Chapter 7 — WeMAST: Wetlands Monitoring for Transboundary Basins in Southern Africa (SASSCAL)

Wetlands Monitoring and Assessment Service for Transboundary Basins — Lead Institution: Southern African Science Service Centre for Climate Change and Adaptive Land Management (SASSCAL), Namibia

7.1 Background and Rationale

The Wetlands Monitoring and Assessment Service for Transboundary Basins in Southern Africa (WeMAST) operationalises satellite Earth Observation (EO) and in-situ information for routine wetland and floodplain monitoring across major basins. The goal is decision-ready, harmonised evidence—wetland extent, condition and pressures—delivered through a public geoportal and practical outputs (factsheets, "mapographics," mobile tools) so basin organisations, ministries, conservation authorities and communities can act quickly and consistently. Why wetlands? They buffer floods, secure water supplies, store carbon, and sustain biodiversity—yet remain among the region's most threatened ecosystems. WeMAST tackles this implementation gap by pairing consistent, basin-wide indicators with user-oriented delivery.

7.2 Leadership, Partners and Geographic Coverage

Lead institution. SASSCAL coordinates design, operations and stakeholder engagement.

Geographic scope. Cuvelai, Limpopo, Okavango and Zambezi basins spanning Angola, Botswana, Namibia, South Africa, Zambia, Zimbabwe, Malawi and Mozambique.

Core technical partners (Phase I–II). University of Botswana, University of Zambia, University of the Western Cape, Cape Peninsula University of Technology, Midlands State University (Zimbabwe), South African National Space Agency (SANSA), Zambia National Remote Sensing Centre, among others.

17.3 Service Portfolio and Methods

17.3.1 What the service delivers (user-facing)

Service line	User-visible outputs	Typical decisions supported	Notes on methods
Wetland extent & change	Periodic maps of wetland boundaries; change-detection layers	Zoning, protected-area planning, restoration prioritisation	Multi-sensor time series (Sentinel-1/2, Landsat) fused with global water datasets; cloud workflows (e.g., GEE)
Surface water & flood dynamics	Flood duration/extent/timing products; seasonal briefs	Flood preparedness; infrastructure siting; environmental flow management	Integration of SAR, optical and in-situ observations; hydrologic context
Wetland condition/health	Basin Vulnerability Indicators (BVIs): vegetation, hydrology, climate composites	Early action on degradation hotspots; EIA screening	BVIs aggregate indicators incl. NDVI and SPI
Decision support & outreach	Geoportal, mobile app, QGIS plugin, "mapographics," downloadable reports	Routine monitoring; policy briefs;	Geoportal 1.0 (2021) → 2.0 automation and expanded tools

		community communication	

Public access. WeMAST information site and operational geoportal provide open discovery, maps and downloads.

7.3.2 Methods in brief

- **EO foundations.** Multi-temporal radar (Sentinel-1) and optical (Sentinel-2/Landsat) analytics, plus JRC Global Surface Water, MODIS time series and targeted field validation.
- **Composites.** BVIs blend vegetation (e.g., NDVI trends), hydrologic persistence, moisture and climate anomalies (e.g., SPI) for intuitive hotspot screening.
- **Tooling.** Cloud pipelines via Google Earth Engine; expansion to ESA DUNIA and JRC eStation 3 for automated ingest/processing and higher update cadence.

7.4 Development Trajectory and Activities

7.4.1 Phase I (2017–2021): Foundations and first operations

- **User needs assessment (Harare, Dec 2019).** Prioritised indicators: wetland extent/change, surface-water coverage, water quality and fire frequency.
- **Geoportal 1.0 (June 24–25, 2021) and training.** End-users trained on validation and platform use; materials made available online.
- **Academic partnership model.** Five universities engaged; **6 Master's** and **2 Post-Doctoral** researchers supported, embedding EO methods in curricula.

