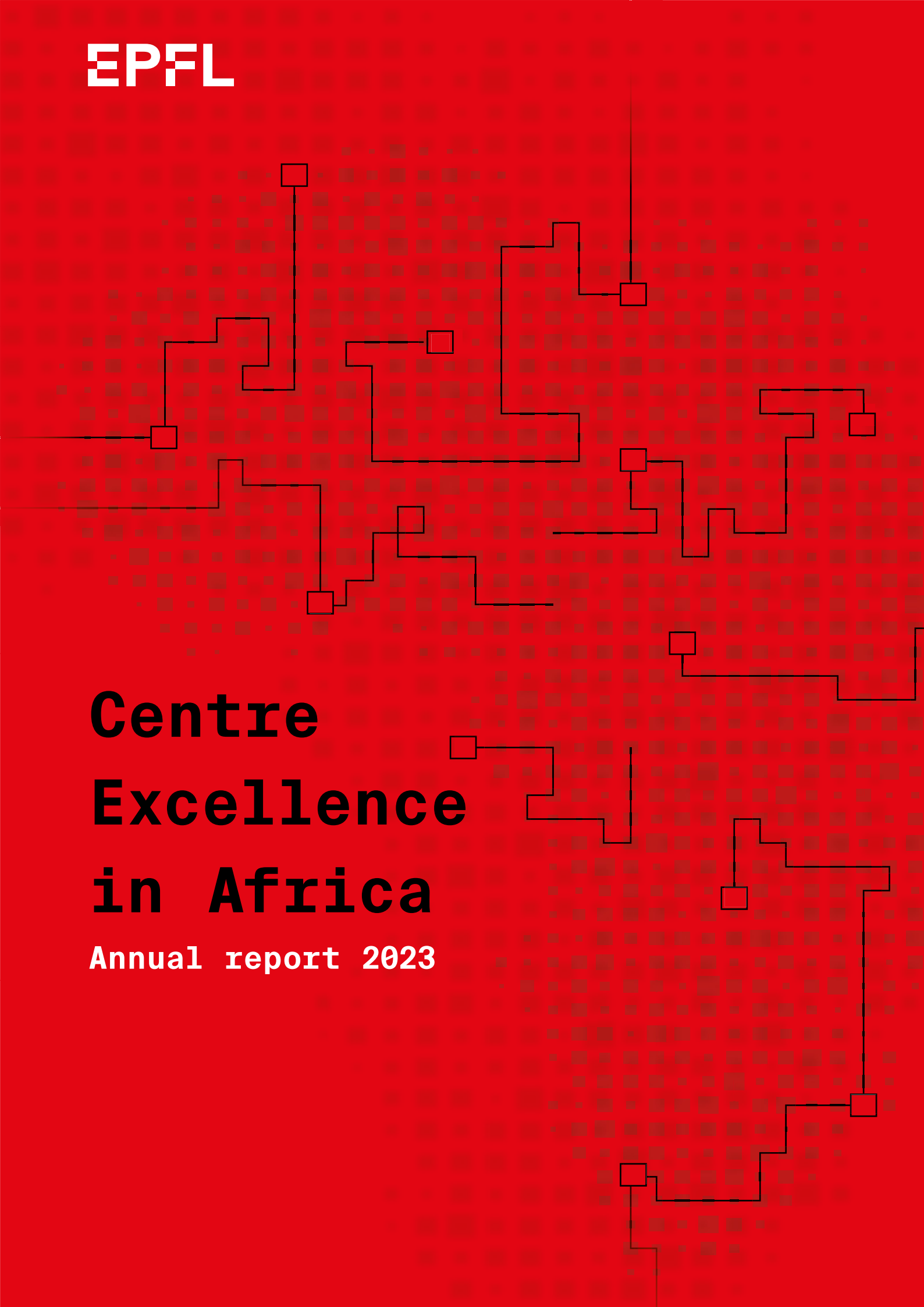


EPFL

**Centre
Excellence
in Africa**

Annual report 2023



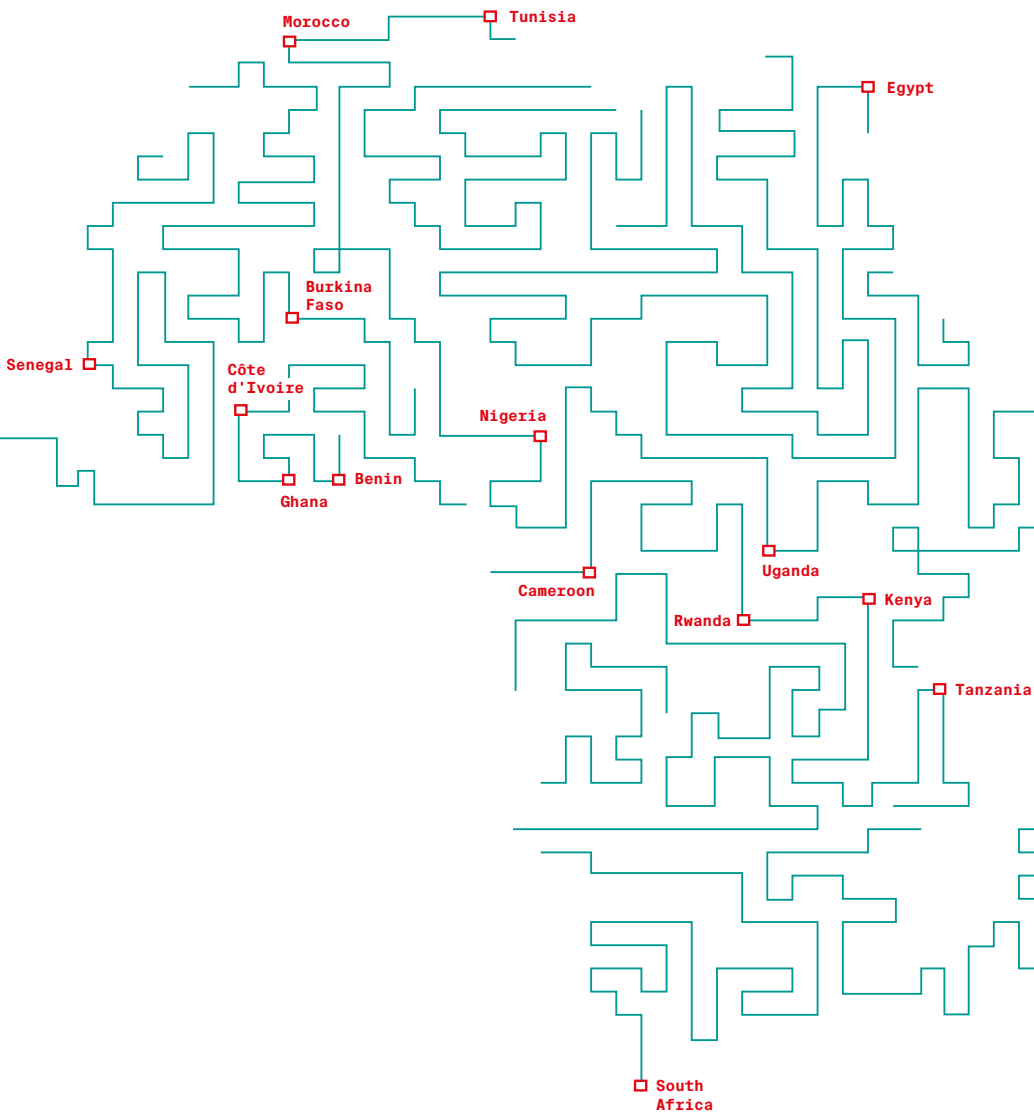
**Centre
Excellence
in Africa
Annual report 2023**

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Excellence in Africa

is an EPFL research centre whose core is digitalisation and excellence in research, training and innovation throughout Africa.



Creation in
January 2020

A team of of
16 people



Director
Dr Jérôme Chenal

Ongoing projects in
15 African countries

3 areas of focus



Academic
excellence



Digital
education



Transmission

After months of hard work and close collaboration with our strategic partner, the University Mohammed VI Polytechnic (UM6P) in Morocco, the results are starting to flow in, underlining the impact of our commitment to excellence in research, education and innovation across the African continent.

