



ICID•CIID

EAU,
AGRICULTURE
ET TERRITOIRES



26th INTERNATIONAL CONGRESS ON IRRIGATION AND DRAINAGE

12-17 October 2026, Marseille, France



13th N.D. Gulhati Memorial Lecture for
International Cooperation in Irrigation and Drainage
**Bridging Heritage and Innovation:
Navigating Global Water Scarcity in
the Spirit of N.D. Gulhati**

Prof. Michele Perniola

Department of Agricultural, Forestry, Food and Environmental Sciences University of Basilicata, Potenza, Italy

13th N.D. GULHATI MEMORIAL LECTURE
for International Cooperation in Irrigation and Drainage
on

**Bridging Heritage and Innovation: Navigating
Global Water Scarcity in the Spirit of N.D. Gulhati**

Presented at
26th International Congress on Irrigation and Drainage
and delivered by



Prof. Michele Perniola

Department of Agricultural, Forestry, Food and Environmental Sciences,
University of Basilicata, Potenza, Italy
President, Italian National Committee of ICID – ITAL-ICID

Prof. Michele Perniola is currently National President of Ital-ICID (Italian National Committee of the International Commission on Irrigation and Drainage), a position he has held since July 2026. He is a long-standing academic at the University of Basilicata, where he has served as a researcher and faculty member since 1986 and currently heads the Degree Course in Agricultural Sciences and Technologies.

A distinguished agronomist with over 230 scientific publications, Prof. Perniola has made significant contributions in plant-water relations, irrigation management, crop adaptation to climate change, and precision agriculture in Mediterranean environments. He previously served as President of the Italian Society for Agronomy, Editor-in-Chief of the Italian Journal of Agronomy, and National Coordinator of the CNR Irrigation Study Group. He is also a member of the Accademia dei Georgofili.

13th N.D. GULHATI MEMORIAL LECTURE

for International Cooperation in Irrigation and Drainage

on

Bridging Heritage and Innovation: Navigating Global Water Scarcity in the Spirit of N.D. Gulhati

delivered by

Prof. Michele Perniola

Department of Agricultural, Forestry, Food and Environmental Sciences

University of Basilicata, Potenza, Italy

President, Italian National Committee of ICID – ITAL-ICID

Presented at

26th International Congress on Irrigation and Drainage

12–17 October 2026, Marseille, France



ICID•CIID

INTERNATIONAL COMMISSION ON IRRIGATION AND DRAINAGE



Er. N.D. Gulhati

A Visionary Water Resources Engineer

Er. Niranjan Das Gulhati, popularly known as N.D. Gulhati, a visionary, was one of the forces behind India's march towards food self-sufficiency through Green Revolution. As the Chief of the Natural Resources Division in the Planning Commission, Government of India, he laid its foundation by initiating proposals relating to the development of irrigation and power, soil conservation and mineral development in the First Five-Year Plan. The notable positions he held in Government of India service includes Secretary, Central Board of Irrigation and Power (CBIP) from August 1945 to March 1949; Chief Engineer and Joint Secretary in 1953 and Additional Secretary to Government of India in 1958. While serving on these positions, he championed the cause of irrigation and drainage at national and global level.



(1904-1978)

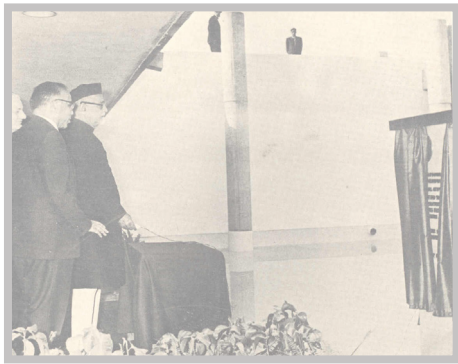
As the Chief Representative of Government of India on the Indus Water Negotiations under the aegis of International Bank for Reconstruction and Development (IBRD), he played a key role in the successful conclusion of the historical Indus Water Treaty between India and Pakistan in 1960 (ratified in 1961). He represented India in many international engineering conferences and made immense contributions to India's agricultural, water and power sectors. In recognition of his "distinguished services of a high order", Er. Gulhati was bestowed with one of India's highest civilian honours "PADMA BHUSHAN" by the President of India in 1961.

