

User Needs for AI-supported Water Management in the Limpopo River Basin

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Back cover photo: Group photo from the April 16, 2026 workshop in Maputo, Mozambique (*photo*: Gold Services Moz)

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Acronyms and Abbreviations

Acronym	Description
AI	Artificial Intelligence
AWARD	Association for Water and Rural Development
CGIAR	Consultative Group on International Agricultural Research
DT	Digital Twin
GIS	Geographic Information System
GloFAS	Global Flood Awareness System
HEC-HMS	Hydrologic Engineering Center – Hydrologic Modeling System
IWMI	International Water Management Institute
LIMCOM	Limpopo Watercourse Commission
LRB	Limpopo River Basin
LULCC	Land use and land cover change
SSP	Shared Socioeconomic Pathway
SWAT	Soil and Water Assessment Tool
UAE	United Arab Emirates
UN Water 2026	2026 United Nations Water Conference
WaterCopilot	Limpopo WaterCopilot conversational decision-support tool

Executive Summary

This report presents a synthesis of user needs identified through a workshop hosted by the Limpopo Watercourse Commission (LIMCOM) in Maputo, Mozambique, on 16 April 2026. The workshop formed part of a broader two-day capacity-building, testing, and scenario co-development event focused on the LIMCOM Digital Twin Platform and the AI Water Project. Day 2 focused specifically on introducing the AI Water Project to LIMCOM Member State representatives, co-developing an initial Limpopo scenario library, and eliciting user needs relevant to future dashboard design, AI-enabled modelling workflows, and conversational decision-support interfaces. The workshop was positioned within the CGIAR AI Hub for Water and the planned UN Water 2026 demonstration, for which the Limpopo River Basin has been selected as a primary proof-of-concept basin.

Rather than providing a comprehensive account of the workshop process, which is covered in a separate workshop report (Clifford-Holmes et al., 2026), this report focuses on the user needs emerging from the Day 2 process and interprets their implications for the AI Water Project, the Limpopo Digital Twin, and associated AI-enabled decision-support tools. It should be read as a qualitative synthesis of targeted expert and user input, rather than as a statistically representative survey of all potential users in the Limpopo River Basin. The value of the findings lies in the direct relevance of the participants' institutional mandates, their familiarity with basin-level water management challenges, and the specificity of the decision questions, data constraints, and interface needs they identified.

The findings indicate that participants require decision-support tools grounded in real management questions, especially around water allocation, environmental flows, flood and drought management, water quality deterioration, land degradation, sedimentation, infrastructure planning, and transboundary coordination. These decisions are being made under real-world conditions of uncertainty, uneven monitoring coverage, fragmented information systems, and varying institutional capacity. These conditions are not peripheral to the user-needs picture; they are central to understanding what future AI-enabled water-management tools will need to do.

A central finding is that users need modelling approaches and decision-support systems that are viable under variable data conditions and uneven monitoring coverage. Participants repeatedly raised issues such as missing gauges, data gaps, limited telemetry, calibration risks, fragmented datasets, delayed access to information, and limited technical or software capacity. In this context, the relevance of the AI Water Project lies not simply in producing more advanced hydrological simulations, but in its potential to make scenario-based modelling faster, more adaptive, and more usable for basin-scale decision support. This includes reducing setup and calibration burdens, expanding the range of feasible scenarios, and supporting knowledge transfer across gauged and less well-gauged parts of the basin.

The workshop findings also indicate strong demand for user interfaces that combine current-status visualization, scenario comparison, natural-language querying, concise reporting outputs, and clear communication of uncertainty. Participants expressed interest in tools that can serve both technical and leadership audiences, including maps, charts, dashboards, report exports, PowerPoint-ready visuals, plain-language summaries, and access to underlying data where needed. This reinforces the importance of designing for multiple workflows: technical users need access to assumptions, scenarios, diagnostics, and exportable outputs, while policy and leadership audiences need concise, credible, and communicable products that support decision-making.

Taken together, the findings suggest that the next phase of the AI Water Project and related Limpopo Digital Twin development should prioritize decision-relevant scenario design, integrated and trusted data pathways, AI-supported modelling workflows that are robust under variable data conditions, accessible and explainable interfaces, and outputs that travel effectively between technical analysis and policy-facing communication. The strongest value proposition is therefore not only to build a more powerful model, but to create a more usable pathway from data and models to enhanced decision-making in the Limpopo River Basin.

1. Introduction

1.1. Background and Purpose

The Limpopo River Basin has been selected as a primary Southern African proof-of-concept basin for an AI-augmented hydrological foundation model being developed under the CGIAR AI Hub for Water, in partnership with AI71 and other collaborators. The initiative is intended to support more efficient setup, calibration, and scenario analysis in basin-scale hydrological modelling, with a live demonstration targeted for the 2026 United Nations Water Conference in the United Arab Emirates (UAE). The workshop hosted by the Limpopo Watercourse Commission (LIMCOM), on the 16th April 2026 in Maputo, Mozambique, acted as the formal introduction of the AI Water Project to LIMCOM and Member State representatives, and as the start of a structured process to co-develop a Limpopo scenario library for future modelling and demonstration purposes.

The purpose of this report is to synthesize the decision- and policy-maker user needs that emerged from that Day 2 process. It therefore responds to a different requirement from a conventional workshop report. Rather than describing the event in full, it focuses on what potential users said they need from a future AI-enabled hydrological decision-support environment, and what those needs imply for the design and positioning of the AI Water Project and its relationship to the broader Limpopo Digital Twin ecosystem.

This work also builds on an earlier foundation of LIMCOM-linked stakeholder engagement around the Digital Twin, WaterCopilot, and citizen-science integration. While those engagements had different immediate focuses, they provide useful context for interpreting the April 2026 findings and suggest that some of the themes now emerging have a longer trajectory in basin-wide digital water governance work.

1.2. Relationship between the Limpopo Digital Twin and the AI Water Project

The AI Water Project and the Limpopo Digital Twin are complementary rather than competing systems. The existing Digital Twin provides near-real-time monitoring, spatial visualization, and operational intelligence across the basin (Garcia Andarcia et al., 2025), while the AI Water Project is intending to extend this ecosystem into more advanced, calibrated, scenario-based hydrological modelling. The goal is for the operational intelligence from the Digital Twin to feed into and validate the AI-powered hydrological model developed by the AI Water Project, while scenarios tested and run through the latter can enrich the planning context available through the Digital Twin dashboard (Figure 1).

