PASS NETZERO

Student Research Advancement Report

May 2026

Report Period	May 2026
Reporting Date	May 16, 2026
Source Documents	GA Meeting transcript (May 13, 2026) + student presentation slides (all 5 students)
Universities	NUST Namibia • LUANAR Malawi
Active Students	5 (3 NUST Namibia, 2 LUANAR Malawi)
Programme Coordinator	Claude Martinet, President — Pass NetZero

PROGRAMME CONTEXT & COORDINATOR'S OVERVIEW

This report draws on two complementary sources: the Pass NetZero General Assembly Meeting held on 13 May 2026 (full transcript) and the individual student presentation slides submitted for that meeting. Together these provide an unusually complete picture of each student's progress, combining the verbal Q&A and supervisory feedback from the transcript with the precise numerical data and methodological detail from the slides.

All five students are now in active Phase 2 experimentation. The Namibian students (NUST) have generated substantial datasets; the Malawian students (LUANAR) are either mid-experiment or at the threshold of implementation. This report is the most data-rich of the series to date, reflecting a programme that has moved decisively from planning into evidence generation.

The GA meeting also featured participation from external experts — Dr. Ignacio Rodriguez (Rio Cruces Wetland Center, Chile; RAMSAR STRP), Dr. Dikabo Mogopodi (University of Botswana), Dr. Thaisa Michelan (Brazil), and Dr. Kossi Hounkpati (Togo) — whose feedback is incorporated in the individual student sections below.

PROGRAMME HIGHLIGHTS — MAY 2026

Key Developments This Period

- All five students presented research progress at the General Assembly (May 13, 2026) to an international panel of supervisors and invited experts.
- Fenni Amadhila (NUST): objectives 2, 3, and 4 substantially complete — full CHNS characterisation data obtained, mortar testing across three methods and three locations finalised.

- Veruschka Dumeni (NUST): 4 of 6 sampling events complete; baseline hypereutrophic status of Goreangab Dam quantitatively confirmed; clear visual and parametric improvement trends emerging.
- Steven Chirwa (LUANAR): experiment fully operational at Kauma STP; bi-weekly data collection underway through May 2026.
- Ellen Kachulu (LUANAR): tanks set, fingerlings secured, most chemicals sourced — implementation expected within days of the GA.
- Hilia Hatutale (NUST): Dutch bucket system successfully installed; both Cyperus species procured; acclimatisation begun 14 May 2026.
- Preliminary AI performance evaluations completed: Veruschka highest overall (10/10 report consistency); Steven most consistent (8/10 across all categories); Fenni impact potential 9/10.
- Dr. Thaisa Michelan (Brazil) expressed interest in future collaboration and offered a dedicated 30-minute presentation to the student cohort.
- Documentary preview (Malawi footage) shared by Takondwa Senzani — positively received by all panel members.
- New collaboration approach from AEST organisation (Togo) noted.

ITEMS REQUIRING COORDINATOR ATTENTION

⧗ HIGH — Veruschka Dumeni: Laboratory analysis backlog

- TN and TP (persulfate digestion): in progress but delayed by persistent NaOH neutralisation overshooting. Expected resolution: next 4–6 weeks.
- COD (closed reflux): reagents prepared but deprioritised due to capacity constraints. Expected: next 4–6 weeks.
- Heavy metals (ICP-OES, Cr/Zn/Pb/Cu/Cd): machine part now received — analysis can resume. Expected: upon instrument availability.
- Biomass data: collected but not yet digitised. Expected: next 2–3 weeks.
- Action: Monitor lab throughput; confirm ICP-OES recommission date; clear TN/TP backlog before end of sampling.

⧗ MEDIUM — Hilia Hatutale: Wastewater supply and schedule delay

- Experiment delayed from May to July 2026; Gammams Water Care Works unable to supply sufficient wastewater volume at time of request.
- Container procurement for wastewater transport still outstanding.
- Acclimatisation begun 14 May — but full experimental volume not yet secured.
- Action: Escalate wastewater procurement if needed; confirm July start is still achievable.

⧗ MEDIUM — Steven Chirwa: Laboratory instrument access

- Limited access to advanced analytical instruments causing delays in sample processing (grinding equipment unavailable, reagent shortfalls).
- Heavy metal and carbon analyses particularly affected by cost and equipment constraints.