Late N.D. Gulhati dedicated his entire professional life to the development of irrigation engineering and conceived and implemented the concept of an 'International Commission' for ensuring international cooperation on advancing the world knowledge in the fields of irrigation, drainage, flood management and river training by pioneering the idea of setting up an International Commission to the Government of India in 1946. The Commission was set up in the year 1950 and Er. Gulhati was befittingly selected as its first Secretary General to lead its operations in its budding period. Later he led the Commission from the forefront holding positions of Vice President (1957-1960), and President (1960-1963) of ICID.

President Honoraire Gulhati was a globally renowned Water Resources Consultant, whose services were utilized by many State Governments in India and global organizations like IBRD (1963), International Development Association (1963-1973), and United Nations (ESCAP) in 1969.

Born on 15 November 1904 in Lahore, Pakistan, Er Gulhati completed his technical education from the Thomson Civil Engineering College, Roorkee in 1926 (later University of Roorkee and now IIT Roorkee) where he achieved honours. He was appointed to the Indian Service of Engineers in October 1927 and posted to the Irrigation Branch of the Public Works Department, Punjab. Er N.D. Gulhati passed away in December 1978.

Er. Gulhati was amongst the foremost supporters of ICID and did everything possible to promote the objects of ICID. His mature leadership, dynamic personality and diplomatic and adroit handling of all matters won him universal respect and endearment with all the members of the ICID fraternity. As the architect of the "International Commission" who laid a strong foundation for Commission's growth during its nascent years, Er. Gulhati has been aptly called the 'Father' of ICID.



13th N.D. GULHATI MEMORIAL LECTURE

for International Cooperation in Irrigation and Drainage

Preserving the memory of the visionary Water Resource Engineer, ICID, in collaboration with Gulhati Trust has been organizing the 'N.D. Gulhati Memorial Lecture for International Cooperation in Irrigation and Drainage' at the time of its triennial Congresses. The memorial lecture aims at encouraging exchange of significant global developments relevant to irrigation and drainage engineering including all allied aspects like environment, sociology, economics etc. and fostering and enhancing international cooperation to meet ICID objectives. The lecture is delivered by an invited eminent person in a field related to ICID's mission. An honorarium of US \$ 1000 is presented to the invited distinguished Lecturer as a token of appreciation.

N.D. Gulhati Memorial International Lectures held so far:

	Year	Lecture delivered by
	2023	SH. GAJENDRA SINGH SHEKHAWAT Union Cabinet Minister, Ministry of Jal Shakti, Govt. of India. Delivered the Twelfth Lecture on “Ensuring Water and Food Security Through Climate Resilient Infrastructure”, during the 25th ICID International Congress, November 2023 at Visakhapatnam (Vizag), Andhra Pradesh State, India
	2022	HON KARLENE MAYWALD, DUNIV, FTSE, GAICD South Australian Water Ambassador and Chair of the Australian National Water Commission (Australia), Delivered the Eleventh Lecture on “Putting People at the Heart of What We Do” during the 24th ICID International Congress, October 2022 at Adelaide, Australia
	2017	DR. FELIPE IGNACIO ARREGUÍN CORTÉS Director General, Mexican Institute of Water Technology / Instituto Mexicano de Tecnología del Agua (IMTA), Delivered the Tenth Lecture in October 2017 at Mexico City, Mexico on “Reforms in the Administration of Irrigation Systems: Mexican Experiences”
	2014	MR. JEREMIAH R.D. LENGOSA Deputy Secretary-General World Meteorological Organization, Switzerland Delivered the ninth lecture in September 2014 at Gwangju, Korea on “Climate Variability and Change: Impacts on Water Availability”

