Chapter 2 — Monitoring Natural Resources and Food Security in Eastern Africa (IGAD/ICPAC)

Monitoring Natural Resources and Food Security in Eastern Africa — Lead Institution: Intergovernmental Authority on Development (IGAD) Climate Prediction and Applications Centre (ICPAC)

2.1 Background and Rationale

Eastern Africa encompasses some of the continent's most ecologically diverse systems—semi-arid rangelands, montane and coastal forests, lakes, and coral-fringed coasts. These landscapes sustain food security, biodiversity, and rural livelihoods but are increasingly stressed by climate variability, fire, invasive species, land-use change, and population growth.

The **IGAD Climate Prediction and Applications Centre (ICPAC)** leads the *GMES & Africa* consortium **"Monitoring Natural Resources and Food Security in Eastern Africa,"** whose mission is to embed **Earth Observation (EO)** data—satellite imagery, derived indicators, and model outputs—into routine decisions of ministries, wildlife and forestry authorities, disaster-risk offices, and community programmes.

The consortium's goal is *timely, actionable, and accessible evidence* for planning and operational response. It monitors rangelands, forests, and agricultural zones to support food security, biodiversity conservation, and climate resilience through products such as drought early warnings, forage outlooks, fire alerts, and habitat-condition assessments.

Geographic coverage. Services extend across fourteen countries—Comoros, Djibouti, Eritrea, Ethiopia, Kenya, Madagascar, Mauritius, Rwanda, Seychelles, Somalia, South Sudan, Sudan, Tanzania, and Uganda—ensuring consistent regional indicators while allowing national adaptation and uptake.

2.2 Leadership, Governance, and Stakeholders

Lead institution. ICPAC, IGAD's specialised climate centre, hosts the consortium and operates the regional EO platforms, collaborating with a broad network of national and academic partners.

Representative partners. Key institutions include the **Wildlife Research and Training Institute (WRTI)** and **Kenya Wildlife Service (KWS)** (Kenya), the **Tanzania Forest Services Agency**, the **Sudan Ministry of Animal Resources**, and **Makerere University** (Uganda).

Institutional engagement. Phase II recorded collaboration with approximately **458 institutions** spanning government, academia, NGOs, and the private sector—demonstrating a deliberate strategy to pair regional platforms with national and local uptake.

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

2.3.1 Catalogue of Operational Services

Service Theme	Deliverables	Supported Decisions	Phase Progression
Natural habitats monitoring	Land-cover and habitat-condition layers for parks and ecological corridors	Park zoning, corridor protection, environmental impact assessments	I → II (routine)
Rangeland condition and early warning	Pasture-status and anomaly layers, fire/burned-area maps, forage outlooks	Livestock movement planning, drought measures (water points, fodder)	I → II (expanded)
Agricultural seasonal monitoring	Seasonal crop-condition and rainfall/vegetation advisories	Planting choices, contingency	I (maintained)

		planning, assistance targeting	
Forest cover monitoring	Loss, degradation, and fire alerts; regeneration tracking	Enforcement, restoration targeting, carbon baselines	II (new)

Phase II consolidated earlier mapping efforts into *operational* services—adding a dedicated forest line and stabilising rangeland and habitat products through regular updates.

2.3.2 Methods in Brief

Products combine Sentinel-1/2 and Landsat imagery with rainfall and vegetation indices; fire layers derive from hotspot and burn-scar analytics. Rangeland modules include forage-availability modelling, while forest modules integrate change detection and alerting for enforcement and restoration planning.

2.4 Public Platforms and Data Access

- **ICPAC GMES Hub:** A unified portal giving access to three operational platforms (forests, rangelands, habitats) with both expert (GeoTIFF/vector) and simplified (PDF, dashboard) outputs.[1]
- **Programme pages and releases:** Regular institutional updates describing roll-outs, trainings, and user stories.

Accessibility and refresh consistency define the consortium's "operational" standard; Phase II prioritised both discoverability and systematic data updates.

2.5 Achievements and Activities

2.5.1 Phase I (2017–2021): Establishing Foundations

Three core service lines—habitats, agriculture, and rangelands—were launched, accompanied by an initial geo-portal and early capacity building (≈ 60 national staff trained and two Master's scholarships).

2.5.2 Phase II (2022–2025): Scaling and Routine Operations

Date / Period	Output or Activity	Source / Evidence	Users	Immediate Value
2022–2025	Forest-cover monitoring added; three platforms fully functional	Consortium records	Environment and wildlife agencies	Closed critical information gap; ensured regional updates
2023	Testimonial on EO for protected-area planning (Uganda)	UWA statement	UWA planning teams	Institutional integration of EO in management plans
Jul 2024	Rapid fire assessment — Amboseli National Park (564 ha mapped in one week via Sentinel-2)	WRTI / KWS	KWS, WRTI	Guided rehabilitation priorities; demonstrated rapid-assessment utility
2024	Invasive-species mapping — Tsavo and Oldonyo Sabuk	WRTI records	Park managers, county stakeholders	Established baselines for control programmes
2024–2025	Regional workshops and user trainings	Consortium templates	Ministries, universities	Broadened user base; standardised methods

2025 (to date)	≈ 500 institutions accessing data; > 1,100 people trained; > 3 TB downloads	Monitoring template	Regional community of practice	Confirms demand and operational status

Together these records confirm the transition from pilot to institutionalised, region-wide service delivery.

