides, debris avalanches, and ice–rock avalanches associated with cryospheric change;

- Extreme runoff, rapid river-level changes, and changing hydrological regimes;
- Formation of temporary natural dams and impounded water bodies following landslides, avalanches, or debris flows;
- Potential secondary or cascading flood events following an initial cryosphere-related disaster;
- Downstream impacts on rivers, lakes, wetlands, groundwater, ecosystems, settlements, agriculture, hydropower, roads, bridges, railways, communications, and other critical infrastructure;
- Changing seasonal and long-term water availability;
- Transboundary propagation of cryosphere-related hazards and hydrological risks; and
- Other emerging cryosphere-related hazards capable of affecting human security, ecosystems, livelihoods, infrastructure, and regional stability.

A central principle of CDON shall be ―observe upstream, warn downstream.‖ Monitoring shall therefore not terminate at the cryosphere or at the national border. Information concerning a developing hazard shall be capable of being transmitted through the hydrological system to potentially affected downstream authorities, communities, infrastructure operators, and emergency-management institutions.

CDON shall establish an integrated chain of:

> Observation → Detection → Assessment → Forecasting → Early Warning → Communication → Preparedness → Preventive Action → Response Support → Post-Event Learning.

Particular emphasis shall be placed on real-time and near-real-time information exchange, interoperable data systems, satellite observation, ground-based monitoring, hydrological and meteorological observations, seismic information, remote sensing, digital elevation and terrain analysis, modelling, community observations, and other appropriate technologies.

CDON shall also address a critical weakness revealed by recent Himalayan events: the absence of a hazard does not necessarily mean the absence of risk. Small or newly formed glacial lakes, unstable glacier margins, steep ice-rock interfaces, permafrost-affected slopes, and rapidly changing mountain terrain may remain inadequately represented in conventional hazard inventories. Recent scientific analysis of the 2024 Thame Valley disaster in Nepal similarly found that relatively small, rapidly evolving glacial lakes could produce cascading GLOFs and emphasized the need to monitor all relevant glacial lakes and vulnerable downstream settlements, rather than relying solely on large, previously identified lakes.

CDON shall therefore promote dynamic risk inventories capable of being continuously updated as glaciers retreat, new lakes form, existing lakes expand or contract, permafrost thaws, slopes destabilize, river channels change, and downstream exposure evolves.

CDON would build upon and interoperate with existing international and regional monitoring and scientific systems, including the World Glacier Monitoring Service, the International Permafrost Association, the World Meteorological Organization and its cryosphere-related observing systems, UNESCO programmes, the International Decade of Action for Cryospheric Sciences 2025–2034, regional mountain and hydrological institutions, national meteorological and hydrological services, geological and disaster-management agencies, and relevant satellite-observation programmes.

CDON would not establish parallel scientific institutions or replace existing national or international monitoring systems. Instead, its principal function would be to connect existing observations and capabilities into interoperable transboundary architecture capable of converting scientific information into timely risk information and actionable warnings.

The Network shall particularly strengthen cooperation between source countries and downstream countries, recognizing that a cryosphere-related hazard may originate in one jurisdiction while its consequences propagate rapidly across another.

Accordingly, CDON should support:

1) shared hazard inventories and risk maps;
2) interoperable monitoring and data standards;
3) cross-border data and information exchange;
4) joint hazard assessment and modelling;
5) common or mutually recognized warning thresholds;
6) rapid notification protocols;
7) multilingual and accessible public warning systems;
8) community-based observation and preparedness;
9) regular transboundary simulation and preparedness exercises;
10) coordination among scientific, hydrological, meteorological, geological, disaster-management, infrastructure, and local authorities;
11) post-event scientific reconstruction and lessons-learned processes; and
12) continuous updating of risk assessments as cryospheric and hydrological conditions change.

The CDON architecture should also recognize that early warning is only effective when it reaches people in time to act. The Convention should therefore promote an end-to-end warning system connecting scientific detection with national authorities, local governments, infrastructure operators, communities, and individuals exposed to downstream hazards.

In this respect, CDON would represent more than a scientific monitoring network. It would constitute a planetary hydrological security early-warning architecture, linking the condition of frozen water at the source with the safety of people, ecosystems, infrastructure, and economies downstream.

Core CDON Principle

> No cryosphere-related hazard should remain an upstream observation when its consequences can become a downstream catastrophe.

The experience of Nepal demonstrates the importance of this principle. The 2026 disaster showed how rapidly a high-altitude cryosphere disturbance can propagate through interconnected mountain systems and affect communities and infrastructure far downstream and across an international boundary.

Accordingly, CDON should be one of the Convention's principal operational mechanisms for turning cryosphere science into preventive international action—ensuring that changes detected in glaciers, snow, permafrost, lakes, slopes, and headwaters can be translated into timely information, warnings, preparedness, and coordinated action before cascading hazards become humanitarian disasters.

Institutional and Implementation Architecture

The CPHSCS would connect four complementary dimensions:

Dimension	Description
Legal Protection	International obligations concerning the conservation, protection, and sustainable management of cryospheric systems
Scientific Observation	A coordinated scientific and monitoring architecture, including CDON, capable of connecting cryospheric observation with downstream hydrological risk
Practical Implementation	Implementation mechanisms including the 0.01% Solutions, Distributed Pond Systems, ecosystem restoration, recharge areas, and Green Web networks
National Action	National Cryosphere Protection Plans through which States translate international commitments into national strategies, monitoring systems, investment programmes, and disaster preparedness

Conclusion and Call to Action

The cryosphere is not a distant or isolated environmental concern. It is a fundamental component of the Earth's water and climate systems, storing freshwater, regulating hydrological flows, influencing climate processes, sustaining ecosystems, and supporting the lives and livelihoods of billions of people. Its accelerating degradation is already altering the timing, quantity, and reliability of water availability, increasing risks from floods and other cryosphere-related hazards, contributing to ecosystem degradation and desertification, and creating cascading consequences for food security, energy, public health, infrastructure, livelihoods, and peace.