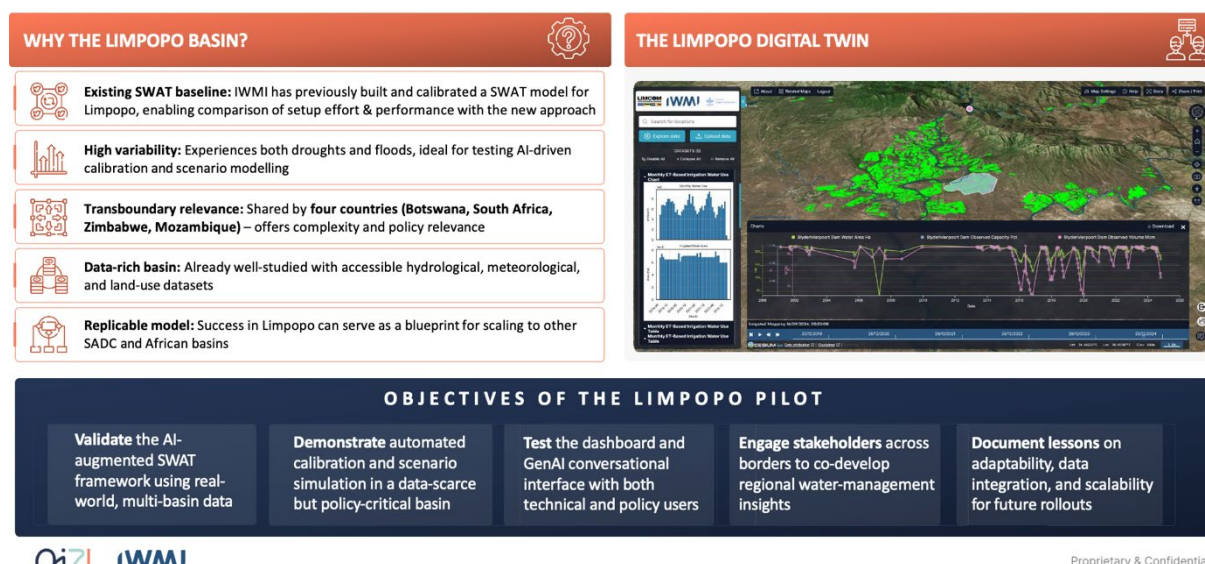


Figure 1. Motivation for the Limpopo River Basin to be the pilot for the AI Water Project.

Source: ai71 2025

This linkage was also emphasized in the workshop, with the Limpopo River Basin (LRB) described as the first real-world test of the AI-driven hydrological model, framing the pilot as an opportunity to test both the modelling approach and the associated dashboard and generative AI conversational interface with technical and policy users. The strategic relevance of the LRB is that it is, simultaneously:

- ⇒ data-rich enough to be technically feasible,
- ⇒ transboundary enough to be policy-relevant,
- ⇒ variable enough to test climate and flood/drought dynamics, and
- ⇒ sufficiently connected to an existing Digital Twin ecosystem to enable practical experimentation (Figure 1).

The relationship between the two systems is therefore best understood as one of **functional layering**: the **Digital Twin** serves as the operational intelligence and monitoring backbone, while the **AI Water Project** is intended to add a more explicitly scenario-based planning and modelling layer. Seen in this way, user needs expressed during the workshop are relevant not only to the AI Water Project in isolation, but also to the wider question of how a basin-scale digital water ecosystem should evolve in a way that is coherent, usable, and policy-relevant, while maintaining scientific rigor.

1.3. Why AI Matters in this Context

The workshop began with framing AI as a possible response to persistent hydrological modelling bottlenecks. These include the time and effort required for data collection and harmonization, basin delineation and model setup, calibration and validation, and scenario development and application – with the current duration of around a year shortened by an AI-supported workflow from years to months (Figure 2). Other technical innovations were introduced in the opening sessions, including the way in which an AI knowledge transfer from gauged to ungauged sub-catchments works, enabling predictions where no observational data exists and where conventional calibration is difficult or impossible because of weak monitoring infrastructure.

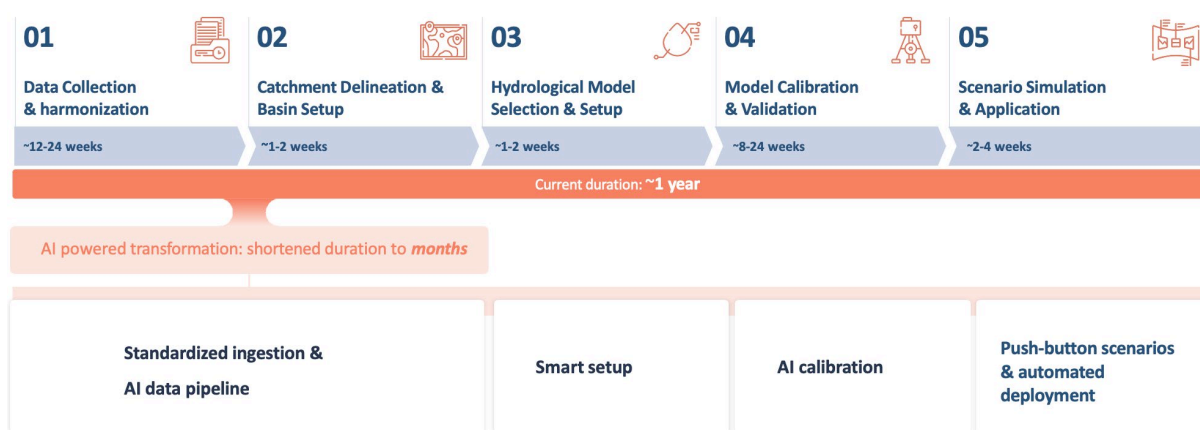


Figure 2. AI-supported hydrological modelling transformation pathway (from conventional workflow to accelerated workflow).

