# Chapter 5 — MarCNoWA: Marine & Coastal in North & West Africa (UG/RMC)

*Marine and Coastal Areas Management in North and West Africa — Lead Institution: University of Ghana (Regional Marine Centre)*

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## 5.1 Background and Rationale

Coastal zones in North and West Africa sustain tens of millions of people through fisheries, trade, energy, and tourism, yet exposure to **marine hazards** (rough seas, storms), **oil spills**, **IUU fishing**, **shoreline change**, and **ecosystem degradation** is rising. The **Marine and Coastal Areas Management in North and West Africa (MarCNoWA)** consortium under **GMES & Africa** converts satellite Earth Observation (EO) and oceanographic modelling into **operational public services** for safer seas and a more sustainable blue economy. Coordinated by the **University of Ghana (UG) — Regional Marine Centre (RMC)**, MarCNoWA operates across **18 coastal countries** (12 in West Africa; 6 in North Africa) in partnership with national agencies and regional maritime bodies to turn data into day-to-day decisions.

**Geographic coverage.** West Africa: Benin, Cabo Verde, Côte d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Nigeria, Senegal, Sierra Leone, Togo. North Africa: Algeria, Egypt, Libya, Mauritania, Morocco, Tunisia.

**Strategic approach.** Co-design with end-users; multi-channel dissemination—**app, USSD, SMS/WhatsApp, radio, beach flag systems**; progressive institutionalisation via **MoUs** and **SOPs** embedded in authority workflows.

## 5.2 Leadership, Partners, and Governance

**Lead institution.** University of Ghana (Regional Marine Centre) — technical and coordination hub.

**Core partners (illustrative).** Ghana Meteorological Agency (GMet); **CEDARE** (oil spill portal, North Africa outreach); **CERT** (Tunisia); **UCD** (Chouaib Doukkali University, Morocco); national fisheries and ocean agencies across WA/NA; technical support from **EUMETSAT** and **EC-JRC**.

**Security & fisheries users. MMCC Zone F (Gulf of Guinea)** and **FCWC** (Fisheries Committee for the West Central Gulf of Guinea) are priority end-users for vessel surveillance and fisheries intelligence.

## 5.3 Service Portfolio and Methods (Phase I → Phase II)

### *5.3.1 What the services deliver*

| **Service line** | **What users receive** | **Typical decisions supported** | **Phase trajectory** |
|---|---|---|---|
| **Ocean State & Marine Weather Early Warning** | Daily maps and alerts (today + 3-day outlook) categorising sea state (Calm/Rough/Dangerous) via app, **USSD**, **SMS/WhatsApp**, radio, and **beach flags** | "Go/No-go" for artisanal fleets; harbour-master safety notices; SAR readiness | Piloted in 12 WA countries (Phase I) → **18 countries (Phase II, 2022)** |
| **Oil Spill Detection & Monitoring** | Near-real-time **Sentinel-1 SAR** detections; spill footprint maps; proximity to sensitive coasts; **drift modelling**; web portal | Pollution alerts; boom placement; evidence for enforcement | New/expanded in Phase II; integrated web app **released 2024** |

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|---|---|---|---|
| **Fishing Vessel Surveillance (AIS + SAR)** | Daily density maps and "anomalies" (dark targets, loitering, PA incursions); periodic country traffic reports; interactive portal | Targeting IUU patrols; closure compliance; maritime domain awareness | Regular distribution since **Aug 2022** across 18 EEZs |
| **Potential Fishing Zones (PFZ)** | Daily maps of likely productive grounds (SST fronts, chl-a, upwelling), delivered as JPEG/GeoTIFF and via GMES-UG app | Cooperative advisories; patrol focus; closure justification | Established Phase I; refined **GAM/OPFish** models and wider delivery in Phase II |
| **Coastal Ecosystems & Vulnerability** | Mangrove/shoreline change; vulnerability screening; site-level change atlases | Restoration targeting; coastal set-backs; MSP | Phase I pilots → Phase II mainstreaming (site expansion) |

***Methods in brief.***

- **Marine weather:** CMEMS wave models drive significant wave-height thresholds (e.g., >2.5 m = "Dangerous") simplified for fishers.
- **Oil spills: Sentinel-1 SAR**—slicks as dark patches; look-alike filtering; **oil-drift model** projects movement for response.
- **Vessels: AIS** fused with **SAR** to reveal "dark" ships and behaviours (loitering, transhipment, protected-area encroachment).
- **PFZ:** Daily **Sentinel-3** SST and ocean colour (chl-a), plus MODIS where useful, combined via **GAM** or **OPFish** index to flag productive grounds.

**Public entry points (general readers).** MarCNoWA site (service overviews); **Geoportal** (interactive layers, downloads); **USSD/app** shortcodes for ocean-state alerts (e.g., Ghana **920*88#*, Nigeria **347*87#*).

## 5.4 Achievements and Activities (dated)

### *5.4.1 Phase I (2018–2021): Foundations*

- PFZ and ocean-variable monitoring launched; monthly ocean bulletins for the Guinea Current LME; pilots on mangroves/shoreline change.
- **User-centred dissemination**: early adoption of **USSD/SMS**, community **flag systems**, and **radio briefs** to reach artisanal fleets.