- Methane emission sensor acquisition proposed by PNZ — Steven to assess feasibility and provide budget estimate.
- Action: Discuss equipment access and budget with Dr. Mtethiwa; Steven to email Prof. Omoregie directly.

◎ **PENDING — Methane sensor acquisition (Goreangab Dam)**

- PNZ proposed GHG sensors for Veruschka and Hilia to quantify methane emissions at Goreangab Dam.
- Core team discussion (PNZ, Prof. Kwaambwa, Prof. Omoregie) required to determine budget allocation.
- Rationale: methane data would significantly strengthen the Phase 3 pilot proposal narrative.
- Action: Core team to agree on budget and proceed; evaluation template also to be sent to Prof. Omoregie.

STUDENT RESEARCH UPDATES

1. Steven Chirwa — Wastewater Treatment & Carbon Sequestration (LUANAR Malawi)

Research Title	The Efficiency of Phragmites australis and Typha latifolia in Wastewater Treatment and Carbon Sequestration
Supervisor(s)	Dr. A. Mtethiwa | Prof. J. Kang'ombe (LUANAR)
Study Site	Kauma Sewage Treatment Plant (61,000 m³/day capacity), Lilongwe, Malawi
Current Phase	Phase 2 — Active data collection (March – May 2026)

Research Objectives

Main objective: to investigate the efficiency of a combination of Typha latifolia and Phragmites australis in wastewater treatment and carbon sequestration. Three specific objectives address: (1) water quality parameters as affected by each macrophyte species; (2) heavy metal concentrations; and (3) carbon storage content in plant biomass and sediment to identify the best candidate for carbon sequestration.

Experimental Design & Methodology

Treatment	Description
T1	Control — no macrophytes
T2	Typha latifolia only
T3	Phragmites australis only
T4	50% T. latifolia + 50% P. australis

Completely Randomised Design (CRD); 4 treatments x 3 replicates = 12 experimental units. Macrophytes transplanted with 14-day hydraulic retention time (HRT) and 14-day acclimatisation before sampling begins. On-site parameters measured twice daily (09:00 and 16:00); lab analyses at 2-week intervals. Carbon content assessed via Dumas combustion method on plant biomass (shoots, leaves) and sediment. Data analysis in R Studio (one-way ANOVA, α = 0.05).

Parameter	Method/Instrument
Temperature, DO, Conductivity, Salinity, TDS, pH	Multi-parametric water quality meter
Nitrates, Chlorophyll-a, Ammonia, Total Phosphorus	Spectrophotometry
BOD / COD	Spectrophotometry
Carbon content	Spectrophotometry (Dumas combustion)
Heavy metals (Zn, Pb, Fe, Cu, Cd, As)	Spectrophotometry

Current Progress

The experiment has been successfully implemented at Kauma STP and is running on schedule. Data are being collected on-site and analysed at the AQFS Laboratory at LUANAR. Systematic bi-weekly sampling is underway for all parameters. Preliminary data cleaning and trend analysis are in progress alongside ongoing data collection. Study period: March – May 2026.

During the GA panel discussion, Prof. Omoregie recommended that Steven measure nutrients (nitrates, nitrites, phosphates) in the plant biomass itself — not only in the water — to assess eutrophication removal potential. Steven confirmed he would incorporate this. Dr. Hounkpati advised preserving remaining samples for future analysis if current funding limits comprehensive testing. PNZ raised the question of downstream methane emissions and proposed adding targeted sensors to the study scope.

Next Steps

- Complete bi-weekly data collection through May 2026 end date.
- Data cleaning, processing, and preliminary trend analysis.
- Comprehensive statistical analysis using R Studio (one-way ANOVA, α = 0.05).
- Assess feasibility of downstream methane emission measurement; provide budget estimate to PNZ.
- Contact Prof. Omoregie directly to discuss methodology and equipment challenges.
- Write Chapters 3–4 of dissertation in parallel with data collection.

AI Evaluation Score: 8/10 across all categories — most consistent score in the cohort.