Source: adapted from ai71 and IWMI 2026

This framing of AI is especially relevant in light of the workshop findings themselves. Participants repeatedly raised issues such as data gaps, missing gauges, insufficient telemetry, calibration risks, weak system capacity, and the need for stronger modelling tools and support. Multiple participants also emphasized the difficulty of making decisions under incomplete or delayed information. The relevance of the AI Water Project, in this context, lies in attempting to make hydrological modelling more feasible, faster, and more adaptable under exactly the kinds of real-world conditions that participants described.

Earlier stakeholder engagement with LIMCOM around WaterCopilot and the Digital Twin – led by IWMI – also surfaced a closely related pattern: enthusiasm about faster, more direct, area-specific access to information, paired with concerns about trust, cost, responsibility, and the continuing importance of human verification and governance (Langa et al., 2025). These earlier reflections reinforce the point that AI in the context of the LRB is best understood as part of a practical decision-support problem, rather than as a purely technical innovation agenda.

1.4. Report Structure

This report is structured as follows:

[Section 2: Method and Evidence Base](#) – describes the workshop process and the evidence used for the synthesis, including participant inputs, scenario co-design forms, user-journey materials, presentations, and supporting project documentation.

[Section 3: User Context](#) – summarizes who the intended users are, what kinds of decisions they make or support, and the institutional and technical conditions in which those decisions are made.

[Section 4: Core User Needs Identified Through the Workshop](#) – presents the main substantive user needs emerging from the workshop, including water allocation, environmental flows, climate variability, floods and droughts, water quality, land degradation, sedimentation, data integration, and transboundary coordination.

[Section 5: User Needs for Interface, Workflow, and Communication Design](#) – focuses on how users need to interact with the system, including maps, charts, dashboards, scenario comparison, natural-language queries, automated summaries, exports, and uncertainty information.

[Section 6: Implications for HydraFound and the Limpopo Digital Twin Ecosystem](#) – interprets what the identified user needs mean for future platform design, modelling workflows, data integration, decision-support functionality, and the relationship between HydraFound, the Digital Twin, and WaterCopilot.

[Section 7: Priority User-Needs Synthesis](#) – provides a concise prioritized synthesis of the most important user needs to guide the next phase of design, development, testing, and stakeholder engagement.

[Section 8: Conclusion](#) – summarizes the strategic significance of the findings for the AI Water Project, the Limpopo Basin pilot, and the planned UN Water 2026 demonstration.



Participants and facilitators interacting over the course of the workshop on April 16, 2026 in Maputo, Mozambique
photo: Gold Services Moz 2026

2. Method and Evidence Base

This report draws on broader project documentation about the UAE-funded AI Water Project, the slide deck created for the workshop itself, and the consolidated findings from the Microsoft Form-based survey that was run with workshop participants over the course of the 16th April 2026. Broader Digital Twin reports and papers are also drawn from and, where appropriate, cited.

Analytically, the material was read through four linked questions:

1. What kinds of decisions are the intended users trying to make?
2. What data and modelling constraints shape those decisions?
3. What kinds of scenario and analytical capability do users need from a future platform?
4. What forms of interface, visualization, explanation, and reporting are likely to make such a platform useful to both technical and policy audiences?

The report therefore treats the workshop not merely as a consultation on software features, but as a structured entry point into broader questions of decision support, data scarcity, modelling feasibility, institutional usability, and the practical meaning of AI-enabled hydrological tools in a transboundary basin setting.

This report should be read as a qualitative synthesis of targeted expert and user input, rather than as a statistically representative survey of all potential users in the Limpopo River Basin. The workshop involved a small but strategically relevant group of nine participants drawn from LIMCOM Member State institutions, including technical specialists, managers, and coordination roles (see Table 1 for details). The value of the material therefore lies not in sample size, but in the direct relevance of the participants' mandates, their familiarity with basin-level water management challenges, and the specificity of the decision questions, data constraints, and interface needs they identified. The findings should therefore be interpreted as an initial, practice-grounded user-needs basis for design and prioritization, to be refined through subsequent engagement, testing, and validation with a wider set of users.

3. Intended Users and Their Decision-Making Needs

Nine professionals representing institutions from all four LIMCOM Member States – Botswana, Mozambique, South Africa, and Zimbabwe – participated in the workshop (Table 1), with the participants including hydrologists, engineers, scientists, analysts, and managers, illustrative of the project goal that the intended user group spans both technical specialists and individuals with broader coordination or management responsibilities.

Table 1. Participants in the April 16, 2026 workshop, in Maputo, Mozambique.

Country	Institutions represented	Roles represented
BW Botswana	Department of Water and Sanitation; Water Utilities Corporation	Water resources engineer; hydrologist
MZ Mozambique	National Directorate for Water Resources Management; ARA-Sul	Hydrologist; hydraulic engineer; basin division manager
ZA South Africa	Department of Water and Sanitation	Scientist; LIMCOM focal point/coordinator
ZW Zimbabwe	National Department of Water Resources Development and Utilisation	Hydrologist; hydrological data analyst

Source: authors' creation

Although the participant group was small, it reflected the institutional diversity likely to matter for future uptake of these tools: national departments, basin authorities, utilities, and transboundary governance structures. This is particularly relevant given that user needs are shaped by institutional position and decision context, and not just technical function or roles. Recognizing this, the April 2026 workshop was designed to engage a set of overlapping technical and governance roles, in a transboundary context, rather than a homogenous user profile.

The workshop confirmed that participants are concerned with a wide range of basin-relevant decisions (Figure 3). These include:

- water allocation,
- dam and reservoir operations,
- environmental flow maintenance,
- seasonal forecasting,
- flood preparedness,
- water quality deterioration,
- land degradation and sedimentation, and
- the effects of climate variability and land-use change on future basin conditions.