	2011	DR. CHARLES M. BURT Professor of Irrigation and Chairman of the Irrigation Training and Research Center (ITRC), USA Delivered the eighth lecture in 2011 at Tehran, Iran on "The Irrigation Sector Shift from Construction to Modernization: What is Required for Success?"
	2008	Prof. Dr. Chandra A. Madramootoo Dean, Agricultural and Environmental Sciences McGill University, Canada Delivered the seventh lecture in 2008 at Lahore, Pakistan on "Irrigation in Context of Today's Global Food Crisis"
	2005	Er. Albert J. Clemmens Founding Member and Director American Academy of Water Resources Engineers, USA Delivered the sixth lecture in 2005 at Beijing, China on "A Process-Based Approach to Improving the Performance of Irrigated Agriculture"
	1999	Dr. Marvin E. Jensen National Program Leader, Water Management and Salinity Research, Agricultural Research Service, USDA, USA Delivered the fifth lecture in 1993 at The Hague, Netherlands on "The Impacts of Irrigation and Drainage on the Environment"
	1996	Late W.R. Rangeley OBE Independent Consultant, Water Resources Development, World Bank, UK Delivered the fourth lecture in 1990 at Rio de Janeiro, Brazil on "Irrigation at a Crossroads"
	1993	Late Adriaan Volker Professor Extra-Ordinarius in Hydrology Delft University of Technology, The Netherlands Delivered the third lecture in 1987 at Casablanca, Morocco on "Role of Failures and Negative Secondary effects in the Development of Irrigation, Drainage and Flood Control"

	1990	Late K.K. Framji Chief Engineer and Joint Secretary Ministry of Irrigation and Power, Government of India Delivered the second lecture in 1984 at Fort Collins, USA on “Past and Likely Future Developments in Irrigation and Drainage and Flood Control Measures in Developing Countries”
	1987	Prof. Dr. M. Holy Dean of Civil Engineering Prague Technical University, Czechoslovakia Delivered the first lecture in 1981 at Grenoble, France on “Irrigation Systems and their Role in the Food Crisis”



13th N.D. Gulhati Memorial Lecture
for International Cooperation in Irrigation and Drainage

**Bridging Heritage and
Innovation : Navigating Global Water
Scarcity in the Spirit of N.D. Gulhati**

Prof. Michele Perniola*

INTRODUCTION

It is an extraordinary honor to deliver the N.D. Gulhati Memorial Lecture at the 26th ICID International Congress here in Marseille. Some of the most critical environmental and social pressures of our century find inspiration in the legacy Niranjan Das Gulhati, a true pioneer of international water diplomacy, irrigation engineering, and cooperative resource governance, has left us. This lecture honours N. D. Gulhati, the engineer who conceived the International Conference on Irrigation and Drainage, considering his work as a method rather than a memory.

Decades ago, Gulhati recognized that water engineering could never be confined strictly to the technical domain of hydraulics and concrete structures. To him, water was a dynamic social, diplomatic, and economic thread essential for sustaining peace and human dignity. Today, as climate change accelerates and freshwater ecosystems face unprecedented stress, Gulhati's vision of holistic, integrated, and shared water management is not merely a historical reference; it is an urgent blueprint for our survival.

To deliver the Gulhati Lecture here, at the 26th International Congress and the 77th meeting of the International Executive Council, is both an honour and a responsibility, because the theme chosen for these days, water and agricultural resilience in the face of climate change, was precisely the kind of question Gulhati spent his career on.

I want to take the memorial seriously rather than ceremonially. A memorial lecture is not an obituary. The most useful thing I can do with Gulhati's memory is to ask what his work still tells us about the choices in front of irrigated agriculture today. The instruments have changed, the climate has changed, and the water we are now willing to call a resource has changed; the method Gulhati left us has not.

