# The Muscat Call 2022

**This declaration presents and advances the outcomes of the *Global Forum: Technology, Sustainability and Humanity*, held in Muscat, Oman, October 17-19, 2022**[1]

**A call for action, setting directions for the way forward, it represents the joint effort, actions, and aspirations of the *Water and Humanity*[2] network, a multi-stakeholder platform serviced out of Muscat, Oman.**

1 This "*Global Forum, Technology, Sustainability and Humanity*" constituted the 29th edition of the Global Forum, an IT-think tank founded in Sophia Antipolis 1992. Co-organised on the occasion with *Water & Humanity*, this was the first Global Forum held outside the OECD, and the first in the Middle East. The event itself, which took place at the W Hotel in central Muscat, was accompanied by action-oriented workshops and breakout sessions, including preparations of the *present document*.

2 *Water and Humanity*, https://waterandhumanity.com/, represents a multi-stakeholder, multi-sector, and trans-disciplinary platform that is independent of individual governments, authorities or businesses, serviced by the Secretariat of the Organisation for Quality and Innovation Strategies (Qualies), a not-for-profit company founded and registered in Salalah but headquartered in Muscat, while linked to an international network of partners and associated experts.

# The Muscat Call 2022

The Muscat Call draws on the Global Forum that took place in Muscat, Oman, October 17-19, 2022. The ancient maritime nation of Oman is located at the cross-roads of the Middle East, Asia, Africa, and the West. While embracing novel solutions brought by digitalization and the new technologies, Oman cherishes cultural heritage and respects tradition. The 2022 Global Forum connected technology, sustainability, and humanity. Participants joining from all over the world contributed to joint creative work in a multicultural environment.

Diverse competences and a wealth of experience have shaped the Muscat Call. It is action-oriented and aims to be practically relevant for addressing some of the most significant issues of our time. At stake is our ability to manage and sustain our world's most precious natural resources, the world's water cycles among them, along with the living eco-systems which shape the very basis for our joint existence on planet Earth.

Following beneath, the Muscat Call is structured in four parts. The first introduces the agenda. The second presents building blocks for a way forward. The third presents concrete solutions that also represent untapped opportunities. The fourth represents a call for action. While clamouring what is at stake, this document highlights what is being achieved, or is under way, in response. Above all, it aims for inspiration and represents an invitation for diverse competences to come together in taking joint action to realize and scale solutions to prime outstanding issues confronting us all.

# I: INTRODUCTION

## 1.1 Where we are: Technology, Sustainability, Humanity

Staged in a process of ferocious advance, *technical progress* brings unprecedented new tools and abilities. With those, we are poised to potentially resolve whatever vast, outstanding issues confront us. On the other hand, applied to enable ever-more effective resource exploitation, along with means of violence and destruction, technology equally undermines *Sustainability*.

Meanwhile, Climate Change, biodiversity loss, broken land-use and water cycles are interlinked with what and how we produce and consume. *Humanity* has become entangled in a systemic crisis, propelled by collective mismanagement and lack of investment in nature, reflecting inability to appreciate and convert nature's endless, multifaceted value streams into mechanisms for devising responsibilities and sustainable resource use.

National *governments*, *multilateral organisations*, *financial markets*, the *corporate* sector, *citizens*, and *consumers*, fail to combine efforts to rectify the situation. Yet, actions on the ground, in various corners of the world, demonstrate that tangible change - and progress - is possible. More is required, however, to learn from good practices, scale up solutions, and realize untapped opportunities.

While no single silver bullet is at hand, to rectify the situation, the key to change resides with *people*. How technology is eventually put to use, and for what purpose, comes down to multiple influences, at polling stations, in the marketplace, on-line, or the square where demonstrators assemble. Yet, many people experience they have little "say". Fear and prejudice are consciously stoked on, by populist leaders and narrow interests shielding privilege, to put the blame elsewhere, confuse, and divide. Meanwhile, technocrats argue that those lacking material wealth are best served by environmental and cultural decay, as a price that must be paid at the altar of economic development.[3]

[3] This argument, propelled since long by mainstream economists, ignores that the short-term benefits resulting from the destruction of nature, disproportionately feed rent-seeking by vested interests who put proceeds into real estate, luxury items, and bank accounts overseas, while destroying the basis for sustainable communities, particularly for local and indigenous people, and also damaging long-term prosperity for society as a whole.

The majority of the world's scientists, however, overwhelmingly crave for a change of course. The UN Biodiversity Conference (COP15) pledged huge commitments to defend nature. ESG (Environment, Society, and Government) frameworks devised to induce green investor behaviours, are ascribed to by much of global finance. Carbon credits and green bonds set out to reward protection of the environment. Yet, we suffer a disconnect, a missing link with what actually happens on the ground. On this basis, the **Muscat Call advocates another Way forward.** Rather than enumerating what needs to be done, it takes note of action under way, of opportunities at hand, and points to ways of leveraging, scaling, replicating, and doing more by collaborating among us, rather than countering each other.

Progress requires, however, a greater effort to reach out cross-border, link diverse competences, sectors, disciplines, and the demarcation lines of nation states, geography, culture, and mindset. We are all humanity in the face of the systemic crisis confronting us – and we must face it through inclusion and collaboration or perish.

**Next, the Muscat Call presents the building blocks and principles behind the approach that we advocate. The ensuing, third part presents actions. The final calls for leverage and expanded action.**

## II: BUILDING BLOCKS

### 2.1 Taking stock of, and confront, the challenge for what it is

The way forward requires taking stock of the shifting planetary environmental, socio-economic and geopolitical boundaries of our time. We must confront the fundamental challenge facing us all; *under-investment in nature*. The benefits of nature are multifarious, ever-expanding in all directions, transgressing from our past to the present, into our future, for ever and ever. The omnipresent benefits of nature mean that no enterprise, entrepreneur, or market dynamic devoting resources, effort, and time to act in the defence of nature, is to be able to capture a corresponding reward, at least not in the world of material gains.

Therefore, our economic system, by its nature, gravely underinvests in nature – while a myriad of combined policy and market decisions are busy each day and each minute in taking out their share of the pie, undercutting and destroying what is there, until it is gone. The consequence takes multiple shapes – climate change, biodiversity loss, consumerism, ever-expanding waste streams of which little is properly treated or fed back to recycling and re-use, food-water-energy disruptions, the loss of fertile lands, pollution of air and water, and so forth.