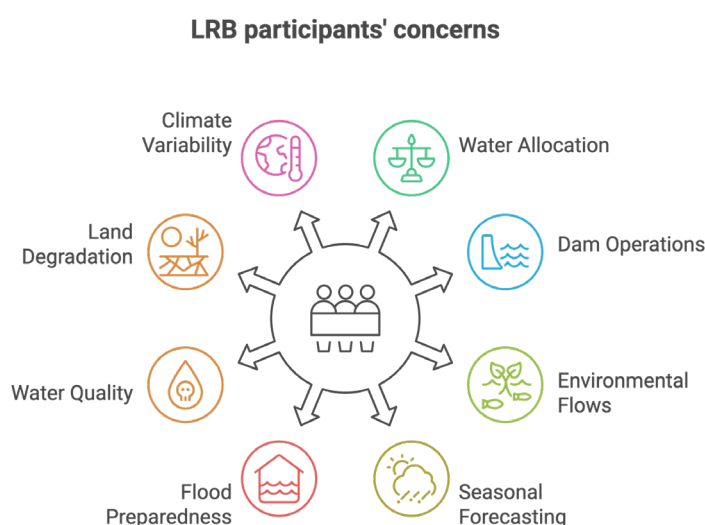


Figure 3. Visual summary of basin-relevant concerns raised by participants in the April 2026 workshop.

Source: IWMI 2026

Several of the more detailed responses were explicitly framed as decision questions, such as how climate change and upstream water use may affect environmental flows, how hydrological datasets can better support reservoir operations, and how the combination of nutrient loading and reduced flows may worsen algal blooms.

Several of these decisions are inherently transboundary, while others are focused on specific national sub-basins, reservoirs, or reaches. The findings also demonstrate that participants work across multiple spatial scales (Figure 4A and 4C). Some responses are basin-wide in focus, especially where questions concern environmental flows, water quality, or transboundary cooperation. Others focus on sub-basins, individual dams, or specific river reaches, such as the Upper Limpopo, the Lower Mzingwane sub-catchment, or the Manyuchi and Massingir dam contexts. Planning horizons similarly range from the next six months to five years, to 2030, 2040, 2050, and beyond (see Figure 4B and 4D). This is significant for platform design. It suggests that users need tools that support both near-term operational questions and longer-term strategic planning, rather than assuming a single planning horizon or a single spatial unit of analysis. A future HydraFound-linked platform will need to move between basin-wide perspective and targeted operational relevance if it is to serve the kinds of users represented in the workshop.

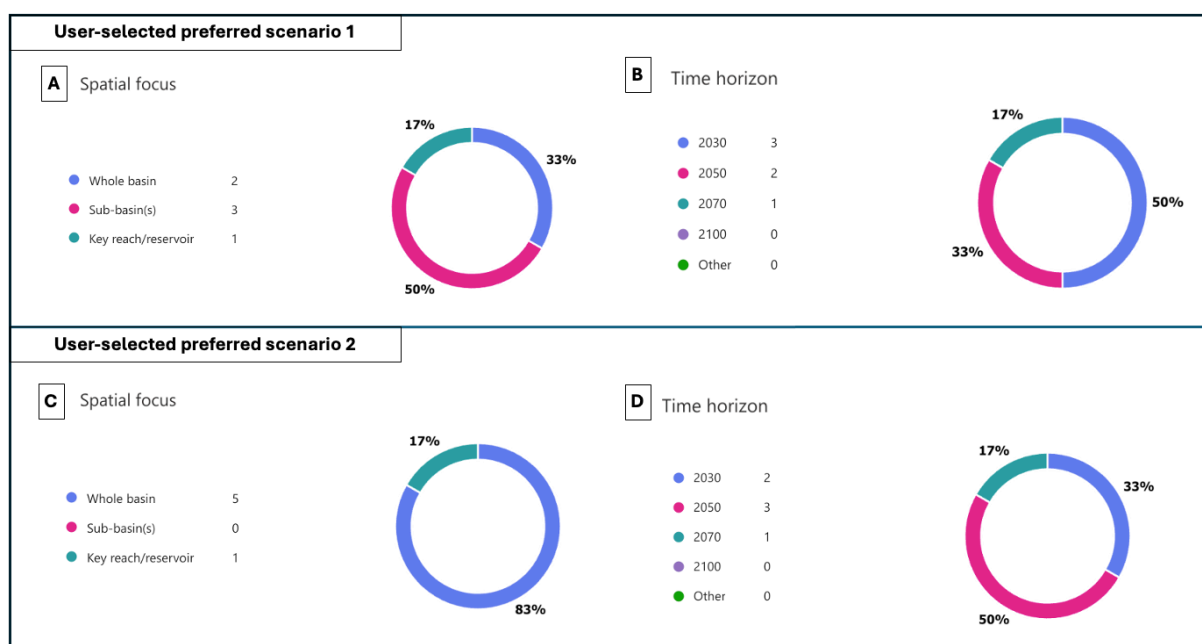


Figure 4. Spatial scales (A and C) and temporal scales / time horizon (B and D) for the user-selected scenarios 1 (A and B) and scenario 2 (C and D).

Source: IWMI 2026

The findings also show that users are operating under considerable constraints, including:

- insufficient or delayed data,
- limited gauging density,
- data gaps in tributaries,
- limited system capacity,
- software licensing problems (including difficulties with renewing software),
- fragmented analytical environments, and
- challenges in communicating results effectively to leadership and stakeholders.

Some respondents explicitly referenced poor stakeholder response, political interference, and lack of formal communication around upstream data and gauge failure. Others highlighted that tools are hard to access or insufficiently collaborative to enable shared decision-making. These constraints are central to the interpretation of user needs, suggesting that the core challenges include:

- decision-making under uncertainty,
- partial information,
- uneven monitoring infrastructure, and
- institutional fragmentation.

Any attempt to understand user needs in this setting must begin from those realities.

4. Core User Needs Identified Through the Workshop

A clear finding from the workshop is that users want future tools to support specific water management decisions, rather than offer generic modelling outputs. Management questions asked by participants are highly concrete and decision-oriented, around the specific impacts of climate variability, nutrient loading, and groundwater recharge, for example, and what interventions may reduce sediment inflow and protect reservoir storage (see Figure 5).

This suggests that the tools developed through the AI Water Project should **begin from a decision-question logic**. In practice, this means that scenario design, outputs, and interface flows should be structured around the kinds of questions that basin managers and technical teams need to answer (as in Figure 5), rather than around internally convenient model structures alone. The issue is not simply which scenarios can be run, but which ones matter for real basin governance and operational decision-making.

