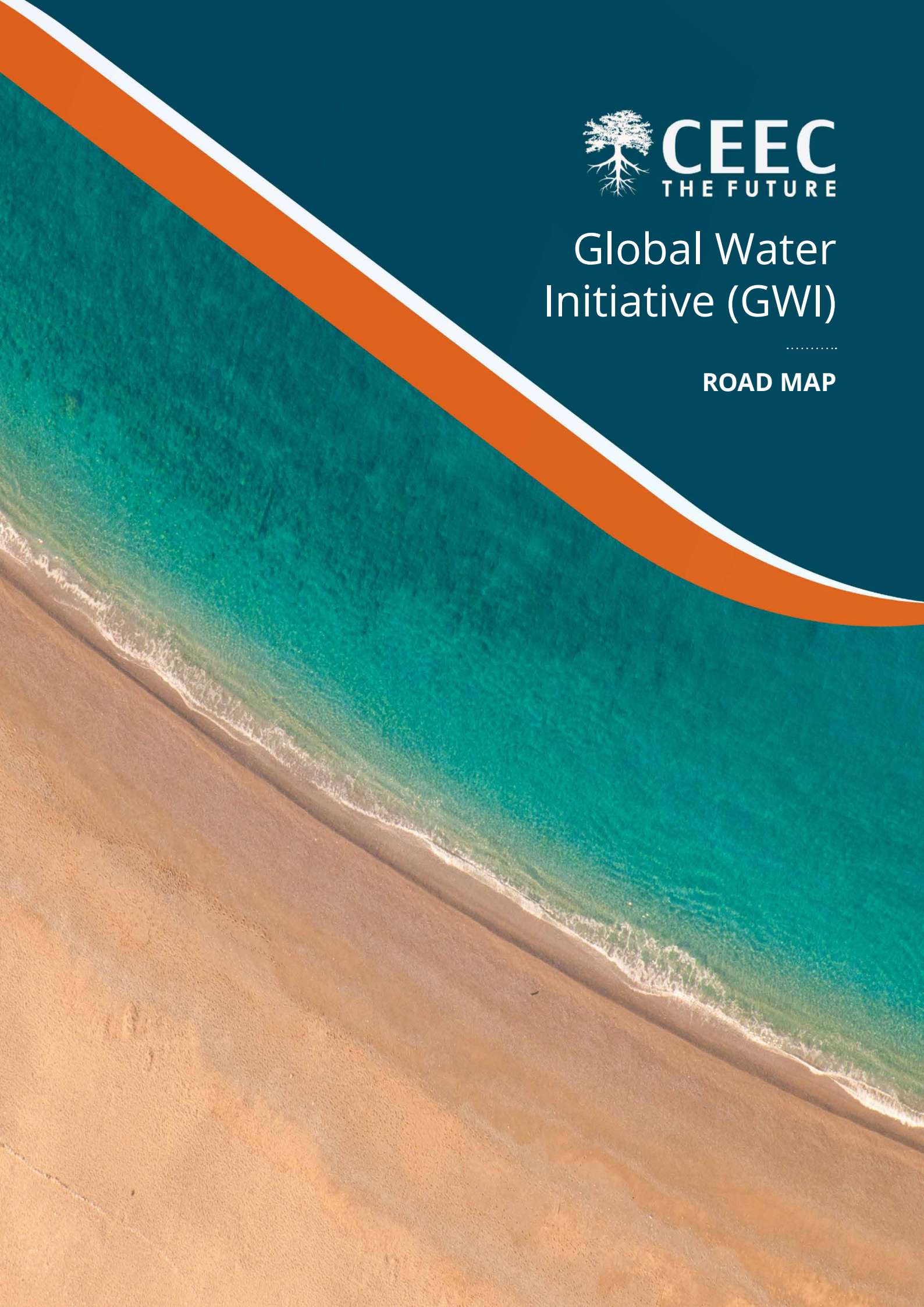

CEEC
THE FUTURE

Global Water Initiative (GWI)

