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RINA

A **circular** and **regulated water** for the future

President & CEO **message**

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Our experience. Your growth.

Water is a vital and indispensable resource for human life and for all living beings on the planet. Our bodies, made up of about 60% water, demonstrate how essential it is not only for our well-being but also for our very survival. Its scarcity represents one of the most serious challenges that humanity will face in the coming decades.

Climate change is causing an uneven redistribution of water resources: while some areas suffer from extreme drought, others are devastated by floods. This chaotic management of water resources puts millions of people at risk.

Currently, about 2 billion people lack access to safe drinking water. The lack of water can have devastating effects, not only on human health but also on agriculture, which heavily depends on water resources. Moreover, water scarcity fuels conflicts and social tensions, even leading to wars over control of this resource. Drought accounted for 5% of natural disasters between 1995 and 2015, affecting 1.1 billion people, with economic damages estimated at over $100 billion.

It is therefore essential that urgent measures be adopted to manage and conserve water sustainably. Raising awareness about its importance, especially in more developed countries like Italy, is crucial to promote responsible usage practices. Investing in infrastructure to mitigate the effects of climate change and improve water resource management is a priority to ensure a secure future.

Understanding the importance of preserving this resource is essential for the well-being of present and next generations. Only with a global and collaborative commitment we can hope to achieve a sustainable future.

Ugo Salerno

Executive Chairman, September 2024

Today, the **Global Water Security and Sanitation Partnership** (GWSP) 2023 Report estimates that global investment required in the water sector will exceed $1.37 trillion. Achieving **SDG 6 (Clean water and sanitation for all)** by 2030 only would necessitate a sixfold increase in investments from current levels. Primary benefits of the claimed investments on water would result in healthier people, climate-resilient ecosystems, adequate irrigation and drainage services as well as expanded water storage capacity.

While this message primarily targets **policymakers**, given that water management predominantly falls under the public sector, the escalating risks faced by the **private sector** underscore the pivotal role of **private investors** in shaping the future of water management over the next decade. Even if the fundamental importance of water for the economy and life on earth is strong enough to support any amount of capital, **financial innovation** is needed to drive this massive investment and related operations, accompanied by **technical innovation** and **governance strategy**. For instance, maximising synergies will be a must, e.g. water systems provide water services whilst also reducing risks to other services from natural hazards such as floods and droughts.

RINA is sharing this position paper to make a meaningful contribution to the ongoing global dialogue on water, a pressing challenge facing the world today with the aim of ensuring **global water security**. Leveraging its operational presence in over 200 offices across 70 countries worldwide, RINA has accumulated valuable on-the-ground experience regarding water challenges and opportunities across diverse operational contexts. By engaging with various stakeholders, RINA has developed its own set of **ten priorities** aimed at advancing the strategy for a **circular and well-regulated water system for the future**.

Carlo Luzzatto

CEO & General Manager, September 2024

Water cycle **needs**

Population growth, urbanization and industrialization, including energy transition needs, have a significant impact on resource consumption at global level. Currently, the planet is consuming more resources than it can produce. Earth Overshoot Day in 2024 falls on August 1st, whilst in 1990 the data was October 11th. Today, the world's population is consuming the equivalent of **1.6 planets per year** compared to a ratio of 1:1 in the early 1970s. Additionally, climate change is increasing the challenges of **water access and use on Earth**, even in regions historically rich in water.

