AI driven Digital Twin for Water Management for Limpopo River Basin and Inclusive Integration with Citizen Science

IWMI

Gaborone, Botswana
9–11 June 2025

Online Agenda

bit.ly/4jVtXgR

REPUBLIC OF BOTSWANA

LIMCOM
LIMPOPO WATERCOURSE COMMISSION

DIWASA

Supported by

CGIAR DIGITAL TRANSFORMATION

Enabel

THE LEONA M. AND HARRY B. HELMSLEY CHARITABLE TRUST

In collaboration with

aws

Digital Earth AFRICA

Global Water Partnership Southern Africa

Microsoft

Day 1

LIMPOPO
DIGITAL TWIN

Digital Twin Hands on

Listening Session for Data Challenges

Digital Twin Concept

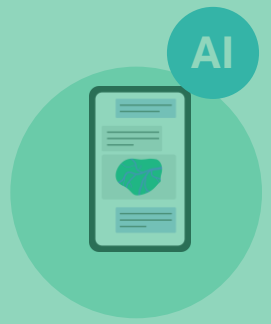
Hands on:

Water Availability

Irrigation Water Use

Droughts Index

Day 2



AI for Water Management

AI and Data Governance

101 generative AI

Prompt engineering

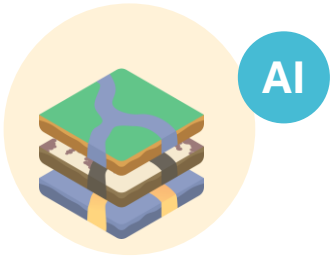
Hands On:

Limpopo

Water Copilot

Citizen Science Co-designs

Creating trust on citizen science data



DIWASA Training

Use cases from DEA

Day 3

Listening Session

Stakeholder consultation scaling opportunities

Tentative_schedule.docx

IWMI International Water Management Institute

Welcome to WaterCopilot

Water Copilot is a smart virtual assistant created by the **International Water Management Institute** (IWMI) and **Microsoft Research** in partnership with LIMCOM to support water management in the Limpopo River Basin (LRB).

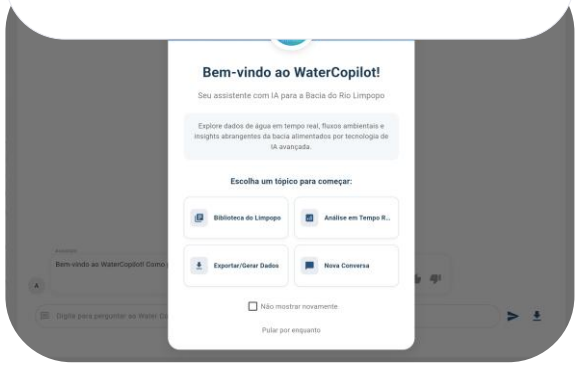
Features

⚙ Intelligent Analysis

Advanced AI capabilities for data interpretation and reporting support

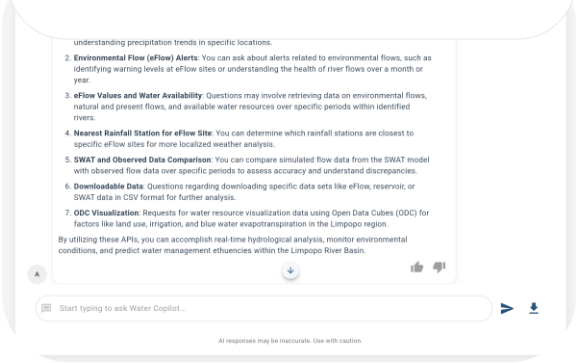
🌎 Multilingual Support

Accessible in English and Portuguese



Real-Time Data

Operational monitoring datasets of rainfall, discharge, and environmental conditions