Our five research projects selected in the first phase of the **“Junior Faculty Development”** programme, the first focus of Excellence in Africa, have made remarkable progress. These projects, focusing on crucial challenges for the African continent such as health and energy, confirm our expectations and illustrate the synergy created between researchers.

The **“100 PhDs for Africa”** programme, the second pillar of our initiative, has seen its first fruits with the signing of contracts for the first ten PhD students. The initial objective of testing this scheme has been achieved, and the preliminary results are very encouraging. Our doctoral students have begun their research and have already presented their projects at international conferences and undertaken their first internships at EPFL, reflecting the enthusiasm of our colleagues for this initiative.

The third area, **“Digital Education”**, has made significant progress. Our teams are working tirelessly to get the studios at the six winning universities up and running. We expect a series of inaugurations in 2024, demonstrating our commitment to integrating digital technology into higher education in Africa.

The start-up loan phase of the **“Digital Solutions for Sustainable Cities in West Africa”** project ended at the end of 2023, so the project should begin in 2024 with the support of the Swiss Agency for Development and Cooperation (SDC). The project aims to develop innovative solutions to urban challenges in cities such as Abidjan and Cotonou. In 2023, we launched

the initiative to set up a Living Lab in Abidjan, a collaborative space for universities, municipalities and businesses to test and develop digital urban solutions. The first workshops and symposia have been organised, engaging various stakeholders and laying the foundations for a participatory and local approach.

The **African Cities Lab** is now online after a year and a half of development. This platform is ready to host a large number of MOOCs (Massive Open Online Courses) from all over Africa. In 2023, twelve new online courses were created and will be hosted on the platform in 2024. This initiative strengthens our ability to offer quality education accessible to a wide audience, promoting educational innovation and the acquisition of key skills for urban development. Thousands of young learners have already taken the courses.

At the same time, we have carried out a number of studies, including the **“Urban strategy of the Swiss Agency for Development and Cooperation”** in partnership with the London School of Economics, and the **“E-learning in low connectivity contexts”** project for the Unité association. These initiatives strengthen our expertise and our impact in various fields that are essential for the continent's development.

The year 2023 has been rich in achievements thanks to the commitment and collaboration of all our partners, researchers and teams. We look forward to building on this momentum in 2024, strengthening our projects and supporting excellence in education and research across Africa, and with many new projects to tell you about next year.

Dr Jérôme Chenal
Director of the Centre
Excellence in Africa



Excellence in Africa Initiative

The University Mohammed VI Polytechnic (UM6P) in Morocco and EPFL, through the EXAF centre, have designed a programme based on the following four pillars: Junior Faculty Development, 100 PhDs for Africa, Digital Education and Digital solutions for sustainable cities in West Africa.

in partnership with

UM6P

University
Mohammed VI
Polytechnic



Pillar 1 Junior faculty Development

Five research teams are currently working on ongoing projects.

The progress of their research projects is summarised below.

A second call for projects was launched in 2023.

17 tandems bringing together professors from EPFL and the African continent have been formed and their applications are currently being evaluated.

Projects in progress

The following results were obtained by the tandems who began their research:

Ines Elbini / Hilal Lashuel Tunisia, Institut Pasteur de Tunis (IPT) / EPFL



The main scientific activities in 2023 were devoted to in vitro testing of biomolecules extracted from scorpion and snake venoms. These molecules had been isolated and purified the previous year. Their activity was also assessed in neuronal models to confirm their potential for inhibiting the aggregation of α -synucleins, proteins that form insoluble fibrils in Parkinson's disease. Preliminary results showed a clear reduction in the formation of aggregates thanks to the target biomolecules studied. A technology transfer between the EPFL and the IPT enabled the α -synucleinopathy cell model to be maintained and replicated at the IPT in Tunisia. Subsequent analyses, initiated at the end of 2023, now aim to explore and understand the mechanisms involved in this phenomenon.

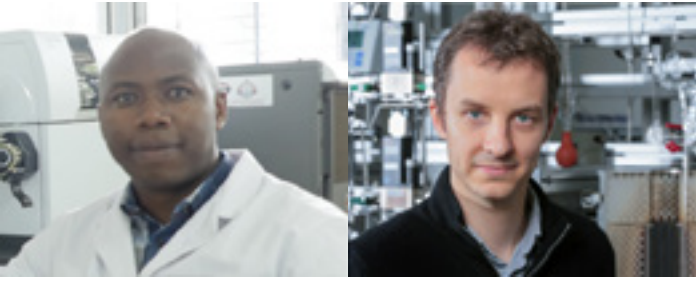
Considering the limited quantity and the difficulty of obtaining these biomolecules with sufficient purity, it was also decided in 2023 to synthesise heterologous versions of them in the EPFL laboratories. In addition, based on the initial results obtained during the project, in silico research was carried out to identify other biomolecules likely to have similar properties. Among these, certain biomolecules from sea anemones have shown interesting potential.

As part of this project, Ms Nour-elhouda Neili (doctoral student at the IPT) carried out a 12-week internship in Prof. Lashuel's EPFL laboratory in 2023, and the project was presented at several seminars:



Ms Nour-elhouda Neili, a doctoral student at the IPT, during her stay at EPFL.

- GRC days – Parkinson disease Proteins, Pathway, and Pathophysiology, 2023, “Contribution of Synuclein Species to Pathology”.
- 9th Conference of Mediterranean Neuroscience Society MNS-Carthage Tunisia, 14-18 October 2023 “Insights into Parkinson's with Potassium Channels at the Forefront”.
- 3rd Young Researchers Colloquium, Pasteur Institute of Tunis, Tunisia. 25-27 October, 2023, “The Puzzle of Parkinson's: Alpha-Synuclein Aggregates and Their Role”.
- 10th International Scientific Edition of Tunisian Association of Toxicology ATT, “Health and Environmental Protection for Sustainable Development”, 2023, Yasmine Hammamet, Tunisia “Exploring the Connection between Pesticide Neurotoxicity and Neurodegenerative Pathways”. Ines ELBini.
- 3rd ISN Tunisia Neuroscience School on Neuroimmunology and Neuroinflammation in Neurodegenerative diseases: Current Challenges and Therapeutics opportunities; 5-12 March 2023.
- Open access conference: “Targeting alpha-synuclein aggregation for the treatment of Parkinson's disease”, 2023. Presented by Prof. Abid Oueslati.
- Symposium as part of the 32nd Ion channels meeting in Sète, France, 2023 “Ion channels as Therapeutic Targets in Motor Diseases”.



Thomas Kivevele
Jeremy Luterbacher
 Tanzania, Nelson Mandela African Institution of
 Science and Technology (NM-AIST) / EPFL

In 2023, the project teams explored the potential of various non-edible oils for biodiesel production. Among these, oil extracted from cashew nut shells, castor oil and various oils from tropical plants (croton megalocarpus, podocarpus usambarensis and thevetia peruviana) have shown definite potential for biodiesel production.

In addition, rice husks, a residue from the agri-food industry, were tested as a support in the production of catalysts. After being treated to remove the silicon, the rice husks provided an ideal material for fixing nickel atoms, offering a very large contact surface. Research has been initiated to develop a resistant, stable, environmentally friendly and inexpensive biochar-based catalyst for the hydrothermolysis of triglycerides into biodiesel.

Other residues from the agri-food industry, orange peels, have been converted into a crude liquid containing phenolic and aromatic compounds, as well as hydrocarbons. This liquid could be used to extract renewable fuels and chemicals. In the same vein, the teams are also exploring the use of loquat by-products. The results show that the peels of this fruit contain molecules with high antioxidant potential, which could be used to protect biodiesel from oxidation.

As part of this project, a PhD student from NM-AIST, Mr Wilson Leonidas Mahene, spent three months in Prof. Luterbacher's laboratories during the summer of 2023. In addition, Prof. Thomas Kivevele spent a month at EPFL.

A scientific workshop was organised in October 2023 at the NM-AIST. A post-doctoral student from the EPFL, Dr Julio Terra, and a delegation from the EXAF Centre attended.

In addition, the project has been presented at several seminars.