2. Fenni Amadhila — Ulva Carbon Capture & Cement Biomass Additive (NUST Namibia)

Research Title	Evaluating the Potential of Ulva sp. for Carbon Capture and Its Application as a Biomass Additive in Cement
Supervisor	Prof. H.M. Kwaambwa (NUST)
Co-Supervisor	Prof. E. Omoregie (NUST)
Study Sites	Three coastal locations near Swakopmund, Namibia (Locations A, B, C)

Current Phase	Phase 2 — Objectives 2, 3, 4 complete; Objective 1 ongoing (natural monitoring)

Objective 2: Biomass Characterisation — Results

Full characterisation of Ulva biomass at three coastal locations has been completed (FTIR, CHNS, moisture determination).

Physiochemical characteristics of collection sites and moisture determination:

Location	Biomass Description	Temp (°C)	pH	DO (mg/L)	Conductivity (mS/cm)	Salinity (PSU)	% Moisture
A	Medium-sized, thick and firm fronds	22.0	7.1	6.06	48.80	37.28	1.80
B	Long, spiral, tougher/harder texture	22.0	6.4	6.07	47.30	34.73	1.40
C	Larger, thin and delicate; softer thalli	21.8	6.7	6.19	49.70	36.04	1.40

CHNS analysis of Ulva biomass and surrounding shells:

Sample	Location	Carbon (%)	Hydrogen (%)	Nitrogen (%)	Sulfur (%)	%CO_2
Ulva biomass	A	28.69 ± 0.01	4.87 ± 0.21	6.95 ± 0.97	3.56 ± 0.29	1.05
Ulva biomass	B	34.74 ± 0.11	5.72 ± 0.31	14.64 ± 0.06	3.72 ± 0.64	1.27
Ulva biomass	C	32.88 ± 0.01	5.41 ± 0.27	21.77 ± 0.01	3.34 ± 0.49	1.21
Shells (env.)	A	13.09 ± 1.06	0.22 ± 0.04	3.08 ± 0.42	0.09 ± 0.02	0.48
Shells (env.)	B	12.92 ± 0.00	0.32 ± 0.07	6.67 ± 1.97	0.16 ± 0.01	0.47
Shells (env.)	C	12.66 ± 0.01	0.29 ± 0.07	9.13 ± 1.70	0.12 ± 0.03	0.46

Key finding: Ulva biomass contains 1.05–1.27% CO_2, compared to 0.46–0.48% CO_2 in surrounding environmental shells. Location B biomass has the highest carbon content (1.27%). FTIR analysis confirmed similar functional groups across all three locations, with Location A showing deeper spectral signals (higher functional group concentration and stronger dipole moment), suggesting superior cement additive performance.

Objectives 3 & 4: Cement Mortar Testing — Results

Three mortar incorporation methods were tested across all three Ulva collection locations, evaluating flexural and compressive strength at 2-day, 7-day, and 28-day curing intervals. Control mix ratio: sand:cement:water = 6:2:1.

Method 1 — Addition of Ulva biomass to cement mortar (without reducing cement ratio):

Dosage	Loc A — 28-day Compressive (MPa)	Loc B — 28-day Compressive (MPa)	Loc C — 28-day Compressive (MPa)
Control	7.42	7.42	7.42
2.5g	6.53	6.17	6.76
5.0g	5.74	5.70	6.08
10.0g	4.87	4.87	4.66
20.0g	3.45	3.67	—

Method 2 — Partial replacement of cement with Ulva biomass:

Dosage	Loc A — 28-day Compressive (MPa)	Loc B — 28-day Compressive (MPa)	Loc C — 28-day Compressive (MPa)
Control	7.42	7.42	7.42
2.5g	6.89	6.49	5.40
5.0g	5.81	5.53	5.84
10.0g	5.17	3.94	4.65
20.0g	5.00	4.28	—

Method 3 — Old building materials replacing sand (sustainable method):

Dosage	Loc A — 28-day Compressive (MPa)	Loc B — 28-day Compressive (MPa)	Loc C — 28-day Compressive (MPa)
Control	8.08	8.08	8.08
2.5g	7.70	7.58	6.93
5.0g	7.56	7.65	7.36
10.0g	6.53	7.40	7.28
20.0g	3.32	2.52	3.48

Key finding: Method 3 (crushed old building materials as sand substitute) outperforms both other methods — the control achieves 8.08 MPa vs. 7.42 MPa in Methods 1 and 2. Up to 10g of Ulva (approximately 1–2% substitution) can be incorporated with acceptable performance, compared to a maximum of 5g in Methods 1 and 2. This represents the most promising pathway for sustainable construction applications. Higher dosages (20g) cause a sharp drop across all methods.