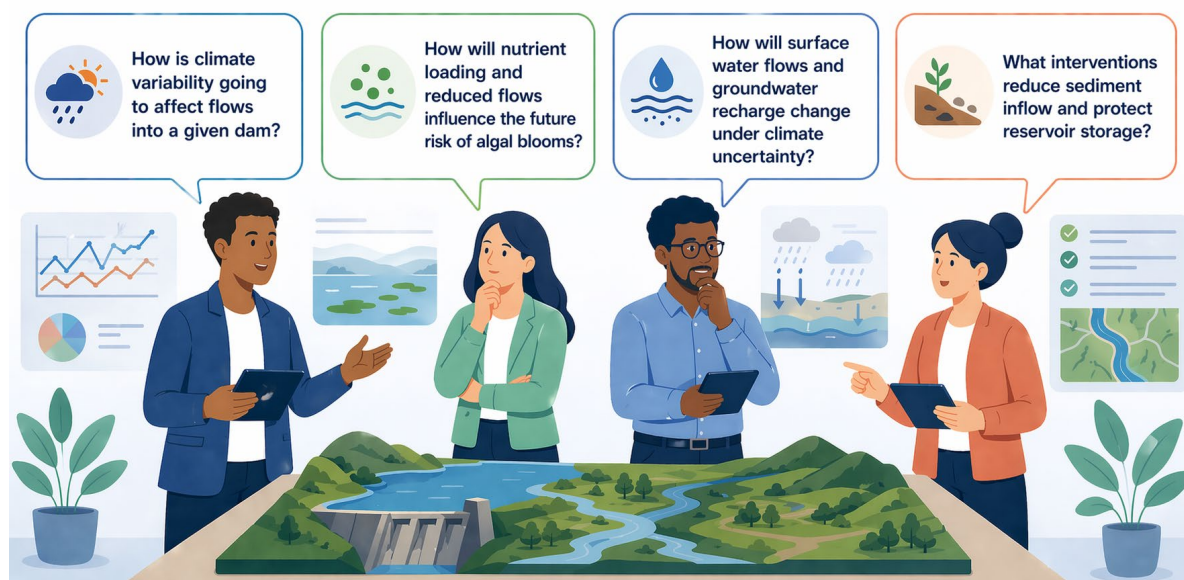


Figure 5. Examples of management questions asked by participants at the workshop in Maputo on April 16, 2026.
Source: IWMI 2026

A second major need concerns **the quality, integration, and accessibility of data**. The workshop responses indicate that participating institutions can contribute river discharge data, hydrological time series, dam parameters, reservoir operation data, groundwater information, land-use and irrigation data, water quality observations, sediment information, and rainfall-runoff projections. At the same time, many respondents also identified constraints around missing periods, institutional approval requirements, inconsistent formats, and uncertainties in data quality and validation.

What emerges here is not simply a need for more data, but for better integrated and more trusted data environments. Future systems will need to account for institutional realities of **access, confidence, and sharing**. They will also need to **communicate where gaps remain**, rather than imply a false level of completeness. This need for trusted and shareable data is especially important in a transboundary basin, where decisions are affected not only by national datasets, but by the quality and flow of information across borders.

A particularly important theme that has emerged is the need for modelling approaches and decision support tools that are **viable under conditions of incomplete monitoring and limited technical capacity**. Multiple participants referred to missing gauges, poor data density, calibration risks, limited telemetry, and the need for improved modelling tools or software. Rather than being minor technical inconveniences, the latter factors should be understood as structural barriers to the use of conventional hydrological modelling workflows in many basin contexts (and the opportunities for AI – as introduced in [Section 1.3](#)).

Users are therefore seeking decision-support tools that do not collapse with incomplete data and that do not require an impractical burden of expert setup for each scenario cycle (as described in Figure 2). The relevance of tools being developed through the AI Water Project is not only that they may produce scenarios, but that they may lower some of the modelling barriers that currently prevent scenario-based planning from being more routinely usable.

The shortlisting and prioritization exercises further show that users want the ability to compare plausible futures and assess which are most relevant to basin management. Across the workshop results, the strongest interests clustered around the climate mid-range pathway (SSP2-4.5 – prioritized by 64% of participants within the possible climate change scenarios) and urban expansion (prioritized by 36% within the land use and land cover change

(LULCC) scenarios) (see Figure 6). In the case of the LULCC scenarios, deforestation and agricultural expansion and irrigation conversion were both prioritized by 23% of the participants, with reforestation and catchment restoration closely behind at 18%. These scenario choices align closely with the management concerns raised in the workshop, especially around climate variability, allocation pressure, land degradation, and flood or drought risk.