**Take stock of, and confront, the problem for what it is, and name it accordingly. We are faced with a *systemic sustainability crisis* caused by multiple interrelated forces which exploit and destroy nature. Ingrained in our collective mindset, institutions, policies, and markets is an anthropocentric place of confinement in desperate need not just of repair but of a changed course of action, enabling regeneration of the living world.**

### 2.2 Affirming that people and widened collaboration are key to progress

Viable solutions to addressing the systemic crisis at hand rest with humanity, i.e., people on the ground. Crucially, it is not about people in isolation - mindset, behaviours, and relations take centre stage. How we collaborate, tap into each other's experience, perspectives, and interests, caring for what goes beyond ourselves, is priceless. Are we in denial of each other, of nature, our own health and of our future, led by jealousy and "we-know-best", or is there room for diversity, compromise, trust, joint considerations, shared responsibilities?

Culture and social relations go together. Governance, leadership, role models, and participatory approaches matter, yes, but all follow on acquisition of knowledge, education and, ultimately, a resourceful and endearing childhood. Our early years in life, and what examples engulf our children, dwarf all else. Relative to its importance, education is the most under-valued, under-staffed, and under-developed industry in the world. Formal education is the most decisive for the least privileged –who receive the least of it.

Technology in education meets with unique dilemmas. Then there is the question of – how can sustainability be embedded in teaching and learning to create a generational change? Teaching sustainability is yet to be adequately embedded in the education system as a subject, both from an early age and by way of offering opportunities for specialisation.

Engaging in digital communication, updating, and designing content, as well as embedding interactivity, are key elements where children are the most receptive, and grown-ups do best assuming a learning stance. They may learn as well to navigate social relations and communicate outside the classroom. All this forms part of the toolbox essential to the training of future citizens aspiring to achieve sustainability. Yet, none of this is granted much space in the high halls of education. Teachers' training to this effect is next to non-existent.

Teachers everywhere need access to training and to be able to possess the necessary resources to integrate educational models based on sustainability into their classrooms. They must also be a role model for students as eco-responsible teachers who know how to listen as well as to speak. Training that is responsive to the need of sustainable development can change the way people think and contribute to developing attitudes that encourage the building of a fairer, healthier, and more prosperous world.

Teachers should build self-perception of themselves as agents of change and direct their academic leadership towards this issue. Teachers' roles are essential to develop students' competence as well as maturity. To meet the objectives of the different spheres of action, not only is it necessary to make creative, critical, and safe use of technologies, but also to learn about their eco-responsible usage. The latter requires acknowledging the impact of technologies on the environment and establishing measures to minimize that impact. It also requires promoting an experimental and collaborative training model. Approaches that are merely theoretical should be dismissed and those based on applied knowledge be adopted. Teacher profiles should draw on competence as well as moral compass, such as caring, selfless, resilient, reliable and inspiring". The role of teachers takes pride from awareness of their responsibility and power to improve education and society through sustainable education and fostering of eco-awareness.[4]

**Acceptance is required, that humans, culture, collaboration, and governance are central to sustainability, necessitating that responsive actions need to be devised and implemented accordingly.**

[4] Builds on the statements by Dr. Ajay Shukla, World Class Scholars, the UAE, opening session, October 17, 2022.

### 2.3 Recognizing that resources must go where the action must be

The systemic crisis must be met on the ground. Where urgent action must happen, resources and capacity building must reach! How to channel resources accordingly goes beyond multilateral bodies, or government-to-government debate. Increasing pressures have led more than half the world's corporate assets to become ESG compliant, with real consequences for the cost of capital, debt as well as equity, worldwide. Frameworks such as SASB (Sustainability Accounting Standards Body), GRI (Global Reporting Initiative) and TCFD (Task Force on Climate-related Financial Disclosures) provide guidance, set standards for financially relevant sustainability information, with implications for the interface between corporates and investors. Yet, the relevance of all this is questionable. Sharper guidance and motivations need to be framed for the financial and corporate sectors to meet with the real needs and efforts of achieving sustainability on the ground.

**The challenges of finance need to be tackled by developing and implementing mechanisms capable of fixing today's disconnect between pledges to investment "green" and what real impacts appear on the ground. We intend to propel a process engaging key actors and stakeholders in bringing about a changed dynamic.**

### 2.4 Identifying and building on solutions at hand

After decades of globalisation, we currently experience a state of fractionalisation, dismantling of supply chains, and new 'cold wars' between nations, making addressing global challenges collectively looking both a necessity and an impossibility. The creative scope and reach of human ingenuity keep advancing tirelessly as observed every day, in many instances nurturing nature and humanity side-by-side. These abilities and efforts are held back by rigidities and barriers, however. Enhanced communication and cooperation, openness and welcoming of new solutions need to go together with enhanced resource flows and other enabling conditions for entrepreneurship and innovation put in place. [5]

[5] Stressed at the event by Her Excellency, Stella Kloth, Ambassador of the Kingdom of the Netherlands to the Sultanate of Oman.

**Our fourth action centres on joining forces in an *inclusive effort cross-border* to support and leverage viable solutions to the systems crisis. Training and resource mobilisation should feed capacity building including openness to diversity and for complementary competencies to come together and spur synergies in realising new opportunities.**

## III: CONCRETE SOLUTIONS, UNTAPPED OPPORTUNITIES

### 3.1 Why Water

Water arguably constitutes one of the world's most valuable resources. Its usage takes multiple shapes – drinking, agricultural, industrial, sanitation, etc. With industrialisation, urbanisation and the population explosion, humanity has come to exert vast influences on the world's water resources. Dams already in place or planned to be constructed in multiple rivers put an end to the replenishment of fish stocks and leave huge previously fertile lands dry. Oceans and lakes are polluted, subjected to acidification and loss of oxygen. Meanwhile, more than a billion people lack basic water access, two billion lack safe and clean drinking water at home, while some four billion live without safely managed sanitation. Floods and other water-related disasters, exacerbated by Climate, account for an estimated 70% of all deaths linked to natural hazards.[6] Working out a response may seem daunting. Yet, solutions are at hand.

Here, we take stock of concrete solutions that have already been developed and proven effective under various conditions. Their potential for scaling and replication may well be stifled for what reasonably cannot be depicted as any sensible reason at all.