Objective 1: Carbon Sequestration Monitoring — Status

Laboratory-controlled Ulva cultivation was formally discontinued due to variability in growth conditions and resource limitations (aeration, light intensity, CO_2 levels). The methodology has been modified: the study now monitors naturally occurring Ulva at an identified coastal site. Sampling began end of March 2026; five weekly samples collected so far. Biomass is being processed and will be evaluated for carbon content over the full three-month monitoring period.

Key Panel Feedback

- Prof. Mogopodi: Overlay FTIR spectra for direct signal intensity comparison; add functional group identification table; use Student t-test for 'no significant difference' claims.
- Prof. Omoregie: Separate MSc thesis scope from PNZ project clearly; avoid comparing marine (Ulva) and freshwater species in the thesis; focus thesis on Ulva as biomaterial for the construction industry.
- PNZ: Conduct torsion and tension tests on the composite — compressive loss may be offset by gains in these properties. Cross-species comparison (with Veruschka) is a PNZ project activity, not a thesis objective.

Next Steps

- SEM and XRD analysis of Ulva biomass and cement mixture (surface morphology, particle size).
- ANOVA statistical analysis on mortar test data (percentage difference in strength).
- Analyse five collected biomass samples for carbon sequestration capacity.
- Overlay FTIR spectra; add functional group table to presentation.
- Conduct torsion and tension tests on the composite material.
- Continue monthly coastal sampling for the full three-month monitoring series.
- Clearly delineate MSc thesis data components from PNZ project data.
- Collaborate with Veruschka Dumeni on cross-species cement behaviour comparison (PNZ project scope).

AI Evaluation Score: Comparable to Steven overall; impact potential rated 9/10 — highest in cohort for this criterion.

3. Veruschka Dumeni — Phytoremediation of Goreangab Dam Water (NUST Namibia)

Research Title	Concentration-Dependent Phytoremediation of Eutrophic Dam Water in Namibia: A Microcosm Assessment of Native and Adaptive Aquatic Macrophytes
Main Supervisor	Prof. E. Omoregie (NUST)
Co-Supervisor	Prof. H.M. Kwaambwa (NUST)
Study Site	Goreangab Dam, Windhoek, Namibia
Current Phase	Phase 2 — Active 12-week trial; 4 of 6 sampling events complete

Experimental Design

45-drum floating constructed wetland (FCW) microcosm. Three species: Vetiveria zizanioides (Asian vetiver, adaptive), Chrysopogon nigritanus (native African vetiver), and Cyperus papyrus (native). Three treatment groups: T1 = 100% Goreangab Dam water; T2 = 50% dam water + 50% primary treated wastewater; T3 = 100% primary treated wastewater. Bi-weekly sampling; 12-week total duration. Plants sourced and established on FTW floaters fabricated from locally available materials.

Baseline Water Quality — Goreangab Dam Confirmed Hypereutrophic

Parameter	Goreangab Dam (mean)	GWWTP Primary Effluent	WHO/Namibia Limit	Status
Temperature (°C)	23.2	26.3	<25	Within limit
pH	7.52	7.14	6.0–9.0	Within limit
Conductivity (µS/cm)	1,342	1,790	<2,500	Within limit
TSS (mg/L)	147.5	475.0	<100	⚠ Exceeds
DO (mg/L)	0.88	0.67	>6	⚠ Critical — near-anoxic
Turbidity (NTU)	34.4	594.7	<10	⚠ Exceeds

Both source waters confirm severe impairment. The dam's near-anoxic DO (mean 0.88 mg/L), high TSS (147.5 mg/L), and high turbidity (34.4 NTU) collectively confirm hypereutrophic state, consistent with total phosphorus thresholds >0.4 mg/L. The GWWTP primary effluent is dramatically worse on all parameters, providing the concentration gradient for the experimental design.