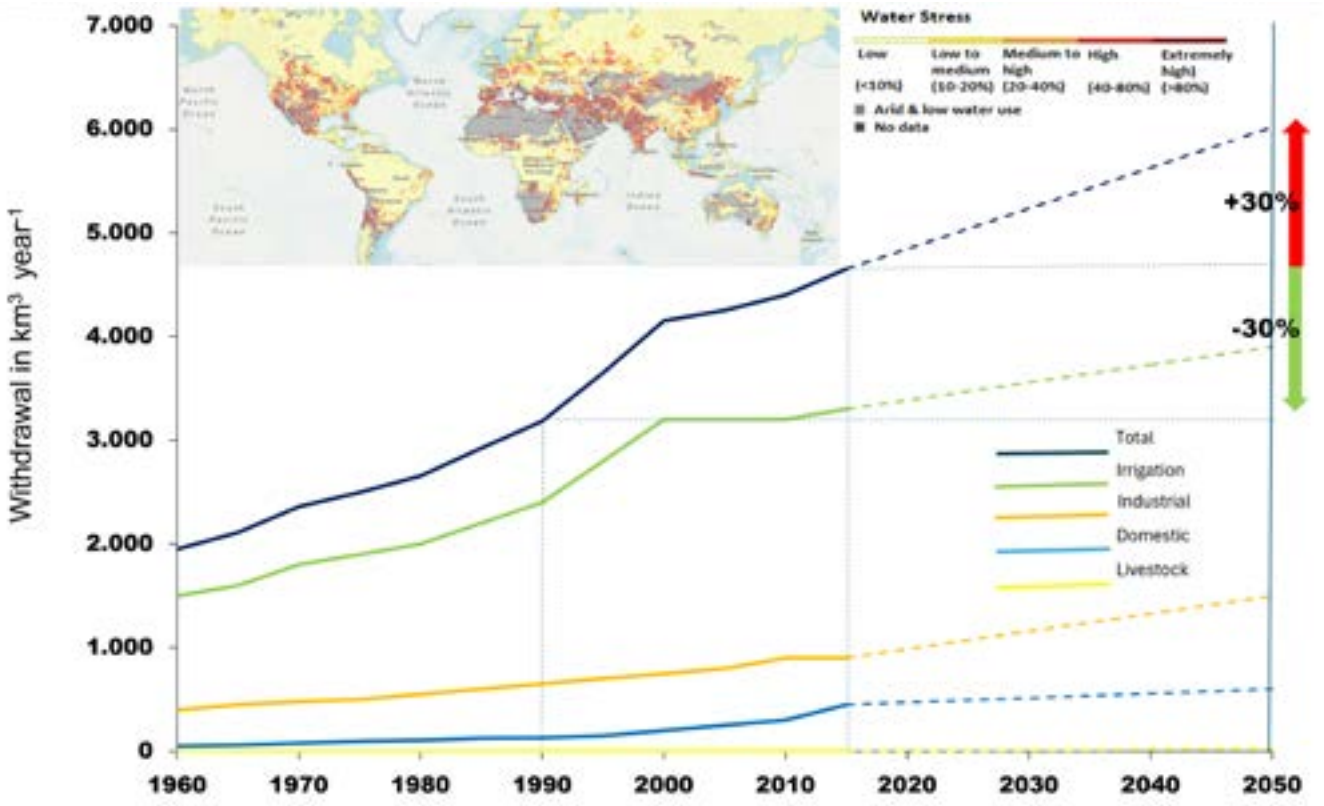

Figure 1. World water withdrawal per category

The **World Resources Institute** (www.wri.org) highlights that water withdrawals for agricultural purposes have consistently been the primary contributor to global water use since the 1960s. Meanwhile, household water demand has surged by 600% over the same period (Fig. 1). Projections for total water withdrawals by 2050 indicate a potential increase of approximately 30% compared to 2014 levels, assuming no specific actions are taken to curb water consumption. Ideally, water consumption should revert to levels established in the early 1990s, which were 30% lower than the 2014 baseline. By 2050, the anticipated water stress levels (Fig. 1) could affect 51 out of 164 countries and territories (www.wri.org), with these areas experiencing high to extremely high-water stress (World Resources Institute, Aqueduct Water Risk Atlas, www.wri.org). Given that 97% of the Earth's water is saltwater, and only 3% is freshwater, of which less than 1% is readily accessible for life on the planet (Earth Data Open Access, **NASA**), it is imperative to manage and conserve this essential resource with utmost urgency.

This recognized resource consumption poses a stress to the natural availability of water resources associated with the **water cycle** leading to a decrease in the **global freshwater supply**, accentuated by pollution levels. A schematic representation of the **water value chain**, depicting known threats and opportunities, is illustrated in Figure 2.