2.6 Decision Pathways and Measurable Effects

How Information Becomes Action

- **Habitat and park management:** Land-cover and fire layers inform zoning, restoration, and corridor protection. In Amboseli National Park (July 2024), a 564 ha burn scar was mapped and validated within a week, guiding rehabilitation and patrol deployment.
- **Rangeland early warning:** Forage and pasture-condition products enable drought preparedness and resource-conflict mitigation. In Mwea National Reserve, EO evidence of vegetation decline linked to elephant density supported translocation measures.
- **Forest monitoring:** Loss, degradation, and fire alerts underpin enforcement and restoration, providing baselines for national and project-level reporting (e.g., Kibale National Park, Uganda).

Indicators

Indicator	Current Status	Planned Publication
User reach	≈ 500 institutions; > 3 TB downloads	Annual usage digest (country distribution, top layers)

Human capacity	> 1,100 trained	Training atlas with gender/youth statistics
Operational platforms	Three platforms (forests, rangelands, habitats)	Release notes on update frequency and uptime
Case outcomes	Amboseli rehabilitation, Tsavo/Oldonyo invasive control	Before/after maps and trend statistics

2.7 Capacity Development and Inclusion

Over **1,100 participants**—including ministry analysts, park ecologists, county planners, and university researchers—were trained during Phase II. Many now serve as institutional EO focal points integrating satellite analytics into planning frameworks. The consortium's mapping of ≈ 458 organisations highlights a growing regional *community of practice* in operational EO.

2.8 Illustrative Case Studies

A. **Rapid Fire Assessment – Amboseli National Park (Kenya, July 2024).** A wildfire near Iremito Gate burned ~564 ha. WRTI and KWS deployed field teams; Sentinel-2 imagery validated the burn scar within one week, producing a rehabilitation map that prioritised reseeding zones and patrol routes.

B. **Invasive Species Mapping – Tsavo and Oldonyo Sabuk (Kenya, 2024).** Baseline maps for *Prosopis juliflora* and *Opuntia stricta* were generated using NDVI time-series, allowing for the quantification of control success and guiding the implementation of mechanical and biological interventions.

C. **Uganda Wildlife Authority (UWA) Testimonial (2023).** UWA integrated EO fire, land-use, and climate data into General Management Plans for protected areas—formalising EO use within institutional planning cycles.

2.9 Alignment with Agenda 2063 and the SDGs

Agenda 2063 links

- *Aspiration 1* – Environmentally sustainable, climate-resilient economies (climate-smart agriculture and restoration).
- *Aspiration 3* – Evidence-based governance through routine EO integration.
- *Aspiration 6* – People-driven development via co-management and community advisories.
- *Aspiration 7* – A strong and resilient Africa through regional platforms and partnerships.

SDG contributions

- **SDG 2 – Zero Hunger:** Crop monitoring and drought early warning.
- **SDG 13 – Climate Action:** Rangeland drought risk and fire analytics.
- **SDG 15 – Life on Land:** Habitat and forest monitoring for restoration and biodiversity.
- *Cross-cutting:* SDG 6 (water ecosystems) and SDG 1 (livelihoods).

2.10 Sustainability and Outlook (2025–2027)

Operational continuity. ICPAC will maintain the three platforms with scheduled updates and publish usage and training statistics, ensuring transparency and reliability.

Institutionalisation. Co-developed **Standard Operating Procedures (SOPs)** will link each alert or layer to a concrete action (patrol deployment, grazing adjustment, restoration plan). Cross-consortia collaboration will sustain harmonised methods and cost-efficiency.

Evidence release plan. Over the next cycle, ICPAC will publish before-and-after indicators for key cases—burned area rehabilitation (Amboseli), invasive cover reduction (Tsavo/Oldonyo), and forest restoration gains (Kibale)—alongside service release notes on uptime and update frequency.

References

1. ICPAC GMES Hub. *Monitoring Natural Resources & Food Security Platforms* (2025). https://gmes.icpac.net
2. WRTI & KWS. *Amboseli Fire Assessment Report* (July 2024).
3. Uganda Wildlife Authority (UWA). *EO Integration into Protected Area Management Plans Statement* (2023).
4. IGAD Climate Prediction and Applications Centre (ICPAC). *Phase II Progress Template and Training Atlas (2025)*.