Aymard Plakoo

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I work on bringing deep learning into long-term energy models for African countries where data are scarce.

Before the PhD, I ran a systematic review of 1,053 energy modelling studies on Africa for AISESA (African Institute for Sustainable Energy and Systems Analysis), co-built with Enrico Patanè a simulator of West Africa's upcoming electricity market (project supervised by SENELEC and EPEX SPOT) and developed a hybrid physics–AI approach during an internship at Safran Composites.

Doctoral thesis, 2026–2029

Enhancing Long-Term Energy Models with Deep Learning: An Approach for Data-Scarce African Contexts

Long-term models guide national investment choices, but they assume reliable input data and rely on expensive optimisation applied to a few hand-built scenarios. In sub-Saharan Africa data are often patchy, and the informal economy, traditional biomass and power cuts remain largely absent from the representations.

The thesis aims at a methodological framework that accounts for these specificities, copes with data scarcity and produces plausible scenarios quickly. It will start from a case study pairing one sub-Saharan African country with one long-term energy model.

Directions under consideration

- **Satellite imagery** to reconstruct the inputs the models are missing.
- **Optimisation-informed neural networks** to emulate an optimisation model quickly.
- **Constrained diffusion models** to generate physically admissible scenarios.

Planned timeline

2026–27 Literature review; choice of the country and reference model; data collection; first baseline models.

2027–28 Development and validation of the methods on the case study; first publication.

2028–29 Generalisation into a framework that transfers to other countries and models; publications and dissertation.

Keywords: long-term energy planning, deep learning, data scarcity, sub-Saharan Africa, scenario generation, surrogate models.

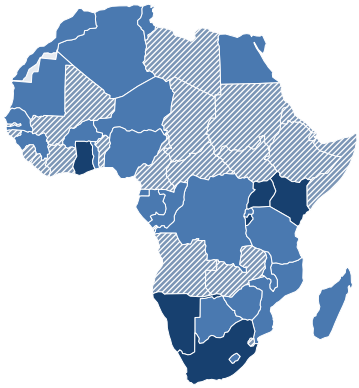
Supervision
Nadia Maïzi (supervisor), Jesús Angulo (co-supervisor)

Unit and team
Mathematics and Systems unit · CMA team (Centre for Applied Mathematics), Mines Paris – PSL, Sophia Antipolis

Doctoral school and field
STIC (ED 84), PSL University · Control, optimisation, foresight

Period
October 2026 – September 2029 (doctoral contract)

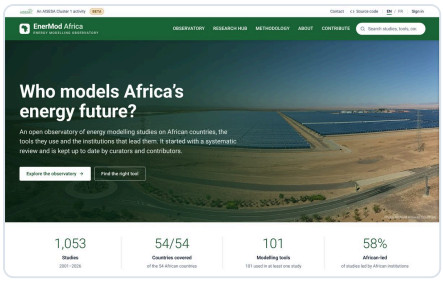
In 2022, Ember found no public electricity generation data for 23 of 54 African countries (score 0 out of 5)



Good (6) Limited (25) No public data (23)

Transparency of national electricity generation data, score from 0 to 5. Source: Ember, *African Electricity Data Transparency* (January 2022), reused in EnerMod Africa. The situation may have changed since. I count 23 countries at 0/5 from the report's country profiles; its summary text says 21. Cape Verde, Comoros, Mauritius, São Tomé and Príncipe and Seychelles are counted but not drawn (too small).

Projects



EnerMod Africa

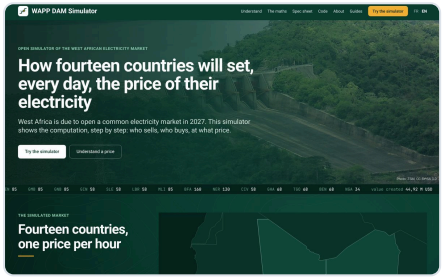
Online (beta) · Mission for AISESA Cluster 1 · OSE Master · 2025–2026

An open observatory of energy modelling studies on African countries, the tools they use and the institutions that lead them.

- PRISMA systematic review carried out at the CMA under the supervision of Nadia Maïzi: 9,582 records, **1,053 studies included** (published 2001–2026).
- 101 modelling tools, 54 countries, gap analysis, country readiness index, model recommendation, open exports.
- An AISESA Cluster 1 activity, designed for handover to the AISESA community.

Next.js · FastAPI · PostgreSQL · GPL-3.0 (code), CC BY 4.0 (data)

enermod.africa github.com/aymardino/enermod-web



WAPP DAM Simulator

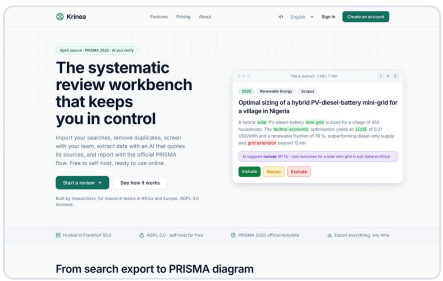
Online · Group project supervised by SENELEC and EPEX SPOT · OSE Master · 2025–2026

An open-source educational simulator of West Africa's upcoming day-ahead electricity market, covering the 14 countries of the WAPP (West African Power Pool). Independent project, not affiliated with the WAPP.