ROAD MAP

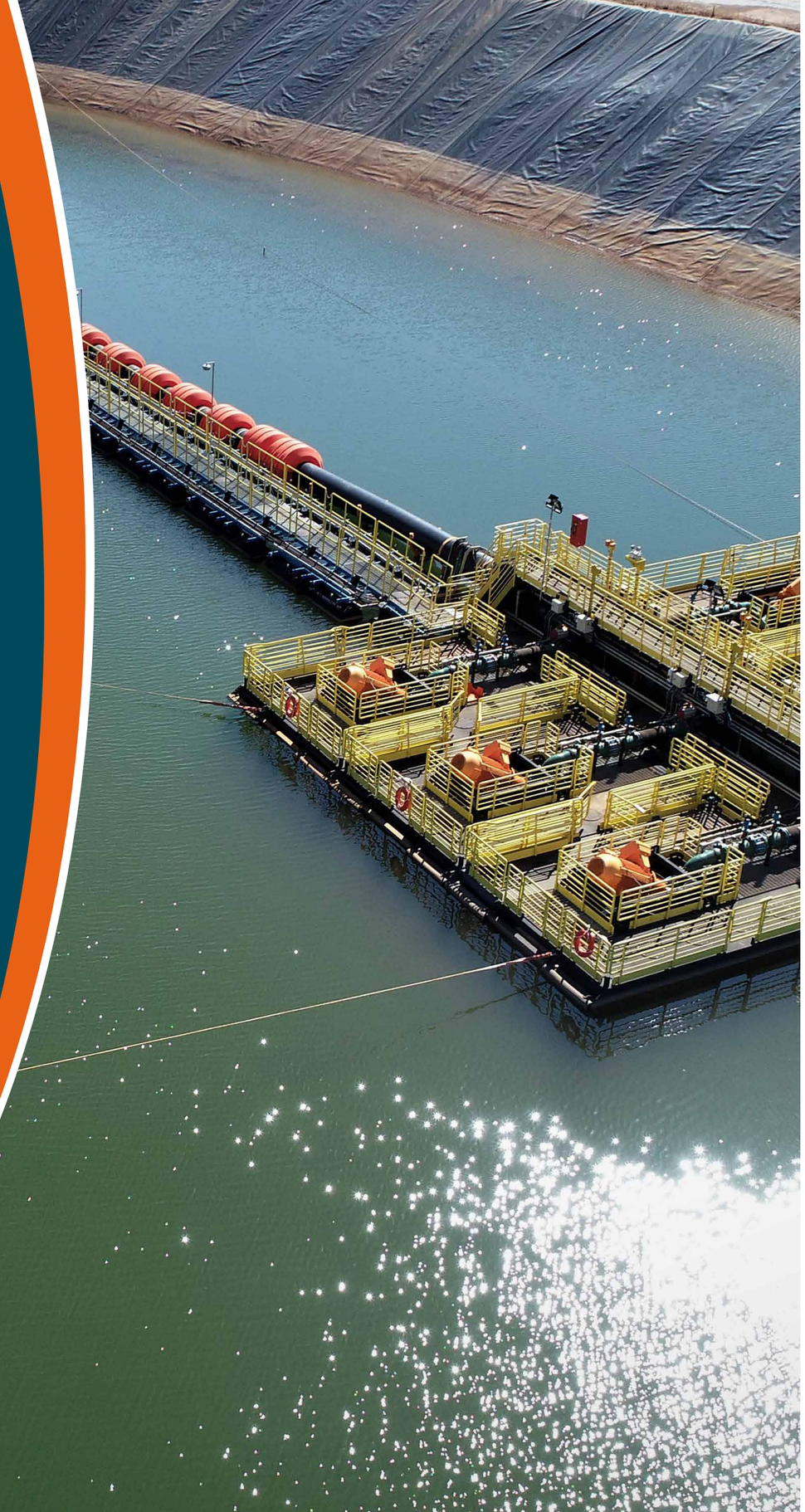

IMAGE: WEIR

EXECUTIVE SUMMARY

The CEEC International Global Water Initiative (GWI) is a collaborative strategy to tackle water-related challenges in resource extraction industries. It emphasises interdisciplinary collaboration as being vital in addressing issues like water scarcity, excess, contamination, seasonality and overall water quality.

This Roadmap is a comprehensive guide outlining the outcomes of the GWI campaign and the intended pathways for the research agenda.

The campaign process followed has involved industry leaders, practitioners, researchers, experts and other stakeholders. Sessions focused on assessing the current state, defining the gaps, envisioning a future state, brainstorming ideas and potential solutions and then aligning on key initiatives and themes.

Key focus areas identified include interdisciplinary collaboration, technological innovation, cultural and social considerations, environmental responsibility, and water management and treatment. Near-term actions include finalizing the roadmap document, establishing partnerships with research institutions, and securing government funding and other in-kind support.

Potential obstacles to achieving the goals of the GWI have also been explored and outlined. They include conflicting priorities, barriers to information sharing, treatment of intellectual property, clarity of communication and resource constraints.

Communication principles are highlighted to ensure transparent, engaging, and inclusive communication within the initiative, emphasising clarity, consistency, and recognition of the wide variety of stakeholders' contributions.

The importance of avoiding duplication of efforts or existing work has been rightfully highlighted and will be addressed as a high priority. It is important to CEEC that the findings, learnings and outcomes of the GWI are ultimately available in as open and accessible a format as possible.

In conclusion, the CEEC International Global Water Initiative Roadmap provides a high-level Charter and framework for collaborative action to achieve sustainable water management in the mining industry. By leveraging collective expertise and resources, the initiative aims to address water-related challenges effectively and ensure access to quality water at critical times for all stakeholders involved.

01 CONTENTS

CEEC THE FUTURE

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Compiled by Philip Bangerter, Laurie Reemeyer, Janine Herzig and Tri Helix from material produced at the CEEC International Global Water Initiative campaign and various virtual workshops held from November 2023 - April 2024.

APRIL 2024

IMAGE: AGNICO EAGLE MINES

IMAGE: AGNICO EAGLE MINES

INTRODUCTION

The Global Water Initiative is a collective industry effort to address water-related challenges through collaboration and research. This Roadmap is a comprehensive guide outlining the intended pathways.

This document is intended for stakeholders, including sponsors, researchers and CEEC. It presents our vision, goals, and a detailed roadmap for action, emphasizing the importance of collaboration, innovation, and effective communication.

By working together and leveraging our collective expertise and resources, we aim to make significant progress towards ensuring sustainable water management and access for all.

We would like to extend our sincere appreciation to our sponsors for their invaluable support in this Global Water Initiative. Without their generous funding and resources, this endeavour would not have been possible.

SPONSORS

Thank you to our sponsors.