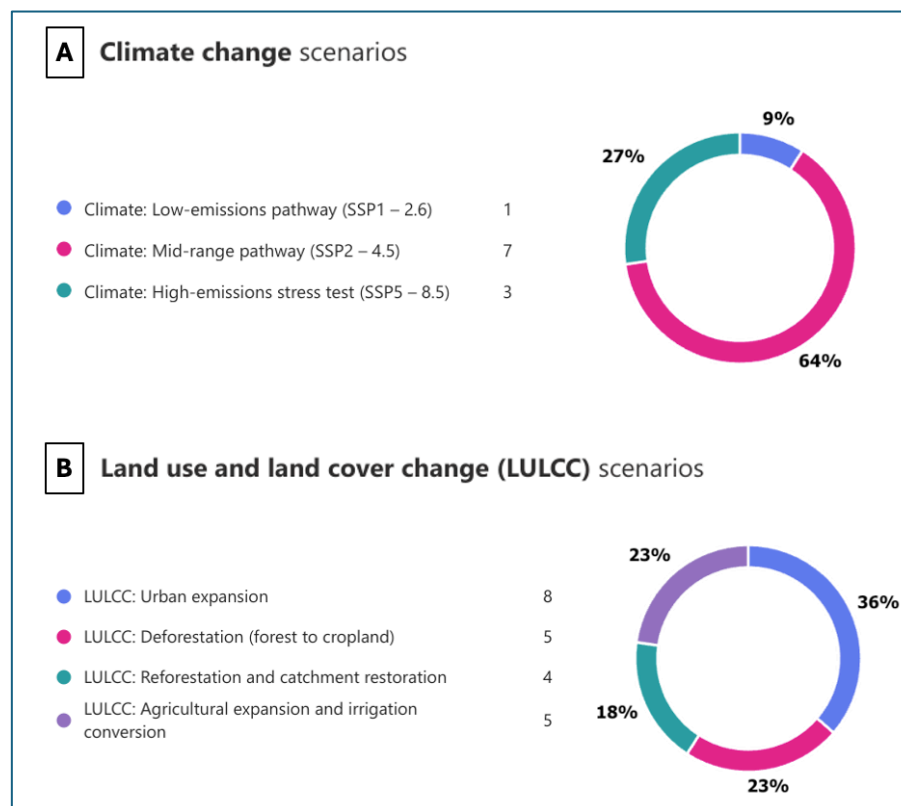


Figure 6. Summary of the prioritized scenarios emerging from the Day workshop.

Source: IWMI 2026

These results indicate that future HydraFound work should place particular emphasis on **comparison**, **prioritization**, and **interpretability**. Scenario tools should not merely run options in the background; instead, they should help users understand

- **which** futures are worth paying attention to,
- **why**, and
- with **what** degree of confidence.

In the user journey sections of the workshop, there was strong demand for **outputs that combine analytical usefulness with communicative clarity**. Participants rated highly the importance of river flow maps, water balance overviews, drought and flood indicators, climate and land-use scenario exploration, map-based results, automated reports, uncertainty information, and natural-language querying. They also indicated that leadership audiences often prefer dashboards, PowerPoint-based presentations, maps, and concise reports, although some still want access to raw data. This reinforces the need for outputs that can travel across levels of governance. A future platform will need to support both **technical exploration** and the **production of leadership-ready material**. This includes visualizations, automated exports, plain-language explanations, and transparent communication of uncertainty.

Earlier LIMCOM-linked co-design work around citizen-science integration into the Digital Twin pointed in a similar direction. Participants in the 2025 Botswana workshop emphasized the value of real-time alerts, historical comparison, accessible dashboard formats, downloadable outputs, charts for trends, and visual materials suited to both government and community-facing communication. They also stressed that computer-based interfaces alone would be insufficient, and recommended hybrid communication approaches involving channels such as SMS and radio (Langa et al., 2025). While the immediate focus of that earlier work was different, the recurrence of these themes suggests a degree of consistency in stakeholder expectations across the evolving digital water ecosystem in the LRB.

5. User Needs for Interface, Workflow, and Communication Design

Workshop participants noted that they already use a range of digital and analytical tools, including the Digital Twin, WaterCopilot, GIS tools, GloFAS, HEC-HMS, ZEDNET, Hydstra, data warehouse dashboards, and a variety of reports, spreadsheets, and monitoring systems. This indicates that future HydraFound-linked systems will not enter an empty landscape. They will need to coexist with, complement, and in some cases simplify existing workflows.

At the same time, participants voiced many frustrations with the current management environment and the associated tools at their disposal. These included:

- inadequate data,
- delays in receiving information,
- complexity of tools,
- lack of collaborative functionality, licensing barriers,
- limited analytical capacity, and
- poor communication or uptake of results by stakeholders.

These concerns suggest that future tool design should be attentive not only to technical functionality, but also to workflow friction and institutional usability. The earlier WaterCopilot-focused workshop feedback is useful here as contextual reinforcement. It suggested that users appreciated tools that were simple, direct, area-specific, and useful for emergency decision-making, but also had concerns about cost, trust in outputs, accountability, and over-reliance on AI. The importance of human verification of AI-supported outputs and the value of allowing users to upload their own data to fill gaps and refine analysis were also raised (Langa et al., 2025). These earlier concerns resonate strongly with the April 2026 findings and suggest continuity in how LIMCOM-linked stakeholders are evaluating AI-enabled tools.

Read against the workshop findings, the above suggests that users need AI-enabled platforms to do at least six things (summarized in Figure 7 below). The significance of AI, therefore, lies in its potential to alter **how quickly**, **how widely**, and **how effectively** decision support can be generated and shared.