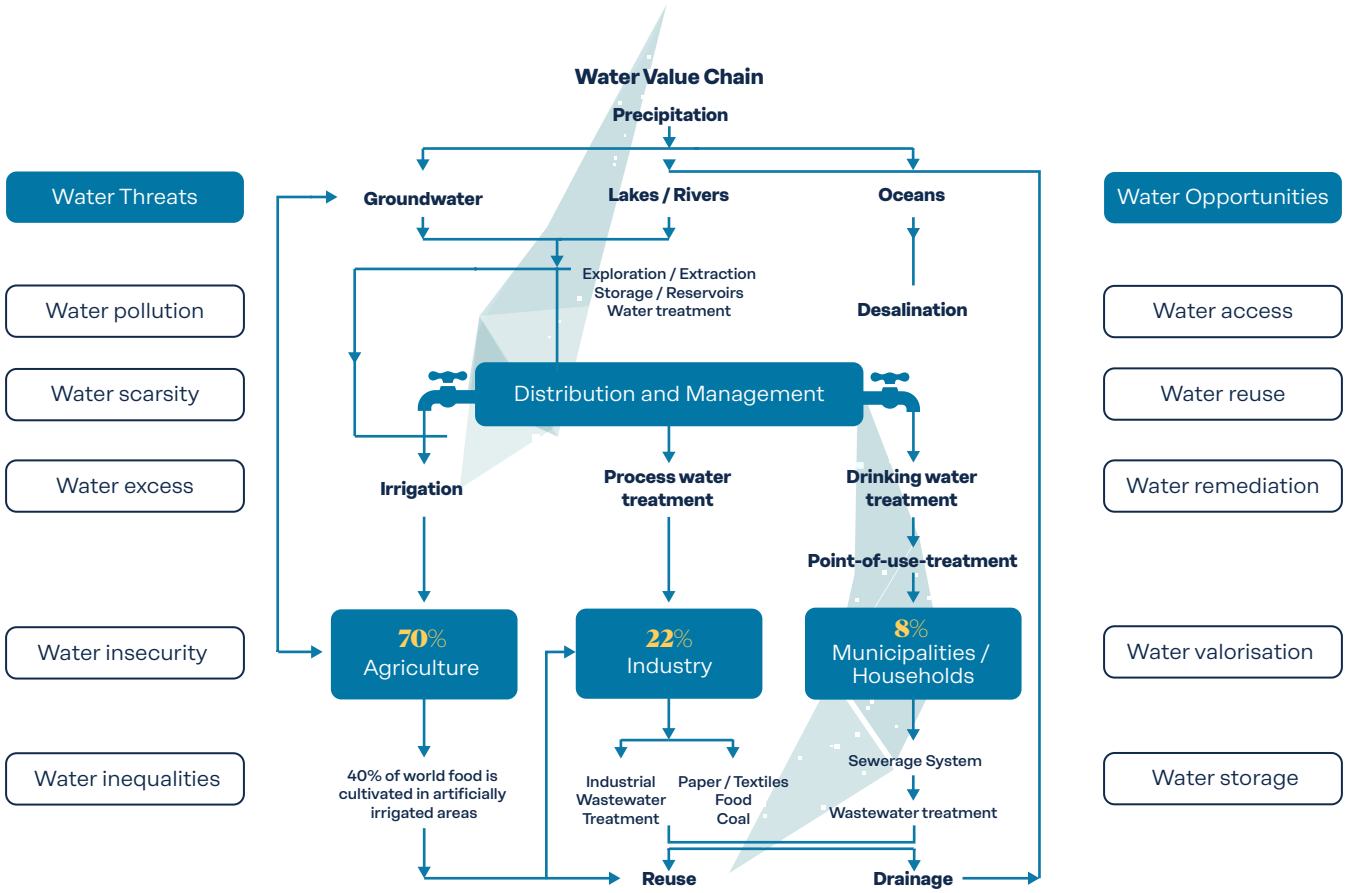

Figure 2. Water Cycle Value Chain scheme

Therefore, critical approaches to transform future water systems include transformative actions to reduce **freshwater consumption** in our **homes, cities, industries, agriculture fields and green areas, and food production**. Proactive actions must also address climate change's correlated effects such as desertification and saltwater penetration effect in dried areas and management of excess water due to floods and rising sea levels in flat lands. Efforts are required to optimize **water usage**, minimising losses, and inefficiencies, stemming flood flow, recovering excess water for further use when necessary, and rethinking industrial processes to minimise use of water and operate on a **circular basis**. Innovation, best practises in water and energy consumption, sustainable growth, and use of natural resources are all vital for mitigating harmful impacts on people's livelihoods, preserving adequate level of water quality and sanitation, and safeguarding biodiversity.

The way **forward**

Simplification
Streamlining processes and solutions to make water management more accessible and efficient.

Safety and security
Ensuring the integrity of water sources and the safety of water-related infrastructure.

Circularity
Maximising the water value in a cycling sustainable process through technology, best practises, and governance support.

Regulation
Adhering to and promoting regulatory frameworks that enhance water governance globally.