CEEC THE FUTURE

AGNICO EAGLE

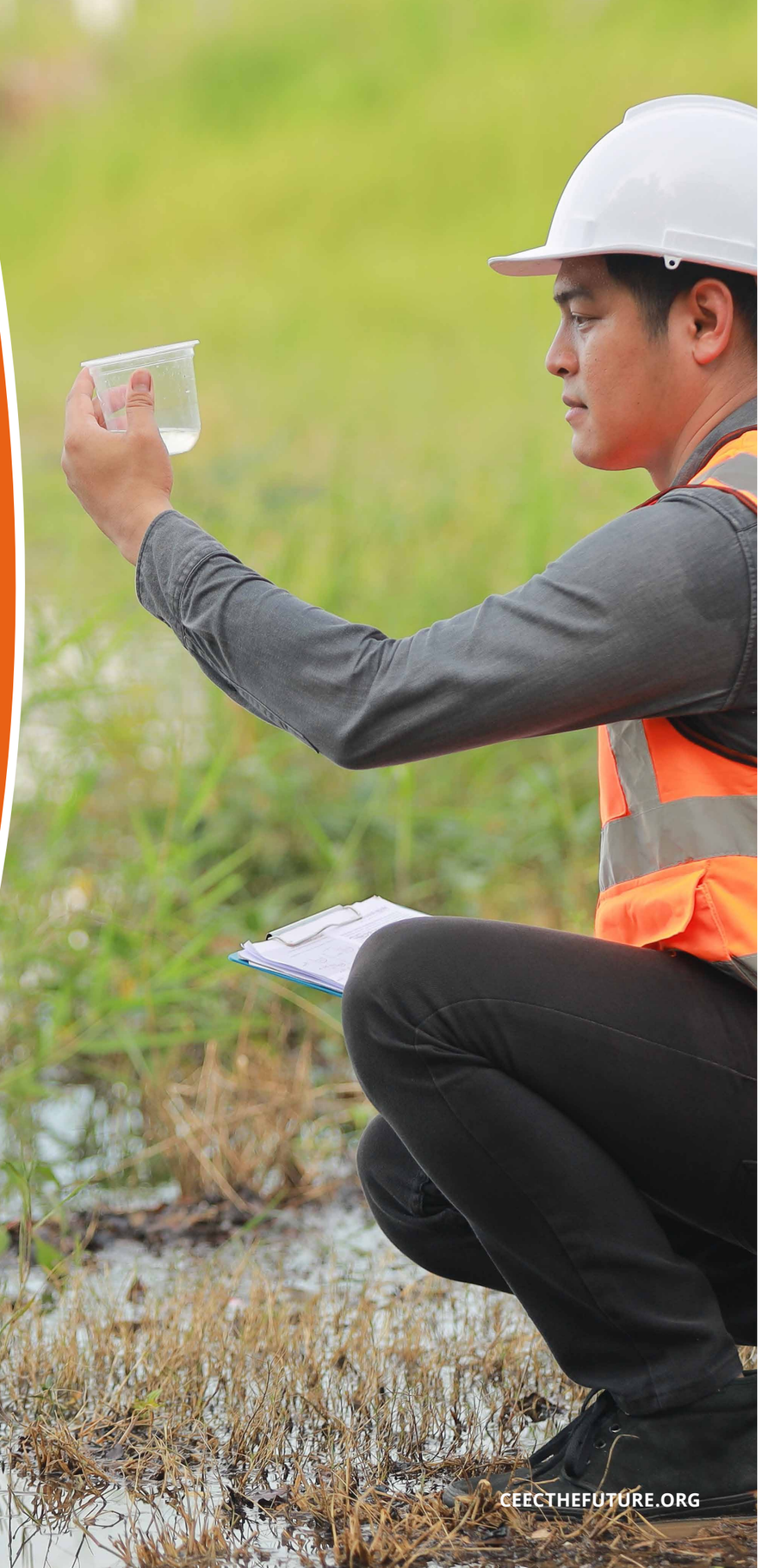
WEIR

Nova Terra

SMI Sustainable Minerals Institute

UBC

03 VISION AND GOALS



CASE FOR CHANGE

Water is vital for humanity and the environment and is necessary for resource extraction. Challenges such as increased social and environmental risks, water scarcity, conflicts over water rights, the increasing frequency of extreme weather events and groundwater contamination, all hinder minerals production and escalate costs.

The development of industry guidelines (e.g., ICMM, IRMA and UNEP), collectively highlight the need for context-specific water solutions. Guidelines such as these represent a starting point and provide valuable insight, yet gaps remain in: data collected and reporting and communication with stakeholders; application of appropriate water management in operations and consistent methodologies for evaluating emerging technologies for improved water outcomes.

Water issues are inter-disciplinary, and successful outcomes rely on collaboration.

The CEEC Energy Curves initiative from a decade ago was successful and the resulting tools have been widely adopted by industry. Attempts by CEEC to replicate “curves” for water management revealed the significant added complexities of water as a resource, prompting the birth of the Global Water Initiative (GWI). Water quality, quantity and boundaries all play a critical role and the context at the individual sites and operations is highly relevant for the success of the GWI.

Dedicated to sustainability, CEEC-aligned professionals have taken the opportunity to convene sponsors, miners, METS (mining equipment, technology and services) and research professionals on the vital topic of water. CEEC’s strategy is based on educating resources professionals to strengthen water management knowledge across disciplines.

The Roadmap provides guidance and a Charter of sorts to ultimately build shared understanding and identify gaps and needs in water management and risk mitigation.

The GWI has been evolving through workshops, research and other collaborative interactions and will continue on this path with regular reviews to ensure existing work is not being duplicated. By equipping professionals in a variety of disciplines with enhanced water management knowledge CEEC aims to raise industry standards and meet the challenges posed by water and tailings.

Refer to appendix 1 for list of campaign participants to date.

VISION

What will the GWI legacy mean?

Water management, treatment, procurement and handling will become pivotal considerations for resource operations and included in life of mine planning instead of as an after-thought or as a result of a problem.

The vision for the GWI includes:

- A future without water-related disasters.
- Alignment of investors, regulators, industry professionals and communities.
- An environment where responsible water use is the norm.
- Professionals being more knowledgeable about water issues and hence more effective at identifying and solving water-related challenges and communicating with stakeholders on water topics.
- Achieving a greater and more widespread understanding of water management with open collaboration and knowledge-sharing.
- All stakeholders recognising and prioritising sustainable water practices, minimising negative impacts and improving overall ESG performance.
- Collaboration expanding beyond operational boundaries to foster innovation and integration, beginning with mine planning.
- Consideration of the entire mine life cycle including closure and the repurposing of mining features and wastes.