- Poster presented at the symposium "Le Grand Rift Africain – À la confluence des Temps", Collège de France, Paris 17-18 November, 2023 (CNRS). *"Du mega au low-tech: Qu'est-ce qu'un système énergétique durable en Afrique de l'Est."*
- Meeting at the Centre National de la Recherche Scientifique (CNRS) à l'École des Hautes Études en Sciences Sociales (EHESS), 20 – 30 November 2023.

- Biofuels workshop, October, 2023. Participants from EPFL (LPDC), EXAF-EPFL, Swiss Embassy, NM-AIST, Arusha Technical College, Tanzania Commission for Science and Technology (COSTECH), Tanzania Renewable Energy Association (TAREA) and Ministry of Energy.
- September 2023: Competition organised in primary and secondary schools around Arusha, based on a project relating to biofuels.

Articles published in 2023 as part of the project:

- Kariim, I., Park, J., Kazmic, W. W., Swai, H., Lee, I. & Kivevele, T. 2023. Solvothermal liquefaction of orange peels into biocrude: An experimental investigation of biocrude yield and energy compositional dependency on process variables, *Bioresource Technology (ELSEVIER)*, 129928. [↗](#)

- Kichonge, B. & Kivevele, T. (2023). Viability of Non-Edible Oilseed Plants and Agricultural Wastes as Feedstock for Biofuels Production: A Techno-economic Review from an African Perspective, *Biofuels, Bioproducts and Biorefining (WILEY)*. [↗](#)
- Kariim, I., Swai, H., & Kivevele, T. 2023. Bio-Oil Upgrading over ZSM-5 Catalyst: A Review of Catalyst Performance and Deactivation, *International Journal of Energy Research (WILEY)*, Volume 2023 | Article ID 4776962 . [↗](#)
- Kariim. I., Waidi D.y., Swai, H. & Kivevele, T. 2023. Catalytic hydrothermal liquefaction of orange peels into biocrude: An optimization approach by Central Composite Design, *Journal of Analytical and Applied Pyrolysis (ELSEVIER)*. [↗](#)
- Kahimbi, H., Kichonge, B. & Kivevele, T. 2023. The Potential of Underutilized Plant Resources and Agricultural Wastes for Enhancing Biodiesel Stability: The Role of Phenolic-Rich Natural Antioxidants, *International Journal of Energy Research (WILEY)*, vol. 2023, Article ID 9389270, 30 pages, 2023. [↗](#)
- Mahene, W. L., Kivevele, T., & Machunda, R. 2023. The role of textural properties and surface chemistry of activated carbon support in catalytic deoxygenation of triglycerides into renewable diesel. *Catalysis Communications (ELSEVIER)*, 181, 106737. [↗](#)

Presentation of “biofuels” projects by students who took part in the competition organised by the NM-AIST.





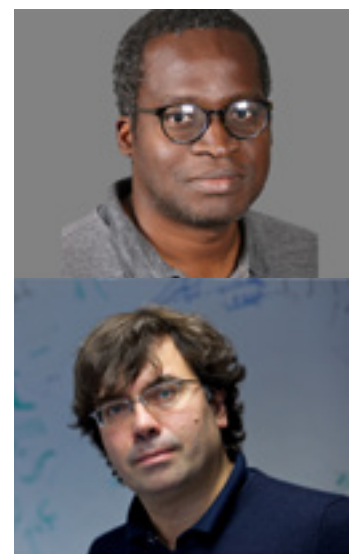
El Mehdi Amhoud
Andreas Burg
 Morocco, UM6P / EPFL)

In 2023, the research teams began preliminary research to determine a radio telecommunications protocol (LoRaWAN) enabling the transmission of data packets suitable for a wide range of applications. This protocol will subsequently be tested at EPFL. Preliminary results seem to confirm that the LoRa network technology selected is a good option for optimising the energy efficiency of networks. With this in mind, a reinforcement algorithm has been proposed to increase energy efficiency.

The project started at the very end of 2022, so 2023 was used to recruit the teams and initiate the various components of the research project. In addition, the researchers involved in the project presented it at a conference and submitted several articles for publication.

- M. Jouhari, K. Ibrahim, J. B. Othman and E. M. Amhoud, "Deep Reinforcement Learning-Based Energy Efficiency Optimization for Flying LoRa Gateways", *ICC 2023 - IEEE International Conference on Communications*, Rome, Italy, 2023, pp. 6157-6162. [🔗](#)
- Jouhari, M., Saeed, N., Alouini, M. S., & Amhoud, E. M. A survey on scalable LoRaWAN for massive IoT: Recent advances, potentials, and challenges. *IEEE Communications Surveys & Tutorials*. 2023 [🔗](#)
- Delamou, M., Noubir, G., Dang, S., & Amhoud, E. M. An Efficient OFDM-Based Monostatic Radar Design for Multitarget Detection, 2023. [🔗](#)
- Jouhari, M., Ibrahim, K., Othman, J. B., & Amhoud, E. M. Deep Reinforcement Learning-based Energy Efficiency Optimization For Flying LoRa Gateways. *ICC*, 2023. [🔗](#)
- Etiabi, Y., Jouhari, M., Burg, A., & Amhoud, E. M. (2023, June). Spreading Factor assisted LoRa Localization with Deep Reinforcement Learning. In *IEEE 97th Vehicular Technology Conference (VTC2023-Spring)* (pp. 1-5), 2023. [🔗](#)

Steve Ndengue
Nicola Marzari
Rwanda, East African Institute for
Fundamental Research - University
of Rwanda, Kigali / EPFL



2023 saw a significant event for this project, with the announcement that one of the two research leaders, Steve Ndengue, was to leave his post as Professor at the University of Rwanda. Despite this blow, the research teams involved in the project have continued their work and produced excellent results in order to advance our understanding of the mechanisms of water photocatalysis, thanks to the application of computer simulations using classical and quantum dynamic

models. In particular, they worked on establishing the electronic structure of photocatalysts, both in terms of their internal structure and their surface.

The project was presented at a major event in Kigali in June 2023: the 7th African School for Electronic Structure Methods and Applications (ASESMA 2023).

Practical session at the African School for Electronic Structure Methods and Applications (ASESMA 2023).





**Samir El Hankari,
Wendy Queen**
Morocco, UM6P / EPFL

For those in charge of the project, 2023 has served as a springboard for recruiting the doctoral students who will carry out the research. A great deal of effort has also gone into equipping the new laboratories with the right equipment to carry out the various tasks involved in the project. During the summer of 2023, a UM6P PhD student carried out experiments at EPFL, familiarising himself with the techniques and equipment in place in Prof. Wendy Queen's laboratories in Sion.

This project aims to produce synthetic fuels by producing hydrogen and simultaneously combining it with CO₂ molecules. This is an extremely ambitious challenge, given the need to carry out these two reactions on the surface of the

same catalyst. To maximise the project's chances of success, 2023 has been devoted to optimising each of the reactions separately.

Among the metal-organic frameworks (MOFs) available, the project teams identified zirconium- and titanium-based catalysts as the most promising because of their chemical stability. The research teams have begun doping them with nickel, cadmium or cobalt atoms in their active sites.

Second call for projects

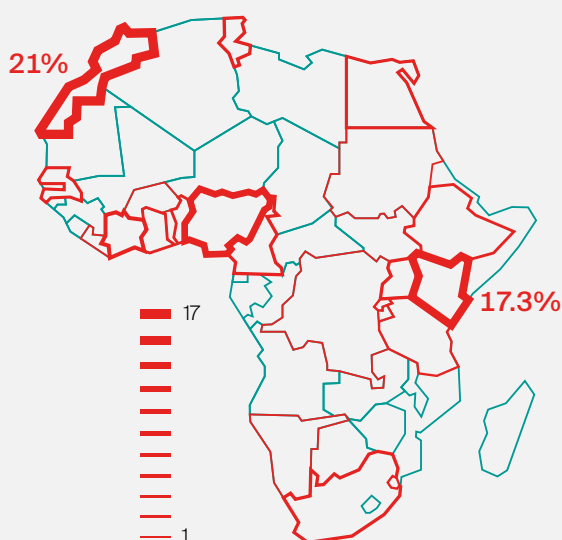
A second call for projects was launched in 2023. In total, 112 applications were submitted on the platform, 81 of which were eligible. The percentage of female applicants was 21%, a significant increase on the previous year (we received around 16% female applications in 2020). In terms of the geographical origin of applications (graph 1), Morocco and Kenya were the most represented, with 21% and 17.3% respectively.