Digitalization
Harnessing the power of technology for data-driven decision-making and resource optimization in water management.

Efficiency
Contributing to sustainable water efficiency practises and reducing the environmental footprint in water-related activities.

Decalogue of **priorities**

Operating across numerous countries alongside diverse clients and partners, RINA recognizes the varying sensitivities and priority perceptions influenced by local regulations and governance structures. Over the past decade, RINA has amassed a wealth of global evidence concerning water challenges and opportunities. It has cultivated a comprehensive vision for addressing these issues and crafted a decalogue of priorities aimed at fostering a **circular and regulated water system for the future**. This initiative encompasses both proactive measures and ongoing efforts to enhance the value of services provided to local stakeholders and authorities. Embracing water management as a global imperative, RINA is eager to share its prioritized agenda with others invested in tackling this pressing issue.

N°1. Collect stormwater and freshwater by promoting restoration of old dams and reservoirs to secure a better water reuse where needed.

Expected technical enhancement: dam rehabilitation, including spillway, fishway retrofits for migratory fish passage, reservoir reoperation; sustainable sediment management, which includes measures to pass sediment through or around dams, as well as other mechanical measures to restore sediment connectivity.

Expected impacts/benefits: new capacity of reservoirs in combating Water Scarcity by improving a) storing and distributing water for diverse uses including irrigation; b) controlling & regulating Water Flow; c) hydropower generation; d) recreational opportunities.

N°2. Enhance the safety of existing peculiar water infrastructures, such as the embankments of large earthen reservoirs, by means of dynamic risk assessment prediction tools based on sensors distributed networks.

Expected technical enhancement: reduce risk of relevant earth structure collapse through active monitoring; establish rules to safely manage these important water infrastructures, which are today out of control; improving maintenance techniques to reduce vulnerability; developing contingency management and design appropriate safeguard services.

Expected impacts/benefits: widespread use of digitalisation in predicting embankment failure processes through integration with digital networked systems as well as adaptive learning capacity to achieve a) safe operations management; b) flood-related disaster avoidance; c) high water quantities loss and basin recovery cost prevention; d) increased integration with local authorities, regulatory bodies and associations.

N°3. Promote the structured development and growth of decentralised wastewater treatment plants maximising use of Nature Based Solutions (NBS), complemented with increased sanitation capacity, through appropriate standards, private-public partnerships models and operative practises.

Expected technical enhancement: reduce the presence of pathogens and sanitation risk; eliminate the presence of pollutants from emergent compounds, like pharmaceuticals, pesticides and forever chemicals; increase the synergy between centralised and decentralised WWTP; improve the activated sludge treatment.

Expected impacts/benefits: maximising synergy between centralised and decentralised WWTPs to better valorise reclaimed water to a) increase the water quality for reuse in urban context applications, b) remove recalcitrant molecules as well as micro and emerging pollutants in treated water, c) decrease overload peaks and improve flow rate stability through time at centralized WWTP thanks to synergy with decentralised plants, d) promote circularity and reduce operation costs.

N°4. Reduce maintenance and water loss costs by improving the automated monitoring capacity of large water concrete-based reservoirs, including connection pipelines with distribution nodes by means of Artificial Intelligence (AI) driven inspection Remotely Operated Vehicles (ROVs).

Expected technical enhancement: integrate vision-based equipment and image-processing technologies on both underwater and aerial ROVs; enable intensive machine learning on fully characterised cracks/flaws images on different materials (concrete for dams and steel for the connection and distribution pipelines network); integrate solutions to match internal and external points of water loss from distribution pipelines network.

Expected impacts/benefits: enhance smart maintenance and water loss prevention from large concrete based water infrastructures to sustain water management operations by means of a) increased underwater control capacity as unaffordable so far; b) decreased risks to human operations; c) reduced business discontinuity and water flow availability; d) provision of continuous water leakage monitoring inside large conduits to the destination point.

N°5. Clean water from pollutants before any discharge to river/sea or prior to recharge the aquifer in a safe circular economy perspective.

Expected technical enhancement: integrate existing Waste Water Treament Plants (WWTPs) with innovative technology for the decontamination of the wastewater due to nutrients and their subsequent uptake / valorisation in a view of circular economy; specialise both centralised and decentralised systems to provide treated water solutions for fertirrigation services in all relevant cases, e.g. urban green park, nearby agri-fields.