The scientific evidence demonstrates that cryosphere change cannot be addressed through climate policy alone. The cryosphere is physically connected to the entire hydrological cycle—from atmospheric water and snow and ice storage through glaciers, permafrost, headwaters, springs, groundwater, rivers, lakes, wetlands, and ultimately coastal and marine systems. Consequently, the protection of the cryosphere must be understood as an essential element of planetary hydrological security, linking climate stability, freshwater security, ecosystem integrity, disaster-risk reduction, sustainable land management, and human security.

Yet the international governance architecture remains fragmented. The UNFCCC, CBD, UNCCD, water conventions, disaster-risk frameworks, and other instruments each address important components of the problem, but no single international legal instrument provides a comprehensive framework for the protection and sustainable management of the cryosphere as an interconnected planetary system. This governance gap becomes increasingly consequential as glacier retreat, ice-sheet loss, snow decline, permafrost thaw, sea-ice changes, hydrological disruption, and cryosphere-related hazards accelerate.

The proposed CPHSCS is intended to help fill this gap. It is conceived as a sister convention to the UNCCD, not as a replacement for existing international agreements, but as a complementary legal architecture connecting the upstream cryosphere with the downstream water, land, ecosystem, livelihood, and human-security systems that depend upon it. The Convention would establish common principles, obligations, scientific cooperation, monitoring and observation systems, early-warning mechanisms, financing arrangements, technology and

capacity-building, ecosystem-based adaptation, and international cooperation necessary to preserve cryospheric stability and maintain hydrological continuity.

The proposed Convention also advances a broader understanding of planetary hydrological security. Security of water is not merely a question of how much freshwater is available. It includes the availability, quality, ecological integrity, accessibility, continuity, timing, and sustainable use of water, together with the resilience of the ecosystems and communities through which water moves. Protecting the cryosphere therefore requires protecting the continuity of the entire water system and addressing the interconnected pressures of climate change, land degradation, desertification, biodiversity loss, pollution, unsustainable abstraction, and disaster risk.

The Convention should also recognize that scientific knowledge alone is insufficient unless it can be translated into timely preventive action. A future cryosphere governance system must connect observation and research with interoperable data, transboundary information exchange, risk assessment, early warning, preparedness, adaptation, restoration, national planning, financing, and implementation at the local level. It must bring together governments, scientific institutions, Indigenous Peoples and local communities, pastoralists, civil society, youth, financial institutions, and other relevant actors in a system of shared responsibility.

The Distributed Pond Systems (DPS) and Green Web concepts proposed within this framework illustrate how planetary hydrological security can be translated from a global principle into locally adaptable action. Water-retention, infiltration, wetland restoration, groundwater recharge, vegetation restoration, sustainable land management, and other nature-based measures can complement cryosphere protection by helping landscapes retain and use water more effectively, particularly in drylands and other water-stressed regions. Where appropriate and where all applicable requirements are satisfied, climate-finance mechanisms, including cooperative approaches under Article 6.2 of the Paris Agreement, may provide additional resources for such actions, while remaining supplementary to public and international climate, adaptation, development, biodiversity, and land-restoration finance.

The Convention should therefore be understood not simply as a treaty for protecting ice. It is a proposed legal framework for protecting the continuity and stability of the planetary water system. The cryosphere is its frozen reservoir; the atmosphere is its source and transport system; rivers, groundwater, wetlands, and lakes are its connecting pathways; ecosystems are its living infrastructure; and communities are both beneficiaries and stewards of the system. Protecting one component while allowing the others to deteriorate cannot provide lasting hydrological security.

The international community now has an opportunity to move from recognition to architecture, and from fragmented responses to integrated prevention. The existing international frameworks provide important foundations; the scientific community provides increasingly clear evidence; and initiatives concerning glaciers, cryospheric sciences, water, biodiversity, rangelands, land restoration, disaster-risk reduction, and the three Rio Conventions provide growing points of convergence. The CPHSCS seeks to bring these strands together into a coherent legal and institutional framework capable of responding to the interconnected nature of the challenge.

Accordingly, States, international organizations, scientific institutions, Indigenous Peoples and local communities, civil society, financial institutions, and other stakeholders are invited to study, scrutinize, debate, improve, and, where appropriate, advance this proposal through

an open, science-based, inclusive, and intergovernmental process. The purpose is not to create another isolated international instrument, but to determine whether the international community requires a dedicated legal architecture for the cryosphere and planetary hydrological security—and, if so, to develop that architecture with the highest standards of scientific integrity, international law, equity, transparency, and accountability.

The choice before the international community is ultimately a choice between reacting to cascading hydrological and cryospheric crises after they occur, or investing in the stability of the systems that prevent those crises from becoming irreversible. The protection of the cryosphere is therefore not only an environmental responsibility; it is an investment in freshwater security, resilient societies, sustainable development, human security, and peace.

The cryosphere must be protected not only for what it is, but for everything that depends upon it. Protect the frozen water, preserve the hydrological continuity, restore the landscapes, strengthen the resilience of communities, and secure the future of humanity.

Restoring Land. Restoring Hope by Restoring Water.

Protecting the Cryosphere. Securing Humanity's Future.

The 0.01% Solutions–Green Web–Cryosphere Convention Initiative Team

An independent, civil society initiative
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