04 COLLABORATION CAMPAIGN PROCESS

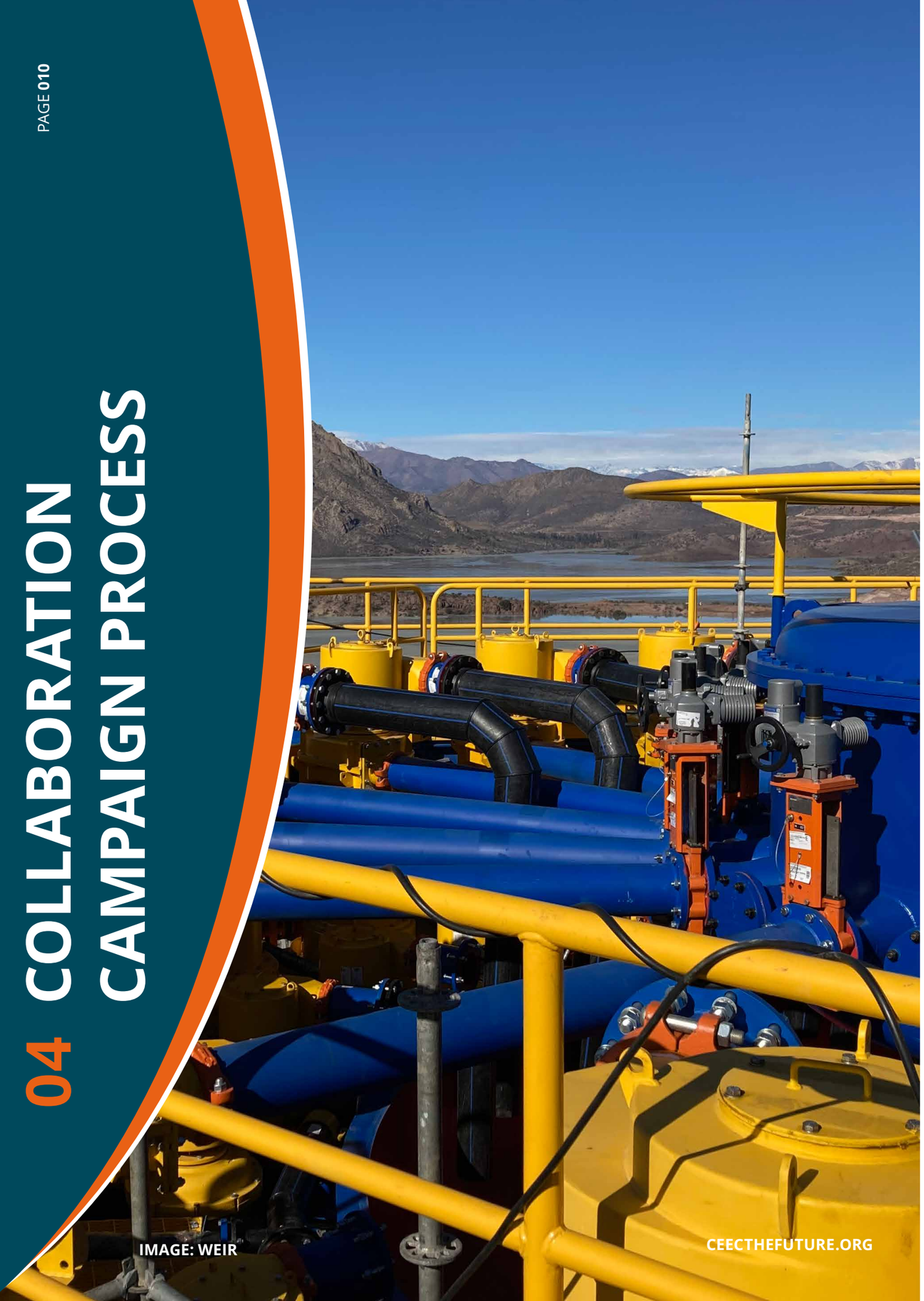


IMAGE: WEIR

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A collaboration campaign is a strategic series of activities aimed at guiding, engaging, and motivating individuals with a shared purpose to develop and achieve outcomes. It emphasizes transparency, alignment, and the pursuit of common goals.

The Global Water Initiative (GWI) campaign was structured around four distinct sessions as described below:

SESSION 1
LAUNCH AND CURRENT STATE

The campaign was officially launched live at the MetPlant conference in Adelaide on November 6, 2023. This included a facilitated interactive panel session with industry leaders, including Q&A with conference delegates. The launch was specifically focused on building industry engagement and determining the perception and thoughts of conference participants on the current state in relation to water management.

Refer to appendix 2 for the identified current state outcomes.

SESSION 2
FUTURE STATE DEVELOPMENT

This session focused on imagining the future state for water. A group of 25 enthusiastic professionals with a passion for water (drawn from CEEC advocates, resource company representatives, sponsors, Mining Equipment, Technology & Services (METS) companies, and the research sector) participated in a collaborative virtual workshop focused on divergent thinking and establishing a shared perspective on water-related issues.

This workshop was conducted as a “sprint,” with a focus on generating many and varied ideas within a limited timeframe, with subsequent sessions aimed at refinement and convergence.

After the workshop the CEEC team reviewed each of the 345 ideas generated and grouped them into five possible categories of initiatives across 32 high-level themes.

Participants were also invited to access the Miro board to review the possible initiatives, themes and ideas and provide further feedback.

Refer to appendix 2 for future state outcomes.

Laurie Reemeyer, Angelica Amanda Andrade, Janine Herzig, and Philip Bangerter at the 2023 MetPlant Conference.

SESSION 3
FUTURE STATE ALIGNMENT

These sessions focused on building alignment around the future state. In Sessions 3A and 3B of the Global Water Initiative, alignment between CEEC, producers, METS, and research providers continued in collaborative virtual workshops. The objective of this workshop was to converge and refine the five core initiatives and 32 high-level themes that were generated in Session 2.

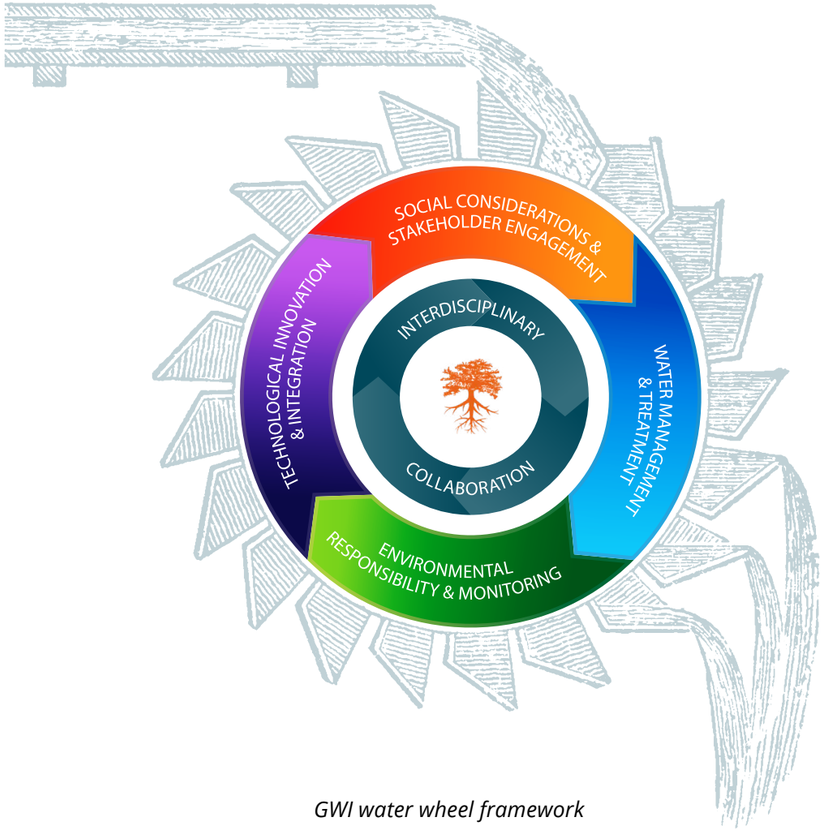
The workshop was split into two sessions tailored to different time zones and allowed for in-depth discussions by 25 people over the five core initiatives. The outcomes included the identification of priorities for the future, the initial necessary tasks to be undertaken, and possible early deliverables.

Refer to appendix 3 for future state alignment outcomes.

SESSION 4
ROADMAP ALIGNMENT

In Session 4 of the Global Water Initiative, CEEC, sponsors, METS, and research providers, explored the GWI Roadmap in some detail, confirming key initiatives, high-level timeline, barriers to action, how various parties will work together and a high level communications plan. This workshop was conducted with a small working group and focussed on validation of the key principles, identification of any gaps and resulted in some minor additions and clarifications to the draft GWI Roadmap.

05 ROAD MAP



GWI water wheel framework

WATER WHEEL FRAMEWORK

When identifying possible initiatives and themes, the CEEC team envisioned a way to illustrate how these focus areas interact.

The concept of a water wheel emerged with the hub of the wheel representing the central concept of interdisciplinary collaboration. This collaboration effectively provides the power and momentum required to drive and sustain the efforts that will be distributed across the remaining four groupings of initiatives.

