

Session 8: Human Resource Capacity in Geodesy: summary notes

GGOS-Africa 2026 Workshop, Nairobi · Wednesday 7 October 2026 · 11:19–13:00 EAT

Moderator: Roelf Botha

Written from the Zoom transcript, cross-checked against the speakers' slides. Audience speakers' names are given only where they could be identified with reasonable confidence. Figures are as presented. Please check against the recording before quoting anyone.

Key points

- **Training exists, but not at the top end.** The continental survey found plenty of geospatial programmes, mostly at bachelor's and master's level. The **top five training gaps** are:
 1. CORS installation, maintenance and operation;
 2. GNSS network design and processing;
 3. geodetic reference systems;
 4. geoid modelling;
 5. space geodesy (VLBI, SLR, DORIS).
- **The workforce is ageing and thin.** The UN-GGCE *State of Geodesy 2026* scores Africa 1.7/5 for training and education and 1.3/5 for knowledge management. Almost no geodesists in the room were under 40.
- **Regional centres offer channels that already exist.**
 - AFRIGIST (ex-RECTAS, Ile-Ife) runs postgraduate programmes and is launching master's and PhD programmes in geodetic science and hydrography. It has two new CORS (AFR1, AFR2) it will contribute to AFREF.
 - RCMRD has run an annual AFREF and GNSS workshop since 2007. It proposes a three-track "Frame to Parcel Africa" programme from 2027, with GGOS-Africa co-owning the "Frame" track.
- **A proposed Pan-African Geodetic Research Consortium (PAGRC):**
 - 10 PhDs and 20 master's students across 5 regional nodes over 4 years (about US\$2.5M).
 - It would start with a US\$35k workforce and curriculum survey.
 - It would work under AFREF, GGOS-Africa and UN-GGIM: Africa, not as a new body.
- **Retention is the hard part.** Graduates trained abroad often don't return, and graduates trained at home are lost to industry. Ideas raised: train in-house, fund research posts (as DARA does for astronomy), bring in people from neighbouring disciplines, and share teaching across the continent by e-learning.

Talks

Godfrey Ogonda: Assessment of the Geodetic Human Capacity in Africa

(GGOS-Africa project Work Package 2; the infrastructure half was presented on Monday)

- **Method:** questionnaire (online and some face-to-face interviews) plus desktop review. Sections covered education and training, technical skills, and training needs.
- **Respondents:** 30 from about 20 countries: 14 public universities, 1 private university, 14 government agencies and 1 regional organisation.
- **Training areas** (share of institutions): cartography 23%, land information systems 25%, GIS 26%, surveying/geospatial/geodesy 26%.
- **Training levels:** certificate 6%, diploma 13%, bachelor's 34%, master's 29%, doctorate 18%.
- **Software skills:** most respondents reported they were comfortable with the geodetic processing software they use (Likert self-assessment).
- **Top training needs:**
 1. CORS installation, maintenance and operation (18%)
 2. GNSS network design and data processing (15%)
 3. Geodetic reference systems (13%)
 4. Geoid modelling (12%)
 5. Space geodesy: VLBI, SLR, LLR, DORIS (11%)
 - Then emerging technologies (UAVs, LiDAR, cloud GIS) 9%, new tools and software 7%, coding/AI/ML 6%, ITRF-to-national transformations 5%, and network adjustment.

- **Preferred training mode:** blended 50%, face-to-face only 43%, online only 7%.
- **Conclusions:**
 - Most countries have professional bodies that certify or license geospatial practice (95%).
 - The top-five gaps should be checked against existing curricula and built into university courses or CPD.
 - The survey has gaps; more sources are needed to validate it.

Lazarus Ojigi: Geodesy Education at AFRIGIST

(Executive Director, African Regional Institute for Geospatial Information Science and Technology, Ile-Ife, Nigeria)