Cross-Platform

Available on web, mobile, and desktop for maximum accessibility

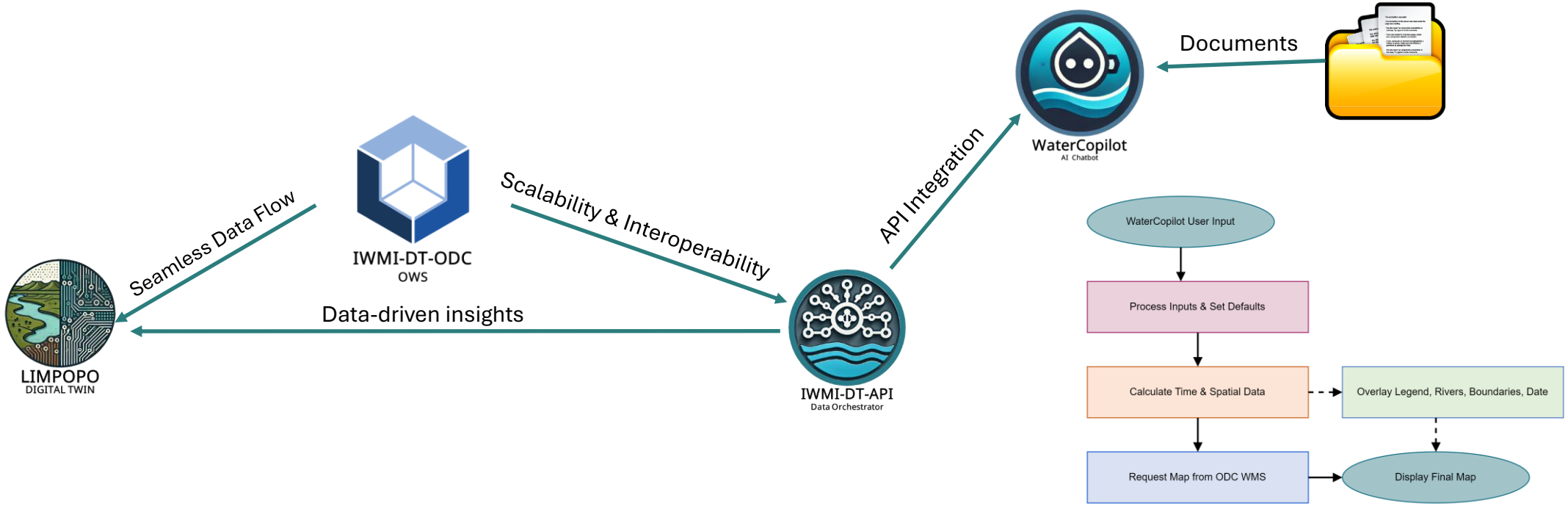
The Challenge

Water Resource Management in the Limpopo Basin

- Complex transboundary water management across four countries
- Need for real-time monitoring and predictive analytics (droughts, floods etc.)
- Diverse stakeholder groups with varying technical capacity
- Ddecisions requiring accurate, timely data
- Language barriers limiting access to technical information

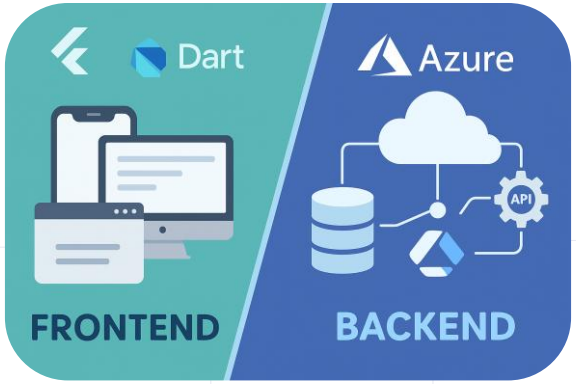
Technical Architecture Overview

- Built using AI, cloud computing (Docker, AWS)
- Integrates live and historical datasets
- Integrates multiple data sources (API, static etc.)



Technical Architecture

Built with Modern Technologies



Frontend Architecture

- Flutter for cross-platform compatibility
- Responsive design for all devices
- Offline capability for field use
- PWA support for web deployment

Backend Infrastructure

- Azure Cognitive Services
- RESTful API architecture
- Real-time data processing
- Scalable cloud infrastructure

Core “Plugins”

1

Limpopo Document Library

Access comprehensive documentation, research papers, and historical data about the Limpopo River Basin

2

Real-Time Analysis

Monitor current conditions including rainfall data, e-flow measurements, water availability and access the ODC

3

Data Export & Visualisation

Generate reports, export data in multiple formats, and create visual representations for stakeholder presentations

4

General Conversation

Leverage GPT-4 technology for intelligent analysis, predictions and support

User Experience

"Designed with both technical experts and field workers in mind"

Conversational Interaction

natural language interaction

Visual Data Display

charts, graphs, and maps

Export Options

PDF reports, data downloads, sharing

Quick Actions

pre-defined queries for common tasks

Language Toggle

instant switching between languages

Potential Real-World Applications

How WaterCopilot Could Help Different Users

1

👩‍🌾 For Farmers

“When should I irrigate based on rainfall predictions?” / “What's the current dam levels ?”

2

👩‍🔬 For Researchers

“Analyze 10-year rainfall trends” / “Compare current e-flows with historical averages”

3

👩‍💼 For Policy Makers

“Generate basin-wide water availability report” / “Assess drought risk for the current hydrological year”

4

👷 For Field Officers

“Find nearest rainfall station data” / “List all the real-time stations that are inactive”

Getting Started

Your First Steps with WaterCopilot

🚀 **Quick Start Guide:**

1. Navigate to the WaterCopilot portal
2. Click “Sign Up” or “Login”
3. Choose your preferred language
4. Start with a suggested query or ask your own question!

https://digitaltwins.demos-only.iwmi.org/watercopilot_dev

Scan me to get started!

