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Hydrological Sciences Journal

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/thsj20

The IAHS Science for Solutions decade, with Hydrology Engaging Local People IN a Global world (HELPING)

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To cite this article: Berit Arheimer, Christophe Cudennec, Attilio Castellarin, Salvatore Grimaldi, Kate V. Heal, Claire Lupton, Archana Sarkar, Fuqiang Tian, Jean-Marie Kileshye Onema, Stacey Archfield, Günter Blöschl, Pedro L. Borges Chaffe, Barry F.W. Croke, Moctar Dembélé, Chris Leong, Ana Mijic, Giovanny M. Mosquera, Bertil Nlend, Adeyemi O. Olusola, María J. Polo, Melody Sandells, Justin Sheffield, Theresa C. van Hateren, Mojtaba Shafiei, Soham Adla, Ankit Agarwal, Cristina Aguilar, Jafet C.M. Andersson, Cynthia Andraos, Ana Andreu, Francesco Avanzi, Ryan R. Bart, Alena Bartosova, Okke Batelaan, James C. Bennett, Miriam Bertola, Nejc Bezak, Judith Boekee, Thom Bogaard, Martijn J. Booij, Pierre Brigode, Wouter Buytaert, Konstantine Bziava, Giulio Castelli, Cyndi V. Castro, Natalie C. Ceperley, Sivarama K.

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To link to this article: https://doi.org/10.1080/02626667.2024.2355202

Accepted author version posted online: 20 May 2024.

Publisher: Taylor & Francis & IAHS

Journal: *Hydrological Sciences Journal*

DOI: 10.1080/02626667.2024.2355202

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Abstract

The new scientific decade (2023-2032) of the International Association of Hydrological Sciences (IAHS) aims at searching for sustainable solutions to undesired water conditions - may it be too little, too much or too polluted. Many of the current issues originate from global change, while solutions to problems must embrace local understanding and context. The decade will explore the current water crises by searching for actionable knowledge within three themes: global and local interactions, sustainable solutions and innovative cross-cutting methods. We capitalise on previous IAHS Scientific Decades shaping a trilogy; from Hydrological Predictions (PUB) to Change and Interdisciplinarity (Panta Rhei) to Solutions (HELPING). The vision is to solve fundamental water-related environmental and societal problems by engaging with other disciplines and local stakeholders. The decade endorses mutual learning and co-creation to progress towards UN sustainable development goals. Hence, HELPING is a vehicle for putting science in action, driven by scientists working on local hydrology in coordination with local, regional, and global processes.

Keywords: water crises; holistic solutions; co-creation; transdisciplinary; local context; Anthropocene

1. Introduction

The Earth is facing severe problems caused by climate change, global consumption, and population growth that are pushing the Earth system out of safe and just boundaries (e.g. Rockström et al., 2023). The rapid changes happening now in the Anthropocene are well documented (e.g. Steffen et al., 2011; Seitzinger et al., 2015; Bai et al., 2016; Zalasiewicz et al., 2017; Witze, 2023) and undermine critical life-support systems (IPBES, 2019; UNEP, 2019; IPCC, 2021; WEF, 2022) that may soon put the planet into an emergency state caused by irreversible tipping points (Steffen, 2018; Armstong McKay, et al., 2022). The impacts on and intertwinings with the water cycle are accelerating the crisis; freshwater supply often varies between being too much, too little or too polluted for sustainable development (GCEW 2023a; 2023b). The consequences vary greatly among social groups and countries (Biermann et al., 2020; Folke et al., 2021) and challenge the relevance of current research procedures and scopes in hydrological sciences (Ceola et al., 2016; Sivapalan, 2018; di Baldassarre et al., 2019).

Hydrological engagement is needed more than ever to address these problems where current water management fails. Water, climate change, biodiversity loss and land use change interact in a crucial juncture faced by the global community, with severe and multidimensional water security issues, that requires immediate and decisive actions (UNESCO, 2012; UN Water, 2013; Young et al., 2015a; GCEW, 2023b). However, the impact on and management of water issues face a high heterogeneity across the planet, and are spread over many actors and organisations. Likewise, scientific knowledge on water-related robustness, resilience and security is fragmented; related data and information are often not-Open, un-FAIR, not chained and inconsistent (Wilkinson et al., 2016; Cudennec et al., 2020, 2022a,b; UNESCO, 2021) and in-situ monitoring is declining (Dixon et al., 2022). In addition, there is a substantial lack of synthesis and of easily digestible scientific messages among hydrologists, across disciplines and between scientists, practitioners, decision-makers, indigenous/traditional communities and the general public. Nevertheless, there is a strong wish from scientists to contribute with different perspectives on the hydrological threats the world faces, especially from early career scientists (e.g. van Hateren et al., 2023).

Hence, there is a need to coordinate actions from the hydrological sciences community to link local hydrological research with global patterns of the water cycle, and further, to provide science-based water-centric decision support. Key issues that impact hydrology across scales include e.g. climate change, energy security and energy transition (with more renewables), and food and nutrition insecurity. Hydrological sciences must therefore better identify local water problems in holistic analysis (i.e. linking local and global scales, disciplines and needs, and connecting the dots into systems analysis). This resonates well with the mission of the International Association of Hydrological Sciences (IAHS), which is to "*Collectively advance and promote hydrological sciences worldwide - contributing to interdisciplinary understanding of water-cycle processes, sustainable use of water resources and risk mitigation*".

In this paper, we analyse the needs to scientifically face these challenges, and address the role and duty that IAHS has to serve as a platform when developing water sciences for solutions to the water crisis; IAHS can foster hydrologists who must be bold and push boundaries to make an impact. As a global organisation with more than 10 000 individual members from 150 countries, IAHS is of both global and local relevance, connecting people across and within regions (e.g. Global, Global North-Global South, North-North, South-South) and locally, in order to provide synthesis to answer the needs of society for sustainable development, safety and security. Water management has always required more than physical science (e.g. Sivapalan et al., 2012; Savenije et al., 2014; Lund, 2015), but nowadays, concerted actions by hydrological scientists providing water-related knowledge in engagement with other disciplines and stakeholders are more essential than ever for solving fundamental environmental and societal issues, most of which depend on water. To sum up, there is an urgency for an IAHS-led initiative on a Science for Water Solutions Decade.

The overall aim of scientific decades organised by IAHS is to accelerate and capitalise scientific knowledge in a priority field of research. These decades streamline global research efforts and foster coherent engagement and sharing through vivid discussions and synthesis work. IAHS has recently ran two successful scientific decades, which accumulated knowledge and triggered new ideas on:

1. Predictions in Ungauged Basins (PUB): 2003-2012 (Sivapalan et al., 2003; Hrachowitz et al. 2013; Blöschl et al., 2013)
2. Change in hydrology and society — Everything Flows (Panta Rhei): 2013–2022 (Montanari et. al., 2013; McMillan et al., 2016; di Baldassarre et al., 2019; Kreibich et al., 2022)

In this triad (Fig. 1), *the first decade* tackled the problem with data scarcity and transfer of hydrological knowledge in space and time, while *the second decade* addressed the concept of change and human alterations/co-evolution with the hydrological cycle. During the participatory community discussion that ignited t*he third IAHS Decade*, the need for it to be solution-oriented became immediately clear, as well as the necessity for the decade to aim at finding a scientific basis for understanding and reducing the effects on local people from the rising global water crisis of the Anthropocene.

It was recognised from the first community consultations that the topic of a decade needs to be broad enough to engage the wider hydrological community but narrow enough for concerted actions. It must be timely and relevant to generate interest and make an impact, as well as attracting funding from research councils and academia. Moreover, the topic of the decade should link to and synergize with other ongoing activities in IAHS, such as work by commissions, committees and working groups. For instance, in the middle of the Panta Rhei Scientific Decade, the IAHS community identified 23 Unsolved Problems in Hydrology (UPH; Blöschl et al., 2019) with scientific questions. It is important that the new decade takes stock of these identified hydrological knowledge-gaps in holistic synthesis of water challenges, as a basis when providing new actionable solution pathways.

The discussions in the IAHS community expressed readiness to make a joint effort in realising many global sustainable development goals (SDGs) and in conserving Planet Earth the way we know it. Having SDG 6 on 'clean water and sanitation' does not mean that hydrological issues are sufficiently considered in the Agenda 2030 and in fact, hydrology is hardly considered in SDG 6 despite being essential to achieve most of the SDGs. Below the process is described that formulated the scope of the new decade. Then follow the results from the community consultations during the initial year (2023) with vision, scope and organisation of the work for this third initiative in the triad of IAHS scientific decades.