Many view water as a source of conflict. Yet, through history, it has represented a unifying factor, shaping cultural and social cohesion through centuries, and over millennia. This clearly applied to much of Africa, South Asia, and the Middle East, where collaboration in securing, managing, and dividing water resources were essential for any civilization to last (the importance of water in various shapes has been equally visible elsewhere, see Appendix 2).[7]

---

6 Dr. Santucci, presentation on October 18, 2022.

7 Prof. Majid Labbaf Khaneiki, UNESCO Chair on Aflaj Studies (Archaeo-Hydrology), University of Nizwa.

Our approach to water is wide-ranging and holistic, based on openness to realising untapped opportunities, held back by hurdles which could be overcome by genuine effort to achieve cross-border collaboration. The following form important building blocks:

i) **Learn** from the indigenous and traditional water management systems of our historical heritage[8], their links to diverse fields such as biology, soil management, nutrition, health, furthered through novel collaborative ventures and kinds of activities;

ii) Build on the expanding **climate literacy** to encompass the role of water, through complementary measures spurring an ecosystem conducive to **entrepreneurship** and **innovation**, where synergies are propelled between educators, investors, facilitators, IP/patent specialists and angel networks, VCs, strategic investment arms of holding companies, insurance companies, and technology firms of the future[9];

iii) The scope for **teachers training and regenerating education systems** is being rethought taking helm for developing awareness of the universal importance of water, and inspiring relevant behavioural change. Vocational training and skills development in support of enhanced water, clean energy, and food production present a case in point. These agendas span all societies and all social groups in the post Water and Humanity 2022 context.

### 3.2 Reorienting the Technology Push

Connecting with the role of technology, the Muscat Call aims to shift attention from the endless pursuit of what more technology can achieve, to what it ought to be used for. Such a shift is essential for humanity to achieve sustainability. Here we flag two applications in this respect, both of which gained attention at the Muscat event: i) the Internet of Things (IoT), and; ii) Artificial Intelligence (AI) and its links to Ethics.

#### i) IoT and utilities

The development and utilisation of IoT reckon among the most widely touted manifestations of digitalization. With regard to water, IoT opens for enhanced effectiveness, efficiency, and economy all along the smart water value chain:

---

[8] Besides the Aflaj, Oman, such heritage include "Kariz", Iran, Afghanistan, Pakistan, Azerbaijan and Turkmenistan, “Qanat”, Yemen, "Ain", Saudi Arabia, "Kahriz”, Iraq, "Kanerjing", China, "Foggara", Algeria, "Khattara", Morocco, "Qanat Romoni", Syria and Jordan, "Mambo", Japan, "Suran-bawi", India, "Galleria", Spain, "Inguttati", Sicily or Bottini, Siena, Italy, or Bisses, Vaalais, Switzerland.

[9] Sponsored by Sven Olme, President & CEO of European-American Business Organization, and managed by Mr. Lazslo Horwath, CEO Active Media, and Ms. Ingrid Andersson, Vice President of the Global Forum, the Muscat Event featured a global entrepreneurship competition, in which 12 start-ups from around the world were evaluated, with selected winners attaining one year’s mentoring opportunities by five venture capital firms in Silicon Valley.

- Consumption – detection & prevention of leakage on consumer property, monitoring of consumption patterns, accurate billing based on actual consumption, easy data collection via Low Power Wide Area Networks (LPWAN).

- Utilities – simplification of the management of water distribution, smooth management of water demand peaks, leak detection, tracking & measurement of the water quality, stronger engagement, and direct communication with customers.

- Regulation – use of smart water meters and other sensors for enabling measurement of the regulated Key Performance Indicators set by the local regulators and certain regulated initiatives within the water market.

LPWAN can be designed to support sensors and data that enables smart water metering and makes water networks secure, scalable, future-proof, and cost-effective. Smart Water Management is under way in multiple cities as one of the top applications of IoT. By enabling sensing and response in almost real time, IoT combined with Artificial Intelligence opens for drastically improving customer engagement and reducing costs in operations and maintenance.

Applications suited for some of the areas in greatest need are at hand, as demonstrated in collaborative work by W&H and entrepreneurs in South Africa since 2020.[10] Inclusion is key, however, who is reached and who becomes aware. Rather than Government and Business becoming more aware, the focus should shift to enabling better informed user decisions, and empowerment to call attention to deficiencies, ranging from cracking infrastructure to inefficient use of water resources and quality issues. Stress sites and bottlenecks can be addressed by 'War on Leak' agents acting in real time, countering water losses, unemployment, and lack of resources in "one go". IoT has the potential to turn every citizen into a responsible guardian of precious water preservation, departing from reliance on malfunctioning municipality administration in identifying stress sites. Moreover, local engagement and ownership can be magnified by shifting from content development on conventional proprietary social network platforms, to developing and applying open source on user-driven inclusive platforms that link and consolidate community efforts.

Therein lies immeasurable potential for the integration of 4$^{th}$ generation technologies beyond IoT, through which innovations such as artificial intelligence (AI), cognitive AI, machine

[10] METSI Communication Portal", Sigidi Solutions, South Africa, in *Water and Humanity*", (2)2.

learning, blockchain, and virtual reality contend to improve the accessibility, mobility, and performances of resources, knowledge, people, and products in ways that bring humanity closer to our sustainable objectives.

ii) Guidelines for AI Ethics

AI already performs tasks commonly associated with intelligent beings – diagnosing disease, translating languages, identifying persons, providing customer and employee service, and so forth. It is under way to establish the most disruptive technological shift ever experienced by humanity. Fundamental questions arise about the relationship between AI and humans. Its achievements will depend on what purposes it is mobilised for.

With the state of art of technology, and society's expectations in a state of flux, the applicability of traditional law to AI becomes increasingly unclear, inevitably making it critical what ethical principles apply. Can such principles be defined, however, even less applied?