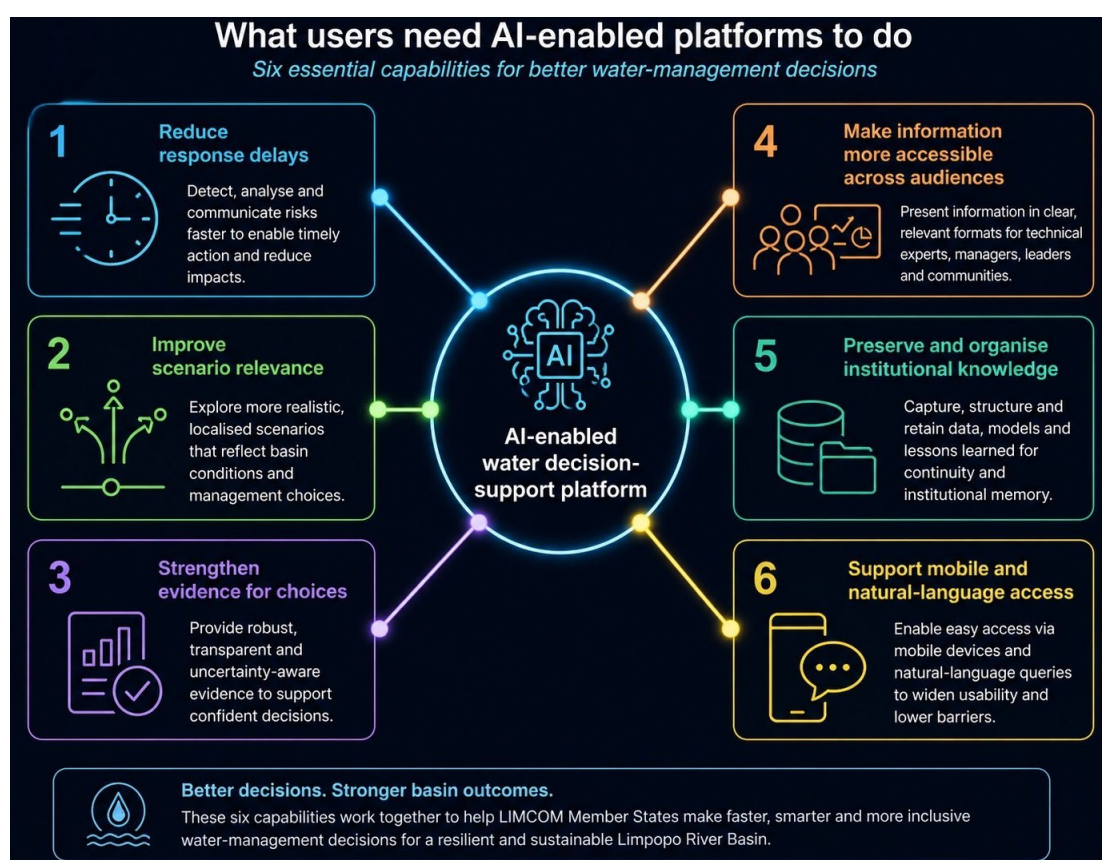


Figure 7. Six broader capabilities that users need AI-enabled water decision support platforms to provide.
Source: IWMI 2026

The user journey sections of the April 2026 workshop provided especially direct evidence on desired future features. Respondents gave high importance scores to the following:

- current-state visualization, including flow maps and drought/flood indicators;
- to climate and land-use scenario exploration;
- to side-by-side comparison of futures;
- to summary charts and map-based results;
- to automatically-generated summary reports,
- to uncertainty information; and
- to natural-language questions, such as asking about current conditions, scenarios, or explanatory reasoning.

The above suggests that a future AI Water platform should combine four capabilities in a unified way:

1. current-state situational awareness,
2. scenario-based exploration,
3. explainable and communicable outputs, and
4. conversational interaction.

A platform that only addresses one or two of these dimensions is likely to fall short of the needs expressed in the workshop.

Participants also indicated that senior audiences often prefer Microsoft PowerPoint® slides, reports, maps, dashboard views, and concise visual summaries, though in some cases raw data is also needed. This implies that future outputs should be flexible enough to support different governance and communication contexts. A useful design principle would therefore be to think **not only in terms of what the model produces**, but also in terms of **what the next conversation, briefing, or decision process requires**. This point is reinforced by the earlier Digital Twin co-design work, which similarly emphasized the need for charts to identify trends, visuals to support presentations and decision-making, and formats that remain accessible beyond specialist technical audiences (Langa et al., 2025).

6. Implications for the AI Water Project and the Digital Twin Ecosystem

The workshop findings suggest that **scenario design should begin with decision relevance**. Scenarios should be selected and structured based on the real management questions users face, rather than on abstract model completeness alone. This means giving priority to scenarios linked to climate variability, land-use change, environmental flows, allocation pressure, water quality, flood risk, and sedimentation, and ensuring that users can compare scenarios across multiple planning horizons and spatial scales.

The findings also support the **strategic importance of the Limpopo as a pilot basin for AI-enabled hydrological modelling**. As noted in [Section 1.2](#), the strategic relevance of the LRB is that it combines transboundary importance, climatic variability, an existing SWAT baseline, and a sufficiently developed digital ecosystem to enable practical testing (see Figure 1).

The user-needs findings also make clear that **the promise of AI should be judged** not just by novelty, but **by whether it helps to reduce real bottlenecks**, such as setup burden, calibration delay, weak gauging coverage, and poor accessibility of modelling outputs. If the AI Water Project can help lower those barriers, it may address a genuine need of participants. If it cannot do so transparently and credibly, its relevance will be more limited. Human oversight, confidence communication, and clear governance around data and assumptions will therefore remain essential.

The findings further indicate that **both technical and policy users should be treated as core audiences**. This suggests that dashboards and conversational interfaces should be designed not as separate products, but as different access points into a shared intelligence environment. Natural-language interaction should span both current conditions and future scenarios, while outputs should support both deeper exploration and rapid communication. The emphasis participants placed on **explanation, comparison, and reporting** suggests that future interface design should prioritize interpretability alongside analytical power.

Prior feedback from LIMCOM stakeholders around the Digital Twin and usefully reinforces this point. As part of the 2025 engagements, users said they valued simple, area-specific, and paywall-free interfaces, but also wanted transparency, verifiable information, and continued human verification of outputs (Langa et al., 2025). These earlier concerns suggest that trust-building and explainability should remain central to the design of any future conversational interfaces.

Finally, the workshop shows that **adoption will depend on institutional fit** as much as on technical sophistication. Data-sharing bottlenecks, uneven capacity, collaboration needs, and differing expectations across Member States all shape what is feasible. This reinforces the importance of LIMCOM and Member State participation as co-design partners, rather than treating them as downstream end-users only. The workshop was designed with this in mind, recognizing that the basin governance bodies hold the institutional knowledge, historical data, and policy context that determine which scenarios matter most.

7. Priority User Needs Synthesis

The workshop findings point to a coherent set of priority user needs for future developments as part of the AI Water Project and the Limpopo Digital Twin. These include:

- support for concrete management questions;
- stronger data integration and transparency;
- modelling approaches that are more feasible under data scarcity and weak gauging;
- flexible scenario comparison and prioritization;
- accessible visual and conversational interfaces; and
- outputs that can be easily communicated.

These needs are interrelated, suggesting that the strongest value proposition for HydraFound lies in combining improved modelling workflows with clearer and more usable decision-support outputs. In other words, the opportunity is not merely to build a better model, but to build a more usable pathway from model(s) to enhanced decision-making (Figure 8).