You got mail!

Mpho Kgobe

Date: 24 June 2025
To: Ms Thandi Mokoena, Chief Water Resources Officer, Limpopo Catchment Management Agency

On behalf of the Limpopo Farmers' Cooperative (2,300+ irrigators), we request current data to finalize irrigation schedules for July–September 2025.

Specifically, we request:
1. Reservoir storage (Area and if possible % of capacity) for Flag Boshielo, Massingir, Lotsane, Mokolo dams.
2. E-flow status at mamba weir for the past year
3. Rainfall trend (last 60 days and the forecast for the next 60 days).
4. Is the basin trending toward normal, stressed or critical conditions? Include any recommended restrictions.

We kindly request a response within 3 working days.

Sincerely,
Mpho Kgobe | Secretary, Limpopo Farmers' Cooperative
Tel: +27 82 555 1234 | Email: mpho.kgobe@limfarmers.org

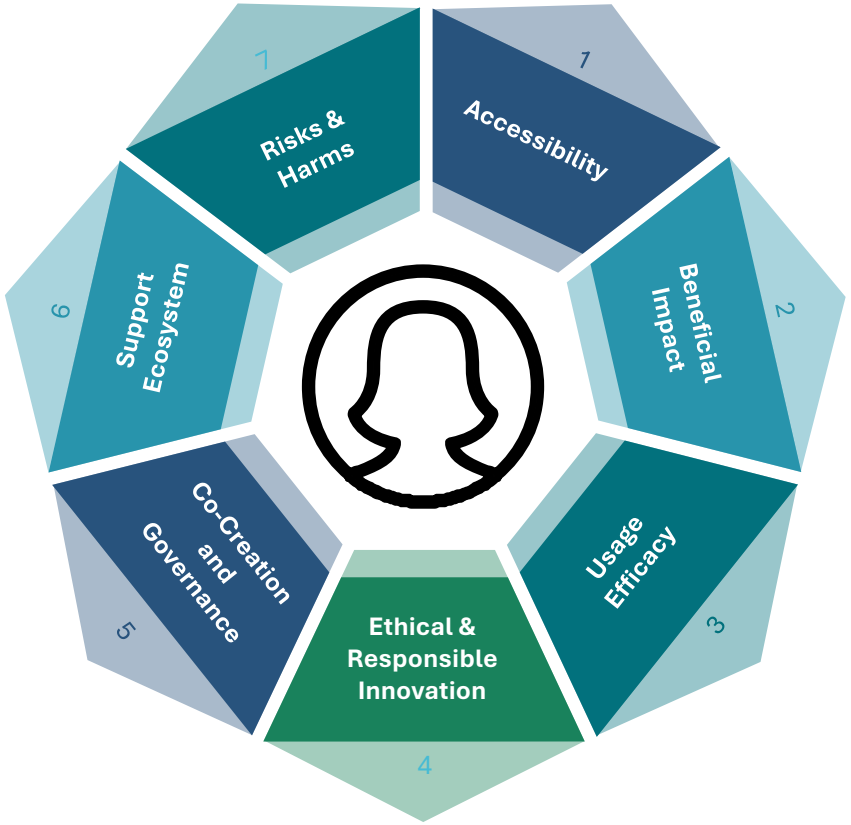
The social implications of using the water co-pilot

- **Women**: Does this tool consider my specific habits and routines as a woman?
- **Young people**: Is this tool safe to use?
- **Elderly people**: Will this tool replace our skill-sets and occupations?
- **People with special:** Does this tools have functionalities that enable me to use it?
- **People with minimal formal education**: Is the language and features of this tool accessible to me?
- **Rural communities**: Does this tool infringe on our cultural norms as a community?

IWMI's Water Co-pilot prototype (Demonstration and Hands-on)

The MDII Framework

360º view



Innovation Usage

1. **Accessibility:** Measures availability and accessibility of digital resources for underrepresented groups.
3. **Usage Efficacy:** Assesses the ease and effectiveness of digital tool and service usage among underrepresented users.
6. **Supportive Ecosystem:** Supports the seamless adoption and sustained use of digital solutions.

Social Consequences

2. **Beneficial Impact:** Evaluates the positive impacts of digital innovations on underrepresented users.
7. **Risks & Harms:** Evaluation of the potential negative impacts that digital innovation products might have on users.

Stakeholder relationships

4. **Ethical & Responsible Innovation:** Ensures ethical practices and responsible innovation in digital initiatives.
5. **Co-creation & Governance:** Encourages collaborative innovation and inclusive governance in digital initiatives.

MDII Survey

Digital Inclusiveness - Form for Tool Users (Ex-Ante Version)

IWMI
International Water Management Institute

IWMI International Water Management Institute

SCAN FOR MORE INFORMATION

THANK YOU!

Research and Innovation for Water Security

Driving Action • Propelling Change

CGIAR