### *5.4.2 Phase II (2022–2025): Scale-up and institutional use*

| Date | Output/activity | Why it matters |
|---|---|---|
| **Q1 2022** | Phase II launch; coverage extended to **18 countries**; North-African partners (CEDARE, CERT, UCD) onboard | Regional scale and North–West knowledge transfer |
| **Aug 2022** | Fishing Vessel Monitoring reports begin across all EEZs; agency registration opened | Systematic IUU intelligence for enforcement hubs |
| **14–16 Feb 2023** | UG–Mercator Ocean International training on CMEMS data & MarCNoWA services | Builds technical capacity across partner agencies |
| **Nov 2023** | GMES & Africa Forum (Sharm El-Sheikh): cross-regional MoU (e.g., with CICOS) | Pan-African interoperability & knowledge sharing |

| | | |
|---|---|---|
| **Jul 2024** | Steering Committee, Dakar: unveiling **integrated oil-spill + vessel** web app (SAR + AIS + drift); success stories (Egypt, Tunisia, Côte d'Ivoire, Senegal) | Major tech milestone: end-to-end pollution + MDA portal |
| **4 Jul 2024** | **UG–Ghana Navy** high-level meeting & **MoU** to strengthen Maritime Domain Awareness and data sharing | Institutional anchoring for security uptake of EO tools |

**North Africa use-case (Egypt).** Through **CEDARE**, the **EEAA** receives rapid oil-spill detections/alerts via the new portal, enabling quicker containment and reduced environmental/economic damage.

## 5.5 Decision Pathways and Effects

### *5.5.1 How information becomes action*

- **Safety at sea.** GMet and partner NMHSs issue **daily ocean-state alerts** via mobile, **USSD**, and radio; **beach flag systems** translate risk at landing sites—reducing departures in dangerous conditions and strengthening SAR readiness.
- **Pollution response.** SAR detections trigger environment-agency alerts (email/WhatsApp); **drift models** guide boom placement and shoreline protection; integrated portal tools shorten response time.
- **Fisheries enforcement. AIS+SAR** fusion reveals **dark vessels**, loitering, and protected-area incursions; **MMCC** and national agencies use density/anomaly maps for patrol tasking and closure monitoring.
- **Livelihood support. PFZ maps** help cooperatives plan effort and reduce fuel costs; **FCWC** overlays PFZ with vessel activity to prioritise Monitoring, Control, and Surveillance (MCS).

### *5.5.2 Indicators (status & plans)*

| Indicator | Current status / examples | Planned publication |
|---|---|---|
| Public platforms | MarCNoWA website & Geoportal online; app/USSD alerts operational | Annual release notes (uptime, update cycles, user stats) |
| Security uptake | **UG–Ghana Navy MoU**; routine feeds to **MMCC Zone F** | Before/after metrics: interceptions, response times, patrol cost per infraction |
| Fisher safety | Multi-channel alerts and beach-flag practice embedded | Incident trends (per 10,000 trips); targeted awareness drives |
| Fisheries compliance | Seasonal-closure monitoring using PFZ + density maps (e.g., Ghana, Côte d'Ivoire; planning support for Benin 2024) | Annual compliance dashboards; geo-referenced case logs |
| Pollution control | Operational oil-spill portal with drift model; **EEAA** alerts and actions (Egypt) | Event logs with time-to-alert and time-to-contain indicators |

### 5.6 Capacity Building and Inclusion

**Training.** Continuous cycles on **CMEMS** data/use (UG–Mercator, Feb 2023); vessel-data analytics (AIS) with **UNESCO/IOC Africa** and partners; **FCWC** workshops on PFZ interpretation and operations.

**Last-mile design.** Services tailored for low-connectivity users via **USSD**, **SMS**, community WhatsApp groups, **radio**, and **flag systems**; manuals are translated and visualised for non-technical audiences.

### 5.7 Tools, Portals, and Discoverability

- **Project hub:** MarCNoWA service descriptions & news (UG/RMC).
- **Geoportal:** Interactive layers & downloads (oil-spill detections, PFZ, vessel density/anomalies).
- **Ocean-state alerts:** USSD shortcodes and GMES-UG mobile app (Android/iOS).
- **News & briefs:** Safety-at-sea outreach; IUU surveillance updates.

### 15.8 Alignment with Agenda 2063 and the SDGs

**Agenda 2063 (active contributions).**

- *Aspiration 1*: Blue-economy growth via safer navigation, reduced pollution, sustainable fisheries.
- *Aspiration 2*: Regional integration through shared maritime domain awareness (FCWC/MMCC).
- *Aspiration 3*: Evidence-based governance through routine portals, alerts, and SOPs.
- *Aspiration 6*: People-driven development via inclusive dissemination (USSD/SMS/radio/flags) and community training.

**SDGs (primary links).**

- **SDG 14** (Life Below Water) — pollution control & fisheries management;
- **SDG 13** (Climate Action) — marine hazard early warning;
- **SDG 1/2** — safer, more efficient fishing livelihoods & food security;
- **SDG 9** — operational portals & decision systems.

### 15.9 Risks, Lessons, and Outlook (Next 24 Months)

- **Sustainability & O&M.** Maintain 24/7 **SAR/AIS ingest** and model runs; publish **SOPs** mapping each alert to agency action (e.g., Navy/Maritime Authority patrol tasking; Environment Agency spill response).
- **Interoperability.** Deepen cross-consortia links—e.g., inland–coast handshakes with **CICOS/GERNAC** for flood-to-coast scenarios.
- **Impact metrics.** Release before/after indicators: (i) fisher incidents per 10,000 trips, (ii) time-to-alert & time-to-contain for spills, (iii) IUU detections leading to action, (iv) fuel saved via PFZ advisories.

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