There was agreement amongst workshop participants to adopt this model to effectively communicate this important body of work. For example, stakeholders expressed a preference for a circular chart to convey the concept effectively, along with fostering the historical interest in water and the applications of water wheels. Additionally, it helps visualize the impact of water on river flows for downstream and upstream communities, while also serving as a memorable and identifiable GWI brand for CEEC.

FOCUS AREAS OF THE GLOBAL WATER INITIATIVE

The campaign identified the five following focus areas as being key factors to address in order to progress the GWI. Addressing all of these will be necessary to go from the current state to the future state for water in the resources sector and its host communities.

As there is significant overlap across and between these five areas, it is likely that individual projects would seek to address more than one initiative. Using this principle, the key areas will be used to “screen” sub projects to ensure they are addressing the fundamental objectives.

Furthermore, interdisciplinary collaboration is considered fundamental and is a cross-cutting theme that will be integrated in all projects as is consideration of the entire mine life cycle.

INTERDISCIPLINARY COLLABORATION

Initiatives, activities and ideas to foster interdisciplinary solutions that promote effective operational collaboration. Consideration of perspectives, decision-making and the merging of methodologies that include the physical sciences and engineering alongside the social sciences and humanities.

WATER MANAGEMENT AND TREATMENT

Evaluation of alternative water sources, water storage and water treatment methods, either for water fed to processes and unit operations, or for water discharged to the environment. This includes safe and environmentally acceptable management of water flows and inventories to, from and within mining leases.

TECHNOLOGICAL INNOVATION AND INTEGRATION

Ideas and methodologies to evaluate mining and processing methods, flowsheets, equipment selections, reagent schemes, mine planning and potential future expansions and how these ideas influence and interact with water management. This includes assessing technology readiness and deployment, the appropriateness of technologies in a given context and evaluation of technologies through techno-economic modelling.

CULTURAL AND SOCIAL CONSIDERATIONS

Incorporating stakeholder concerns into the decision making on water management. This includes communication of physical system attributes (such as infrastructure, equipment, hydrology, geochemistry and treatment options), expected environmental performance, shared goals, emerging threats and opportunities, all with the objective of building trust through transparency and participative decision making.

ENVIRONMENT RESPONSIBILITY AND MONITORING

Ensuring environmental compliance and minimization of any impacts with respect to water withdrawals and water discharges across the whole mining life cycle, demonstrated by appropriate measurement, accountabilities and disclosures. This includes issues of groundwater contamination, quality, drawdown and resulting impacts of groundwater dependent ecosystems. It also includes communication with regulators to ensure that regulations evolve in constructive ways to achieve desired environmental and social outcomes.

NEAR TERM ACTIONS

The following near-term actions have been defined for the team to complete to launch the Global Water Initiative (GWI) research agenda:

- Completion of and acceptance of this Roadmap document by key stakeholders and contributors.
- Confirm the Intellectual Property (IP) approach with sponsors, researchers and other participants, noting that CEEC prefers an open-source approach to lift overall industry standards and performance.
- Create contracts with the research institutions to allow for the commencement of activities and actions.
- Identify an approach and an agreed methodology to bring on additional institutions and contributors as the program gains momentum.
- Prepare grant applications with an initial focus on Canadian Government grants, including content for submission and mechanisms to transfer matching fund contributions from other organisations.
- Appeal to additional entities and individuals to support and join the GWI. In particular, focus on securing support from mining companies and operations to provide site data, personnel and access to sites, as well as other in-kind and financial support.
- Establish a communications plan including targeted updates to researchers, sponsors and the broader professional community, as well as managing any confidentiality issues from sponsor sites or METS.
- Confirm what in the area of water in mining has already been done or exists (commercially or otherwise) and ensure the GWI activities are complementary or additional to these.
- Avoid duplication and reinvention: this will include compiling information from internal CEEC records on various reference documents and programs that exist globally and requesting that key researchers and other contributors also collate their references and existing bodies of work. This will also include identifying other networks of professionals and organisations working in this space and seeking mutually beneficial information exchange where appropriate.
- Identify where there might be opportunities for early wins or ways to accelerate progress. Early case studies will provide opportunities to attract more students into research in water management topics.
- Ensure early definition of the Archetypes of interest to ensure the identification of sites and operations that fit the characteristics of these Archetypes. This step is key to provide context and validity to data and collection of samples.
- Archetype definition will bring focus to specific solutions. They will encompass a combination of two dimensions:
    - Geographical e.g. climate (arid, semi-arid, seasonal, tropical monsoonal), topography, etc.
    - Mining and process flowsheet configuration e.g. open pit, underground, sulfide flotation, low and high grades, paste backfill, oxide heap leach, commodities, etc.

TIMELINE

The following timeline outlines key milestones, initial timespans, and tasks to be completed, providing a structured roadmap for the GWI's progression, and ensuring timely achievement of objectives.

There will be further details to be added to the timeline, including targeted promotional activities to increase awareness and engagement under the communication plan.

While the timeline currently visually implies that the GWI is an ongoing research program, it will be important in future revisions to clarify the end state and objectives which may include knowledge transfer to sponsors, sites, and other stakeholders.

MILESTONES	2024				2025				2026			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
EARLY ADMIN ACTIVITIES												
Completion of and acceptance of this Roadmap document												
Create contracts with research institutions												
Confirm Intellectual property approach												
Establish communications plan												
EARLY PROJECT ACTIVITY												
Prepare grant applications												
Review & compile historical work, guidelines, literature												
Define Archetypes												
Design Database(s)												
PORTFOLIO PLANNING												
Consider and plan program of work												
Set milestones & reporting schedule												
Plan application to sites & schedule site visits												
ENGAGEMENT												
Mining & METS partners												
New research partners												
BUILD RESEARCH PORTFOLIO												
RESEARCH ACTIVITIES												

HOW WE WILL WORK TOGETHER

Within the Global Water Initiative, the following table visually illustrates the collaborative relationships between sponsors, researchers, and CEEC. It showcases the shared goals and responsibilities among these entities, highlighting the integrated approach to addressing water-related challenges within the initiative. The entities will leverage their respective expertise, resources, and networks to achieve common objectives.

SPONSORS	CEEC	RESEARCHERS
• **Financial Support:** Sponsors provide funding and resources for the research project. • **Contribution:** They contribute to definition of the scope and objectives of the research, noting progress and alignment with their goals. • **Site Access:** Sponsors provide access to sites (or customers in the case of vendors) for data collection and validation and personnel resources.	• Provide a platform for community of practice members and like-minded individuals to come together in the spirit of collaboration. • Disseminate knowledge on practices and research that reduce the impacts of the extraction of resources. • Support activities and initiatives that facilitate reductions in carbon and other emissions, improve water efficiency and utilisation and reduce tailings and other waste production. • Play a leadership role in promoting positive changes in the resources sector internationally. • Establishing forums for open and candid exchange of views and experiences.	• **Research Execution:** Researchers conduct the actual research activities, including designing methodologies, collecting and analysing data, and interpreting results. • **Communication:** Researchers effectively communicate their findings/share knowledge through publications, presentations, and other means. • **Collaboration:** With other researchers, experts, and stakeholders as needed to enhance the quality and impact of their research. • **Continuous Learning:** Engage in continuous learning and professional development to stay updated on advancements in their field and improve their research skills.