Ethical constructs and how they are applied vary, reflecting the particular political, cultural and socio-economic contexts in which they arise. In diverse locations, however, people express concern with overreach and misuse of technology in the hands of both governments and powerful corporate giants. On this basis, a special working group, preparing for the 2022 edition of the Global Forum, set out to define the Muscat principles of AI Ethics. The initial perspectives on the subject varied starkly – some saw no rationale for considering ethics at all. Eventually, presented on October 18, the principles champion rules for the design and implementation of AI to be trustworthy. In effect, they shape a "living" document, a maturing process set to evolve from "below", able to derive from usage and refining by companies, technicians and individuals, feeding insight to policymakers, not the other way around. [11]

Ethical principles should thereby be developed, accepted, and enforced on terms that lead towards a future world in which we and our children, and their children, will wish to live. There are myriads of AI applications that one can imagine for improving the management of water, its collection, distribution, use and so on. Ethical principles should be devised for such specific applications.

[11] *AI and Ethics*, the Global Forum, 2022.

iii) *Incubators, entrepreneurial networks*

Enabling infrastructure and support bodies represent critical public goods, including prototype buildings, mechanisms for testing, venture acceleration, mentorship, investor readiness, and streamlined access to financing, including seed funding, avenues for tapping into business angel networks, venture funding and government support structures. Viable such ecosystems are largely absent across much of the world, including the Middle East and Africa, representing an underdeveloped realm of opportunity. Combining this with the rigidity of educational system, the result is a dearth of growth mechanisms for entrepreneurs and ground-up innovation at the scene of some of the world's greatest remaining ecological resources, whose continued existence is at the mercy of ravaging resource exploitation the day short-term commercial gain, often linked to financial arbitrage skyrocketing in capital-intensive large-scale development projects, kicks in. Governments, multilateral organisations, and development banks mostly put up a bleak defence.

However, local communities linking to entrepreneurial networks, brew across much of the African continent. They are oiled by flourishing start-up communities in a handful of locations, as in Kenya, Rwanda and Ghana. The Vertex Ecosystem and Africa Vision 2030 Fund aim to raise visibility and support linking to established venture capital and entrepreneurial empowerment programmes, specialised in cultivating inclusive innovations. A particular initiative has been taken to link up to the African-wide Wildlife network, spanning 8000 reserves in need of value-enhancing innovations linked to conservation. The result of leverage stands to promise a pan-African movement in pursuit of nature-positive, effective, livelihood-building, inclusive and sustainable interventions across thousands of vulnerable communities and landscapes.[12]

iv) Cherishing the fruits of cultural heritage

The world still features endless wonders. The option to experience what is new, different from elsewhere, reflecting diversity in life-forms or culture, carries value. The scope for attracting tourists and other visitors thereby, represents a source of opportunity with the potential of spurring innovation and investment channelled towards preservation of environmental and cultural assets whose accessibility is guided by value-enhancing services.

[12] Presented at Water and Humanity by Mr. Marc Watum, South Africa and Kenya, representing Vertex and Africa 2030 Fund.

But such scenarios are far from always realized – uncontrolled tourism unleashed in excessive numbers may slowly dismantle – or hurriedly crash – the very source of value those assets once possessed.

Few governments and policymakers have been honing competencies and skill-development in managing this obvious choice between sustainable eco-friendly experience industry, on the one hand, and ravaging mass-tourism on the other. Tourism policymakers have few places to meet, share experiences, gain inspiration, and build partnerships for new initiatives. What may represent the world's largest industry, when including the myriad of local businesses and entrepreneurs who depend on it, tends to evolve at the whim of markets, the weather, pandemics, and other *ad hoc* events, without much strategy or resources to frame outcomes in support of sustainability.

Oman is one among many countries in possession of yet little-known wonders. Its hinterland of Jebel Shams and Jebel Akhdar feature wadis and rocky masses sculpted and shaped by erosion. Many Aflaj canals dug since ancient times are still widely used to channel water for growing roses and garlic, collect drinking water around distant oases and villages, and, near prayer sites, ensure the ablution ritual of the faithful. This ancient water management system, connected by the Aflaj network, is listed as a UNESCO World Heritage Site.

Located between Jebel Shams and Jebel Akhdar, al-Hamra near Al Hoota host one of the largest cave systems in the world -, Bahla with its Fort, a UNESCO World Heritage Site, al-Nakhr, al-Hajer, al-Ghoul, al-Manther, al-Rahba, Misfat Al Abryeen, Bimah, al-Ghafat, Misfah now recognized stops on walking and hiking itineraries. Enhancing these villages as in the case of Misfat Al Abryeen means enhancing native vegetation, for intensive practice of various types of crops and, especially in the warmer months, for tourist activities such as camping, walking, hiking, trekking and climbing.

The demand for the mountains, as a "safe haven" and "healthy" for the Omani population follows development processes picked up in the recognition of Misfah in the category of World's best tourism villages, creating awareness of associated development opportunities.[13]

[13] "World's Best Tourism Village, Misfa and cross-border collaboration realizing the value of Cultural Heritage", by Husni al Abri, Smart Way, Muscat.

Meanwhile, new processes of heritage enhancement have come about as the result of participatory tourist involvement. For instance, tourists' approach to rosewater production or garlic harvesting provoked imitative practices associated with innovative forms of emotional involvement, where preservation of heritage gives way to novel ways of linking the past, the present, and the future in support of enhanced value-generation at both the individual and societal levels.

*v) Valuing water*

Children are enormously receptive but many meet with few chances to gain inspiration by nature. A model workshop has been developed, tested, and fine-tuned through the accumulated experience of experimental applications, across various geographical locations and age groups. Originally launched at the National Museum of Oman, it draws on methodology rooted in motivational interviewing and intuitive discovery-based learning. In Muscat, the interest of 7-8-year-olds was captured by the Aflaj, from there extending via personal connotations to reflection by the children individually as well as in groups, on the value of water, locally and globally, today and in the future. The workshop series and methodology were further advanced by "Valuing water" activities in schools in Germany, Italy, Iran, and South Africa. Novel interactive learning techniques were piloted including the use of art & sound, community messages and practical experiments so as to boost curiosity and the drive to know more.[14]

A panel session dedicated to this topic, held at the Global Forum, was followed up by a focus-meeting involving key stakeholders discussing the agenda forward. It was agreed to initiate joint work by the establishment of a "Valuing Water Taskforce" including partners such as World Youth Parliament for Water, Wavemakers United, Monash University and Nelson Mandela Foundation. The taskforce will be the focal point for advancing activities in schools and public spheres, as well as for disseminating suitable methodologies and results to inspire educational institutions to embed lessons from Valuing Water in their curricula.