Graph 2 also shows the fields of research in which those who applied in 2023 are working. Unsurprisingly, the themes that are most important for Africa in the 21st century are also the most represented. The top three are environmental sciences (27%), information and communication technologies (ICT - 18.5%) and life sciences engineering (16%). The more traditional sciences and techniques are not to be outdone, with very

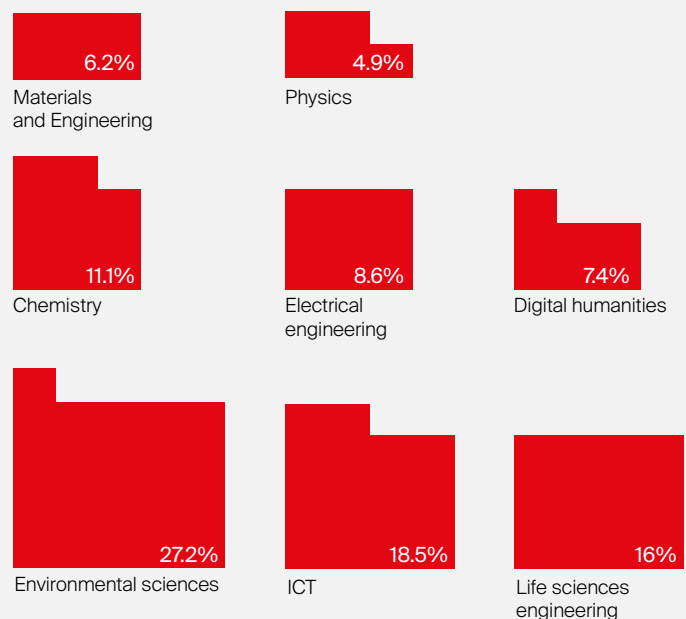
promising applications in chemistry (11%) and electrical engineering (9%). In addition, many applications demonstrate the interdisciplinary nature of the research proposed, for example by proposing projects combining medical and IT research. Applications relating to digital humanities (around 7%) also illustrate this trend.

By the end of 2023, 17 applicants had been matched with EPFL professors. These tandems then refined their research projects, which are currently being evaluated by external experts. There is no doubt that some excellent research projects will be launched in 2024.

Graph 1:
Breakdown of applications by country (total=112).



Graph 2:
Breakdown of applications by discipline.





Pillar 2

100 PhDs for Africa

The “100 PhDs for Africa” programme funds doctorates in an African academic institution, with one member of their institution's teaching staff providing primary supervision and co-supervision by an EPFL faculty member.

Nine doctoral students are currently working on their theses as part of this programme: the progress of their research projects is summarised below. A second call for projects has been launched in 2023: around twenty PhD students will make up the second intake.

Projects in progress

Shimaa Heikal, Egypt

In neuroscience, Shimaa Heikal, from The American University in Cairo, is writing her doctorate on the subject of *“The Egyptian Dementia Network (EDN) registry: towards the discovery of new biomarkers of early-onset dementia”*.

Under the supervision of Prof. Salama (in Egypt) and Prof. Lashuel (at EPFL, in Switzerland), Shimaa Heikal is working to identify biomarkers associated with the early stages of dementia in order to facilitate early diagnosis and a better understanding of the mechanisms of neurodegeneration and dementia in the Egyptian population.

In 2023, she worked on consolidating a register of dementia cases in Egypt, as part of a pilot project run by the American University in Cairo. She was able to establish a database of at least 100 individuals to begin taking clinical samples from patients and continue with the identification of biomarkers.

Her academic stay in Prof. Lashuel's laboratory and her participation in three international conferences enabled her to obtain new support for her research project in Egypt, with several new medical centres associated with her study. She has also taken advantage of her international exposure to bring her research criteria and methodologies in line with the best current international standards. In this respect, an article is currently being reviewed: “Serum Alpha-Synuclein and Inflammatory Markers profile in an Egyptian Alzheimer's and Parkinson's Diseases patient”.



The conferences she attended are:

- Alzheimer’s Association International Conference, San Diego, USA. Poster presented: “Investigating the feasibility of creating a disease registry in Egypt: a case study of dementia”.
- American Public Health Association’s Conference, Boston, USA. Poster presented: “Aging and public health section”.
- Alzheimer’s Association International Conference, Amsterdam, Pays-Bas. Poster presented: “Piloting a research registry for dementia: the Egyptian Dementia Network (EDN) registry”.

In 2024, she plans to extend the initial experiments to identify and characterise biomarkers in the samples taken, and to create a database for analysing and managing the data and results of the Egyptian dementia network register.

Presentation of her poster entitled “Piloting a research registry for dementia: the Egyptian Dementia Network (EDN registry)”, Amsterdam, Netherlands.



Achraf Delhali, Morocco

In chemical engineering, Achraf Delhali from UM6P is completing his doctorate entitled *“Cooling by evaporation aided by dehumidification combined with water recovery. Investigation of advanced adsorbents and systems”*.

Supervised by Prof. Belmabkhout (in Morocco) and Prof. Agrawal (at EPFL, in Switzerland), Achraf Delhali is developing an evaporative cooling technique that is an environmentally friendly cooling technology. The aim of his thesis is to develop an adsorption dehumidification system using porous solids - adsorbents that are manufactured and tested under real conditions to adsorb water from humid air.

During his first year, he verified the properties of phase purity, hydrothermal stability and porosity characteristics of the selected adsorbents. It has also explored new business models for the profitability of materials made from waste.

Achraf Delhali was able to take advantage of his academic stay in Prof. Agrawal's laboratory to characterise samples using laboratory equipment in Switzerland and also in France, at an EPFL partner institution. He also took part in two international conferences and had the opportunity to present his thesis topic to a delegation from the World Bank.



The international conferences he has attended are:

- 1st Mediterranean Conference on Porous Materials, Medpore, 17-19 May 2023, Crete, Greece.
- The São Paulo School of Advanced Science on Nanotechnology, Agriculture & Environment (SPSAS NanoAgri&Enviro), at the Brazilian Center for Research in Energy and Materials (CNPEM), Campinas-SP, Brazil, 03-15 July 2023.



Finally, he has already published an article in a specialist chemistry journal entitled *“Water Vapor Adsorption by Porous Materials: From Chemistry to Practical Applications”*. J. Chem. [🔗](#)

In 2024, he plans to continue his characterisation experiments in the Moroccan and Swiss laboratories with which he is affiliated.

Achraf Delhali at The São Paulo School of Advanced Science on Nanotechnology, Agriculture & Environment (SPSAS NanoAgri&Enviro).





Academic stay in Prof. Michaud's laboratory.

Maurane Gaelle Fokam Fokam, Cameroon

In materials science, Maurane Gaelle Fokam Fokam, from the École Nationale Supérieur Polytechnique de Yaoundé, is doing her doctorate entitled *“Characterisation and study of the behaviour of a composite material reinforced with banana leaf fibre and a natural resin”*.

Under the supervision of Prof. Kenmeugne (in Cameroon) and Prof. Michaud (at EPFL, in Switzerland), Maurane Gaëlle Fokam Fokam is developing a study on the recovery of agricultural waste, more specifically fibres from the main vein of the banana leaf. The material produced will also be composed of a natural resin.

In 2023, Maurane worked mainly on the chemical, physical and mechanical characterisation of banana leaf vein fibres collected in localities in Cameroon. In particular, she took advantage of her academic stay in Prof. Michaud's EPFL laboratory to carry out experiments with traction machines.

In 2024, she plans to characterise a bio-sourced resin and produce composites, as well as testing them. She also plans to publish a paper on the physical, chemical and mechanical characterisation of banana leaf veins.



Joseph Jjagwe, Uganda

In nanotechnology, Joseph Jjagwe of Makerere University is completing his doctorate entitled “*Iron oxide nanocomposite for the detection and elimination of pollutants in water*”.