2. The Community building process (Method)

2.1. Strategic planning approach

The third decade started with an intense participatory process during its first year (using IAHS communication channels with members, national committees and partner organisations) engaging the community in co-creation of vision, goals and activities, i.e. defining the scope and setting up the organisation. To enable inclusiveness, online meetings in various time zones and open forum discussions were used in addition to physical meetings or splinter meetings at conferences. The Sivapalan Young Scientists Travel Award (SYSTA) mechanism was used to facilitate participation from financially disadvantaged countries and additional grants were provided to early career scientists, to further increase diversity (see

Appendix). This inception phase applied a strategic planning approach (Shu-Hsiang et al., 2015) covering three steps to set visions, goals and actions (Fig. 2), which are described in this paper. The implementation Phase with evaluation and monitoring will follow but is still work in progress and thus not described here.

Step 1

Visions and potential topics were first launched and discussed in a web-based Forum opening in late 2022 (see IAHS website at https://iahs.info/), which was a couple of months before the meetings. The Forum attracted about 40 posts and the topics suggested were much related to observations of environmental change and the fast evolution of technology (e.g. sensors and artificial intelligence), combined with values of human rights to water, biodiversity and empowerment of people. Methods suggested were comparative analysis, system analysis and transdisciplinary approaches to understand and affect the transition.

The more intense community efforts then started with interactive meetings; first online meetings in three time-zones (Oceania/Asia, Europe/Africa, and Americas) and that attracted about 50, 40 and 15 participants, respectively. The outcome was reported in plenary at the Cordoba workshop (1-3 February 2023), along with results from in-person brainstorming around tables answering in total 10 questions on Why, What and How (see Appendix, Fig. A1). The 3-days in-person workshop in Cordoba (Fig. 3) attracted a diverse group (Fig. A2) of 50 hydrological scientists, who interacted intensively by brainstorming in smaller groups and expressing ideas using post-it notes and drawings on flip charts, for presentations in plenary, which followed by open discussions. After consolidation, 5 themes for the next decade were identified and analysed using a SWOT approach (i.e. defining Strengths, Weaknesses, Opportunities and Threats). It was agreed that the focus of the next decade should be “Science for Solutions”. The results from the meeting were reported in the Cordoba outcome document and published at the IAHS website (https://iahs.info/).

To further consolidate the outcome (Level 2 in Fig. 2), a questionnaire was sent to all IAHS members for guidance on interests in the various topics beyond the participants at the Cordoba meeting. The top two as well as two support methods (Fig. 4) were then making up the basis for the eventual concept note, which was written by the 15 delegates who led the workshops; the concept note also included the decadal acronym HELPING (Hydrology Engaging Local People IN a Global world).

Step 2

The Forum was opened again to receive feedback from the community after the publication of the Concept note. This time 15 posts were received, which were all positive and appreciated for instance the coherence with the UN 2023 conference on water (22-24 March 2023) and its focus on the water crises, but also the emphasis on local engagement and recognitions of indigenous knowledge, science engagement, and the ambitions to reach beyond the hydrological community. Other physical meetings were then arranged in two splinter meetings of the EGU General Assembly (27 April 2023) followed by a full day workshop at the Technical University of Vienna (29 April 2023). This time the focus was to define goals and strategies for the new decade. The meeting involved some 40 people who discussed in smaller groups and reported back on What to achieve and How to get tangible results from the decade (Fig. 5). The results were consolidated in a variety of potential achievements by a smaller group.

Step 3

To stimulate actions from the community, an open call for working groups addressing the goals was launched as well as an open competition of graphic design for a decadal logo. The progress of the strategic planning was discussed at the IUGG/IAHS General Assembly in Berlin in July (14 July 2023) and the winner of the HELPING-logo competition was identified from voting on 15 contributions by raising hands (Fig. 6).

By the end of 2023, a total of 26 working groups were formatted and briefly described at the IAHS website with the possibility for anyone to sign up for participating. The interest to engage in the groups ranged from eight to 140, with a median value of 56 people per group (see Appendix, Table A1). The groups were categorised according to the Themes and an open call for theme leaders was launched with self-nomination, resulting in three well-qualified leaders to coordinate and coach the working groups. Two identical webinars were organised (2 and 9 November 2023) for all working groups leaders to present their ideas for each other and to the people who had signed up to participate in working groups. In addition, breakout discussions were held for the working groups to gather and start discussing their tasks. 220 people participated on the first occasion and 125 on the second. Overlaps were identified and some working groups thus decided to merge. Others were identified as mispositioned in a theme and changed to another theme. It was decided to have similar meetings at least once a year for reporting progress, sharing perspectives and finding synergies. Most working groups began to work immediately with individual follow-up meetings. Each working group formulates their own science questions with context-related problems to search for solutions during the decade (or part of the decade). The methods involve co-creations with relevant users and producers of knowledge, to easily advance the new knowledge into local actions. To facilitate this process, a specific working group is dedicated to explore various co-creation methods and share lessons learned at an early stage, to then be applied throughout the decade of HELPING activities.

3. The Science for Solution decade (Results)

The Scientific Decade will consolidate the hydrological sciences community, give visibility, and set the trends and agenda for water-related research. It will focus on synthesis work, comparative analysis and transferability of knowledge, to become a vehicle for putting science in action, driven by scientists working on local hydrology. The new decade will provide understanding of water components in environmental and societal challenges, along with the potential impact of measures for resilience or restoration to reach sustainability progress at global and local scale. In particular, the decade will show how context matters when addressing specific problems to identify if and how solutions can be transferred in time and space. Hence, knowledge from local scientists, stakeholders and citizens will be put in the centre.

These evidence-based results will fill the urgent need in policy processes for holistic systems thinking to avoid the water crisis in various nexus, e.g. agri-food systems, energy supply, ecosystem health, flood management, transport and navigation, sanitation facilities, drinking sources, industrial usage, mental health and recreation (e.g. Al-Saidi and Elagib, 2017; Heal et al., 2021; Jiang et al., 2021; WWAP, 2021; WMO, 2021a,b; GCEW 2023b). There is an increasing demand for integrated solutions and also informed decisions for fairness and sustainability (e.g. Greve et al., 2018; Falkenmark and Wang-Erlandsson, 2021). Evidence-based records in comparative studies are here essential for understanding dominant drivers (e.g. Kovács, 1984; Falkenmark and Chapman, 1989; Kuentz et al., 2017; Addor et al., 2020;

Kreibich et al., 2022) to transfer knowledge in collaborative learning processes, leaving no one behind (WWAP, 2019). Such translational research is also appreciated by leading scientific publishers (e.g. Islam et al., 2023).

Water security needs early warning systems, climate indices, and design values from predictions at local and regional scales. The water system on Earth is one unit with complex interactions, which need to be well understood for resilience under Anthropocene (Falkenmark et al. 2019; Yu et al., 2020; Falkenmark and Wang-Erlandsson, 2021) and sustainable development; see for instance the global sanitation-crisis (Wen et al., 2017), or the socio-economical footprints in rivers (e.g. Meybeck et al., 2023). Both knowledge and transfer of knowledge is context related, and therefore, the new decade also needs to encompass capacity development and communication skills among hydrological scientists. Such capacity will facilitate engagement across disciplines and with decision-makers to eventually empower operational hydrologists at various levels and at every site on Earth.

The new decade will profit from current technical achievements with artificial intelligence, big data and open science for innovations and evaluations using many sources of information in quality assurance of findings (e.g. Nourani et al., 2014). It will liaise with the rising movements in citizen science, new sensors and observations to increase hydrological process understanding and facilitate predictions under novel spatial and temporal conditions (e.g. Gorelick et al., 2017; Tauro et al., 2016; Du et al., 2020; Nardi et al., 2022; Manfreda et al., 2024).

The new decade will especially highlight the process from scientific research to practical solutions by quantifying remedial effects from e.g. integrating grey, green, and blue infrastructures (e.g. Kapetas and Richard, 2020), applying environmental flow levels (e.g. Arthington et al., 2023), sustainable groundwater use (e.g. Gleeson et al., 2020), or participatory spatial planning (e.g. Nadin et al., 2021). Experience from one site may be relevant for meeting challenges in another site under new conditions (e.g., Falkenmark and Chapman, 1989; Blöschl et al., 2013; Bertola et al., 2023). For instance, under climate change new sites in the Global North need to learn how to handle drought and benefit from participatory processes, while sites in the Global South need to consider impact-based forecasts and flood warning systems despite data scarcity. Here North and South can potentially learn from each other and transfer solutions successfully, if context-dependent factors first are identified, understood and considered at implementation (Islam et al., 2023).