[14] "Workshops on Valuing Water: Engaging Children and Youth", Documented in *Water and Humanity*" paper series, (1)2. Partnerships have been established with, among others, Wavemakers United, represented by Ms. Tilly Stroh and colleagues at the Muscat conference, Monash University, coordinated by Dr. Azimeh, and World Youth Parliament of Water, which mandated Ms. Julianne Schillinger, University of Twente, for this task.

*vi) Mangroves and Wetlands Development*

Mangroves and wetlands represent complex ecosystems marked by multiple benefits. Because so many stand to gain, coordinating their defence is hard, not to speak of raising support for their restoration. Carbon credits and the call for biodiversity credits expand the expected realm for capturing commercial benefits. Yet, other actor categories, and value streams, typically need to come together and join forces, in order to realise adequate support.[15] Examples include fishermen who stand to gain from better breeding ground for baby-fish, landowners who benefit from land-price increases, insurance companies that run less risk of damage from extreme weather events, and so forth.

Although easier said than done, it is now happening across the shores of South and Southeast Asia, in Oman, in East and West Africa, and in Latin America. It is happening, but by crawling rather than running. Governments requiring land-lease rents, controlling the carbon credits for their own returns, issues of double counting carbon credits, and so forth, hamper progress.

Realizing such projects typically requires mobilising multiple stakeholders, representing different value-streams. The potential of green funding, including carbon and biodiversity credits, needs enhancement as a motivational factor, where the multifarious benefits flowing from environmental and cultural assets become more visible and impactful through a more potent and more collaborative effort.

## IV: CALL FOR ACTION GOING FORWARD

Drawing and extending from the above, in looking ahead, the Muscat Call:

**Notes** the historical significance of well-developed responses by communities and governance systems of the past when it comes to managing scarce water resources,

**Underlines** the systemic, cross-horizontal nature of these challenges, calling from new forms of collaboration in support of sustainability, cross-sectorally, cross-disciplinary and by way of cross-geographical and cross-jurisdictional border issues,

[15] François De Keuleneer, DEME Green, DEME Group, Belgium.

**Takes note** of the shifting planetary environmental, socio-economic and geopolitical dynamics, in view of the limitations of contemporary policy frameworks, accountability, and underpinning tools to address humanity's fundamental needs within the context of climate change, resource scarcity, biodiversity, and disrupted water cycles[16],

**Considers** the presence of huge disparities in incomes and access to information, also reflected in markedly varying access to clean and safe water across communities and regions, as well as when it comes to exposure to aging and inadequate treatment and distribution infrastructure,

**Stresses** the importance of linking and engaging diverse competences, authorities, and interests, to harmonise and align key concepts, perceptions and approaches of relevance to water management so to realise sustainable resolutions and actions,

**Bears in mind** the multiplicity of efforts by governments, scientists, businesses, communities, and various manifestations of stakeholders and other special groupings, to cast light on the challenges brought by accelerating global crises such as those associated with Climate Change and the destruction of biodiversity, while achieving important guidance for collective action, such as the Sustainable Development Goals of the United Nations,

**Yet, underlines** that the efforts thus far fail to halt or turn the course of danger, raising the need of more potent initiatives and mechanisms through which multiple and diverse sets of actors can get together, examine the issues, identity solutions, and proceed with joint efforts to operationalise and scale their application. On this basis, we call on all parties for engagement in the following initiatives:

### *4.1) Revamping Green Funding - Linking with the Ground*

The call for investment in sustainability by governments, multilateral organisations and increasingly by the financial and corporate sectors worldwide, so far lacks adequate connection to action on the ground. The prevailing frameworks for identifying, framing, certifying, verification and validating impact, need to be revamped. Particular weight needs to be attached to valuing and in action cherishing natural assets of fundamental importance which presently meet with scanty support, reflecting few means of capturing commercial or monetary value within the framework of existing institutions and market mechanisms.

[16] Prof Juha Alatalo, Qatar University, Doha, and Prof. Olof Lindén, Linnaeus University, Växjö, and senior advisor, World Maritime University, Malmö.

In the context of Water and Humanity, precious yet largely unaccounted for benefits of multiple river systems as well as wetlands and coastal areas underpinning unique ecosystems, are threatened literally each day by large-scale commercial construction projects who tend to bestow their investors with swift monetary payoffs.

A concentrated effort is required, bringing together diverse experts and actor categories, to reshape the mechanisms for ESG, green bolds, SLBs, and carbon credits, to reward resource mobilisation investing in nature. The Water and Community Voice has already been raised, the message taken forward to follow-up occasions, such as COP27 in Sharm-El Sheikh, Egypt, November 11, 2023, and Davos, Switzerland, on January 18, 2023. In this, a revamping of the mechanisms for green investment has been called for, not by way of paperwork but by active application, testing, and evaluation of support enabling scaling of real-world projects.

### *4.2) A Toolbox for Addressing Cross-Border Water Conflict*

There may be a fine line between water serving as a unifier or turning into a spark generating cross-border conflict. Over a third of the world relies on fresh water from rivers shared by two or more countries, not to speak of the world's oceans, which we all rely on. A range of factors spur growing tensions around water management of various sorts, including climate change, population growth, overfishing, pollution, and so forth.

The very perception that water is taken away, or mismanaged, may cause severe grievances and sow mistrust, especially where people are poor and suffer from multiple sources of stress. Access to water is inherently uneven and problematic. One party appearing taking advantage of better access will easily be viewed as unfair by the other side.

Attaining agreement on how to define 'fairness' is generally hard to achieve, within societies as well as among countries - reflecting differences in cultures, financial resources, population sizes, and water consumption requirements. Uncertainty and ambivalence about what conditions and rights actually apply, amplify the complexity. Opportunistic leaders may actively aggravate a state of confusion and resentment to distract attention from other issues and thus gain an advantage for themselves.

Best practice experience on how to resolve water conflict could help counter the challenges and inspire solutions. It is proposed to frame a toolbox made available and structed on terms that allow for matching and adaptation to specific cases.[17] This should be organised and diffused so as to feed competences in support of collaborative water management coupled with conflict resolution. Soft skills that underpin cultural understanding and ability to handle conflicting interests should be honed and appreciated side-by-side with engineering, technical and economic proficiency.