The roadmap requires both the establishment of metrics and agreed principles for measuring progress effectively.

There will be regular reviews to assess progress and make any necessary adjustments. These metrics will serve as benchmarks for assessment of effectiveness and progress, guiding flexible iterations based on changing circumstances, thus ensuring adaptability and continuous improvement.

To support a flexible and inclusive approach, it will be important to have an agreed framework for onboarding additional stakeholders and sponsors.

While this document specifically addresses the three primary stakeholders, it is important to acknowledge the existence of other stakeholders who may not be actively participating in the GWI per se but who will be interested in the progress and findings and may react to its outcomes.

Data collection can pose challenges in research projects so it will be useful to incorporate appropriate sites who have made their information publicly available.

OBSTACLES TO ACTION

Addressing the complexities of stakeholder dynamics and implementation challenges is paramount in navigating the roadmap ahead. From differing priorities among sponsors, researchers, CEEC and the Community of Practice (CoP) to resource constraints and resistance to change.

The following describe some possible obstacles to be addressed. When handled effectively, these can be turned into opportunities:

- **Communication Challenges:** Effective communication among stakeholders with varying backgrounds and expertise levels is important to avoid misunderstandings or delays.
- **Alignment:** Future stakeholders may not fully align on the goals, strategies, priorities or methods outlined in the roadmap which may lead to some conflicts in decision-making and resource allocation.
- **Resource Constraints:** Limited funding, time, or human resources may hinder the execution of the roadmap, impacting the ability to carry out planned activities or initiatives.
- **Capacity Building:** By analogy to the "30% rule for language proficiency", it's essential for all professionals to achieve a foundational level of common language and understanding in water-related subjects. This is crucial for effective communication and the successful execution of the GWI and may require some additional training.
- **Intellectual Property:** Navigating IP challenges in collaborations involves reconciling ownership, rights, and confidentiality. Sponsors' claims may clash with researchers' interests, while community members seek equitable access.
- **Data Sharing:** Some operators may be reluctant to share data therefore agreement will be needed on common data platforms while protecting confidentiality and any other sensitivities.
- **Community and Government Perceptions:** Fostering meaningful and transparent communication is essential to work through any legacies of mistrust that may have resulted from prior activities.
- **Diversity and Breadth:** Having a diversity and breadth of collaborators, geographical contexts and content is paramount. We need to ensure that we grow the pool of collaborators to achieve a critical mass that can support the realisation of the GWI goals.

[1] David Jenkins, Applying the 30% rule with a campaign approach (2023)

COMMUNICATION PRINCIPLES

By agreeing to and following the communication principles outlined below, the Global Water Initiative contributors can achieve enhanced collaboration, engagement, and effectiveness in addressing water-related challenges. The intention is to communicate findings from the GWI in the public domain to maximise transparency and the potential positive impact.

01 **CLEAR AND TRANSPARENT** Communication by all stakeholders to ensure common understanding of objectives, progress, challenges and opportunities.

02 **CONSISTENT MESSAGING** to maintain alignment and avoid confusion among stakeholders.

03 **ENGAGEMENT AND PARTICIPATION** from all stakeholders with open dialogue, feedback, and contributions to ensure that diverse perspectives are considered and valued.

04 **VARIETY OF COMMUNICATION CHANNELS** to reach different stakeholders effectively.

05 **TIMELY UPDATES AND PROGRESS REPORTS** outlining GWI status - achievements, challenges, and upcoming milestones.

06 **INCLUSIVE LANGUAGE AND TONE** in all communications, avoid jargon and technical language where possible.

07 **ACKNOWLEDGMENT AND RECOGNITION** of the contributions and support of sponsors, researchers, and other contributors.

08 **ACCESSIBLE INFORMATION** via centralised repositories or platforms to facilitate information sharing and collaboration.

09 **ALIGNMENT WITH CEEC'S OBJECTIVES** to ensure messaging and GWI activities contribute to the overarching mission and values.

10 **ADAPTABILITY AND FLEXIBILITY** for the evolving needs, preferences, and dynamics of stakeholders. Sufficient and fair recognition of early adopter sponsors and contributors but maintaining an open-door policy and onboarding of additional contributors.

IMAGE: AGNICO EAGLE MINES

CONCLUSION

The CEEC International Global Water Initiative Roadmap provides a high-level Charter and framework for collaborative action to achieve sustainable water management in the mineral resources industry. By leveraging collective expertise and resources, the GWI initiative aims to address water-related challenges and assist our industry and communities to effectively ensure access to quality water at critical times for all stakeholders involved.

At the core of the Roadmap is the concept of the Water Wheel framework, symbolising the interconnectedness of the various focus areas and emphasising interdisciplinary collaboration as a central theme.

Aside from interdisciplinary collaboration, the identified key focus areas are water management and treatment, technological innovation, cultural and social considerations and environmental responsibility and monitoring.

The vision of the GWI is the integration of water management into every facet of resource operations, the prevention of water-related disasters, the fostering of alignment among stakeholders, and promotion of responsible water usage. This will be achieved through open collaboration, knowledge-sharing, and stakeholder engagement.

The roadmap delineates key focus areas, near-term actions, and a high-level timeline to measure the initiative's progression. Potential obstacles to success have been discussed, including communication challenges, handling of data and IP and and resource constraints, along with some potential strategies to overcome these challenges.

The roadmap is the launching point for CEEC's GWI and will be an ongoing reference as the projects, research, case studies and validation work evolves over the coming years.