Last but not least, the third scientific decade, as the second and first ones and IAHS in general, will inspire and stimulate hydrological scientists to collaborate and co-design research activities (Ceola et al., 2015; Zamenopoulos et al., 2021), contributing more and better together than individually – hence, inclusiveness is key for success.

3.1. HELPING vision

The vision of the IAHS third scientific decade is to solve fundamental water-related environmental and societal problems by engaging with other disciplines and local stakeholders. Hence, this new decade is action-oriented. The acronym HELPING stands for "Hydrology Engaging Local People IN one Global world" and should be understood as:

- *Helping* = we need to collaborate, share and help each other to overcome the water crisis. No discipline, scientist, community or decision-maker can solve the current or emerging water crisis alone.
- *Hydrology* = Hydrological sciences should underpin management and governance of water resources; thus, we need better understanding of impact from global drivers at local scales and vice versa.
- *Engaging* = co-creation of knowledge includes shared capacity, common learning and collective creativity that should be actively contributed to or initiated by hydrologists.
- *Local* = water phenomena and problems are often unique at the local scale and solutions must therefore be solved considering local needs, knowledge and context.
- *People* = the purpose is to connect people (scientists, practitioners, communicators and the general public) with similar interests to co-create, accumulate and transfer hydrological knowledge worldwide.
- *IN one* = together we can advance science faster than individually to overcome shared or similar challenges.

- *Global world* = the Planet is in an emergency state with complex water-cycle interactions, which needs urgent actions to not leave anybody or any catchment behind.

3.2. Scientific scope

As we embark on the new scientific decade, a crucial phase lies ahead in addressing and understanding the impending global water crisis. This decade presents an extraordinary opportunity to bridge the gap between scientific knowledge and practical solutions to water-related problems, by engaging local hydrological scientists as drivers to ensure that no catchment or hydrologist is left behind in the quest for global sustainable water management, which goes far beyond SDG 6 (Fig. 7).

At the heart of this endeavour lies the pursuit of scientific evidence that elucidates the intricate linkages between hydrological processes operating at both local and global scales. By unravelling these connections, we gain a deeper understanding of how water resources are shaped by the interplay of natural, human-induced, and context-related factors.

This knowledge acquisition is not solely the domain of scientific institutions; it is an inclusive endeavour that necessitates active engagement with local scientific activities. Water resources connect socio-economic, cultural, and political factors. Acknowledging the diverse experiences and perspectives of communities across the globe is essential for identifying and adapting solutions that resonate with the local conditions. Hence, the intention is to put scientists, stakeholders and citizens centre stage during the decade.

As we gather this wealth of information, a critical step is to synthesise it into a coherent framework that transcends disciplinary boundaries and recognises the local context. These global syntheses for various water-related problems and solutions will underpin effective water management strategies, providing the foundation for addressing current crises and mitigating future ones.

The new scientific decade is a call of opportunity, fostering an inclusive, contemporary and actionable approach to hydrological research. By embracing local knowledge and synthesising global understanding, we can empower people and nations. With co-creation we can translate scientific discoveries to practical applications that will protect this precious resource for generations to come.

3.2.1. Global and local interactions

We search for solutions to handle the water crisis of the Anthropocene by applying knowledge, which is underpinned by understanding current water systems behaviour and anticipating changes. However, the observed diversity in hydrology across the globe is not well understood using current conceptualisation approaches and data sources (e.g. Archfield et al., 2015; Sivapalan, 2018). Many observed phenomena and discrepancies between scales are not yet explained (e.g. human alterations and feedback to climate or vegetation changes). Therefore, we welcome new coherent global hydrological data and new information at several levels and scales, i.e. global data, national operational databases, experimental catchments (e.g., Nativi et al., 2019; Lindersson et al., 2020; Pimentel et al., 2023).

Collecting and sharing data in the new decade will provide the basis for synthesis and accelerated knowledge in water-system behaviour, evolutionary loops, human alterations and complexities, such as non-linearity, non-stationarity, connectivity, tipping points, system memory and trajectory. Such knowledge will identify water-related risks, opportunities and optimal time and place of measures from a hydrological perspective, for further analysis including the societal context. Such research could be supported by statistics, machine learning/artificial intelligence (AI) or process-based modelling and utilise all kinds of data including in-situ measurements, remote sensing and citizen-science observations. Here we foresee comparative studies and interdisciplinary analysis as well as alignment with open science.

3.2.2. Holistic solutions for water security

Water security is defined (UNESCO, 2012) as the capacity of a population to safeguard access to adequate quantities of water of acceptable quality for sustaining human and ecosystem health on a watershed basis, and to ensure efficient protection of life and property against water related hazards (e.g. floods, landslides, land subsidence) and droughts. It is thus threatened by water scarcity, quality deterioration, floods and hazards. Therefore, these must be forecast and measures should be taken to minimise their impacts in coherence with the local context. Here we recognise the need of understanding and managing water by also analysing the societal environment, such as the political, socio-economical and cultural situation. We search for transdisciplinary evidence to ensure actionable and transferable solutions to water threats across the globe. We are open to exploring all dimensions of water security, such as undesired quantity and quality, extremes, availability vs. demands/needs, transboundary water bodies, compound events and cascading effects. Similarly, we address all sorts of innovative solutions and make comparative studies of already implemented solutions, and predict impact of planned ones, by e.g. modelling or replacing time with space.

Scale effects and side-effects are also important to investigate. Many countries nowadays strive for a green transition of society, with focus on nature-based solutions and fossil free sectors (e.g. Palmer et al., 2015). We trust that research can validate the water system nexus and its links with various sectors, and that this will promote complex water-centric decision-making in the policy space to eventually advance sustainable development and enable resilient societies. For smooth implementation of solutions and long-term maintenance, societies need efficient policy processes across sectors with shared frameworks to evaluate impact on governance, economy, justice, fairness and equality. We therefore appreciate the scientific challenge to find integrated solutions for multiple purposes.

3.2.3. Engaging with people locally

Local specificities may unveil unexpected hydrological processes and interactions that are extremely relevant to both water management and science. We recognise that many water issues may arise from global drivers and policy decisions (e.g. climate change, upstream management changes) but eventually these issues need local solutions and local knowledge when implementing adaptation and mitigation measures. In this, indigenous knowledge may be applicable and help with solutions (e.g. von der Porten et al., 2016; Zvobgo et al., 2022; Nóbrega et al., 2023), and so do local scientific findings in site specific contexts. New methods are sought for such analysis to be applicable when assessing various actionable solutions of water problems.

We recognise science's increasing value for decision-making when going from simple data transfer, through interactive information services, towards networking in knowledge-action systems (e.g. Weichselgartner and Arheimer, 2019; Rusca and di Baldassare, 2019). The world searches for means to translate scientific results into wisdom (e.g. among scientists, practitioners, communicators and the general public) but challenges arise from a culture of information overload and operations in isolation. This is also valid for the hydrological sciences and therefore we encourage training in co-creation to increase perspectives and accelerate knowledge exchange. We also appreciate new methods in science communication using art (e.g. Li et al., 2023), story-telling and games (e.g. Aubert et al., 2019), and within HELPING, we search for further scientific evaluation of their impact on attitudes and actions.

3.3. Targets of HELPING research

After identifying the vision and scope, three themes were identified (see section 2.1), for which goals were identified and working groups proposed by the IAHS community (Fig. 8 and Appendix Table A1). The overarching goal for the Science for Solutions decade HELPING was set to: "*Understanding hydrological diversity and integrating knowledge across scales and regions*". The goals of each theme are further described below.

3.3.1. Theme 1: Global and local interactions

This first theme of the HELPING decadal initiative aims to accelerate hydrological understanding of hydrological processes at local and global scales, how they interact, and how they and their interactions affect water resources in the local context. Among numerous potential research questions falling under this theme, a few examples include: 1) What is the influence of local morphology on hydrodynamics? 2) Which local thresholds and feedback mechanisms trigger global transitions and tipping points? and 3) How can we comprehend surface-groundwater interactions across diverse regions of the world?