When a water conflict emerges, viable solutions may be found only when the arena for exchange, negotiation, and working out the ground for common interest is broadened – outside the realm of water itself. Communication and learning schemes may have to underpin parallel governance reform at multiple levels – locally, regionally, nationally, and cross-border. Enabling experiences of this kind exist, in Europe, the Middle East, Asia, Africa and elsewhere. But the lessons can be better collected, packaged, and linked to capacity building and the operationalization of conflict resolution. It is time.

### *4.3) Co-created NBS in City Development*

Cities and their populations have proven highly vulnerable to harmful impacts of climate change. The causes vary from flash floods to severe long-term drought, rising sea levels in coastal cities, soil salinisation, and disrupted water cycles. Proactive measures are needed!

Traditionally, solutions to such problems relied on expensive infrastructure projects. An example being the use of large city storm drainage pipes. While these offer short-term fix, they basically throw away one of our most valuable resources, drinkable water. Water should infiltrate the ground, reach the aquifers, and feed natural water cycles. Meanwhile, pollutants, e.g., heavy metals or ever-lasting chemicals accumulate, endanger microbiology and our health. Against this backdrop, some cities are turning to Nature-based Solutions (NbS), a sustainable, cost-effective alternative to traditional infrastructure projects.

[17] Such work, initiated on the basis of practical cross-border experience of water diplomacy, was proposed by Mr. Étienne Montbarom-Jalade, Chef de secteur – Dynamique de l'eau, République et Canton de Genève. Other contributions on the way forward were made by Mr. Sanith de S. Wijeyeratne, Climate and Conservation Consortium, Colombo, Mr. Roberto Ordonez, Alkimya Catalyst, UAE, Prof. Marcela Brugnach, BC3, Bilbao, and Dr. Alexandre Hedjazi; University of Geneva.

NbS involve restoring, protecting, or emulating natural ecosystems to provide ecosystem services such as water purification, flood protection, and air quality improvement[18]. They can also provide additional benefits such as biodiversity conservation, recreational opportunities, and aesthetic values. To address the problems at stake, citizen engagement is important from early on, for co-designing and co-creating implementation processes responsive to community needs, as well as for increasing awareness and spurring behaviours that favour of sustainability[19].

Examples of successful co-implementation of nature-based solutions programs include:

(1) Development of urban parks and small community gardens. The systemic effect of multi-scale urban green spaces is known to reduce the "heat island effect", provide habitats for wildlife, and offer social and recreational opportunities for its citizens.

(2) Sustainable urban drainage systems (SUDS) address urban flooding and water management. By mimicking natural water processes, such as infiltration and evapotranspiration, the amount of water entering stormwater systems is reduced. The thereby landscaped areas collect and filter rainwater, gradually stored in the ground.

(3) Tree planting programs are a proven solution for mitigating the urban heat island effect and improving air quality in cities. Trees provide shade, absorb carbon dioxide, trap pollutants, provide habitat for urban wildlife and improve biodiversity in cities.

These programs bring high potential for scaling and adaptation to different cities and regions around the world, regardless of their climate or context. By integrating nature-based solutions into urban design and planning, cities can create more liveable and healthy environments for their residents while also mitigating the impacts of climate change. They provide effective paths to the achievement of multiple sustainable development goals and towards sustainable cities, as they emphasize the importance of incorporating ecological principles and processes. Moreover, nature-based solutions provide opportunities for innovative technological approaches. Through the development of advanced monitoring systems, smart cities can optimize the performance of these systems and improve their resilience to extreme climate events. Overall, nature-based solutions can help cities reduce their carbon emissions, improve air quality as well as the quality of urban life for residents, while enhancing sustainability.

[18] Prof. José Miguel Lameiras, University of Porto, and URBiNAT.

[19] Muna Luqman, Yemeni foundation Food4Humanity, Women's Solidarity Network, Cairo, Egypt.

.

*4.4) Innovation and Digitalization for Culture and Environment*

Innovation and digitalization are at work in leveraging the virtues of heritage and culture. Practices thus far concern the dematerialisation of tangible heritage with free access, or the construction of digitized culture and heritage platforms. More can be achieved though, by way of value-generation flowing from the combination of cultural, environmental and social assets. As a special track, openings for enhanced cross-border Museum collaboration have been presented, granting citizens a key role in turning cultural expressions into journeys of discovery, linking our heritage to our present and perceptions of the future.[20]

A specific proposal, to establish the *Aflaj Museum* – has been envisioned to link diverse solutions that involve society in managing scarce water resources through history.[21] Here, several important considerations will come together, related to the Aflaj as Cultural Sites used to achieve socio-economic as well as political goals, stimulating narratives related to the identity of those who used to live in the area, while also implicating contemporary practices.
Other related initiatives have been proposed as avenues to link divergent spaces, thereby creating fertile common ground for creative common experience and discovery. GIS-based applications coupled with virtual reality tools, can be applied in the field, to help locate, flag, and interpret real-world expressions of heritage and culture. A particular project agenda, where Oman and the Middle East form part of a wider web, relates to the mythical trade routes of the past, by land and sea interrelated - the silk road, spices trade, and that of frankincense. History's shaping of the interfaces between past civilisations could thereby be brought "back to life", paving new ground for people to gauge the way civilisations have been shaped, our identities arisen and evolved.

Through such ventures, if co-created, new content and potential could be framed for internal and external tourism framing customized itineraries (cultural, leisure, marine, mountain, etc.). The result is a practice of cultural storytelling allowing citizens, tourists, and all, to re-discover, experience and even participate in local journeys and production processes.

[20] "Leveraging Cultural Assets Proposed Cross-Border Museum Collaboration", led by Prof. Guido Ferilli IULM, Milan, Italy, and Water & Humanity (1)1, Muscat.

[21] Proposal by Prof. Abdullah al Ghafri, University of Nizwa, Oman, envisioning a showcase of scientific design and concepts blended with visitor experience and engagement, a collection of the History of Tangible and Intangible Heritage meeting with the present.