Expected impacts/benefits: new capacity to clean water from pollutants in the overall water cycle to achieve a) more efficient treatment of urban wastewater removing nitrogen and phosphorus for reuse in urban context applications as well as to recharge the aquifer, b) enhancement of the circularity of the organic matter and the nutrients as fertilizers.

N°6. Increase the establishment of permanent observatory points to measure the local stress level on the water cycle to feed wider forecast models estimating the impacts at planet level.

Expected technical enhancement: sharing of pollution data measurements at WT/WWT plants outlet of water discharge on land and at fixed stations measuring points through the water column at the inlet of main catchment / river flow, as well as at depth by maximising exploitation of existing piezometric wells and foster the close integration with satellite detection capacity.

Expected impacts/benefits: new role of real time and site-based measurement data sharing with broader citizens, technical and governance audiences to a) widen accountability on the environment; b) enable detection of unregulated / inadvertent discharge; c) favour the stabilization and possibly renourishment of the environmental conditions of known hot spots; d) foster the development of local stakeholders' communities to monitor the evidence of the environmental status.

N°7. Improve irrigation practises and agri-farming models through modern fertirrigation techniques combined with reclaimed & empowered water capacity and use of optimised water distribution systems.

Expected technical enhancement: empower the digitalization potential for reclaimed water and treated wastewater quality monitoring connected with the irrigation systems for urban and agricultural contexts reuse; combine with AI based optimisation techniques to reduce the quantity of re-cycled water for use in both urban and agri-field applications.

Expected impacts/benefits: potentiated irrigation and fertirrigation capacity to a) fully replace fresh water for other than human consumption uses; b) reduce quantities of fertilisers to be produced; c) minimise the pollutants discharge in the water cycle sources; d) provide alternative solutions to soil erosion thread in areas affected by water scarcity or heavy drought.

N°8. Increase the water balance evaluation capacity at catchment level based on predictive models and water table measurements techniques to enable the deployment of specific mitigation measures to recover the natural water cycle.

Expected technical enhancement: enhance the predictive capacity for water balance at the district or catchment level by integrating existing models with water table measurements and incorporating precise data on land use and soil properties. Extend geographical coverage through regional and trans-boundary modeling to precisely delineate areas experiencing water cycle stress and to implement appropriate measures across the affected territory.

Expected impacts/benefits: improved water balance evaluation at the appropriate extent and data processing capacity to a) accurately address the water consumption and replenishment rate and predict consequence related to the unbalance; b) proportionate actions to recover and/or manage the unbalanced; c) enable quantification of impact at countries level.

N°9. Improve efficiency of water demanding industrial processes, including emerging energy production systems.

Expected technical enhancement: promote low energy consumption solutions to replace evaporative wet cooling systems with high-rate heat exchange materials; integrate zero liquid discharge (ZLD) equipment to treat and recycle water for paper mills industry; invest on R&D to improve the efficiency of commercial scale electrolysers and reduce the consumption of freshwater for cooling.

Expected impacts/benefits: technology upgrade to abate industrial water demanding processes to a) reduce the burden of water demand in heavy cooling systems; b) maximise water cycling processes; c) develop efficient green hydrogen production technologies to optimise energy conversion.

N°10. Promote greater awareness and quantification of the water value by integrating Water Footprint and Water Efficiency metrics into all water-related activities.

Expected technical enhancement: foster a sustainable water culture from early education through academic pursuits. Enhance professional training on essential water parameter evaluation standards. Advocate for incentives to encourage compliance with water-based metrics accreditation. Establish a procedure for obtaining Certificates based on demonstrated water-saving capabilities.

Expected impacts/benefits: solicitate a drastic change in the accountability of the entire stakeholders' value chain about the importance to measure any saving on water consumption and related impacts for the planet survival to a) reliably ensure water access with increased resilience to the climate change; b) sustainably secure investments on growth avoiding losses for remediation; c) turn to positive the credits for future.

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the water value chain services

References

- **Aqueduct Water Risk Atlas** (wri.org)
- **NASA Earth Data**, Open Access for Open Science, Freshwater Ecosystems https://www.earthdata. nasa.gov/learn/toolkits/freshwater-availability-toolkit.
- **Word Bank**, 2023, "Global Water Security and Sanitation Partnership (GWSP): Annual Report - 2023".
- **www.wri.org** (Domestic Water Use Grew 600% Over the Past 50 Years | World Resources Institute (wri.org)