Anticipated outcomes from the pursuit of these research questions are expected to be substantial (see Table 1). Specific product goals encompass the creation of case studies populating the Digital Water Globe platform (see Section 4.1.2), the development of extensive datasets, and the design of advanced monitoring and assessment tools. In a broader sense, the entire community can aspire to gain novel insights into the interlinked hydrological cycles and variability of water resources. This will contribute to the scientific discourse on water challenges through the publication of peer-reviewed articles spanning data, methods, models, and assessments. Hydrology will then be better recognised as an essential science seamlessly integrated into each SDG.

3.3.2. Theme 2: Holistic solutions for water security

Embarking on the second theme within the HELPING decadal initiative, our aim is to effectively manage existing water crises and proactively mitigate potential future challenges. Specific examples of potential research questions within this theme include: 1) What is the impact of nature-based solutions on the water cycle? 2) Which criteria should guide the selection of measures for high success-rate to enhance local water security? and 3) How to ensure inclusiveness and optimise co-creation across disciplines and local stakeholders for effective problem-solving?

The pursuit of these research questions is poised to yield significant outcomes, including the development of a comprehensive catalogue detailing various solutions and their potential effects (Table 2). Furthermore, specific outcomes involve the formulation of guidelines for assessing solutions and the creation of a catalogue specifically focused on Nature-Based Solutions (NBS) along with their corresponding guidelines. The community goals associated with this endeavour are not only restricted to the impacts of solutions and optimal engineering practices, but also to understanding the local context for transferability so that solutions can be implemented in a sustainable way. The results will be published in peer-reviewed publications covering methods, models, and assessments, and advocating for the visionary perspective where water security is universally recognised as a fundamental human right.

3.3.3. Theme 3: Cross-cutting facilities

The third theme revolves around cross-cutting objectives, aiming to enhance capacity within local societies and draw insights from local experiences to ensure the acceptability, affordability, accessibility, and equitability of solutions (i.e. the local societal context). Potential research questions within this theme include: 1) What should guide the selection of methods for co-creation driven by hydrologists in a specific local context? 2) In which way can scientific engagement with society change people's attitudes, behaviours and actions? and 3) How to apply indigenous knowledge in scientific analysis with requests on evidence-based facts?

The goals at the product level encompass the integration of new data sources into open data repositories, the creation of a catalogue highlighting local associations, methods, and training for co-creation activities, and the establishment of a database showcasing instances where practical/indigenous knowledge converges with evidence-based science (Table 3). Achieving these product-level objectives could lead to community goals such as increased engagement by hydrologists in science communication, transdisciplinary research and with local stakeholders. It would also generate peer-reviewed publications featuring applied showcases and new theories on local prerequisites for actionable solutions, which ultimately foster local ownership in the discovery, implementation, and maintenance of water solutions.

3.4. Organisation of the Science for Solutions decade

The decade will remain a bottom-up process empowered by local hydrologists and scientists using open science and local data/methods when solving local water problems. We envisage that the building of local knowledge and cooperation can inform scientists working under similar situations, for instance when facing unexpected events worldwide (e.g. learning from floods or droughts in one catchment will inform hydrologists and water management in other catchments). To facilitate leadership and continuation throughout the decade, the science for water solutions decade will be organised with a management team and defined theme leaders for groups of collaborative work based on initiatives by the community. Leadership will rotate on a two-year basis. It will be fully open to new initiatives suggested by any IAHS member and such actions will also be open for participation by anyone who wishes to contribute in line with IAHS core values (https://iahs.info/About-IAHS.do).

To facilitate leadership and continuation throughout the decade, the scientific decade will be organised according to a classical management structure with defined themes for clusters of working groups to enable collaborative work at multi-levels (Fig. 9). Inclusiveness is one of IAHS core values and so are active engagement, transparency and personal responsibility in the collaborative process. IAHS recognises that equality and diversity is required for scientific progress and embraces integrity, trust, and respect as guarantee for the openness and creativity that is needed to accelerate science.

The new decade strives for tangible results and transparency, and therefore, the work will be reported regularly and progress will be followed and monitored by the *Steering Committee* to help the Theme leaders with engagement, competences and communication activities, as well as finding synergies and stakeholders or data sources for the various actions. The IAHS communication team will provide information tools, such as the IAHS website, joint publications, social media channels and the Digital Water Globe. A *Steering Committee* will help engage with other global communities (e.g. in the UN family, in particular the long-standing partners UNESCO IHP and WMO), coordinate with other IAHS activities and give visibility to the on-going work and findings. The Steering Committee will also assist in any collaborative disagreements and encourage open science, fair data, commitment to equality, diversity and inclusion (i.e. the IAHS EDI statement https://iahs.info/About-IAHS/about-iahs/), publications, policy briefs and citations. The persons in the steering committee are similar to the IAHS management team.

The theme leaders will identify and approve tasks and actions needed to advance their sub-topic of the Scientific Decade, they will follow up on progress and initiate actions, such as workshops, outreach activities, collaborative publications or projects (e.g. comparative studies or ensemble modelling). They will help and guide the appointed *Working group leaders*, who are responsible for coordinating such specific activities that aim to accelerate knowledge accumulation from the scientific community, and hence, progress within the work clusters.

The working groups are fully open to initiatives from the community and partners, self-organised and serve as a platform for testing ideas in a cooperative manner. Leading such an action also offers an opportunity for scientists to develop their leadership skills with mentoring from senior scientific leaders. Anyone can start a working group, if judged relevant for the decade by the Theme leaders and Steering Committee, and participants can sign-up continuously. Theme leaders are sought for in an open call with self-nomination every second year. This organisation will ensure stability and strong connection with IAHS as a whole, but still allow an agile and evolutionary progress throughout the decade.

4. Setting the scene for urgent and desired actions (Discussion)

The ambitious scope and progressive intentions by the HELPING decade cannot be solved by one single community alone but need collaboration between many disciplines, both other geosciences and engineering, but also with political sciences, economy, biology, law, psychology, etc. (which is also implied by the acronym). Furthermore, it cannot be fulfilled by scientists alone, but needs close collaboration with stakeholders, practitioners, policy-makers and citizens at various levels across the globe. IAHS has to play a crucial role as a central community facilitator, in streamlining and empowering local scientists to contribute to the global agenda for actions that make a difference (Fig. 10). As such, IAHS is a long-term partner of intergovernmental developments.

4.1. Enabling community-based research

4.1.1 The role of IAHS

IAHS supports hydrology and related sciences as a non-profit, non-governmental charity, in the form of networking, hence, it is not a conference, research council or a donor. Instead IAHS provides a platform for collective creative work, independent accumulation of knowledge and scientific ownership. The association consolidates voluntary scientific work and provides mechanisms for networking and scientific publications in the field of hydrology with a vision of sustainable development in a changing world (see more at https://iahs.info/). The activities of the decade must therefore be based on already financed projects or institutional work and thus rely on current research trends (which are often underpinned by societal challenges). As IAHS offers the basis for partnership and participation in synthesis or review publications, it can, however, also be an opportunity for attracting external funding and thus create projects in line with the ambitions of the new decade.

The HELPING decade will apply an agile set-up with learning in feedback loops over time to allow co-evolution during the decade between progress in hydrological sciences and new challenges appearing in society, environment, or other disciplines. The decade supports education and training and will become a fertile breeding ground for continuously evolving new actions. Some working groups may last over the full decade, while others last only a couple of years and new ones may appear. IAHS facilitates engagement by offering an array of services like conferences, workshops and sessions at other organisations events. In IAHS various hydrological sub-disciplines have their own commissions which organise meetings and collaborative work (e.g. synthesis, reviews, opinion papers). Similarly, regional committees connect people in a certain geographical domain in site specific research, while more temporary working groups gather people in a specific activity. The purpose is to facilitate synthesis work and coordinated actions, such as formulating shared scientific questions e.g. the Unsolved Problems in Hydrology (UPH; Blöschl et al., 2019).

Furthermore, IAHS offers grants to selected early career scientists from financially disadvantaged countries every year to boost inclusiveness through the SYSTA mechanism. The IAHS membership is free of charge with a benefit of connecting to a large community and up-to-date information of events and community achievements through e-news. This is a good opportunity for scientific outreach in the hydrological community with more than 10 000 members in 150 countries. Currently, IAHS Press runs two publications; the Hydrological Sciences Journal (HSJ) and the Proceedings of IAHS (PIAHS). Previous book series are accessible online and can be purchased in hardcopy. IAHS also recognises eminent scientists with medals and awards for their outstanding research after nominations from the community every year. Finally, IAHS offers sustainability with more than 100 years of operation and a solid organisational structure, which is transparent through the website, statutes and in regular protocols with democratic decision-making by the Bureau. Hence, IAHS provides good facilities for inclusive and coherent scientific efforts during the science for solutions decade.