Enabled by GIS and associated technologies, a cultural-tourist enhancement of ancient mountain villages and hinterlands may emerge. Alternative expressions of heritage can be imagined and launched by young and old, women and men, problematizing multiple ways in which the past induces the present, personally and collectively.[22]

### *4.5) Centre of Knowledge -- A Global Water Platform*

A Resource base is needed and hereby proposed to be established, a service of the global community affected by and in search of solutions related to water. The establishment process should reflect synergetic leverage of relevance to multiple actors, breeding a cascade of direct and indirect benefits related to water management. The Centre would draw upon, package and further activities in the areas of[23]:

- Education (primary schools, university, research…)
- Enterprises (innovative projects, ethics practices, etc.)
- Civil society (campaigns, experiments, etc.)
- Governments (programmes, incentives, norms, etc.)

Further, 4 basic functions are envisaged:

- Stocktaking (with available documentation: PPT, articles, videos, etc.)
- Communication (résumés in form of (short) videos for social media)
- Dialogue (webinars)
- Monitoring (with appropriate metrics, depending on the topics)

A "standard format" could be adopted, as a basis for "living initiatives" regularly updated with fresh information documenting evolution over time. Such a Bank of Cases is proposed to be piloted in a few regions and/or cities, where it can be fine-tuned before scaled and gradually expanded by those who opt to contribute. To begin with, it could be nurtured by examples coming from Oman, described in above sections, and from the region in France where the next Water and Humanity meeting will be held. It is also possible to pilot cases on selected topics that have been mentioned above such as NbS experiences, water related IOT developments and youth education initiatives (e.g., Valuing Water).

[22] Strategy developed by Dr. Giovanna Zavettieri, Rome Tor Vergata, Rome.

[23] Jean-Eric Aubert, President, Université Internationale de la Mer, Nice, and President of the French Foresight Society, Paris.

### *4.6) Circular Economy*

Inefficient resource use along with excessive waste generation inflict serious damage to the natural systems of our world. Public demands are on the rise for shifting production patterns away from virgin materials as well as for adopting more ecologically friendly consumption behaviours. Social and ecological systems display complex interdependencies, however, lacking mirroring or corresponding fit in institutional conditions. Streams of waste generation are unevenly managed around the world, emanating from a myriad of daily decisions, by public and private organisations as well as by households, each with consequences trespassing boundaries in terms of geography, institutions, and communities, thus far without any viable tempering by way of responsible governance mechanisms or collaborative schemes.

Systematically, circular economy combines the recycle focus, meaning the finite materials, with the regenerative focus, meaning the renewable materials. Circular Economy shift happens in the positive and constructive dialogue and interaction between these two elements. Water can be applied as a central resource and focus point for gauging the implications and formulating a response.

A systemic approach is required, promoting enhanced effort to identity and achieve mutually reinforcing virtuous circles. By combining top-down and bottom-up initiative, policy decisions and learning need to go hand-in-hand with community engagement, co-creation, and increased demand by citizens for circularity. In this, we set out to adopt a novel approach to catalyse and underpin a Community of Practice (CoP) incorporating targeted exchanges and triggers for joint learning, peer-pressure and collaboration in support of circularity.

### *4.7) Women in Tech, Women in Water*

In many societies, women carry prime responsibility for care, education, family and food, while their role is underrated in the public sphere. In infrastructure development and engineering, for instance, the experience and needs of women may take second seat. Meanwhile, girls excel in education across-the-board, and work hard to gain a foothold in a broadening spectrum of professions. Many women enter high-tech and. high-yielding career paths, yet, on average, remain less well paid and meet with obstacles to promotion.

Undoing barriers for women is key to social inclusion and strengthening broad-based networks in support of sustainability. Ample studies demonstrate that women are prone to long-term commitment and investment, while more risk averse. Several existing networks have been developed to boost women in tech, and others in the water sector. Combining and linking the two in an integrated Community-of-Interest powered by women, brings scope for synergies and cross-fertilisation. Heralded by enhanced attention to addressing local community needs, partly related to water using disruptive technologies, innovation, entrepreneurship, and new service development should be ignited.[24] Water and Humanity together with the Global Forum set out to invite key parties for this purpose, offering an inclusive platform for launching this agenda at the next annual Global Forum, to take place in France, date to be decided.[25]

### *4.8) Co-Nature´ing*

Deepening the agenda brought by participatory approaches and co-creation by citizens in the processes around selecting, designing and implementing NBS, needs to be extended to encompass "*co-nature´ing*". With this we refer to a change not just of mind-set, but more fundamentally, of perception, abilities, and actions, in turn linked to values. Co-nature´ing implies linking to, and associating with, nature.[26] While it draws on awareness, it also reflects a choice of caring for - and recognising - being part of our wider ecosystem, where nature´s resources such as air, water, soil, flora & fauna, are not taken for granted.

It is not, as often assumed, or pretended, that values could or should be ignored. The unrelenting coverage and advocacy of indigenous peoples forming what may prove our last stand against the forces of exploitation and destruction of nature's most precious resources, demonstrates what values are about. So does the ample evidence of nature's healing power. For those in deep animosity, staring into the abyss, young as well as old recurrently prove that one remedy alone may show up, *shinrin-yoku*, connecting and spending time with nature. This is not something we pick up by desk-work, or social media. It has to do with shared experience, emotion,

[24] Ms. Dalia Badawi, Cairo, Ms. Aasia, Khan, Lahore Chamber of Commerce, and Dr. Buthaina Al Wahibi, Oman Water and Waste water, Muscat.

[25] Those to be invited include representatives from Women for Water Partnerships (www.womenforwater.org) and EU Women in Tech (www.europeanwomenintech.com)

[26] The concept was coined by Americo Matéus, GUDA, Portugal, at the Water & Humanity conference. Dr. Anna Grichting, Switzerland and Senior Fellow, University of Vermont, pointed to the responsibility of humans encompassing other lifeforms.

engagement, responsibility, empathy, planet-awareness. No doubt, most of all, our early-life perceptions of attachment, biological embedding, have lasting consequences, through life, passing also from one generation to another. Yet, there is hardly a trace in the institutional fabric of modern society by way of guidance and attention in these respects.

In order to re-connect our relations with Nature, various sources of inspiration may come into play, such as: (a) biophilia - "there is an instinctive bond between human beings and other living systems." In other words, by nature we long to be surrounded by life — plants, animals, and other human beings"; (b) biomimetics looks to nature as inspiration for human design and development, by imitating nature to produce the built environment and to create man-made systems. Nature is a guide and a model from which we gain important insights about what serves us best"; (c) regenerative - With regenerative development and design the role of the human being merges with nature. Nature is no longer seen as an "other". Here the purpose of humanity aligns with the purpose of the planetary system itself, having an evolutionary function that looks to continuously improve through feedback loops, learning, and adaptation toward ever-increasing levels of diversity, resilience, beauty, abundance, for example.