07 GLOSSARY

ABBREVIATION	FULL NAME
CEEC	Coalition for Minerals Efficiency
ICMM	International Council on Mining and Metals
IRMA	The Initiative for Responsible Mining Assurance
UNEP	United Nations Environment Programme
GWI	Global Water Initiative
METS	Mining Equipment, Technology & Services
ESG	Environment, Social & Governance
CoP	Community of Practice

APPENDIX 1: WORKSHOP DELEGATES, SPEAKERS, AND ORGANISERS

DELEGATES – NAME AND AFFILIATIONS

NAME	SURNAME	COMPANY	TITLE
Marc	Allen	Unravel Carbon / CEEC International	Co- Founder / Chair
Angelica Amanda	Andrade	The University of Queensland	Higher Degree by Research Scholar
Grant	Ballantyne	Ausenco / CEEC International	Technical Director / Director
Philip	Bangerter	CEEC International	Independent Consultant in Sustainability and the Circular Economy / Director
Alex	Blood	Institute for Sustainability, Energy and Resources, University of Adelaide / CEEC International	Advisory Board Member / Director
Guy	Boggs	CRCTime	CEO
Claire	Cote	SMI CWiMI	Director - Centre for Water in the Minerals Industry
Kiran	Dhatt	Ceco AI	Co-Founder & CEO
Roger	Doyle	Audax Enterprises	Slurry System Specialist
Mario	Drapeau	Agnico Eagle	Senior Metallurgist
Thomas	Genty	Agnico Eagle	Engineer
Damian	Giurco	UTS	Associate Director Research
Kari	Heiskanen	Metso	Technical Director
Janine	Herzig	CEEC International	Executive President
Nadja	Kunz	University of British Columbia	Canada Research Chair in Mine Water Management and Stewardship
John	Landmark	Agnico Eagle	Vice President Corporate Affairs (Australia)
Evert	Lessing	Metso	Vice President Engineering, Pumps Business Line
Nobuzwe	Makhotla	Mining at Innospec Inc.	Global Business Development Manager
Stephen	Marshall	Weir	Director New Technology
Bernardo	Mendonca Severiano	UTS Institute for Sustainable Futures	Student

DELEGATES – NAME AND AFFILIATIONS (CONT.)

NAME	SURNAME	COMPANY	TITLE
Stephen	Northey	UTS Institute for Sustainable Futures	Research Principal
Ingrid	Oyarzun	Eramet	President Eramet Ideas and VP Innovation
Tom	Payten	Novaterra	Accelerating research and development for the future
Raymond	Philippe	Skarn	Water, Mining, Sustainability, Risk & Finance
Peter	Radziszewski	Rampart Detection Systems Ltd	VP Research and Innovation
Laurie	Reemeyer	Resourceful Paths	Principal Consultant
Azada	Rudnicki	Alligator Energy	ISR mining Process Engineer, Project Management
Jorge	Saenz-Diez	Glencore	Product Manager, Designer and Engineer
Erik	Vlot	Weir	Global Manager Tailings & Backfill
Eric	Wasmund	Eriez / CEEC International	Vice President Global Flotation Business / Director
Niken	Wijaya	Weir	Sustainable Solutions Lead

WORKSHOP ORGANISERS

CEEC International

- Philip Bangerter
- Laurie Reemeyer
- Janine Herzig
- Jillian Huth

Tri Helix

- David Jenkins
- Matthew Jenkins

APPENDIX 2: CURRENT STATE OUTCOMES

METPLANT WATER PANEL

During the MetPlant conference on November 6, 2023, a panel discussion was held on the topic of Water. Within this panel discussion, the audience was asked questions using polling software Mentimeter to capture current state data for our GWI roadmap campaign and to provide input into the future state workshops.

Participants were asked, ‘What challenges does water bring?’ in terms of their individual roles and for the industry as a whole. They were also asked, ‘What lines of research should we pursue?’

On average, there were 110 audience responses for each question, representing a wide and diverse group of people. The following categories and charts represent the results of this activity aimed at elucidating the current state.

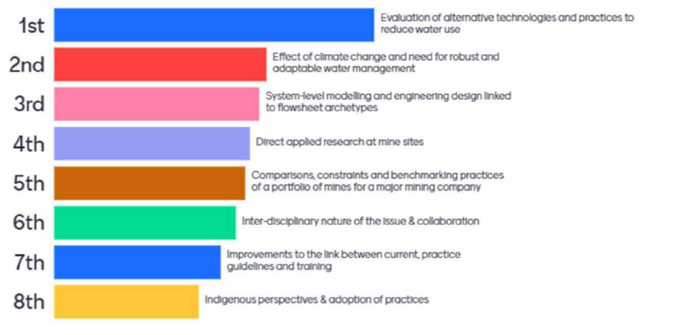
Categories of challenges water bring to support audience completing questions:

- Constraints on operations: e.g., example access to a water source (scarcity) or treatment for environmental release (surplus)
- Social implications and licence to operate e.g., protests vs community support.
- Efficiencies in use: e.g., technological advancement, systemic leakages, increased recycling, lower us intensities.
- Getting better training or knowledge: e.g., access to adequate data, benchmarks, training, and best-practice knowledge.
- Escalating costs: e.g., is the orebody good enough, desalination, treatment for release.

IN YOUR ROLE: WHAT CHALLENGES DOES WATER BRING?

FOR THE INDUSTRY AS A WHOLE: WHAT CHALLENGES DOES WATER BRING?

FOR THE INDUSTRY AS A WHOLE: WHAT LINES OF RESEARCH SHOULD WE BE GOING ON?



CURRENT STATE PRE-WORKSHOP SURVEY

Leading into the first Future State workshop, a current state online survey was conducted with campaign participants to gather further information about the current state. This survey focused on sourcing qualitative data. The following information represents a summarised version of the results of this activity aimed at visualising the current state.

Q1. IN THE CONTEXT OF MINING WHAT CHALLENGES DOES WATER BRING?

- Restricted access to water for mining operations, impacting community benefit.
- Operational hurdles like freshwater depletion and securing social license.
- Balancing water consumption with other uses, efficiency, and environmental needs.
- Difficulty in assigning water-related responsibilities among stakeholders.
- Acid-rock drainage and metal leaching as key management challenges.
- Managing water from draining mines, consumption, and local versus industrial needs.
- Risks include operational, environmental, and social aspects of water management.
- Climate variations affecting water balance and planning for droughts and floods.
- Legacy issues such as contamination and tailings storage breaches.
- Improvement areas: water availability planning and integration into mine planning.

Q2. IN THE CONTEXT OF MINING WHAT CURRENT WATER INITIATIVES ARE YOU WORKING ON?

- Implementing technologies for treating acid mine drainage and recovering critical minerals.
- Forming partnerships with governments for water treatment.
- Focusing on water stewardship practices.
- Adopting improved tailings dewatering methods.
- Using electrochemical tailings treatment and sustainability frameworks.
- Managing water resources in skarn environments.
- Strategies for handling waste rock and metal leaching.
- Implementing dry grinding processes to reduce water consumption.
- Developing flowsheet solutions for water reuse.
- Conducting benchmarking studies on water management.
- Increasing focus on erosion and sediment control, especially in climate change adaptation.

APPENDIX 3: FUTURE STATE OUTCOMES

DIVERGENT THINKING PROCESS

The objective of divergent thinking was to cultivate a shared understanding of water issues. Success was gauged by the quantity of generated ideas; therefore, participants were encouraged not to hold back.