Under the supervision of Prof. Olupot (in Uganda) and Prof. Carrara (at EPFL, in Switzerland), Joseph Jjagwe is exploring solutions for detecting and eliminating pathogenic micro-organisms in water. He has identified iron oxide nanoparticles that have contaminant adsorption and antimicrobial properties. His aim is to develop a new nano-composite that will improve the antimicrobial properties of water cleaning agents.

During his first year, Joseph Jjagwe concentrated on scientific experiments in his laboratory in Uganda. In particular, he has made progress in characterising the iron oxide water powder and its chemical composition.



The first two articles are based on numerous experiments carried out:

- Jjagwe, J., Olupot, P. W., & Carrara, S. (2023). *Iron oxide nanoparticles/nanocomposites derived from steel and iron wastes for water treatment: A review*. Journal of Environmental Management, 343, 118236. [↗](#)
- Jjagwe, J, Olupot, P.W., R. Kulabako., & Carrara. *Electrochemical sensors modified with iron oxide nanoparticles/nanocomposites for voltammetric detection of Pb (II) in water: A review*. Submitted to Heliyon and currently under review. [↗](#)

In 2024, his plans include producing iron oxide nanoparticles from iron oxide waste powder and spending an academic year in Prof. Carrara's laboratory in EPFL.

Maurine Andanje, Kenya

In materials science, Maurine Andanje from Jomo Kenyatta University is doing her PhD on the subject of “*Development of bioplastics, characterisation and optimisation of 3D printing parameters*”.

Mentored by Prof. Mwangi (in Kenya) and Prof. Carrara (at EPFL, in Switzerland), Maurine is studying bioplastics as an alternative way of reducing the environmental impact of traditional plastics. She specialises in the production of bioplastics from agricultural waste and recycled plastics with a view to producing base materials for 3D printing.

During her first year, Maurine Andanje succeeded in producing such biomaterials from rice husks and recycled high-density polyethylene (HDPE). Her experiments led her to look into extrusion, a mechanical manufacturing process that consists of compressing rice husks into the desired format under pressure. She has also made progress on the mechanical characterisation of the material, the analysis of its surface morphology and the analysis of its biodegradability.



This research has led to the publication of two articles and participation in two thematic conferences in Kenya.



Her publications are entitled:

- Andanje, M.N., Mwangi, J.W., Mose, B.R. and Carrara, S. (2022) *A Comparative Analysis of Additive Manufacturing Filaments Developed from Recycled High-Density Polyethylene and Recycled Polypropylene: Extrusion Process Optimization*. Proceedings of the 2022 Sustainable Research and Innovation Conference JKUAT Main Campus, Kenya, 5-6 October 2022, 59-66. [🔗](#)
- Andanje, M.N., Mwangi, J.W., Mose, B.R. and Carrara, S. (2023) *Biocompatible and Biodegradable 3D Printing from Bioplastics: A Review*. *Polymers*, 15, Article No. 2355. [🔗](#)

In 2024, she plans to focus on modelling and developing software to simulate the printability of her designs. She will also spend an academic year at EPFL in Prof. Carrara's laboratory.



Geoffrey Mwendwa, South Africa

In physics, Geoffrey Mwendwa, from the University of the Witwatersrand, is completing his doctorate entitled “*Correlation of ferroic orders in multiferroic rare earth composite thin films*”.

Supervised by Prof. Wamwangi (in South Africa) and Prof. Dil (at EPFL, in Switzerland), Geoffrey Mwendwa is working on the physical properties of materials with the potential, for example, to improve the performance of photovoltaic solar cells.

In 2023, his time at EPFL enabled him to use high-precision laboratory equipment (such as lasers and advanced equipment for determining the crystalline structure of materials). This has greatly improved the analytical characterisation of his samples.

He has also had the opportunity to participate in national and international conferences at which he has presented the progress of his research, notably at the Southern Africa Powder Diffraction Conference 2023 (SPDC 2023), Midgard Country Estate, Okahandja, Namibia, 16 - 21 April 2023.

In 2024, he plans to finalise his experiments, write the bulk of his thesis, publish one or more articles, and envisage a defence for the end of the year or early 2025.



Academic trip to Switzerland, with Prof. Dil.

Interview with
Lou Tinan
Ange-Laetitia
Tra during her
stay at EPFL.



**Lou Tinan Ange-Laetitia Tra,
Côte d'Ivoire**

In urban planning, Lou Tinan Ange-Laetitia Tra, from the Centre Suisse de Recherches Scientifiques in Côte d'Ivoire and the Université Félix-Houphouët-Boigny, is completing her doctorate entitled "*Optimisation of the management of sludge from septic tanks in Non-Collective Sanitation in low-income sanitation in low-income areas of Africa: the case of Abidjan in Côte d'Ivoire.*".

Supervised by Prof. Dongo (in Côte d'Ivoire) and Dr Jérôme Chenal (at EPFL, in Switzerland), Lou Tinan Ange-Laetitia Tra is developing an urban sanitation model for disadvantaged areas using a management tool equipped with Artificial Intelligence.

In 2023, Lou Tinan Ange-Laetitia Tra conducted an exploratory survey to map out the study area in terms of housing

types and on-site sanitation, ensuring the viability and reliability of her survey methodology. She also organised a workshop to launch her study, in order to involve all the stakeholders in the sanitation sector, incorporate their respective grievances and ensure their support for her project. She is currently writing an article on this research, which will be submitted to an academic journal. Lou Tinan Ange-Laetitia Tra also spent an academic year in Dr Jérôme Chenal's laboratory, where she was able to collaborate with other researchers, who provided input for her future research.

In 2024, she plans to continue the empirical analysis of her subject, develop a digital tool for modelling her data and write the first draft of her thesis, while publishing a second scientific article.



Brandon BISSCHOFF, South Africa

In Astrophysics, Brandon Bisschoff from the University of KwaZulu-Natal is completing his doctorate entitled “*The Intergalactic Magnetic Field (IMF): Simulations and Observational Probes*”.

Under the supervision of Prof. Ma (in South Africa) and Prof. Kneib (at EPFL, in Switzerland), Brandon Bisschoff is carrying out simulations to understand the properties of the intergalactic magnetic field.

In 2023, Brandon Bisschoff was able to carry out the literature review for various chapters of his thesis while at the same time carrying out observation projects based on his simulation projects.



Since starting his thesis, he has attended two international conferences, including :

- MIST conference in Corsica, France (25-29 September 2023): “Cosmic turbulence and Magnetic fields: physics of baryonic matter across time and scale”.
- Conference in Paris, France (26-27 October 2023): “Revealing cosmic magnetism in the near future: promises and challenges of Faraday rotation”.

He also spent two months in Prof. Kneib’s EPFL laboratory, where he established collaborations with other researchers in the group. He also attended three workshops and took part in two courses given by other EPFL professors. He plans to publish his first article in 2024 and to make progress on his observation projects.

Amal MACHTALAY, Morocco

In Mathematics, Amal Machtalay, from UM6P, is completing her doctorate entitled “*Bridging medium-field games and multi-agent models via Markov chain aggregation*”.

Under the supervision of Prof. Retnani (in Morocco) and Prof. Kressner (at EPFL, in Switzerland), Amal Machtalay studies the micro-macro models involved in complex systems such as cell populations, crowd dynamics, social behaviour and traffic flow. She uses game theory as a mathematical framework to understand these systems and their interactions.

In 2023, Amal made progress on the literature review and the methodological aspects of her research. After an initial visit to EPFL at the end of 2022, she plans to return to Switzerland to continue her collaboration with Prof. Kressner’s research team.





Pillar 3 Digital education

Digital education cuts across a number of our activities. It supports and enriches our various initiatives, from the simple acquisition of technical skills to the promotion of a dynamic digital culture.

In particular, it promotes the dissemination of our expertise and strengthens our impact within our community by favouring an interactive and participative approach while stimulating creativity and commitment.

The creation of a Certificate of Open Studies (COS), support for the design and development of MOOCs as part of the African Cities Lab project, technical capacity building for our partners, and the launch of a call for proposals for the creation of Online Labs are just some of the projects that are now benefiting from this approach.