Water Quality Trends: Sampling Events 1–4

Parameter	Key Trend (SE1 → SE4)	Interpretation
Total Dissolved Solids	Sharp drop in SE3 (T1: ~597 → ~195 mg/L), partial recovery SE4	Rainfall dilution signal; dilution correction formula applied
Total Suspended Solids	T1 sharp increase SE2 then declining; T3 more moderate; SE4 pending	Eutrophication bloom then plant-mediated uptake beginning
Dissolved Oxygen	All treatments above 6 mg/L at SE1; sharp drop by SE2 and SE4	SE3 data missing (equipment failure); consistent microbial O_2 demand
BOD_5	Strong decline: mean ~4.69 (SE1) → 1.02 (SE2) → 0.00 (SE3) → -0.31 (SE4)	T2 starts highest (~6.24); all converge downward across treatments
Turbidity	Strong downward trend all treatments SE1 → SE4; approaching WHO 10 NTU	T2 (mix) started highest (~108 NTU); T1 and T3 lower at baseline
TN, TP, COD, Heavy metals	Analyses in progress (see pending table)	Samples preserved; awaiting lab capacity

Plant Growth Observations

Photographic documentation shows strong root establishment across species within 10–20 days of deployment. Vetiveria zizanioides (Asian vetiver) demonstrates rapid root elongation and shoot growth. Cyperus papyrus shows predominantly mature brown roots with active new white root formation, confirming ongoing nutrient uptake. Chrysopogon nigritanus also showing clear new root development. Algal bloom observed intensely at SE1 (particularly T2 and T3), then declining by SE4 as plants mature and compete for nutrients. Wall absorption of algae documented and addressed by gentle 10-second mixing protocol.

Pending Analyses

Analysis	Status	Reason for Delay	Expected
TN (persulfate digestion)	In progress	NaOH neutralisation overshooting — troubleshooting ongoing	4–6 weeks
TP (persulfate digestion)	In progress	Same as above	4–6 weeks
COD (closed reflux)	Prepared, not yet run	Deprioritised; reagents ready	4–6 weeks
Heavy metals Cr/Zn/Pb/Cu/Cd (ICP-OES)	Samples preserved, waiting	ICP-OES machine under maintenance — part now received	Upon recommission
Biomass data digitisation	Recorded, not yet digitised	Voice-to-text transcription backlog	2–3 weeks

Next Steps

- Complete TN/TP and COD analyses across all preserved samples (T0–T4).
- Begin ICP-OES heavy metals analysis (machine part received).
- Digitise all biomass data — growth trend analysis to follow.
- Complete sampling events 5 and 6 (May and early June 2026).
- Apply dilution correction formula across all rainfall-affected datasets.
- Calculate removal efficiency percentages (RE%) per drum and per treatment for TSS, turbidity, DO, BOD, and eventually TN/TP and heavy metals.
- Begin SPSS statistical analysis (Shapiro-Wilk normality test → ANOVA or Kruskal-Wallis).
- Draft Chapter 4 (Results) of dissertation.
- Monitor and document winter onset effects on plant performance.

AI Evaluation Score: Highest overall — 10/10 report consistency; high scores for impact potential and research quality.

4. Ellen Christabel Kachulu — Spirulina Carbon Sequestration & Fish Growth (LUANAR Malawi)

Research Title	Efficacy of Spirulina (Arthrospira platensis) in Carbon Sequestration and Growth Performance of Oreochromis shiranus
Supervisor(s)	Dr. A. Mtethiwa | Prof. J. Kang'ombe (LUANAR)
Study Site	Bunda Fish Farm, Lilongwe, Malawi
Duration	Carbon sequestration phase: 14 days; Fish growth phase: 3 months (8 weeks total study)
Current Phase	Phase 2 — Setup complete; implementation imminent

Experimental Design — Carbon Sequestration Phase

Arthrospira platensis cultured in a greenhouse using aquaculture effluent supplemented with sodium bicarbonate. Conditions: 30–35°C, pH 9–10.5. Pure cultures isolated under microscope and scaled up in Zarrouk's medium.