4.1.2. The Digital Water Globe

During the pandemic of COVID-19 IAHS recognised the need for new digital facilities to engage scientists worldwide. Recently, a new tool for scientific sharing was therefore launched; the Digital Water Globe (DWG; https://dwg.smhi.se/dwg), which is an on-line tool specially designed for, and by, IAHS members able to give visibility to (un)published results, research sites and find peers for collaborating around the world (Fig. 11). The DWG is a web-based software platform where IAHS members share results from case studies, personal profiles, IAHS references and links to data repositories. The different items are linked to a geographical position on a global map as well as keywords for quick search using filter functions. The DWG offers co-creation and re-examines the role of scientific outreach by exploring novel digital ways to interact between scientists and society for mutual understanding and co-evolution. The information is kept short and concise like a digital poster exhibition with key messages. Filter functions facilitate the search and there are links between the items and personal profiles. The DWG will help finding global and regional patterns from analysing local case-studies during the HELPING decade. It will also help with outreach and networking in the IAHS community and beyond, as the tool is open for any visitor.

4.2. Embracing co-creation and open science

The Science for Solutions decade endorses co-creation, which means inviting stakeholders and users into the creative process to ensure fitness-of-purpose in design of problem solving. This approach started in the industrial sector (Aarikka-Stenroos and Jaakkola, 2012; Grönroos, 2012) but soon spread to governments and the civil society, paving the way for new participatory methods in water-related decision-making, e.g. serious games (e.g. Aubert, et al., 2019; Crochemore et al., 2021; Mittal et al., 2022) and innovation laboratories (Bergvall-Kareborn and Stahlbrost, 2009; Witteveen et al., 2023). It is widely recognised that co-creative approaches involving a broad range of competences in "learning by doing together" allow better understanding of complex problems and facilitates new innovative ideas in an interdisciplinary context.

Current water-related challenges can be sorted into different categories (Winde et al., 2023) and each one needs co-creation among scientists, governance, industry, and civil society, which is already well recognised by the IAHS and wider community (e.g. Cudennec and Hubert, 2008; Koutsoyiannis et al., 2016; WEF, 2018; Dixon et al., 2020; Kootval and Soares, 2020; Kreiling and Paunov, 2021). Stakeholders and civil society at play are polycentric and multiform (Ostrom, et al., 1999), especially at the intersection between common goods, water and knowledge (Boulton, 2021; ISC, 2021; UNESCO, 2022), and between knowledge systems (UNESCO, 2021; Nóbrega et al., 2023). Water challenges may cause international conflicts (Kundzewicz and Kowalczak, 2009) but more often result in collaboration (Wheeler and Hussein, 2021) and HELPING will therefore embrace and explore such potentials using collective creativity.

Co-creation, covering at least co-ideation, co-design, co-implementation and co-evaluation (Pearce et al., 2020) may capitalise from existing references in hydrology and other fields, to be further explored and applied in emerging multiple problems of the water sector. Citizen science is actually blooming in water issues, ranging from crowdsourcing, to engagement with indigenous and local people's knowledge, to management processes (Nardi et al., 2022). We anticipate that the HELPING decade shall serve as a platform to harvest and share lessons, and to elaborate on the conceptualisation and practices of co-creation. In this way the decade will empower both scientists and stakeholders.

Co-creation is closely linked to and dependent on the Open Science paradigm, which is another example where IAHS plays a significant role. It was rooted in the scientific community itself (e.g. Ceola et al., 2015; Wilkinson et al., 2016; Carroll et al., 2020; Boulton, 2021; Hall et al., 2022; ISC, 2021; Cudennec et al., 2022b) and is progressing at policy levels. Noteworthy contributions include UNESCO's recommendation on open science (UNESCO, 2021), the WMO unified data policy resolution (WMO, 2021c), and broader efforts on open data at the UN level.

4.3. Alignment with the global agenda

Global action on water should be less rhetoric and more scientific, concluded the recent high-level conference on water at the UN headquarters (Nature Editorial, 2023; President of the UN GA, 2023) which was a mid-term review of the International decade for action "Water for sustainable development" 2018-2028, and also timely regarding the inception of the International Decade of Sciences for Sustainable Development 2024-2033. The third IAHS scientific decade therefore goes beyond the search for traditional scientific knowledge by expanding into transformative comprehension, feeding the intergovernmental policy processes with action-oriented facts. The research will extend towards problem-solving strategies aimed at guiding societal development. The scientific understanding of the Anthropocene was already triggered by international scientific cooperation in pioneer foresight studies (Meadows et al., 1972; Oki et al., 2006; Cosgrove and Cosgrove, 2012; Bai et al., 2016; TWI2050, 2018). The advancements on the scientific front, coupled with explorations of plausible futures, have raised global awareness regarding water-related challenges through multilateral political events and mechanisms (e.g. Rahman, 2023). Over the past century, IAHS has played an essential role in consolidating and synthesising scientific findings, being the only global hydrological community.

Key milestones for a global sustainable-development policy, such as the UN water conference in Mar del Plata (1977), the Earth summit in Rio (1992), the Rio+20 conference (2012), and the UN conference on water in New York (2023) have materialised into several agendas for action and conventions. The current SDG number 6 includes water in the name, 'clean water and sanitation', but also establishes intricate linkages with most of the other SDGs (ICSU, 2017; UN Water, 2018), and in fact, water is crucial for realising all SDGs as well as climate actions (Rahman et al., 2023). However, monitoring progress of Agenda 2030 reveals that numerous countries are not on track to meet the water-related targets. The SDG6 global acceleration framework (UN Water, 2020) has consequently identified various instrumental streams encompassing finances, data and information, capacity development, innovation, and governance. Here hydrological sciences should advance through HELPING and play a more active role to ensure water-centric decisions based on hydrological understanding in societal transformation.

IAHS maintains a longstanding and robust collaboration with UN organisations such as the World Meteorological Organization (WMO) and the United Nations Educational, Scientific and Cultural Organization (UNESCO) through its Intergovernmental Hydrological Programme (e.g. Young et al., 2015b; Rosbjerg and Rodda, 2019). This partnership bridges science and high-level policies, to facilitate practical national implementation. Such contemporary multilateral initiatives that solicit contributions from the self-organised hydrological scientific community, are for instance the ongoing development of the WMO Global Hydrological Status and Outlook System (HydroSOS), the annual WMO State of the Global Water Resources report (WMO, 2023) and the collaborative design by UNESCO, UN agencies, and

Member States for initiating a Science-Based Global Water Assessment (Unesco, 2023; Nature Editorial, 2023).

Hence, the forthcoming HELPING decade aligns seamlessly with global debates and science-based mechanisms for multi-level assessment, policy design, and research funding. This enables effective implementation and uptake of results towards water security and sustainable development. Furthermore, the cascading of multilateral shared values and knowledge from global to local scales, alongside national commitments, is similar with the multi-level and co-creation approach of HELPING. This framework might thus establish international standards for upholding and overcoming challenges in cooperative efforts and science-policy dialogues at all levels. The ultimate outcome of the Science for Solutions decade will be empowerment through scientific understanding and capacity development, with open access to data and information in various settings for global and local sustainable development.

5. Conclusions

Water-related issues are at the heart of the emergence and acceleration of the Anthropocene, and so strongly underlie security and human rights dimensions. The water crisis has been recognized as one of the top 10 worst global risks by the World Economic Forum for a long time. The hydrological community is eager to contribute to sustainable development and break the disastrous trends. A new scientific decade was therefore suggested to focus on science for solutions to the water crisis, using co-creation processes (driven by hydrologists) with shared knowledge between disciplines and stakeholders for holistic understanding and decision-support. As such, the decade seeks to provide actionable knowledge across scales, scientific communities, societal sectors and contexts, focusing on water as a resource or a risk for societal and environmental benefit. This initiative called HELPING recognises that present and emerging water problems need help from many actors in collective creativity to find sustainable solutions.

Hence, the vision is to solve fundamental water-related environmental and societal problems by engaging with other disciplines and local stakeholders. The decade strives for advancing hydrological knowledge into actionable pathways, and to this end, IAHS encourages the hydrological community to focus on: 1) global and local interactions using systems analysis, to develop enhanced understanding of local impacts and local people but from a global lens; 2) holistic solutions to the water crisis, embracing nature-based measures, participatory management and nexus analysis including other disciplines and multiple stakeholders; 3) development of methods appreciating indigenous and local people's knowledge, citizens science, engagement and communication, as well as strategic high-level collaboration and outreach, to reach global scientific empowerment in water issues.