Presentation of Digital Education Expert certificates at Nangui Abrougoa University in Côte d'Ivoire.

Inauguration of the Centres of Competence in Digital Education (C-CODE) 15 and 16 March 2023

Award ceremony for digital education experts at the Université Nangui Abrougoa (UNA), Côte d'Ivoire

After a one-day workshop to prepare their presentation for the graduation ceremony, the experts in digital education from the Université Nangui Abrougoa led an interactive and dynamic session on their new teaching practices before receiving their certificates. The ceremony was attended by Her Excellency the Swiss Ambassador, Mrs Anne Lugon-Moulin, Prof. Tano Yao, President of the UNA, and the representative of the Ministry of Higher Education and Scientific Research (MESRS).



↑ Official inauguration of the studio by the Ministry's representative.

➤ Demonstration in the new multimedia studio of NM-AIST.

2 October 2023 Inauguration of the NM-AIST C-CoDE in Arusha

The opening of the Centre of Competence in Digital Education (C-CoDE) at the Nelson Mandela African Institution of Science and Technology (NM-AIST) marks a new stage in the deployment of digital education within the University.

The new educational video production studio was inaugurated on 2 October 2023, in the presence of the distinguished Prof. Ladslaus Mnyone, representative of the Ministry of Education, Science and Technology, accompanied by Mr Holger Tauschet, Deputy Ambassador of Switzerland, as well as the Vice-Chancellor of NM-AIST, Rafiq El Alami of UM6P, and Dr Jérôme Chenal.

The event was preceded by a ceremony at which certificates of achievement were awarded for the digital education expert training provided by the EXAF centre. In all, three experts and 10 members of the faculty were honoured.

Dr Janeth Marwa, the new Digital Education Expert, receives her certificate of achievement for the EPFL Digital Education course.

Together, they confirmed their determination to exploit the potential of digital education at their university, demonstrating their commitment to educational innovation and the introduction of new teaching practices.



Transfer of equipment and capacity building for technicians Completion of the redevelopment of the recording studios

In 2023, our support enabled six universities to renovate and reallocate new recording studios. These institutions include Kabale University in Uganda, Nelson Mandela African Institution of Science and Technology (NM-AIST) in Tanzania, Moi University in Kenya, Nangui Abrogoua in Côte d'Ivoire, University of Abuja in Nigeria and Ecole Supérieure Multinationale des Télécommunications (ESMT) in Senegal.

Purchase of studio equipment

During this initiative, our role has included supporting universities in acquiring advanced equipment for their recording studios. We facilitated the purchase of equipment for six universities, including Kabale in Uganda, NM-AIST in Tanzania, Moi University





Technician training at NM-AIST (left) and Kabale University (right).

in Kenya, Nangui Abrogoua in Côte d'Ivoire, University of Abuja in Nigeria, and Sèmè City in Benin, to set up recording studios. The ESMT, for its part, has chosen to acquire the necessary equipment by its own means. In 2023, significant disruptions in the production chains forced us to re-evaluate and modify the list of planned studio equipment. To do this, we consulted a number of specialists, including those at EPFL, the University of Lausanne and UM6P. The equipment was exported and imported in 2023, except for the University of Nangui Abrogoua, where it was imported between the end of 2023 and the beginning of 2024.

Technical upgrade

While, technicians from most universities had been trained at UM6P, it had not been in their own studios. We therefore proposed a refresher to interested universities in their own studios. Most of these refresher sessions took place directly on campus, with the exception of Kabale University, which had not yet received any technical training for its staff. To fill this gap, an intensive two-week training course was organised for Kabale: the first week dedicated to installing and configuring



the hardware, and the second focusing on using the software and developing studio production skills.

Here is a video produced during the technical training week:



Introduction to Institutional Repositories (Kabale University)

Table 1
Technical upgrades by university.

Université	Dates	Pays
Kabbale University	21 August to 1 st September	Uganda
NM-AIST	22 au 28 octobre	Tanzania
Moi University	6 to 10 November	Kenya
ESMT	No upgrade	Senégal
Abuja	No upgrade	Nigeria
Nangui Abrogua	No upgrade	Côte d'Ivoire

Online Labs call for proposals launched

At the end of 2023, EPFL and UM6P, through EXAF, launched a call for projects to fund the establishment of 4 to 10 online laboratories in African universities.

The objectives of these laboratories are to:

- facilitate access to technological education,
- access to flexible learning at any time,
- share resources to make better use of equipment,
- guarantee the quality of teaching materials in the fields of science, technology, engineering and mathematics (STEM).

Selected projects will receive funding of up to CHF 40,000. For more information, visit the EXAF Centre website. [🔗](#)

Although the project is scheduled to start in 2024, a major preparation phase has been necessary, including the definition of the main guidelines and the planning of its implementation.



Pillar 4

Digital solutions for sustainable cities in West Africa

The project aims to develop innovative solutions to the challenges of increasing urbanisation in four key urban contexts: Abidjan, Grand Nokoué (Cotonou, Ouidah, Porto-Novo, Sèmè-Kpodji, Abomey-Calavi), Ouagadougou and Bamako. By focusing on improving living conditions, the environment and access to urban services for vulnerable populations, the project promotes a participatory and local approach through the funding of research and innovation.

The project will be carried out in three phases of four years each, for a total duration of 12 years from 2024 to 2035.

In the day-to-day, operational implementation of the urban challenges they face, cities collaborate little with the academic, research and innovation communities, and vice versa. More effective collaboration between these two entities promises productive synergy and innovation rooted in local realities for urban issues. Three specific pillars structure the achievement of objectives within this framework.



The first pillar supports the development and implementation of digital solutions by funding research projects in the project's four flagship cities. Concrete research results will be ready for implementation by the cities. In Abidjan, a Living Lab will be set up as a pilot to test the open-air laboratory concept, which aims to

maintain an ecosystem of several urban players (universities, cities, private sector and civil society) in order to experiment with different solutions and develop them further. A workshop and colloquium were organised in March 2023 to involve stakeholders in the process of setting up the project. The model could be replicated in other cities in subsequent phases.



The second pillar encourages closer links between cities and universities by strengthening their capacities and by the mutual appropriation of new technologies and digital technology for urban development. To this end, calls for projects will be launched in each of the cities, mentioning these criteria for research and the organisation of conferences to popularise science for the cities.