- Zonal coupling with simple orders, blocks, linked and exclusive blocks, minimum income conditions; clearing in three steps (welfare maximisation, then traded volume, then admissible prices).
- 14 zones, 15 interconnectors; a reference day (24 h, nearly 3,000 variables) solved in **under a second** (a few seconds to about twenty with 150 block orders); 68 tests.
- Training room for several participants. Prices are simulated, on estimated capacities and profiles: the market has not opened yet.

Developed with Enrico Patanè, building on a group project that also involved Lucien Kouakou, Mouhamadou Sow and Wissem Hmila. Supervised by El Hadji Tamsir Diop (SENELEC, Senegal's national electricity company) and Adrien Atayi (EPEX SPOT, power exchange).
Python · Pyomo · HiGHS · FastAPI · React · Apache 2.0

wapp-dam-simulator.mastereose.fr github.com/aymardino/wapp-dam-simulator



Krinea

Online (beta) · Independent project · 2026

An open-source workbench for systematic reviews, from search export to the PRISMA 2020 diagram, grown out of the extraction tool built for the EnerMod systematic review.

- Import from RIS, BibTeX, PubMed, Web of Science, CSV and Excel; deduplication; blind double screening with conflict resolution.
- AI extraction into a team-defined form: the AI proposes a verbatim quote for each field.
- During the EnerMod review, the prototype was used to verify **435 studies**; median human verification time: 1.2 minutes per study.

Next.js · FastAPI · PostgreSQL · PyMuPDF · AGPL-3.0 & MIT

krinea.org github.com/aymardino/krinea

Academic projects

Low-carbon S&P 500 portfolio

Sustainable finance, EDHEC Business School · OSE Master · 2025–2026

Low-carbon equity portfolio for a pension fund (case study): 50 stocks, optimisation under carbon, risk and tracking-error constraints, six strategies compared, out-of-sample backtest with quarterly rebalancing. Goal: −50% carbon intensity against the index. Python, pandas, SciPy.

Energy optimisation of healthcare systems

Cohort project · OSE Master · Mines Paris – PSL · 2025–2026

Foresight synthesis on decarbonising the hospital sector (energy efficiency, mobility, teleconsultation, medical waste) and analysis of demand flexibility: demand-response potential, monetisation on the markets, energy cost optimisation.

Writing and talks

2026 Talk	*Mapping energy modelling tools and analytical capacities across African countries.* 3rd AISESA Congress, Kampala (Uganda), 14–16 September 2026.
2026 Master's thesis	Plakoo, K. A. *Who models Africa's energy future? A systematic review of energy modelling studies and tools applied to African countries, and the EnerMod Africa Observatory.* OSE Master, Mines Paris – PSL, for AISESA Cluster 1.
In preparation Perspective paper	Plakoo et al. Perspective paper on energy modelling approaches for African contexts (AISESA Cluster 1).
In preparation Technical note	WAPP DAM Simulator technical note: clearing rules and public test cases.

Background

Experience

Since October 2026 — **PhD candidate**
CMA, Mines Paris – PSL, Sophia Antipolis

October 2025 – September 2026 — **Modelling engineer, African energy systems**
TTI.5 (The Transition Institute 1.5, Mines Paris – PSL) / AISESA · OSE Master work-study
PRISMA systematic review and the EnerMod Africa observatory (see Projects); mapping and critical analysis of modelling tools (TIMES, LEAP, OSeMOSYS…), case studies of African energy pathways.

March – August 2025 — **R&D engineering intern, hybrid AI–physics modelling**
Safran Composites, Itteville
Hybrid architecture coupling physics-informed neural networks (PINN) with LSTM networks, compared against purely data-driven models; experimental validation, generalisation outside the training domain, literature review of more than 50 papers.

June – September 2024 — **Engineering intern, energy efficiency**
Coriolis Composites, Quéven
Energy audit of industrial equipment, predictive diagnostics with machine learning (Random Forest, XGBoost).

Education

OSE Master (Advanced Master, MS®, in Energy Systems Optimisation)
Mines Paris – PSL · 2025–2026
Energy markets, optimisation (LP, MILP, dynamic programming), long-term modelling, game theory.

Engineering degree (thermal science, energy, mechanics)
Polytech Nantes · 2022–2025

Skills

Energy models
TIMES, LEAP, OSeMOSYS, PyPSA, Antares

Optimisation
Pyomo, Gurobi, HiGHS · LP, MILP, stochastic

Machine learning
PyTorch, scikit-learn, PINN, LSTM, XGBoost

Software
Python, FastAPI, Next.js, PostgreSQL, Docker

Languages
French (native), English (TOEIC 905)