The roadmap to the ambitious aim of HELPING includes for instance: committed efforts in all working groups (currently 25 self-organised and initiated by the community), joint search for funding, inclusive collaboration (especially important under new normal international conditions), and intense science communication empowering local initiatives. IAHS enables these community-based efforts by providing support and facilitation. The new decade presumes co-creation and initiatives with other disciplines and stakeholders, in particular in relation to open science. As such, the new decade is well aligned with other global agendas, within the UN, international policy-makers, donors and scientific publishers. Together we can make it successful.

Acknowledgements

This paper is the result of a nine months community effort within IAHS, engaging scientists through on-line meetings, posts in a web forum, participatory exercises in workshops, and discussions at conferences. All active contributors in shaping the new decade have been invited as co-authors to this community paper as the concept inhere builds on the shared ideas and collective creativity. We thank everyone who signed up to working groups, ready to serve the scientific community with their knowledge and ideas in collective creativity for finding solutions. We also thank the IAHS secretariat, in particular Tarryn Payne (IAHS Communication Officer), for patient support and active engagement throughout the process. Finally, we thank everyone who contributed to the graphical-design competition of the decadal Logotype, and especially the winner: Judith Boekee, PhD candidate at the Technical

University of Delft. The manuscript was reviewed by Dr. Anil Mishra (UNESCO) and Dr. Stefan Uhlenbrook (WMO) to whom we are grateful for constructive feedback.

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Appendix

[Figure A1]

[Figure A2]

Table A1. List of working groups (WGs) per theme with leaders and number of assigned participants in Dec. 2023. (WG leaders are working with Theme leaders).

Theme 1 HELPING with global and local interactions	**Theme or WG Leader(s)**	**Number of participants**
Theme 1 leader (coordinating WG leaders)	***Justin Sheffield***	***14***
REHYDRATE - REtrieve historical HYDRologic dATa and Estimates	Miriam Bertola, Paola Mazzoglio	75
Decomposing Complexity	Ankit Agarwal	37
Urban Water - Urbanization phenomenon and adequate water management strategies	Bertil Nlend	43
From local to large scale human-water dynamics	Mohammad Ghoreishi	55
Comparative understanding of runoff generation processes from global experimental watersheds	Fuqiang Tian	81
Water for biodiversity in a changing world	Claudia Teutschbein	53
Understanding drivers and feedbacks of soil moisture variability across scales, from local to global	Justin Sheffield	56
Deep explanation and evaluation of hydrological Changes for local solutions (DEEPHY)	Suxia Liu	64
Effective Aquifer Governance for Agriculture	Maria Elena Orduna Alegria	24
Hydrologic Design - Solutions and Communication	Svenja Fischer	115
Water Quality Under Global Changes	Albert Nkwasa	44
Development and application of river basin simulators	Jun XIA	86
Ensuring evidence-based findings	Benjamin Wullobayi Dekongmen	8
Droughts in Mountain Regions	Francesco Avanzi	135

Theme 2 HELPING with holistic solutions for water security	WG Leader(s)	Number of Participants
Theme 2 leader (coordinating WG leaders)	***Ana Mijic***	***11***
Drought in the Anthropocene	Marthe Wens	138
Participatory Water Systems	Santosh Subhash Palmate	19
Near-term (annual to decadal) forecasts of water availability	Kristian Förster	46
Acceptance of Nature-based solutions and their implementation in guidelines	Junguo Liu, Nejec Bezak	112
The Water-Energy-Food-Ecosystem (WEFE) nexus	Claudia Teutschbein, David Christian Finger, Shiv Narayan Nishad	133
Water systems analysis for integrated planning and management	Ana Mijic	78
Stepwise ecological restoration of watersheds	Junguo LIU	44
WATER & HEALTH - Integrated water pollution solutions to tackle the water and health nexus	Stefan Krause	67
Theme 3 HELPING with cross-cutting goals	**WG Leader(s)**	**Number of Participants**
Theme 3 Leader (coordinating WG leaders)	***Adeyemi Olusola***	***6***
Strategic UN-Collaboration Group (SCG-Hydro)	Mojtaba Shafiei	44
Outreach, Communication and Science Interfaces	Christina Orieschnig	50
Co-Creating Water Knowledge	Giulio Castelli, Wouter Buytaert, Natalie Ceperley	107

Table 1. Identified goals HELPING with global and local interactions.

Research goals	**Outcome/product goals**	**Community goals**
Understanding local hydrological processes	Case-studies populating the Digital Water Globe platform	Synthesis for joint global description of diversity
Understanding differences and similarities between regions	Large-sample datasets; Tools for monitoring or assessments	Collaboration between people at similar conditions world-wide
Understanding global-local interactions and their impact on water resources	Methods to link global estimates with local conditions	Recognition when implementing general policy at local level

Table 2. Identified goals HELPING with holistic solutions for water security.

Research goals	Outcome/product goals	Community goals
Understanding potential and challenges with mitigation methods (for floods, droughts, water quality/pollution)	Catalogue of solutions and potential effects; Tools for evaluations	Empowered hydrologists in water security
Understanding sectorial nexus and societal context of problems/solutions	Guidelines for assessments of solutions, which affects several sectors and local context	Participation in trans-disciplinary analysis and applied research
Nature-based solutions for achieving water security	Catalogue of NBS and their Guidelines	Foster sustainability and green societal transition

Table 3. Identified goals HELPING with cross-cutting goals.

Research goals	Outcome/product goals	Community goals
Integrating new technologies with existing	New data sources in open data repositories	Facilitate evaluation/application of current concepts and study new hypothesis
Co-creating hydrological knowledge between people and between disciplines	Catalogue of local associations; Methods and training in co-creation activities; Database of good examples merging practical/indigenous knowledge with evidence-based science	Engage with local people globally Enhance science communication, inclusiveness, and applications of citizen science Foster transdisciplinary research

Figure Captions

Figure 1. The succession of IAHS scientific decades.

Figure 2. Flowchart of the strategic planning method applied for preparing and implementing the HELPING decade. ws = workshop. Number of people engaged in the process illustrates recommendations by Shu-Hsiang et al., 2015.

Figure 3. Photos from activities and outcome of the Cordoba meeting early 2023.

Figure 4. Results from survey to all IAHS members on most popular topics from the ones defined in Cordoba. The red box marks the top two topics as well as two support actions chosen.

Figure 5. Photos from the Technical University of Vienna workshop defining HELPING goals.

Figure 6. Photo from the workshop at the IUGG General Assembly in Berlin when voting on the logo to represent the new Science for Solutions decade HELPING.

Figure 7. Some societal sectors, which should share the water resources in wise decision-making based on hydrological decision-support to fulfil the UN Sustainable Development Goals.

Figure 8: Interactions between the three themes and keywords for their assigned working groups when starting the new decade in 2023.

Figure 9: Organisation of the IAHS Science for Solutions decade HELPING 2023-2032.

Figure 10. Exploring policy goals (left cone) and water management (right cone) by HELPING research.

Figure 11. The digital water globe at https://iahs.info/ is populated by scientific results from case-studies, personal profiles of IAHS members, and links to open datasets or IAHS publication. Filter functions help the visitor to find and access relevant information from peers.

Figure A1. Agenda with discussion points at satellite on-line meetings and at the Cordoba workshop early 2023, to answer on Why, What and How to set up the next decade. The in-person work was organised in round-table discussions (8 persons per Table) steered by answering the questions and reporting in Plenum, followed by open discussions.

Figure A2. Some metrics on diversity among the scientists participating at the workshop in Córdoba when collecting input for the next decade during three days, 1-3 February 2023.