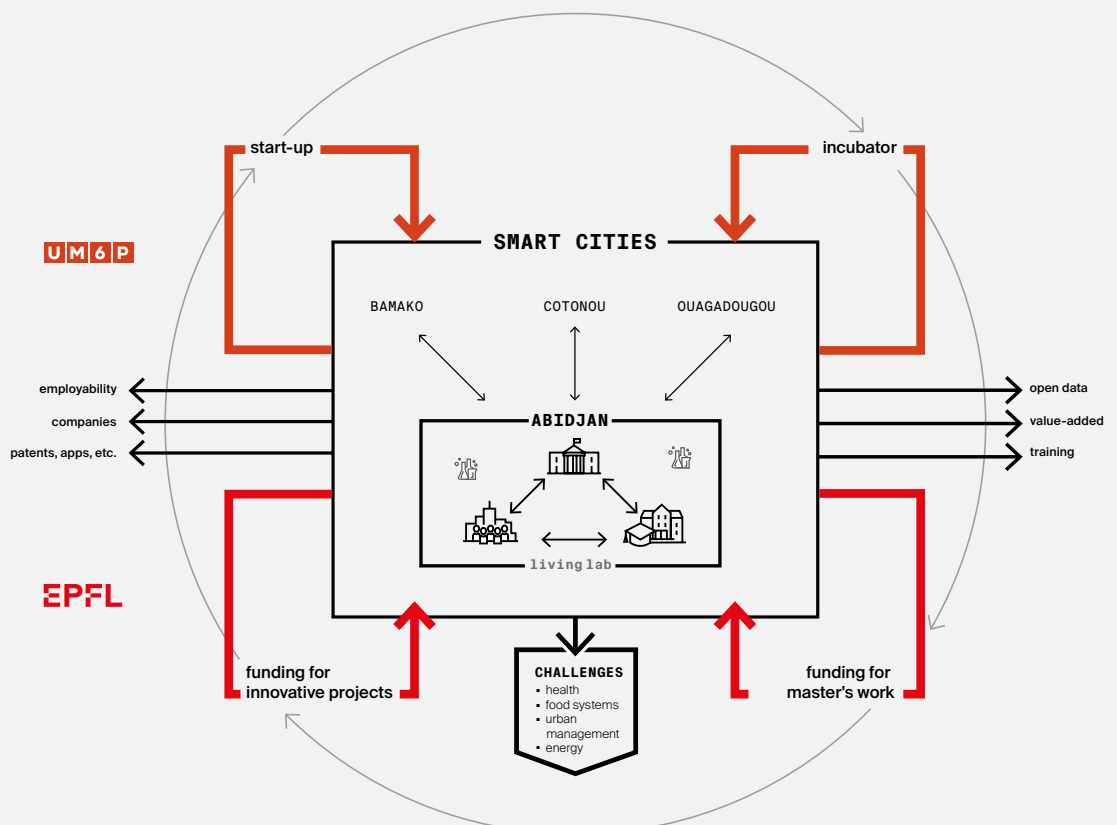


The third pillar encourages the acceleration of the digital solutions developed and their incubation to create start-ups. This component should be an integral part of the projects funded, and their solution should be able to be developed into a business model for the urban context it affects. By creating added value and jobs, this pillar also has a bearing on sustainability, on the possibilities for co-financing with private structures, and on the long-term vision that this project is aiming for, so that the solutions find a lasting foothold.

- **Abidjan Living Lab as a pilot laboratory:** the Abidjan Living Lab will act as a pilot laboratory for the first phase of the project. Applied research activities will be concentrated in this city in order to produce innovations.

- **Evaluation for replication of the Living Labs:** the lessons learned and the evaluation at the end of the first phase will make it possible to assess the possibility of replicating the Living Labs in the other contexts covered by the project from the second phase onwards. This flexible approach means that the project can be adapted according to the results obtained.
- **Research funding:** researchers in Cotonou, Bamako and Ouagadougou will continue to receive funding during the first phase. The calls for projects aim to encourage researchers to work with cities and civil society in designing and implementing their solutions.

Graph 5
Schematic diagram
of the smart city
concept.



↓
The EXAF team and focal points received by the Ministry of Communication and Digital Economy.

↘
The Vice-President in charge of cooperation, at the Université Félix Houphouët Boigny, at the opening of the workshop.



Preliminary activities for setting up a Living Lab in Abidjan

Prior to the mission to Abidjan in March 2023, the EXAF team and focal points used platforms such as Zoom to establish preliminary contacts with various partners. They sent out appropriate invitations and assessed the risks associated with each partner with the help of the focal points.

The mission to Abidjan had **several key objectives which were successfully achieved:**

1. Meetings with stakeholders and institutional partners prior to the two events.
2. Closer collaboration with universities in Côte d'Ivoire, in particular the Université Félix Houphouët Boigny.
3. The organisation of a workshop to include stakeholders in the development of the Living Lab, on 15 March 2023.

The Abidjan workshop and colloquium were a resounding success, as evidenced by the numerous feedbacks from partners and the clear motivation to continue the collaboration. The focal points have continued their work of establishing contacts and maintaining relations with the partners.

4. The organisation of a conference to enable urban and digital players to understand the challenges and solutions facing the city of Abidjan, on 16 March 2023.
5. A meeting of the focal points in the four towns to strengthen the team and support the organisation of the workshop. The mission to Abidjan was a crucial stage in the progress of the project, marked by careful planning, effective contacts with partners and the successful delivery of key events to promote understanding

of the challenges of digital and urbanisation in the region. The events were a success, not least in terms of the diversity of the participants present (see table on next page).

6. Two focus groups.

Following changes to the project budget, the workshops initially planned for Cotonou, Ouagadougou and Bamako were cancelled. However, the focal points played an active role in enriching the drafting of the project document, and their activities were highly relevant to the progress of the project, particularly through the focus groups.

Cotonou

In January 2023, the EXAF team met with the Swiss Cooperation Office in Cotonou, and took the opportunity to establish direct contacts with various local partners for the project.

Joëlle Elvire Kante (urban planning expert) was appointed as the focal point for Benin. Her involvement was significant, including her contribution to the drafting of the sections dedicated to Benin in the project document. In addition, she undertook the identification of potential partners through a mapping of local stakeholders, initiating preliminary contacts. She also conducted two focus groups.

Ouagadougou

Focal point Scarlett Zongo (an expert in digital and urban planning) was commissioned with terms of reference similar to those of Joëlle in Cotonou.

The main difference in the progress of the tasks was that a date had been set for the workshop, and a number of logistical elements had been booked in advance, with invitations also ready to be sent out. Scarlett also met with the other focal points in Abidjan during the workshop. She also conducted two focus groups.

Bamako

Focal point Mamadou Doumbia (a specialist in digital transformation) was tasked with missions corresponding to terms of reference similar to those of Joëlle and Scarlett. Faced with the complexity of the security situation in Mali, he demonstrated his commitment by actively contributing to the identification of various risks, thus bringing a valuable perspective to the team. Mamadou Doumbia had already initiated preliminary contacts with identified local partners, and several logistical aspects had been carefully anticipated, planned and booked. He also conducted two focus groups.

A project document setting out the basis for the project was drawn up and sent out at the end of September 2023.

The EXAF team with the focal points (from left to right) Emmanuel Somy (Abidjan), Axel Yoboue (Abidjan), Scarlett Zongo (Ouagadougou), Joëlle Kante (Cotonou) and Mamadou Doumbia (Bamako).



Representative sectors of the Living Lab - present	Organisms
Universities	Université Félix Houphouët Boigny (UFHB)
Public actors	Ministère de la Construction, du Logement et de l'Urbanisme (MCLU) Ministère de l'intérieur et de la sécurité (MIS) Ministère de la Communication et de l'Économie numérique (MICEN) Autorité de Régulation des Télécommunications/ TIC de Côte d'Ivoire (ARTCI) District Autonome d'Abidjan (DAA) Direction Générale de la Décentralisation et du Développement local (DGDDL) Union des villes et communes de Côte d'Ivoire (UVICOCI) Bureau National d'Etudes Techniques et de Développement (BNETD) Mairies d'Anyama, du Plateau, de Cocody, de Koumassi, de Bingerville
Private actors	Ze Box/Jool International Impact Hub LIFI LED Green Invest Africa DsN
Users	DigiFemmes Association des Jeunes de la Commune de Koumassi Autres acteurs institutionnels présents Ambassade de Suisse en Côte d'Ivoire Banque mondiale JICA Côte d'Ivoire Ordre des Architectes de Côte d'Ivoire Ordre des Urbanistes de Côte d'Ivoire

Table 2
Participants at the workshop in Abidjan.

↙ Meeting with the Swiss Cooperation office in Cotonou, with Gérard Babalola Laleye (left) and Björn Schranz (right).

↓ Focus group in Ouagadougou.
↘ Focus group in Bamako.



African Cities Lab

The African Cities Lab project aims to create a digital education platform and MOOCS on urban development in Africa.

in partnership with the Swiss State
Secretariat for Economic Affairs



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

African Cities Lab

The African Cities Lab (ACL) initiative, funded by the Swiss State Secretariat for Economic Affairs (SECO), gives all urban players access to high added-value training courses on sustainable urban development.

The overall aim of the project is to provide a long-term response to the challenges facing African cities, by building the capacity of those involved in their development.

ACL is an African digital education platform for urban development, offering high-quality MOOCs (Massive Online Open Courses) and continuing education for professionals in the sector. 4200 people have already signed up, mainly from Africa.

Six African institutions, both English- and French-speaking, are behind this project, with the aim of creating a network in the field of digital education and making an impact across the continent.

These institutions are responsible for implementing the project, in conjunction with EPFL. They have different levels

of responsibility, but all actively contribute to the dissemination and promotion of ACL in their respective countries, ensuring a wide audience in the short and long term.