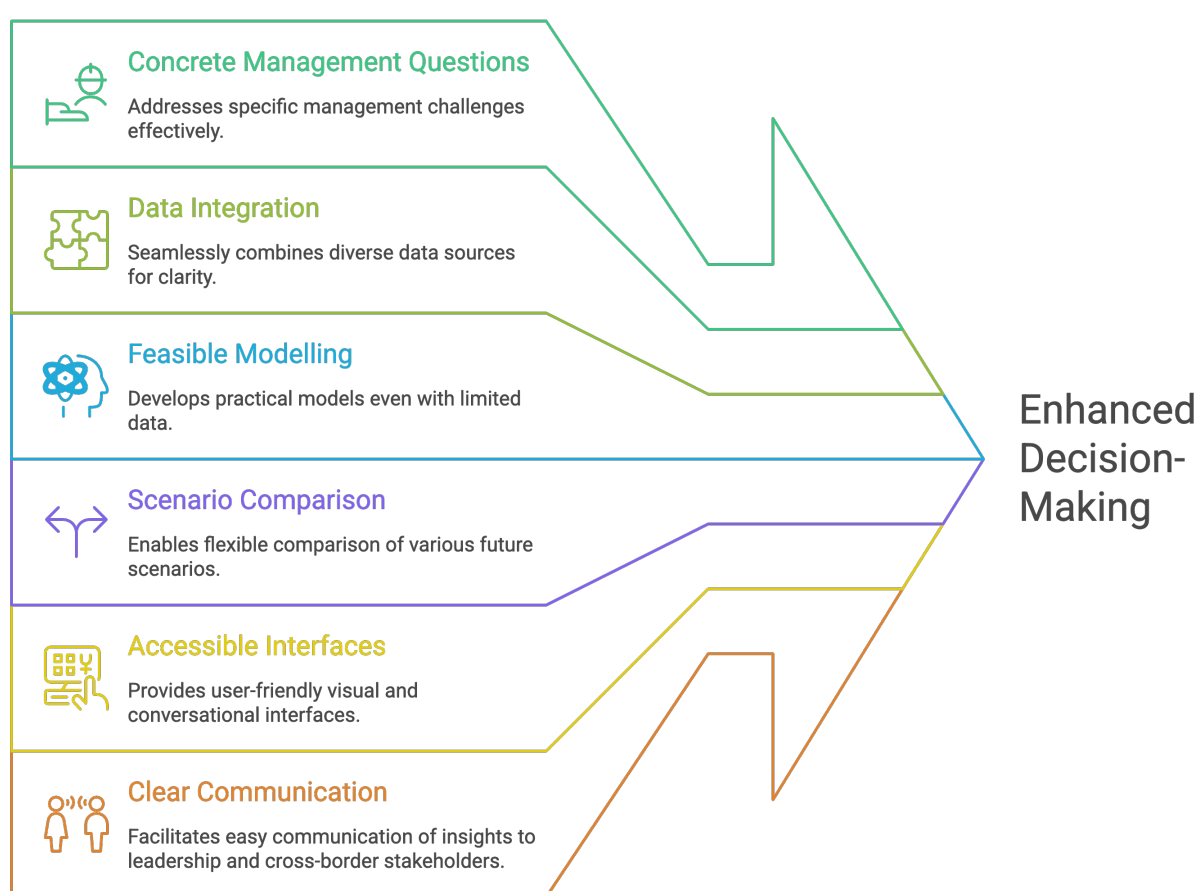


Figure 8. The pathway to enhanced decision-making, via addressing the priority user needs.

Source: IWMI 2026

Seen in relation to earlier Limpopo Digital Twin and WaterCopilot engagements (including the June 2025 workshop in Gaborone, Botswana), the April 2026 workshop also suggests a notable degree of continuity in stakeholder expectations in the LRB. Users consistently describe wanting and needing tools that are

- usable,
- explainable,
- visually communicative, and
- adaptable to mixed institutional and communication environments,

while remaining transparent about uncertainty, governance, and the role of human oversight.

These needs are summarized in Table 2, below.

Table 2. Priority user needs synthesis matrix.

Priority user need	Implication for future development
Decision support grounded in real management questions	Design scenarios and outputs around concrete basin decisions
Better integrated, trusted, and shareable data	Improve data pipelines, transparency, and communication of gaps
Faster and more adaptive modelling under data scarcity	Prioritize AI-supported setup, calibration, and transfer learning where feasible
Scenario comparison and prioritization	Support side-by-side comparison across multiple planning horizons
Accessible visual, conversational, and report-ready outputs	Serve both technical users and leadership audiences with explainable outputs

Source: authors' creation

8. Conclusion

The relevance of the AI Water Project lies in its potential to make scenario-based hydrological modelling faster, more adaptive, and more usable for basin-scale decision support. The workshop findings suggest that an AI-augmented modelling approach is well aligned with multiple user needs identified by LIMCOM Member State representatives, especially where these relate to

- data integration,
- missing or unevenly distributed gauges,
- calibration constraints,
- scenario analysis and planning, and
- the need to translate complex model outputs into practical planning evidence.

The value proposition of the AI Water Project is therefore a lot more than the fact it can generate sophisticated simulations, but rather that it may help create a more usable pathway from data and models to decisions.

The workshop also made clear that technological capability alone will not determine usefulness or uptake. For the AI Water Project and the wider Limpopo Digital Twin ecosystem to be credible and useful, future development will need to prioritize transparency, explainability, data governance, uncertainty communication, human oversight, and institutional fit. Users need to understand

- what data has been used,
- where gaps remain,
- how confident the model is, and
- how outputs should be interpreted in relation to their own mandates and decision processes.

The findings also reinforce the importance of designing for multiple audiences and workflows. Technical users need access to data, assumptions, scenarios, diagnostics, and exportable outputs. Policy and leadership audiences need clear maps, concise summaries, dashboards, PowerPoint-ready visuals, and report-ready products that can support communication and decision-making. Natural-language querying and AI-assisted explanation may help bridge these audiences, provided that outputs remain transparent, verifiable, and appropriately governed.

This report therefore provides an initial user-needs synthesis for the next phase of the AI Water Project and Limpopo Digital Twin development. It suggests that future work should prioritize decision-relevant scenario design, integrated and trusted data pathways, AI-supported modelling workflows that are robust under variable data conditions, accessible interfaces, and outputs that travel effectively between technical analysis and policy-facing communication. A separate workshop report has documented the broader event process, survey results, scenario-prioritization outputs, and agreed next steps in greater detail (Clifford-Holmes, et al., 2026).

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