Fig. 1

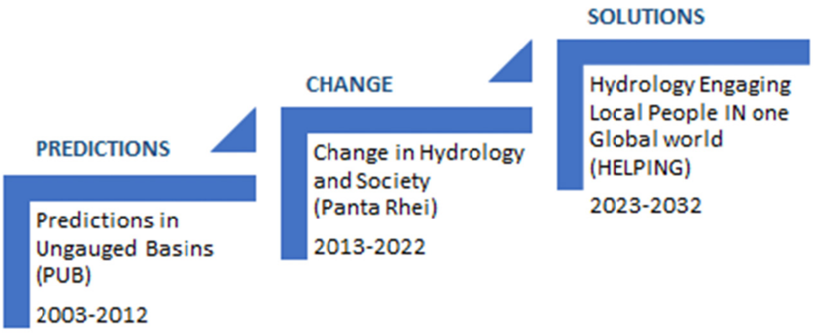
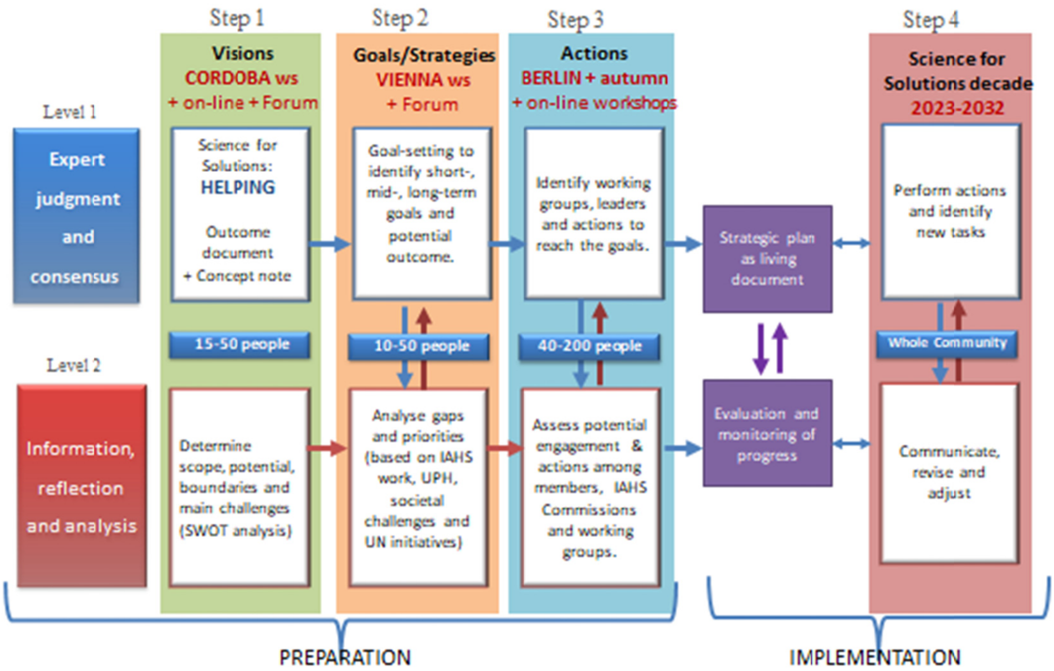

PREDICTIONS
Predictions in Ungauged Basins (PUB)
2003-2012
CHANGE
Change in Hydrology and Society (Panta Rhei)
2013-2022
SOLUTIONS
Hydrology Engaging Local People IN one Global world (HELPING)
2023-2032

Fig. 2



Step 1
Step 2
Step 3
Step 4
Visions
CORDOBA ws
+ on-line + Forum
Goals/Strategies
VIENNA ws
+ Forum
Actions
BERLIN + autumn
+ on-line workshops
Science for Solutions decade
2023-2032
Level 1
Expert judgment and consensus
Science for Solutions: HELPING
Outcome document
+ Concept note
Goal-setting to identify short-, mid-, long-term goals and potential outcome.
Identify working groups, leaders and actions to reach the goals.
Strategic plan as living document
Perform actions and identify new tasks
15-50 people
10-50 people
40-200 people
Whole Community
Level 2
Information, reflection and analysis
Determine scope, potential, boundaries and main challenges (SWOT analysis)
Analyse gaps and priorities (based on IAHS work, UPH, societal challenges and UN initiatives)
Assess potential engagement & actions among members, IAHS Commissions and working groups.
Evaluation and monitoring of progress
Communicate, revise and adjust
PREPARATION
IMPLEMENTATION

Fig. 3

Fig. 4

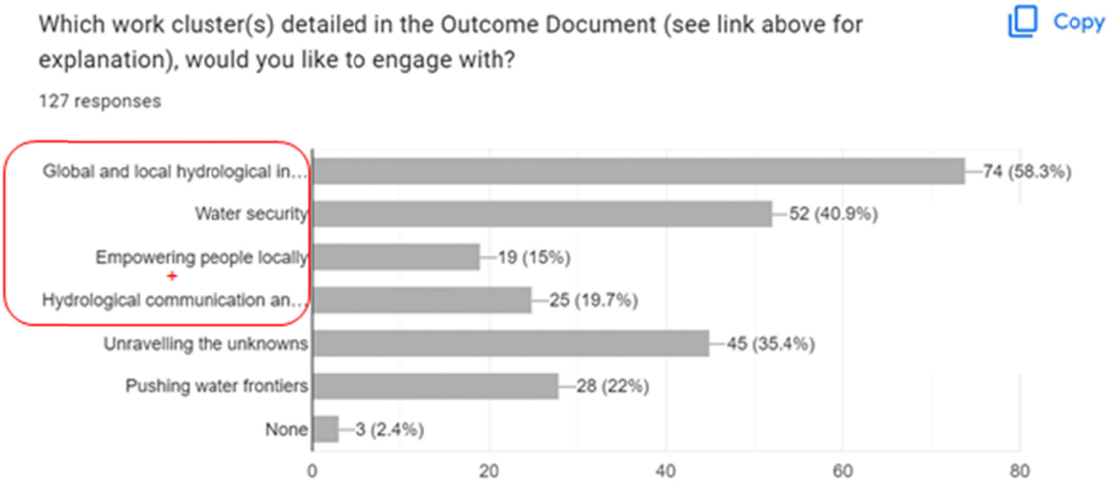

Which work cluster(s) detailed in the Outcome Document (see link above for explanation), would you like to engage with?
Copy
127 responses
Global and local hydrological in…
Water security
Empowering people locally
Hydrological communication an…
Unravelling the unknowns
Pushing water frontiers
None
74 (58.3%)
52 (40.9%)
19 (15%)
25 (19.7%)
45 (35.4%)
28 (22%)
3 (2.4%)
0
20
40
60
80