- **History:**
 - Founded in 1972 under UNECA as RECTAS (Regional Centre for Training in Aerospace Surveys), following the 1963 UN Cartographic Conference for Africa.
 - It is bilingual (English/French), an intergovernmental body with diplomatic status in Nigeria, and open to all African countries (not only West and Central Africa).
 - It is on the Obafemi Awolowo University campus.
- **Programmes:**
 - Mainly postgraduate (PGD, master's, PhD) plus modular short courses, accredited by CAMES.
 - Delivered with partners including OAU, FUT Akure and Université d'Abomey-Calavi (Benin).
 - About 12 programmes and 25 academic staff. About 59 graduates this year; about 4,000 trained since founding.
 - Fees are waived for member-state candidates within quota, and students receive stipends.
 - It also trains military personnel (navigation, search and rescue).
- **New:** an MSc and PhD in **geodetic science** and in **hydrography and coastal management** with the University of Lagos. They are about 95% ready but waiting on the university to sign the MoU.
- **Geodesy content:** projections, reference systems, geometric and physical geodesy, GNSS processing, control surveys, hydrography and UAV mapping.
 - Teaching relies on global gravity models because local data are lacking. Graduates then can't operationalise their skills at home.
 - He urged countries to invest in their own data (citing Tanzania's airborne gravity survey).
- **Infrastructure:** two new CORS installed in May 2026 (**AFR1, AFR2**; 1 s data, solar power, uninterrupted internet), to be contributed to AFREF and IGS. The old 2007 Leica station is obsolete. A vendor network across Nigeria is available to students for research.
- **Services:**
 - Geological mapping in southern Mali.
 - Border-delimitation training in The Gambia (Nov 2025, with GIZ and AUBP).
 - An MoU with the AU Commission on border management (June 2026).
 - SDI prototypes, and training for the Nigeria Customs Service and the Geological Survey.
- **Challenges:** funding, staff, and obsolete laboratory equipment. **Call for horizontal collaboration** across African institutions.

Martin Murimi: Geodesy Education at RCMRD: From Frame to Parcel

(Regional Centre for Mapping of Resources for Development, Nairobi)

- **Who trains the operators?** Senegal and Uganda were trained by the IGN FI consortium when their CORS networks were set up. Later, Ugandan technicians still asked RCMRD for help. "The knowledge must also stay in Africa."
- **The need:**
 - World Bank (2013): fewer than 10 land surveyors per million people in Ghana, Kenya and Uganda, against 197 in Malaysia, a 20× gap.
 - About 63 geodesists from 29 countries came to the UN-GGCE workshop in Nairobi in May 2025. The hunger is there; a programme is needed every year, not once.
- **RCMRD:**
 - Founded 1975 under UNECA; 20 member states in Eastern and Southern Africa; 50+ years.
 - Co-operates 4 CORS hosted at partner universities, with 15 more looking for host partners.

- Its training institute (since 2018) runs certificate and diploma courses.
- **An existing channel:** an annual AFREF and GNSS workshop since 2007, with a sponsored nominee from each member state.
 - In 2026 it switched to a Land Information Management Systems course instead (55 participants, 21 countries).
 - Land officers kept asking about datums, epochs and CORS: “the two halves have to talk to each other.”
- **“Frame to Parcel Africa”** (proposed from 2027), three tracks:
 - **A, Frame:** AFREF, epochs, velocities, dynamic datums, geoid. RCMRD is weakest here and wants GGOS-Africa to co-own it.
 - **B, Position:** CORS, RTK/PPP. RCMRD’s strength.
 - **C, Parcel:** LIMS and cadastre.
- **Self-assessment against the top-five needs:** strong on CORS and GNSS networks; medium on reference systems; weak on geoid and space geodesy (summer school idea with SARAO and Manchester).
- **“The geodesist of 2035: half engineer, half data scientist, fully African.”** Able to handle dynamic frames, AI-based quality control and InSAR+GNSS, and to explain all this to an MP.
- **Three offers:**
 1. GGOS-Africa co-owns the Frame track from 2027.
 2. Three regional hubs with one shared curriculum: RCMRD (East/South), AFRIGIST (West/Central), CRTEAN (North).
 3. A modular, stackable geodesy curriculum with shared AFREF datasets.

Charles Paradzayi: The Pan-African Geodetic Research Consortium (PAGRC)

(Midlands State University, Zimbabwe)