In no small part related to that fact, we have come to a place in our history where nature cannot save us by treatment - we must find a way to be proactive, and inclusive. While there is no single answer *how*, several ways are known to work out. Our final message and invitation in the Muscat Call is to join forces in collecting, building on, and leveraging those as a basis for launching a comprehensive strategy to *achieve Co-naturing for all*.

## APPENDIX 1: Events Going Forward

i) The 29th Global Forum, the first ever outside the OECD, merging with Water and Humanity shared intentions to formalise and lead international cross-disciplinary cooperation with the aim to permanently alleviate the issues, and to affect the absolute achievement of the operative clauses (or actionable solutions), presented hereto.

ii) The Muscat Call has fed into the EU **NBS Task Force III of EU Horizon 2020 Research and Innovation Project**s, addressing **Governance, Business Models and Financial Mechanisms**, at the EC Side Event in the EU Pavilion of COP27 in Sharm El Sheikh, Egypt, on November 9, 2022.

iii) The Muscat Call has already spiralled into the **World Economic Forum, Davos**, Switzerland. On January 18, 2023, Water and Humanity joined forces with the EU NBS Task Force as well as the Global Commons Alliance, the Global Forum, Intent, and the Centre of Excellence University of Geneva, in organising a follow-up Multistakeholder Forum on the theme of "Revamping Green Investment".

iv) All members of the Water and Humanity network and Global Forum are invited to join the **30th Global Forum, again to be merged with Water and Humanity, this time to take place in France,** dates to be decided, again to navigate around a theme placing emphasis on linking technology, sustainability and humanity.

## APPENDIX 2: The Water Medium

Water arguably represents the most important resource anyone of us will ever encounter, rivalled only by the air we breathe. Water is 2/3s of our bodies, covers 71 percent of the Earth's surface, and is the key enabler and building block of lives.

Humans knew, for thousands of years, how to manage water – their life depended on it. Societies were shaped and structured by the associated prerequisites, as manifested in the remnants of traditional water management systems prevalent across the Middle East, Northern Africa, and South-west Asia. The Romans placed water management at the centre-stage of their civilisation. Managing their rivers was a lifeline for the Chinese. In Hinduism, Mother of all life is embodied in the river, notably Ganges, the holiest of all. For the Wayuu in La Guajira, Colombia, life stems from rain, in itself sacred and a living being. Throughout Latin America, spanning the world's largest freshwater reservoir, the Amazon Basin, the frozen glaciers of the Andes, or the steppes of Patagonia, traditional practices of water management and innovation are inherently rooted since millennia in the identity of local communities, based on principles of balance and reciprocity among people as well as all living beings inhabiting a shared space. In Arctic regions, as in Greenland or Canada, the importance of communicating the state of "snow" bestowed local language with a multitude of specialised words totally unknown to others.

On the Indian Ocean, and along its shores, the *silk-road*, the *spices road*, the *road of frankincense*, persisted through thousands of years, until colonialism overthrew them and drew other maps. Some of the greatest cultural works of all time, counted among the Wonders of the World, or the ranks of UNESCO heritage sites, insist on the geography of waters.

Today, water is mismanaged. Vast stretches of land dry up, followed by dramatic damage from overflooding as natural drainage systems are long gone - wetlands, biomass and landscapes that used to preserve balance and stable water cycles. Pollutants take many shapes, e.g., hazardous waste, heavy metals, plastics, etc. Ever-lasting chemicals accumulate, endanger microbiology and our health. Erosion, the salinization of soils, rising sea levels and desolated coast lines spread out.

Excessive water use, mainly by agriculture but also industrial use, along with voluminous use of pesticides, chemicals, and other pollutants, further absorb or degrade the quality of groundwater. Further, the discharge of nutrients deplete lakes and oceans of oxygen, creating gradually expanding dead zones. Overfishing at industrial scale and the constant discharge of plastics and other manmade pollutants in the ocean deplete the natural stocks of sea-life.

Unimpeded construction of dams without consideration to the need of baby fish, along with endless construction and exploitation of coastlines by modern infrastructures, break the cycle of life in lakes and in the ocean. Global Warming puts species under pressure, leading to the death of corals, subjecting large parts of sea-life to growing stress and threatening their existence. Endless and irresponsible emissions of pollutants by maritime industry, the desalination industry in the form of brine, and so forth, deplete life across widening areas.

Technology offers distinct opportunities to counter outstanding issues. IoT, for instance, enables measuring and effectively organising and administrating access to water, as well as controlling and addressing quality issues. Even more so, it brings the potential to empower those in greatest need to be informed and engaged in relevant associated management processes.

At the Global Forum, Santucci took stock of rich opportunities for how to proceed, in support of increased relevance, effectiveness, efficiency and economy along the smart water value chain. Expanding on his presentation, examples span:

*Consumption* - easy data collection via LPWAN;

*Utilities* – simplification of managing water distribution;

*Regulation* – use of smart water meters and other sensors for enabling measurement of regulated Key Performance Indicators, not necessarily set jut by local regulators but with the scope for co-creation – constituting ambitions and initiatives agreed within the water market.

*Security* - the information transferred back and forth from the sensors and meters to utility companies must be secure, calling attention to cybersecurity education and practices;

*Privacy* - utility companies gathering personal information on customers may be tempted to use it to alter pricing, or for other proprietary purposes, calling for reforms in data governance end innovation to enable user-centric data control;

*Cost* - even as IoT becomes more affordable, it is still cost-prohibitive for smaller utilities, resulting in unfair competition and calls for clear communication on the importance and benefits of IoT integration); ‘

*Timely Upgrades* - since access to water must be ensured every day, even for brief periods of time, utilities should be incentivized to take the time, irrespective of market conditions, to maintain and upgrade their water distribution systems.

We are living in a world witnessing increasing gaps between the promises of new solutions and the actual clean water accessibility of countries and communities facing severe water stress. While populations increase together with consumption, communities bare an increasing need for steady, quality, equitable, and affordable clean water. Technology offers the tools, but resources, awareness creation, and participation must follow.