Treatment	Mixing Frequency	Duration

T1 (Control)	No mixing	14 days
T2	Mixed every 24 hours (06:00 daily)	14 days
T3	Mixed every 12 hours (06:00 and 18:00)	14 days

Day	Activity
Day 0	Prepare culture medium; inoculate Spirulina
Days 1–3	Adaptation phase (cells begin growing)
Days 4–10	Rapid growth and carbon fixation phase
Days 11–14	Biomass measurement and carbon analysis

Experimental Design — Fish Growth Performance Phase

Completely Randomised Design (CRD); 3 dietary treatments x 3 replicates. Length and weight of 8 fingerlings per tank measured on a 2-week basis over 3 months. Fish fed twice daily at 5% body weight; feed adjusted weekly. End-of-experiment parameters: weight gain, feed intake, feed conversion ratio (FCR), and specific growth rate (SGR).

Treatment	Diet
T1 (Control)	No Spirulina
T2	15% Spirulina inclusion
T3	30% Spirulina inclusion

Water Quality Monitoring

Parameter	Unit	Frequency	Method
Temperature, pH, DO	°C / unitless / mg/L	Twice daily on-site	Thermometer / pH meter / multi-parameter
Ammonia (NH_3–N)	mg/L	3x at 2-week intervals (lab)	Spectrophotometer
Phosphorus (PO_4^{3-}–P)	mg/L	3x at 2-week intervals (lab)	Spectrophotometer
TSS, Turbidity	mg/L / NTU	3x at 2-week intervals (lab)	Spectrophotometer

Current Status

Tanks set up at Bunda Fish Farm. Fingerlings secured at the farm. Most chemicals for Zarrouk's medium sourced (two still to be purchased). Spirulina (Arthrospira platensis) culture/strain not yet acquired as of GA meeting — this is the primary remaining barrier to implementation. Drone-based aerial documentation of experimental ponds and on-site interviews conducted 26 February 2026.

PNZ encouraged Ellen to consider that the greatest carbon benefit of Spirulina may lie in its use as a substitute for imported animal feed (reducing carbon-intensive feed production) rather than direct sequestration alone. A potential niche human consumption market in Lilongwe was also identified as a secondary value stream.

Next Steps

- Source remaining two chemicals for Zarrouk's medium.
- Acquire Spirulina (Arthrospira platensis) culture — primary outstanding requirement.
- Begin Spirulina culture set-up and carbon sequestration 14-day experiment.
- Commence fish growth performance experiment with O. shiranus fingerlings.
- Maintain consistent fortnightly reporting to address report consistency score.
- Correct 'sequestration' spelling in presentation slides (noted by Prof. Kwaambwa).

AI Evaluation Score: Above average overall; phase progress and report consistency slightly weaker relative to NUST students.

5. Hilia Ndawapeka Hatutale — Heavy Metal Phytoremediation, Cyperus spp. (NUST Namibia)

Research Title	Evaluating the Potential of Cyperus papyrus and Cyperus alternifolius in Heavy Metal Removal from Wastewater: A Comparative Study of Native Plants for Phytoremediation and Wastewater Treatment in Gammams Wastewater, Namibia
Main Supervisor	Prof. H.M. Kwaambwa (NUST)
Co-Supervisor	Prof. E. Omoregie (NUST)
Study Site	Gammams Water Care Works, Windhoek (secondary and tertiary treated wastewater)
Current Phase	Phase 2 — Dutch bucket system installed; acclimatisation begun 14 May 2026

Experimental Setup — Dutch Bucket Recirculating System

Two buried 220-litre reservoirs (black containers to minimise sunlight and algal growth), each connected to 10 individual buckets (20 buckets total). T1 = secondary treated wastewater; T2 = tertiary treated wastewater. Each treatment contains Cyperus papyrus (3 buckets), Cyperus alternifolius (3 buckets), and controls (3 buckets). System is recirculating; water cannot be replaced, requiring acquisition of sufficient volume upfront. Installed at Goreangab Dam Recreational Park, near City of Windhoek offices.

Acclimatisation Protocol

Days	Wastewater Ratio	Tap Water Ratio
Days 1–3	25%	75%
Days 4–6	50%	50%
Days 7–9	75%	25%
Day 10 onwards	100%	0%

During acclimatisation, plant health and water quality are monitored continuously. Acclimatisation formally scheduled 14 May 2026.