Fig. 5

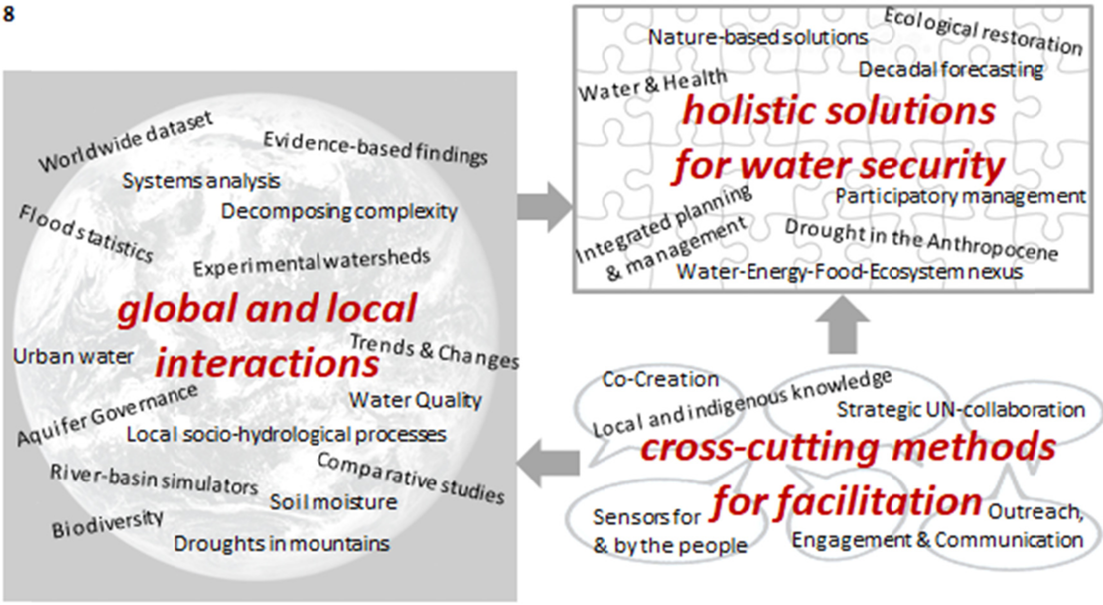
Fig. 6


HELPING

Fig. 7

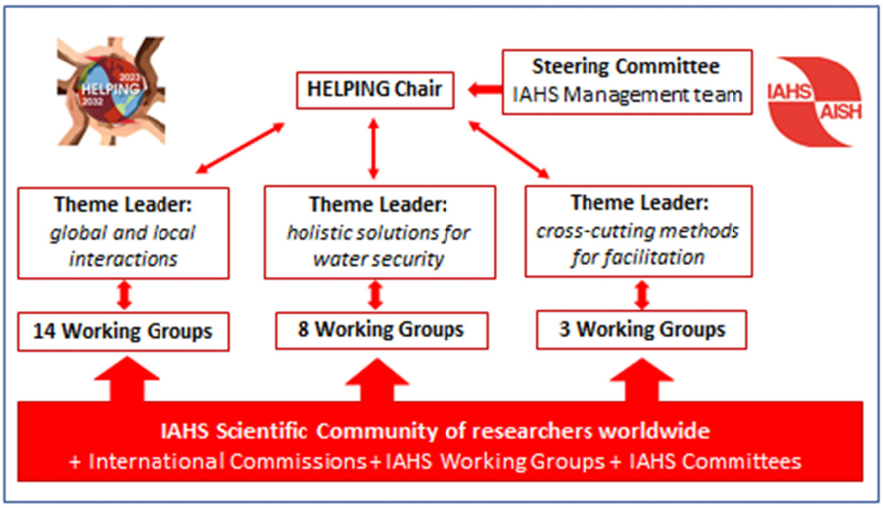

Overaching SDGs
SDGs with planetary boundaries for water management
Energy and Industry
Hydropower, Manufacturing and production
Households and Safety
Drinking water and sanitation, Floods and hazards
HYDROLOGICAL DECISION-SUPPORT
to plan, prioritise, coordinate, balance goals
Agriculture and Forestry
Spatial planning and Infrastructure
Ecological diversity
Resilience, Heritage and Recreation

Fig. 8



Worldwide dataset
Evidence-based findings
Systems analysis
Decomposing complexity
Flood statistics
Experimental watersheds
global and local
interactions
Urban water
Trends & Changes
Aquifer Governance
Water Quality
Local socio-hydrological processes
River-basin simulators
Comparative studies
Soil moisture
Biodiversity
Droughts in mountains
Nature-based solutions
Ecological restoration
Water & Health
Decadal forecasting
holistic solutions
for water security
Integrated planning
& management
Participatory management
Drought in the Anthropocene
Water-Energy-Food-Ecosystem nexus
Co-Creation
Local and indigenous knowledge
Strategic UN-collaboration
cross-cutting methods
for facilitation
Sensors for
& by the people
Outreach,
Engagement & Communication

Fig. 9



HELPING
HELPING Chair
Steering Committee
IAHS Management team
IAHS
AISH
Theme Leader:
global and local interactions
Theme Leader:
holistic solutions for water security
Theme Leader:
cross-cutting methods for facilitation
14 Working Groups
8 Working Groups
3 Working Groups
IAHS Scientific Community of researchers worldwide
+ International Commissions + IAHS Working Groups + IAHS Committees

Fig. 10

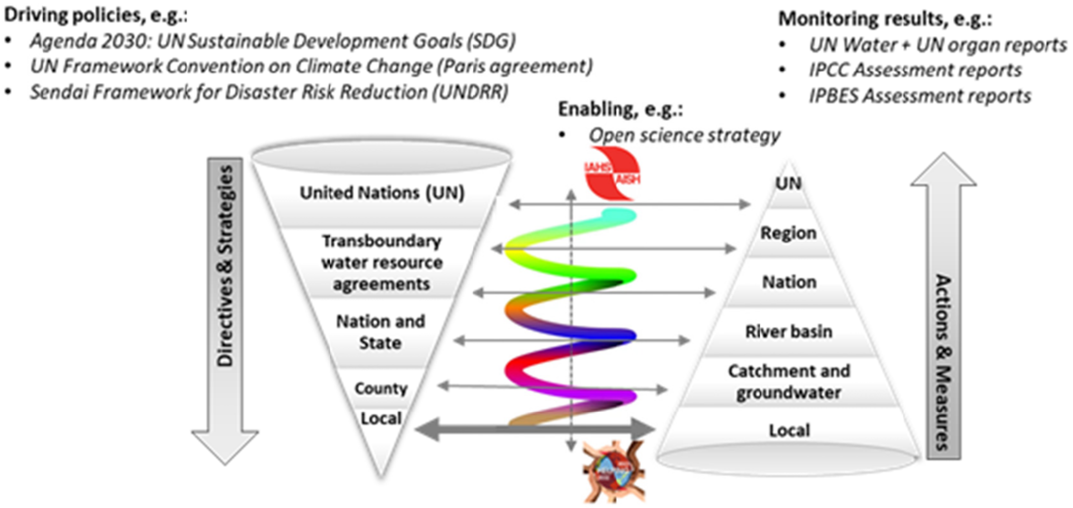
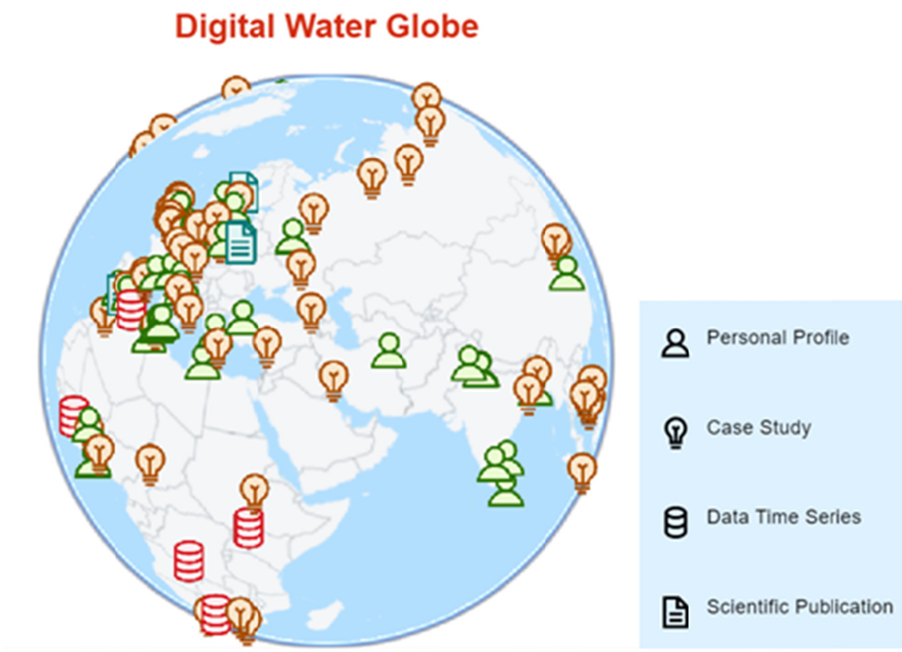

Driving policies, e.g.:
• Agenda 2030: UN Sustainable Development Goals (SDG)
• UN Framework Convention on Climate Change (Paris agreement)
• Sendai Framework for Disaster Risk Reduction (UNDRR)
Monitoring results, e.g.:
• UN Water + UN organ reports
• IPCC Assessment reports
• IPBES Assessment reports
Enabling, e.g.:
• Open science strategy
Directives & Strategies
United Nations (UN)
Transboundary water resource agreements
Nation and State
County
Local
UN
Region
Nation
River basin
Catchment and groundwater
Local
Actions & Measures

Fig. 11


Digital Water Globe
Personal Profile
Case Study
Data Time Series
Scientific Publication

A1

Collecting input to the Concept Note

Input for Plenum 1 Feb at 14 hrs CET:

1. What defines a successful Scientific Decade?
2. What do we want to achieve in the long-term and short-term, respectively?

WHY?

Input for Plenum 2 Feb at 10 hrs CET:

3. What are the current drivers/trends in Fundamental and Applied Research?
4. What are the societal needs of scientific results?
5. Where to position IAHS? (vs other global scientific communities)

WHAT?

Input for Plenum 2 Feb at 14 hrs CET:

6. Brainstorm potential topics (and sub-topics/science questions) of the Next decade!
7. Identify short and catchy names
8. Make a brief SWOT analysis for each one (Strengths, Weaknesses, Opportunities, Threats)

Input for Plenum 3 Feb at 10 hrs CET:

HOW?

9. Identify sub-topics, science questions and Results of the Next Scientific Decade!
10. Suggest an organisational structure and communication/work activities (based on previous experiences)

A2