Chapter 8 — GDZHIAO: Sustainable Wetlands and Floods Management in West Africa

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8.1 Background and Rationale

The **Sustainable Wetlands and Floods Management in West Africa (GDZHIAO)** consortium evolved from the Phase I *GDZHAO* wetlands-focused project (2017–2021) into a more comprehensive Phase II framework (2022–2025) that integrates **flood monitoring, early warning, and disaster-risk reduction**. Led by the **Centre de Suivi Écologique (CSE)** in Dakar, the consortium converts Earth-Observation (EO) and hydrological data into **operational services** for ecosystem protection and community resilience.[1]

Its geographic footprint spans **ten ECOWAS countries**—Benin, Burkina Faso, Côte d'Ivoire, The Gambia, Ghana, Guinea, Mali, Niger, Nigeria, and Senegal—covering transboundary wetlands such as the **Inner Niger Delta** and flood-prone basins including the **Volta, Niger, and Senegal Rivers**.[2] The consortium's network of about sixteen institutions includes the **Volta Basin Authority (ABV)**, **CERSGIS** at the University of Ghana, **CURAT** in Côte d'Ivoire, and **ARCSSTEE** in Nigeria, which joined Phase II to strengthen flood-forecasting integration.[3]

8.2 Strategic Objectives and Policy Fit

GDZHIAO's mandate is to **equip policymakers and technical agencies with geospatial evidence** for wetlands conservation and flood-risk reduction. The project advances three core priorities:

1. **Ecosystem resilience** through conservation and restoration;
2. **Disaster-risk management** via flood mapping and early-warning dissemination; and

3. **Food-security enhancement** through improved water-resources planning.[4]

These objectives align with **Agenda 2063**, the **Sustainable Development Goals (SDGs)**, and **ECOWAS** regional frameworks on disaster-risk reduction and climate adaptation.[5]

8.3 Service Portfolio and Methods (Phase I → Phase II)

8.3.1 User-Facing Services

Service Line	User Deliverables	Decision Applications	Phase Trajectory
Surface-Water Dynamics	Seasonal and annual maps of water-body extent and change	Wetland zoning; infrastructure siting	Baseline in Phase I → automated updates in Phase II
Water Turbidity (Quality)	Sediment/turbidity layers from optical imagery	Catchment management; irrigation planning	Pilots → routine layers
Invasive Aquatic Vegetation	Tracking of *Eichhornia crassipes* and other species	Control campaigns; navigation and fisheries impacts	Continuous service (Phases I–II)
Mangrove Mapping	Mangrove extent and change for coastal wetlands	Conservation and blue-carbon planning	Expanded in Phase II
Flood-Prone Area Mapping	Hazard maps, historical footprints, depth proxies	Land-use control; contingency planning	Scaled up in Phase II

Flood Forecasting / Early Warning	Alerts and comparative flood briefs (e.g., Senegal River 2023 vs 2024)	Civil-protection readiness; dam-release coordination	Strengthened in Phase II (ARCSSTEE integration)

8.3.2 Technical Foundations

GDZHIAO employs **Sentinel-1 SAR** and **Sentinel-2/Landsat** optical data to capture water extent, vegetation dynamics, and inundation patterns under cloud-prone conditions.[6]

Rainfall and river-gauge data contextualize EO observations for hydrological modelling. Comparative analyses such as *"Senegal River Valley: October 2023 vs October 2024"* are now routinely disseminated by CSE.[7]

Public Access Points:

- GDZHIAO Portal — https://gmes-gdzhiao.com
- GMES West Africa Blog — https://gmes4africa.blogspot.com
- CERSGIS Hub — https://gmes.cersgis.org

8.4 Development Trajectory and Activities

8.4.1 Phase I (2017–2021): Wetlands Foundations

The first phase focused on **wetland-extent mapping** and institutional workflows that later informed **Ramsar-site designations** and monitoring in several countries. Multilingual communication (English / French) ensured inclusive participation and established a strong user base.[8]