- **The problem:**
 - UN-GGCE *State of Geodesy 2026* scores: training 1.7/5, knowledge management 1.3/5, and no workforce data for Africa at all.
 - Infrastructure is accelerating (AFREF WG re-established, a second computation planned, GGOS-Africa launched) but the workforce is not: “A CORS station can be installed in a season. A geodesist takes four years.”
 - Tuesday’s show of hands: no geodesists in the room under 40. “Who will be running Africa’s geodetic infrastructure in 2040?”
- **The node gap (participant map):** 51 participants from 18 countries. Eastern Africa 21, Southern 16, Western 6, Northern 1, Central 1. **Northern and Central Africa together: two people.**
- **The missing tier:** short courses exist (RCMRD, AFRIGIST, UN-GGCE, FIG), but **doctoral and master’s research training is missing**, and that blocks analysis-centre capability. The “crab” analogy: you cannot teach young crabs to walk straight if the teachers walk sideways, so supervisors must be properly trained first.
- **Proposal:** 10 doctoral candidates and 20 master’s researchers in 5 regional nodes over 4 years, with cascading mentorship. It would work under the technical direction of AFREF, GGOS-Africa and UN-GGIM: Africa, as a training arm, not a new coordinating body. Draft node themes:
 - **East:** rift tectonic and volcanic deformation.
 - **South:** transboundary water security (Zambezi, Okavango, Limpopo).
 - **West:** coastal subsidence and dynamic vertical datums.
 - **North:** transboundary aquifers and delta subsidence.
 - **Central:** Congo Basin forest biomass.
- **Budget, in phases:**
 - US\$35k for a 12-month African Geodetic Workforce and Curriculum Survey.
 - US\$240k for an 18-month foundation phase with two pilot PhDs.
 - About US\$2.5M for the full 4-year consortium.
- **Three asks:**
 1. Name research training and workforce development as a continental priority in the resolutions.
 2. Expressions of interest from universities that can host nodes (Northern and Central Africa are needed).
 3. Help funding or hosting the survey. He will be at AARSE (Harare, 26–30 October). The aim is a

proposal by year-end and a consortium running in 2027.

Interactive discussion

- **Ziggah (UMaT, Ghana), a personal story.**
 - In 2008 Ghana had about three geodesists. He was sent to China for a master's and PhD (2010–2017) and came back the only geodesist at his university.
 - He built a research group from undergraduates. Five are now at LSU, one completed a PhD in Hong Kong and one is a postdoc in Austria, but **they don't come back**.
 - UMaT is therefore seeking accreditation for its own geodetic engineering MPhil and PhD, so that it can train people in-house who will stay.
- **Roelf Botha:** South Africa has the same problem. People get trained, move to industry and disappear.
- **Jack Radcliffe:**
 - “There is one person under 40, and I'm here.”
 - The curricula shown are very GNSS-focused. Africa should build expertise in other space-geodesy techniques even without the infrastructure, for resilience (“if the US turn off their VLBI array... how do you know?”).
 - Trainer pipelines take a long time, so expect a gap as people retire. Bring in people from neighbouring disciplines.
 - Learn from the **DARA** astronomy programme (about £8.1M per cycle; about 1,500 students, many from physics and maths). It funds research posts at African universities so graduates can return, but new faculty are often swamped by teaching.
- **Ojigi:**
 - Agreed. AFRIGIST's curriculum covers eight branches of geodesy, including astrometry.
 - Teaching is GNSS-heavy because GNSS is accessible end to end; elsewhere students only manipulate global data.
 - Proposed **continental e-learning**: AFRIGIST is installing a large LED screen so that, for example, Saria could lecture from Dar es Salaam.
 - Ghana chairs AFRIGIST's Governing Council, so UMaT should collaborate with KNUST and AFRIGIST.
- **Participant to Ojigi and Paradzayi:**
 - What do AFRIGIST's graduate follow-ups show about retention? **Ojigi:** students are already employed by agencies, receive stipends, and their promotion is tied to AFRIGIST's evaluation, so few leave. AFRIGIST's own staff, however, have been lost to the US, Canada and South Africa.
 - What does “blocked by 2” on the PAGRC slide mean? **Paradzayi:** analysis-centre capability (tier 3) depends on research training (tier 2), which is missing. It draws on the UN-GGCE scores.

Session closed at 13:00 for lunch, resuming 14:00 with a link-up to GGOS Days.

Actions and follow-ups mentioned

- Expressions of interest to Charles Paradzayi (paradzayic@staff.msu.ac.zw) from universities able to host PAGRC nodes, especially in Northern and Central Africa; help sought for the US\$35k workforce and curriculum survey.
- RCMRD's offer: GGOS-Africa to co-own the “Frame” track of Frame to Parcel Africa from 2027 (training@rcmrd.org).
- AFRIGIST's AFR1 and AFR2 CORS data to be contributed to AFREF and IGS.
- Ojigi to share his framework for integrated geodetic capacity development in Africa.
- Explore lessons from the DARA programme for a geodesy equivalent.