* Department of Agricultural, Forestry, Food and Environmental Sciences, University of Basilicata, Potenza, Italy
President, Italian National Committee of ICID – ITAL-ICID

AN ENGINEER'S LEGACY, READ AS A COMPASS

Niranjan Das Gulhati was born in Lahore in 1904 and trained as a civil engineer at the Thomson College in Roorkee. He entered the Indian irrigation service in 1927, and by 1950, as Chief of the Natural Resources Division of the Planning Commission, he was shaping the irrigation, power and soil conservation proposals of India's First Five-Year Plan. He proposed the creation of an International Commission for Irrigation and Drainage to the Government of India in 1946; the Commission was established in 1950, and Gulhati served as its founder Secretary General from 1950 to 1957, Vice President from 1957 to 1960, and President from 1960 to 1963. He was India's principal negotiator for the Indus Waters Treaty of 1960, and he was honoured with the Padma Bhushan Award in 1961.

THE CONTEMPORARY LANDSCAPE: GLOBAL CHALLENGES IN IRRIGATION AND DRAINAGE AND THE RELEVANCE OF GULHATI'S PHILOSOPHY

The modern water crisis presents a dual-layered challenge: an exponentially growing global population demanding for higher food production, contrasted against rapidly dwindling and increasingly volatile freshwater resources.

Agriculture remains the largest utilizer of freshwater globally, accounting for approximately 70% of all withdrawals.

Under the current trajectory of climate volatility, traditional irrigation models are facing systemic vulnerabilities:

- **Hydrological Extremes:** the intensification of the global water cycle has led to rapid alternations between prolonged, devastating droughts and sudden, high-intensity flash floods that overwhelm drainage infrastructure.
- **Groundwater Depletion:** over-reliance on sub-surface aquifers has led to critical drop rates in water tables worldwide, threatening long-term agricultural viability.
- **Structural Degradation:** aging irrigation canals and inefficient distribution networks contribute to massive conveyance losses, before water even reaches the farm gate.

To navigate these compounding crises, we must bridge historical wisdom with modern innovation. The pertinence of Gulhati's framework can be observed across four major contemporary pillars:

1. **Water Diplomacy and Transboundary Cooperation:** as the primary architect of the Indus Waters Treaty (1960), Gulhati demonstrated to the world that transboundary water sharing endured decades of geopolitical tension because it was built on shared, transparent engineering data and

mutual benefit. In our current era, Gulhati's approach suggest that sustainable peace relies on rigorous technical cooperation and joint basin management rather than political posturing.

2. **The Water-Energy-Food Nexus:** long before international bodies coined the term "Water-Energy-Food Nexus," Gulhati insisted that irrigation systems must be planned in complete harmony with general agricultural policy, rural economics and energy production. In the modern context, we cannot design efficient modern irrigation without evaluating its energy footprint (such as transitioning to solar-powered precision pumping) and its impact on cultivating drought-resilient crop varieties.
3. **Modernization, Innovation, and Co-Participation:** achieving absolute water sustainability requires a profound paradigm shift in how technologies are implemented and how stakeholders interact. True modernization is not merely a top-down application of advanced tools, but a co-participatory framework. Modernization fails when it is treated purely as a technological upgrade. Installing automated gates or satellite soil sensors yields little fruit if the local communities are left out of the operational design loop.
4. **Participatory Water Management (PWM):** following Gulhati's strong advocacy for involving local agricultural communities, modern Participatory Water Management (PWM) seeks to transform farmers from passive water consumers into active custodians of the resource. By empowering Water User Associations (WUAs) with digital and data-driven tools, we can ensure equitable distribution, swift conflict resolution, and long-term maintenance of shared infrastructure.

Gulhati's thought also finds relevance in the attention paid to international cooperation built on shared data, the management of water and soil as one problem, and the habit of measuring national practice against a global review. That instinct, that water management and the protection of the soil are one problem and not two, is exactly what the agro-ecological transition now asks us to recover. The third commitment is comparison. Gulhati did not write only about Indian canals. He compiled *Irrigation in the World: A Global Review* (1955) and later set Indian practice within the long history of irrigated agriculture. He measured what he did against what the world did.