7.4.2 Phase II (2022–2025): Scale-up, automation and policy uptake

- **Automation & Geoportal 2.0.** Integrated Sentinel-1/2, Landsat, MODIS and JRC GSW; introduced **BVIs** (water, vegetation, soil-moisture, water-quality, climate variability composites).
- **New EO platforms.** Integration with **ESA DUNIA** and deployment of **JRC eStation 3** (2024); GEE scripts for wetland mapping.
- **End-user enablement (2024–2025).** WeMAST 2.0 trainings for technical partners/end-users on the QGIS plugin, mobile apps, and "mapographics" for policy.
- **AUC monitoring & stakeholder missions (2024–2025).** Reviewed progress and sustainability pathways with regional partners.

7.5 Achievements and Decision Use

7.5.1 Selected dated outputs and why they matter

Year	Output/activity	Immediate institutional use
2021	Geoportal 1.0 operational; end-user training delivered	Basin/national agencies begin routine visualisation of indicators for planning
2023	Basin-level stakeholder engagements (e.g., Maun, Botswana)	Multi-agency coordination on data-sharing and restoration priorities
2024	Phase II technical and end-user workshops	Uptake of QGIS plugin, mobile capture, and "mapographics" in workflows
2024–2025	Automation with DUNIA/eStation 3; **BVIs** introduced	Faster updates; composite vulnerability screening for early action

7.5.2 Examples of decisions and effects (evidence-ready)

- **Flood preparedness & land-use control.** Flood duration/extent layers support floodplain zoning and emergency planning in Cuvelai and Limpopo.
- **Degradation hotspot management. BVI dashboards** flag sites for restoration/protection (e.g., vegetation stress via NDVI, climate anomalies via SPI) to triage interventions.
- **Policy communication.** "Mapographics" distil technical layers into policy-ready visuals for council briefings and basin dialogues.

7.6 Capacity, Inclusion and Institutionalisation

- **Human capital.** Phase I sponsored **6 MSc** and **2 Post-Doc** researchers; multiple curricula now include WeMAST casework, building a pipeline of practitioners.
- **Institutional embedding.** By Phase II, ministries and basin agencies had focal points/protocols to consult WeMAST layers during planning (e.g., siting water infrastructure in floodplains).
- **Outreach & visibility. ~50 media features** and **~225 social posts** reached **>20,000** users, strengthening community awareness and service demand.

7.7 Tools, Portals and Discoverability (public links)

- **WeMAST information site:** basins, services, news, training.
- **WeMAST Geoportal:** operational maps, indicators, downloads.
- **Service descriptions & training notices:** products, indicators, use cases; Phase I & II training reports.

7.8 Alignment with Agenda 2063 and the SDGs

- **Agenda 2063.**
    - *Aspiration 1 — Prosperity & Sustainability:* routine monitoring safeguards critical ecosystems and natural capital.
    - *Aspiration 4 — Peace & Security:* supports cooperative **transboundary** water governance.
    - *Aspiration 6 — People-driven development:* equips communities, policymakers and researchers with accessible tools.
    - *Aspiration 7 — Africa as a global player:* demonstrates African-led EO operations and innovation.
- **Primary SDGs. SDG 6** (Clean Water and Sanitation), **SDG 13** (Climate Action), **SDG 15** (Life on Land); co-benefits for **SDG 1** (No Poverty) and **SDG 2** (Zero Hunger) via resilient wetland-based livelihoods.

17.9 Risks, Lessons and Outlook (2025–2027)

- **Operational sustainability.** Maintain geoportal operations post-grant via SADC/member-state budget lines; institutionalise Communities of Practice and country focal-point networks.
- **Impact metrics.** Co-publish before/after indicators: hectares of wetlands under monitoring-informed management; response time to flood warnings; number of EIAs referencing WeMAST layers.
- **Innovation roadmap.** Refine BVIs; extend mobile data capture and crowdsourcing; standardise “mapographics” for policy reporting; deepen API integrations with national platforms and basin systems.

References (Chicago style)

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