Target Heavy Metals

Heavy Metal	Symbol	Source
Copper	Cu	Documented in Gammams wastewater
Zinc	Zn	Documented in Gammams wastewater
Arsenic	As	Documented in Gammams wastewater
Lead	Pb	Documented in Gammams wastewater
Nickel	Ni	Documented in Gammams wastewater
Chromium	Cr	Common in domestic wastewater
Manganese	Mn	Common in domestic wastewater

Water sampling to confirm which heavy metals are actually present and at what concentrations is scheduled alongside acclimatisation (14 May 2026). Experimental analysis period: 8 weeks estimated, May–July 2026.

Note on species name: Hilia's study uses Cyperus alternifolius (not C. articulatus as reported in some earlier documents). Prof. Omoregie clarified the important distinction between Hilia's controlled domestic wastewater system and Veruschka's open dam water system — the two studies are complementary, not redundant.

Next Steps

- Collect water samples from Gammams to carry out water quality tests and verify heavy metal concentrations.
- Secure containers for transporting wastewater from Gammams to the research site.
- Acquire sufficient secondary and tertiary treated wastewater from Gammams Water Care Works.
- Complete plant acclimatisation protocol (graduated 10-day exposure).
- Monitor plant growth before, during, and after acclimatisation.
- Carry out 8-week analytical programme (May–July).
- Conduct further reading on converting Cyperus biomass into value-added products (lea/bio-fertiliser applications).

AI Evaluation Score: 6.4/10 — above average; strong recovery from earlier delays; phase progress and consistency somewhat weaker.

SUMMARY & PROGRAMME STATUS

Student	University	Research Focus	Status	Key May Milestone
Steven Chirwa	LUANAR Malawi	Typha/Phragmites wastewater treatment & C sequestration	✅ Active	Bi-weekly sampling underway; methane feasibility review requested

Fenni Amadhila	NUST Namibia	Ulva carbon capture & cement biomass additive	✅ Active	Mortar testing complete (3 methods x 3 locations); natural Ulva monitoring ongoing (5 samples)
Veruschka Dumeni	NUST Namibia	Phytoremediation of Goreangab Dam — 45-drum FCW trial	✅ Active	4/6 sampling events done; ICP part received; SPSS initiated
Ellen Kachulu	LUANAR Malawi	Spirulina C sequestration & fish growth	⏳ Pre-launch	Tanks set; fingerlings secured; Spirulina culture still to acquire
Hilia N. Hatutale	NUST Namibia	Cyperus spp. heavy metal phytoremediation	⏳ Delayed — July	Dutch bucket installed; acclimatisation begun; full wastewater volume pending

Collaboration & Strategic Notes

- Dr. Thaisa Michelan (Brazil): invited to give 30-minute presentation to student cohort; student synopses to be shared in advance via Prof. Omoregie.
- Fenni x Veruschka cross-species cement comparison: to proceed as a PNZ project activity, strictly separated from individual MSc thesis scope.
- Evaluation framework updated: 'community engagement' criterion expanded to include seminars and scientific community dissemination.
- AEST organisation (Togo): expressed interest in PNZ research collaboration — follow-up to be coordinated.
- Methane sensor acquisition: core team discussion ongoing; budget figures pending from Prof. Kwaambwa.

FUNDING & COMMUNICATIONS

Evaluation Framework

The May 2026 GA marked the first formal use of PNZ's 100-point student evaluation framework. Pre-meeting scoring across five criteria (phase progress, impact potential, research quality, report consistency, scientific alignment) was performed by AI (Claude, Anthropic). Supervisors retain full override authority. The remaining 15% (autonomy/initiative and community engagement) are assessed by supervisors post-meeting. Scores directly inform budget extension discussions.

Documentary Production

Takondwa Senzani shared a 3-minute preview of the forthcoming 15-minute PNZ documentary at the GA. The Malawi footage — featuring schoolchildren learning to distinguish healthy from polluted wetland environments

— was received positively. Namibia filming to follow. The documentary is expected to be a key communications asset for donor outreach upon release.

Active Funding Pipeline

- UNDP SGP OP8 applications (Namibia and Malawi) — concept papers in preparation.
- Corporate/mining sector outreach — LOI template prepared; ESG and phytomining framing.
- PCIA Interreg Amazonie (French Guiana connection) — being explored via Embrapa and PCIA partners.
- CIEIF grant — bookmarked for ~2027 once Phase 3 pilot is operational.