The case for treated wastewater reuse in Mediterranean cropping systems, governed by Regulation (EU) 2020/741, can be read as the contemporary extension of Gulhati's engineering instinct to enlarge the usable resource. The agronomic value of that reuse depends on managing what enters the soil-plant system, the salts and the emerging contaminants, as carefully as the water volume itself, and its social value depends on the chain of actors, from decision-makers to farmers, that the reused water has to pass through. Resilience, on this reading, is less a technology than the cooperation that lets technologies reach a field.

THE RESILIENCE PROBLEM, STATED IN NUMBERS

Close to two-thirds of the world's farmland depends on rainfall, which makes climate the first determinant of crop productivity and climate change a direct constraint on it. Against that background, irrigated agriculture carries a disproportionate load: it occupies roughly one fifth of cultivated land, yet it produces close to two fifths of the world's food while accounting for about seventy per cent of global freshwater withdrawals.

Those proportions explain why resilience cannot mean a return to a former baseline. The climate under which the Mediterranean irrigation networks were designed, with its expected rainfall windows and its tolerable summer deficits, is no longer the climate they operate in. Resilience has to be read as an adaptive capacity: the capacity of a cropping system to keep producing food and to keep its soil and water base intact while the boundary conditions move. That reading sits well with the President of ICID's framing of the Congress, which puts the agro-ecological transition, soil health and the controlled use of reuse and desalination at the center of the debate.

The Mediterranean carries this general pressure in a sharpened form. Rainfall is concentrated outside the growing season, the summer evaporative demand coincides with the period of peak crop water need, and the inter-annual variability that farmers must plan against is widening. In practical terms the irrigation manager is asked to deliver a larger share of seasonal crop water from storage and from supplementary sources, in years that are individually less predictable. A system designed for an average year performs poorly in a sequence of extremes, and it is the sequence, not the average, that now defines resilience.

In the abovesaid scenario, the management of water use pones three questions. The first refers to how irrigation and drainage can contribute to the agro-ecological transition under climate change. The second asks where we stand on the technologies and practices that raise water-use efficiency, from irrigation management and services to remote sensing and equipment. The third inquires whether non-conventional water, meaning reuse and desalination, can genuinely loosen the grip of scarcity on the resource, and for which uses.

Read together, these are not three separate agendas but one, and they line up almost exactly with the three Gulhati commitments. The agro-ecological transition is the soil-and-water coupling he practised. Water-use efficiency is the global stock-taking he was drawn to. Non-conventional water is where his engineering optimism, the willingness to enlarge the usable resource, meets a frontier he did not live to see. I take the three in turn, and I am sincere about which connections to Gulhati are documented and which are my own extension of his method.

IRRIGATION, DRAINAGE AND THE AGRO-ECOLOGICAL TRANSITION

The agro-ecological transition asks irrigation to do more than delivering water on time. It asks water to be delivered in a way that builds rather than depletes the soil that holds it. In Mediterranean systems the constraint is well known: low and declining soil organic matter, a fragile structure prone to crusting and erosion, and

summers in which evaporative demand far exceeds supply. Drainage, often treated as the quiet half of our discipline, is part of the answer, because salt control and the timing of the soil water balance decide whether reused or marginal water can be applied at all.

This is where Gulhati's coupling of irrigation with soil conservation stops being a historical footnote and becomes an operating principle. When the First Five-Year Plan proposals he led joined irrigation to soil conservation, they encoded a logic the agro-ecological transition now formalises: a cropping system is resilient when its water management protects the structure, the organic matter and the biological activity of the soil, that gives the water its agronomic value. Conservation tillage, cover cropping and well designed crop rotations are the agronomic levers; precise irrigation and drainage are what make those levers usable under a Mediterranean deficit. ICID has framed the modern contribution of irrigation and drainage in the same terms, as a means of enhancing soil health and supporting sustainable water management within new farming systems.