8.4.2 Phase II (2022–2025): Integration of Floods and Scaling Up

Date	Activity / Output	Significance

19–23 Jun 2023	*Annual Exchange Workshop (AEW-2023)*, Banjul (The Gambia)	Defined Phase II roadmap and early-warning architecture review.[9]
3 Nov 2023	*Volta Basin Policy Workshop* (Burkina Faso–Ghana)	Initiated bilateral SOPs for dam releases and alerts—first formal policy linkage.[10]
Oct–Dec 2024	*Comparative Flood Analyses (Senegal River 2023 vs 2024)*	Produced visual series for civil-protection planning.[11]
24–26 Jul 2024	*Cross-Regional Workshop (Dakar)* with University of Ghana / MarCNoWA	Strengthened inland–coastal flood interoperability.[12]

8.5 Decision Use and Early Effects

8.5.1 Translating Information into Action

1. **Volta Basin Policy and Operations.** EO-based analyses enabled **Burkina Faso–Ghana** collaboration on **dam-release SOPs** and real-time flood notifications under the ABV framework.[13]
2. **Urban Resilience.** Flood-hazard overlays informed drainage redesign and zoning in **Dakar and Niamey**, cited in municipal climate-action plans.[14]
3. **Food Security and Fisheries.** Annual flood-extent maps for the **Inner Niger Delta** and northern Nigeria supported fish-quota planning and adaptive cropping calendars.[15]

8.5.2 Indicators

Indicator	Current Status	Planned Outputs
Coverage & Partnerships	10 ECOWAS countries; ≈16 institutions	Phase II registry of partners and contacts

Early-Warning Outputs	Comparative flood briefs (2023–2024)	Lead-time / reach metrics; event archive
Policy Uptake	Volta Basin SOP dialogue (ABV, Ghana–Burkina Faso)	Before/after loss reduction and notification latency
Wetlands Health	Ongoing surface-water and turbidity monitoring	Basin-level condition index and restoration tracking

8.6 Capacity, Inclusion, and Co-Design

CSE organises **Annual Exchange Workshops (AEWs)** and bilingual technical clinics; all training resources are available through **ARCSSTEE's e-learning platform**.[16] The consortium collaborates with **MarCNoWA** on last-mile dissemination (SMS, radio) and with **WeMAST** on automation through **eStation 3** and **DUNIA** cloud processing.[17] Public awareness is fostered through plain-language "mapographics," local media, and social platforms.[18]

8.7 Tools, Portals, and Discoverability

- GDZHIAO (CSE) Portal — flood briefs and dashboards (https://gmes-gdzhiao.com)
- GMES West Africa Blog — regional stories and capacity events (https://gmes4africa.blogspot.com)
- CERSGIS GMES Hub — data access and partner listings (https://gmes.cersgis.org)

8.8 Alignment with Agenda 2063 and the SDGs

GDZHIAO contributes to:

- **Aspiration 1 (Prosperity & Sustainability):** safeguarding wetlands and mitigating flood impacts;

- **Aspiration 3 (Good Governance):** transboundary cooperation through SOPs;
- **Aspiration 6 (People-Driven Development):** inclusive capacity building;
- **Aspiration 7 (Global Player):** African-led EO innovation.[19]

It supports **SDG 6 (Water)**, **SDG 11 (Cities)**, **SDG 13 (Climate Action)**, **SDG 2 & 1 (Food and Livelihoods)**, and **SDG 15 & 14 (Biodiversity)**.[20]

8.9 Risks, Lessons, and Outlook (2025–2027)

The forthcoming cycle prioritises **institutionalisation, impact metrics, and interoperability**.

- *Institutionalisation:* finalise SOPs and publish "service playbooks" linking alerts to agency actions.[21]
- *Impact Metrics:* develop longitudinal datasets on alert lead-time, populations reached, and losses avoided.[22]
- *Interoperability:* sustain harmonisation with **WeMAST** and **MarCNoWA**, leveraging **eStation 3** and **DUNIA** platforms for regional efficiency.[23]

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