To encourage a wealth of ideas, brainstorming was conducted anonymously to ensure a safe environment for contribution. Participants were regarded as professionals and individuals, separate from their affiliations with any specific company or institution. The brainstorming process was driven by a group of passionate individuals united in addressing global water challenges.

Outlined below is what was within the scope of the brainstorming activity. The group collectively decided that water pricing and identifying best practices or planning research agendas were not included in this workshop.

Participants imagined a future 10 years from now across the four areas shown below. They generated many ideas describing what it would look like, feel like and sound like.	Ideas generated
Industry directions: We have new industry directions for technology in both water efficiency and water treatment.	96
Nexus: Our water professionals are fully integrated across the intersection of Metallurgy, energy, Tailings and Water Management.	78
Archetypes: We have common understanding for categorising processing flow sheets linked with their water context.	88
Communities: Our communities are fully engaged with their needs understood with respect to water.	83

Table 1: Future state ideas per brainstorming structure.

CONVERGENT THINKING PROCESS

The objective of convergent thinking was to focus on key initiatives and build a common view on the Global Water Initiative. Success was measured by building alignment around these initiatives. However, this was only the beginning of the alignment process, which continued over the following three months.

Participants reviewed and analysed the potential initiatives and high-level themes, discussed their concerns, positive aspects, and areas that were missing. They then synthesized their thoughts into what they believed were the important points moving forward:

What do we need to prioritize?

What actions do we need to take to get started?

And what deliverables should we aim for?

The CEEC team reviewed all the ideas after the workshop and grouped them into possible initiatives and high-level themes. The list below shows the outcomes from this grouping.

FUTURE STATE POSSIBLE INITIATIVES AND HIGH-LEVEL THEMES ARE AS FOLLOWS:

1. **Interdisciplinary collaboration:**
   - Standardization and Evaluation
   - Collab Across Disciplines
   - Professional Collaboration and Understanding
   - Education and Knowledge
   - Sharing Standardization and Measurement
   - Decision Support Systems

2. **Technological Innovation and Integration:**
   - Advanced Technologies and Techniques
   - Process and Flowsheet Innovation and Integration (including Tailings)
   - Flowsheet Design
   - Innovation Technology
   - Technological Innovation and Integration
   - Process technology

3. **Cultural and Social Considerations:**
   - Collaboration with Stakeholders
   - Community Relations and Trust Building
   - Global Strategy & Reporting
   - Indigenous Knowledge Integration
   - Diversity and Recognition
   - Community Values & Needs
   - Cultural Considerations
   - Public Opinion and Communication

4. **Environmental Responsibility and Impact:**
   - Environmental Impact and Monitoring
   - Responsible Industry Practices
   - Tailings Management and Innovation
   - Sustainable Practices
   - Regulatory Compliance and Responsibility

5. **Water Management and Treatment:**
   - Water Treatment Technologies
   - Advanced Water Treatment Techniques
   - Water Management Strategies
   - Regional and Inter-site Water Management
   - Water Conservation and Management
   - Database and Archetypes

FUTURE STATE ALIGNMENT

The future state alignment session focused on building alignment around the future state between CEEC, producers, METS, and research providers. The outcomes identified priorities for the future, initial necessary tasks, and possible early deliverables as listed below.

Going Forward
(Priorities for the future)

- Commonality in Water Accounting Framework and language.
- Training may be necessary to bring understanding up to a baseline.
- More Mining Company involvement (as Sponsors and/or participants).
- Water Resource Planning (Government role).
- Important, but Incremental Progress with Risk-based Approaches.
- Data Management protocols to be established.
- Ground water and regional infrastructure coordination.

Getting Started
(Initial and necessary tasks)

- Confirm what is existing already in all Initiatives; consolidation of work already done. Don't wish to reinvent the Water Wheel.
- Complement any existing work – avoid duplication.
- Access to a range of sites for data and case studies.
- Frances Creek NT, Australia early example site for Case Study.
- Consolidation of ideas to something manageable.

Deliverables
(Possible early deliverables)

- Base line of technologies, databases, initiatives etc.
- Secure additional mine sites for research case studies.
- Fleshing out of the Archetypes – may need to be opportunistic as to available sites, seasonal and climate factors.
- Complete the Roadmap with focused ideas for the short/medium term.

APPENDIX 4: COMMUNICATION PRINCIPLES

01

CLARITY AND TRANSPARENCY

Communication within the GWI should be clear, transparent, and easily understandable by all stakeholders, including sponsors, researchers, and members of the Community of Practice (CoP). This ensures that everyone involved comprehends the objectives, progress, and challenges.

02

CONSISTENT MESSAGING

Consistency in messaging is crucial to maintain alignment and avoid confusion among stakeholders. All communications, whether internal or external, should convey a unified message regarding the vision, goals, and actions of the GWI.

03

ENGAGEMENT AND PARTICIPATION

Foster active engagement and participation from all stakeholders throughout the initiative. Encourage open dialogue, feedback, and contributions to ensure that diverse perspectives are considered and valued in decision-making processes.

04

TAILORED COMMUNICATION CHANNELS

Utilise a variety of communication channels and formats to reach different stakeholders effectively. This may include email updates, virtual meetings, webinars, newsletters, and social media platforms tailored to the preferences and accessibility of the target audience.

05

TIMELY UPDATES AND PROGRESS REPORTS

Provide regular updates and progress reports on the status of the GWI. Timely communication ensures that stakeholders are informed about achievements, challenges, and upcoming milestones, fostering a sense of accountability and transparency.

06

INCLUSIVE LANGUAGE AND TONE

Use inclusive language and a respectful tone in all communications to promote a collaborative and supportive environment. Avoid jargon and technical language that may exclude or alienate certain stakeholders.

07

ACKNOWLEDGMENT AND RECOGNITION

Recognise the contributions and support of sponsors, researchers, and members of the CoP in advancing the goals of the GWI. Express gratitude and emphasise the collective effort required to address water-related challenges effectively.

08

ACCESSIBILITY AND AVAILABILITY OF INFORMATION

Ensure that relevant information, documents, and resources related to the GWI are easily accessible to all stakeholders. Establish centralised repositories or platforms where stakeholders can access information, share resources, and collaborate effectively.

09

ALIGNMENT WITH ORGANISATIONAL OBJECTIVES

Align communication efforts with the broader organisational objectives and strategic priorities of CEEC International. Ensure that messaging and activities within the Global Water Initiative complement and contribute to the overarching mission and values of the organisation.

10

ADAPTABILITY AND FLEXIBILITY

Remain flexible and adaptable in communication strategies and approaches, to account for evolving needs, preferences, and dynamics of stakeholders. Be open to feedback and adjustments to ensure that communication efforts remain relevant and responsive to changing circumstances.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