Drainage deserves to be named explicitly here, because it is the condition that makes the rest possible. Where lower-quality or reused water is applied, salts accumulate in the root zone unless a controlled leaching fraction and a functioning drainage path remove them between cycles. Managing the soil water balance, the relation between applied irrigation, rainfall, crop evapotranspiration, drainage and the change in soil storage, is therefore not an accounting exercise but the mechanism that keeps a soil cultivable under marginal water. Gulhati's discipline held irrigation and drainage together in a single commission for this reason; the agro-ecological transition gives that pairing a renewed agronomic purpose.

WHERE WE STAND ON WATER-USE EFFICIENCY

Efficiency is the issue on which our discipline has moved furthest since Gulhati's time, and it is worth being precise about what kind of efficiency we mean. Agronomic water-use efficiency, the yield obtained per unit of water applied, is the figure that matters to the farmer, water resource manager and citizens. Raising it has less to do with any single device than with the alignment of the irrigation schedule to the crop's real demand, cycle by cycle and field by field.

The instruments that now make this alignment possible would have been unconceivable in 1955, yet they serve the comparative purpose Gulhati valued. Soil moisture sensing, the FAO-56 crop coefficient approach to estimating crop evapotranspiration, satellite and proximal remote sensing of canopy state, and the use of machine learning to turn these streams into an irrigation decision, together let a manager close the gap between water supplied and water needed. The trajectory is the one an earlier Gulhati lecturer described as the shift from construction to modernisation, from building capacity to operating it well. For Mediterranean durum wheat and horticultural systems, the prize from this alignment is twofold: less water diverted for the same yield, and a smaller drained volume carrying salts and solutes out of the root zone, which is precisely the margin that makes lower-quality water safe to use.

Efficiency is not gained by hardware alone. Technology does not work without diffusion of knowledge and services to the farmers: a sensor or a model change nothing until it reaches the decision of an individual irrigator, through advisory services, accessible data and a tariff that rewards saving rather than spending water. Gulhati spent his institutional life making knowledge travel, from the founding of the ICID Bulletin to the global review he compiled. The modern version of that work is the extension and digital service that carries an evapotranspiration estimate to the farm gate in a form a grower can act on. Without it, the gains stay in the literature.

NON-CONVENTIONAL WATER: REUSE AS THE CONTEMPORARY FRONTIER

The third question is the one where I must be most careful about Gulhati. He did not write about treated wastewater or desalination; to claim otherwise would mean inventing a lineage. What I can honestly claim is that reuse is the contemporary form of his engineering instinct, the enlargement of the usable resource under water scarcity. Where his generation enlarged supply by storing and conveying river water, ours enlarges it by reclaiming the water that agriculture, cities and industry have already used once.

In the European Union this is no longer an experimental option. Regulation (EU) 2020/741 sets minimum requirements for water reuse in agricultural irrigation, defining reclaimed-water quality classes A to D and tying them to crop categories and irrigation methods. For a Mediterranean country the regulation reframes treated wastewater from a disposal problem into a planned, climate-independent and nutrient-bearing source that can be scheduled with the same confidence as a canal turnout. That is the affirmative answer to the Congress question of whether reuse can loosen the grip of scarcity.

The structure of the Regulation rewards agronomic precision. Class A, the most stringent, permits irrigation of all food crops including those eaten raw and root crops consumed raw, while the less stringent classes are matched to processed food crops, to non-food crops, and to irrigation methods that limit contact between the water and the edible portion. The choice of class is thus an agronomic decision as much as a treatment one: crop, irrigation method and water quality are selected together. For a processing tomato or a cereal destined for milling, the combination of an appropriate class with a sub-surface or drip method can place the reused water exactly where the root system needs it, while keeping it away from the harvested product.

The qualification is agronomic, treated wastewater carries more than water and nutrients. It can carry emerging contaminants, the pharmaceuticals, personal-care products and related trace organics that conventional treatment does not fully remove, into the soil-plant system. Whether a given compound reaches the edible portion of a crop depends on its physical chemistry, on properties such as the octanol-water partition coefficient and the degree of ionisation, and on the soil and irrigation conditions that govern root uptake and xylem-mediated translocation. The agronomic task is therefore not to choose between reuse and safety but to manage reuse so that the resource gain is real and the residue entering the food chain stays

controlled. This is the same discipline Gulhati applied to shared rivers, now applied to a shared resource of a different kind: enlarge the supply, but govern what travels with it.

Governing what travels with the water is, in the end, a monitoring problem, and monitoring is where Gulhati's idea of data as a shared good returns. Reuse at scale is trusted only when the quality of the reclaimed water, the loads applied to the soil, and the residues measured in crops and groundwater are recorded openly and read in common by utilities, regulators and farmers. The same transparency that allowed two states to share a river under the Indus Waters Treaty is what will allow a region to share a reclaimed-water scheme without eroding confidence in its produce. The instrument is humbler and the molecules are smaller, but the principle is unchanged.

THE ACTORS THE WATER IS FOR

I hope that this lecture, walking on Gulhati's teaching, will reach decision-makers, intermediaries, extension services and farmers. That list is not a courtesy; it is the chain along which any of the transitions I have described either travels to a field or stops in a report. The ICID was founded on the conviction that water engineering exists for the people who farm, and for all stakeholders involved in water management, in a water-secure world free of poverty and hunger... ICID keeps that purpose in plain sight. Each actor carries a different part of one task. Decision-makers set the standards and the water rights within which reuse and efficiency become lawful and financeable; without Regulation (EU) 2020/741 and its national transposition, reclaimed water remains an experiment rather than a supply. The intermediaries, the utilities and consortia or water users' associations that run the networks, decide whether reclaimed water of a given class actually arrives at the right field at the right time. Extension services turn an evapotranspiration estimate or a quality class into an instruction a grower can act on. The farmer accepts or refuses the risk, and it is the farmer's confidence, earned through monitoring that is open to inspection, that decides whether produce grown with reused water is trusted in the market.

Gulhati read this chain through the institutions of his own time, when the working scale was the river basin and the national plan, and the decisive actor was the state engineer. The actors have multiplied since, and the audience of this lecture reflects that. What has not changed is that the weakest link sets the result: the most advanced reuse scheme fails if extension never reaches the farmer, just as the most careful treaty fails if the data beneath it are not shared. The Gulhati's Call, in placing agriculture at the center of the water transition, is an appeal to align these actors rather than to perfect any one of them.

COOPERATION AND GOVERNANCE: THE GULHATI METHOD IN A WARMING BASIN

None of the three transitions is delivered by engineering alone. Each needs the institutional layer that Gulhati understood better than others. Reuse depends on shared quality standards and on monitoring data that farmers, water utilities and regulators trust in common; efficiency gains depend on services and extension that

reach the individual irrigator; the agro-ecological transition depends on aligning public policy with what is agronomically possible on the ground. These are the cooperative and data-based mechanisms Gulhati conceived the ICID to provide.

The transboundary dimension has only grown more pressing. As water scarcity increases, water shared across borders and across sectors will be contested more sharply, and the Indus Waters Treaty remains a working example of allocation held together by transparency and mediation, rather than by force. The Marseille Call, the appeal issued with this Congress to place agriculture at the center of the water transition is a contemporary statement of the same conviction: that the water problem is solved by cooperation organised around evidence, or it is not solved at all.

Cooperation also has to confront cost honestly, since the non-conventional sources differ sharply in what they demand. Reclaimed water reuses an effluent that has already been collected and treated, so its marginal energy and economic cost is modest and its nutrient content offsets part of the fertilizer bill. Desalination enlarges the resource where no freshwater alternative exists, but at an energy cost that places it, for most field crops, beyond economic reach without subsidy. A resilient strategy does not treat the two as interchangeable; it ranks them, reusing first where reuse is feasible and reserving desalination for the uses and places that justify it. Setting that order is itself an act of the evidence-based governance as Gulhati's method suggest.

CONCLUSION: HONOURING BY CONTINUING & CALL TO ACTION

Gulhati's method can be stated without sentiment. He enlarged the usable resource instead of merely rationing the existing one, he treated water and soil as a single object of management, and he organized both around data that crossed the borders, separating those who depended on the water. None of the three is obsolete. What has changed is the resource we are now willing to count, which includes the effluent we once discarded, and the precision with which we can match supply to need. The argument of this lecture follows from that.

The challenges of the 21st century demand that our water governance models become fundamentally interdisciplinary, co-participatory, and deeply cooperative. If N.D. Gulhati were standing here in Marseille today, he would undoubtedly marvel at our technological capabilities, our remote sensing satellites, artificial intelligence predictive models, and precision drip systems.

Yet, he would gently remind us that technology is merely an instrument. The ultimate success of our mission lies in our ability to bring diverse human perspectives around the same table for a shared and sustainable future. The engineering of tomorrow is not just about moving water; it is about sustaining life, securing food, and fostering peace.





ICID•CIID

Invitation to Join ICID *As* Direct Member

Invitation to Join!

The International Commission on Irrigation and Drainage (ICID) is a leading scientific, technical, and professional not-for-profit international organization established in 1950 with headquarters in New Delhi, India; working in the field of irrigation, drainage, and flood management to promote and achieve 'sustainable agriculture water management' through its vision "A water secure world free of poverty and hunger through sustainable rural development".

ICID's Membership is open to Private Companies, Institutions, and Individuals involved in agriculture water management to join as a 'Direct Member'. By joining ICID as a "**DIRECT MEMBER**", companies, institutions, and individuals working or dealing with irrigation, drainage, flood-related issues, and other allied fields would be part of an international network that offers opportunities to exchange knowledge and experience, establish partnerships; stay informed on recent irrigation, drainage and flood management news and events through Commission's publications; make their voice heard and contribute to improved understanding among stakeholders, enabling new ideas on water policy; benefit from worldwide exposure of their organization's activities by using the Commission's communication tools and by participating in

the Commission's activities; and influence policymakers to develop sound irrigation-related policies and give it higher priority in the political agenda.

ICID organizes triennial International Congress on Irrigation and Drainage – addressing specific questions; World Irrigation Forum, Regional Conferences, International Drainage Workshops, International Micro Irrigation Conferences, etc. regularly. The Commission brings together experts from different parts of the world to share their experiences and knowledge on specific issues through the ICID technical workbodies. The workbodies bring out manuals, guidelines, and special publications from time-to-time.

For more information related to Direct Membership, please visit: https://icid-ciid.org/member/direct_member

Apply Online for Direct Membership: https://icid-ciid.org/member/dm_membership_form

Contact:

*The Secretary General, ICID, 48 Nyaya Marg,
Chanakyapuri, New Delhi 110 021, India,
Tel: +91-11-41510420, E-mail: icid@icid.org
Website: <http://www.icid.org>*





ICID•CIID

26^E CONGRÈS INTERNATIONAL DES IRRIGATIONS ET DU DRAINAGE DE LA CIID

12-17 October 2026, Marseille, France

Hosted by:

Eau, Agriculture et Territoires

Association française pour l'eau agricole, une irrigation et
un drainage durables, 500 rue Jean-François Breton, 34093
Montpellier Cedex 5, France, E-mail: afeid@inrae.fr
Website: <https://www.eau-agriculture-et-territoires.com/>



ICID Central Office:

48 Nyaya Marg, Chanakyapuri, New Delhi 110021, India.

Tel: +91-11-41510420, E-mail: icid@icid.org,

Website: www.icid.org

Follow ICID on :



[/in/icid-ciid-1544819](https://www.linkedin.com/company/icid-ciid-1544819)



[/icidonline](https://www.youtube.com/channel/UC...)



[/icidonline](https://www.facebook.com/icidonline)



[/icidorg](https://twitter.com/icidorg)