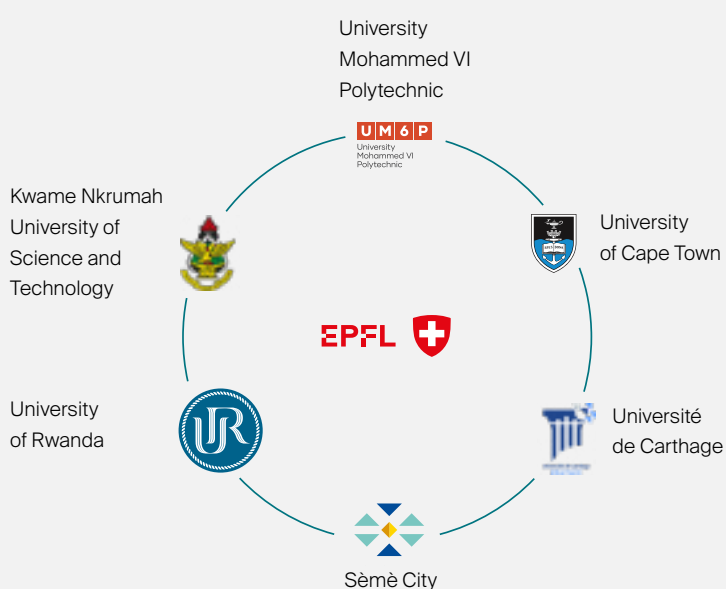
The African Cities Lab's mission is also to provide a space for discussion and exchange on the sustainable management and governance of African cities, with a view to creating a genuine community. To achieve this, a wide range of activities are planned, including :

- the creation of an Executive Masters programme,
- hybrid courses (online followed by face-to-face), ideally based on the MOOCs offered on the platform,
- scientific conferences and webinars,
- organising a Masterclass for African mayors and local decision-makers,
- the launch of a competition for students and young professionals,
- the creation of a series of podcasts,
- the mobilisation of ACL ambassadors in different countries across the continent.

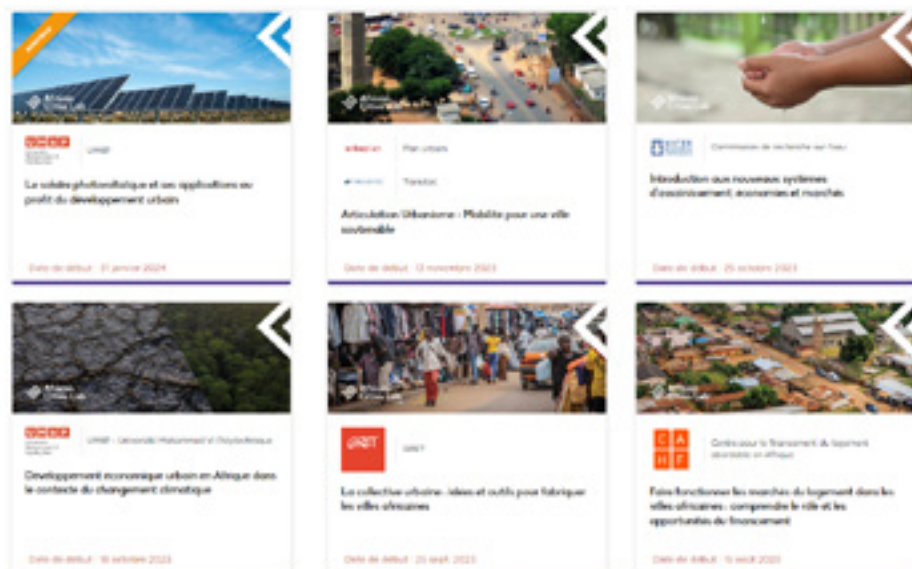
MOOCs

Seven MOOCs, run by prestigious African partners and funded by the African Cities Lab, are currently available on the platform, with others set to be added in the very near future.

Partners
of African Cities Lab.



Overview of MOOCs online on the platform.



The MOOCs are free to access and are structured around eight key themes, and a single MOOC can address several of them. These themes were identified as



priorities by the partners, and were the subject of a call for proposals, following which the first 12 MOOCs were funded by the project. The profile of learners reveals that the majority are young graduates and/or working professionals looking to improve their practices and enhance their skills. Many decision-makers will also find useful, practical resources for everything to do with smarter urban development in Africa.

ACL Summit 23

The first edition of the African Cities Lab Summit on the theme of “Datafication: harnessing the power of data to rethink the design and construction of African cities” took place on 23 and 24 May 2023. For two days, professional urban planners, academics, specialists in technological innovation, entrepreneurs, start-ups, public and private bodies, influential figures and politicians shared their thoughts on the impact of urban technologies in boosting the quality of life in Africa.

This event, organised in a hybrid format, took place simultaneously online and on the campuses of Sème One in Cotonou (Benin), UM6P in Ben Guérir (Morocco) and the Kwame Nkrumah University of Science and Technology - KNUST (Ghana). The African Cities Lab Summit 2023 brought together participants from over 40 countries. The summit generated stimulating discussions and innovative initiatives, enabling participants to discover best practices in smart and sustainable urban development in Africa, while exploring the opportunities for an inclusive



The African Cities Lab Summit 2023 took place on May 23 and 24, 2023.



digital transformation of their cities.

Two keynote presentations and a number of high-level panels addressed the following topics:

- data protection in future African cities,
- the link between tourism and urban development,
- building smart, inclusive cities, the role of the politician and the architect in the African city of tomorrow,
- digital technologies and infrastructures for designing new cities,
- and improving basic urban services using data.

Scientific activities then took place at UM6P and KNUST. 37 scientific papers covering a range of topics related to urban development in Africa were selected and presented in person at UM6P, with live streaming on the summit platform. At KNUST, two thematic sessions on urban mobility were also held simultaneously and broadcast live on the summit platform. The proceedings of the summit are

currently being finalised by UM6P. They will help to disseminate the knowledge generated at the event. Key lessons have also been learned and will be put to good use for future summits.

Webinars

With the aim of strengthening the ACL community and forging links with learners, the project also supports the holding of webinars. Some MOOC providers offer this type of online meeting to explore the subjects covered in their courses in greater depth. On 21 November 2023, Urbaplan and Transitec organised their first meeting as part of their MOOC “Articulation Urbanisme - Mobilité pour une ville soutenable”. This first webinar dealt with urban form and sustainable mobility. Others are planned to complement the modules on offer. A second webinar is due to be organised by UN-Habitat around their MOOC “Digital Governance for Inclusive and Sustainable African Cities”. It should be coupled with a competition involving

students from architecture and urban planning schools or African universities who hold certificates of achievement offered by the MOOCs on the ACL platform. A third webinar is being discussed with UM6P on urban data management for smarter African cities.

Executive Master

The Executive Master specialising in Smart City Strategies in Africa is a one-year academic programme. This programme, launched in May 2023, is specifically designed for working professionals and anyone wishing to develop advanced skills in the field of urban management. It has been developed by UM6P's Urban Systems Centre (CUS).

The 14 students enrolled in the first edition are professionals from a variety of backgrounds. This diversity helps to create a dynamic learning environment, as each learner brings a distinct perspective and specific skills.

The immersion programme ran from 30 October to 3 November. This part of the course was designed to give students the opportunity to explore various smart city ecosystems in Morocco. Participants were able to take part in workshops led by Marrakech city officials, visit the Zenata eco-city project, and explore innovative start-up platforms, including UM6P's STARGATE.

Hybrid continuing education

The African Cities Lab has positioned itself as a key player in the support of professional bodies on the African continent, experimenting with different innovative teaching approaches to guarantee the best results in terms of learning and the acquisition of new skills.

The project offers hybrid training courses aimed at city practitioners, public administration and local authority teams, as well as professionals from the private sector.

These courses initially offer online content, sometimes punctuated by compulsory synchronous meetings, followed by a practical, face-to-face session in the field. They are organised in collaboration with the project's main partners. There are also plans to launch an African Cities Lab training tour, which will travel to different African cities to offer learners who have already successfully completed an ACL MOOC a week's additional face-to-face training in a given field.

Other COS on the management and planning of African cities

The Certificate of Open Studies (COS) in Management and Planning of African Cities is a pioneering project at EPFL. Not only is it the first COS in French, it is also a fully online course tailored to an African audience and to professionals working on the urbanisation of African cities.

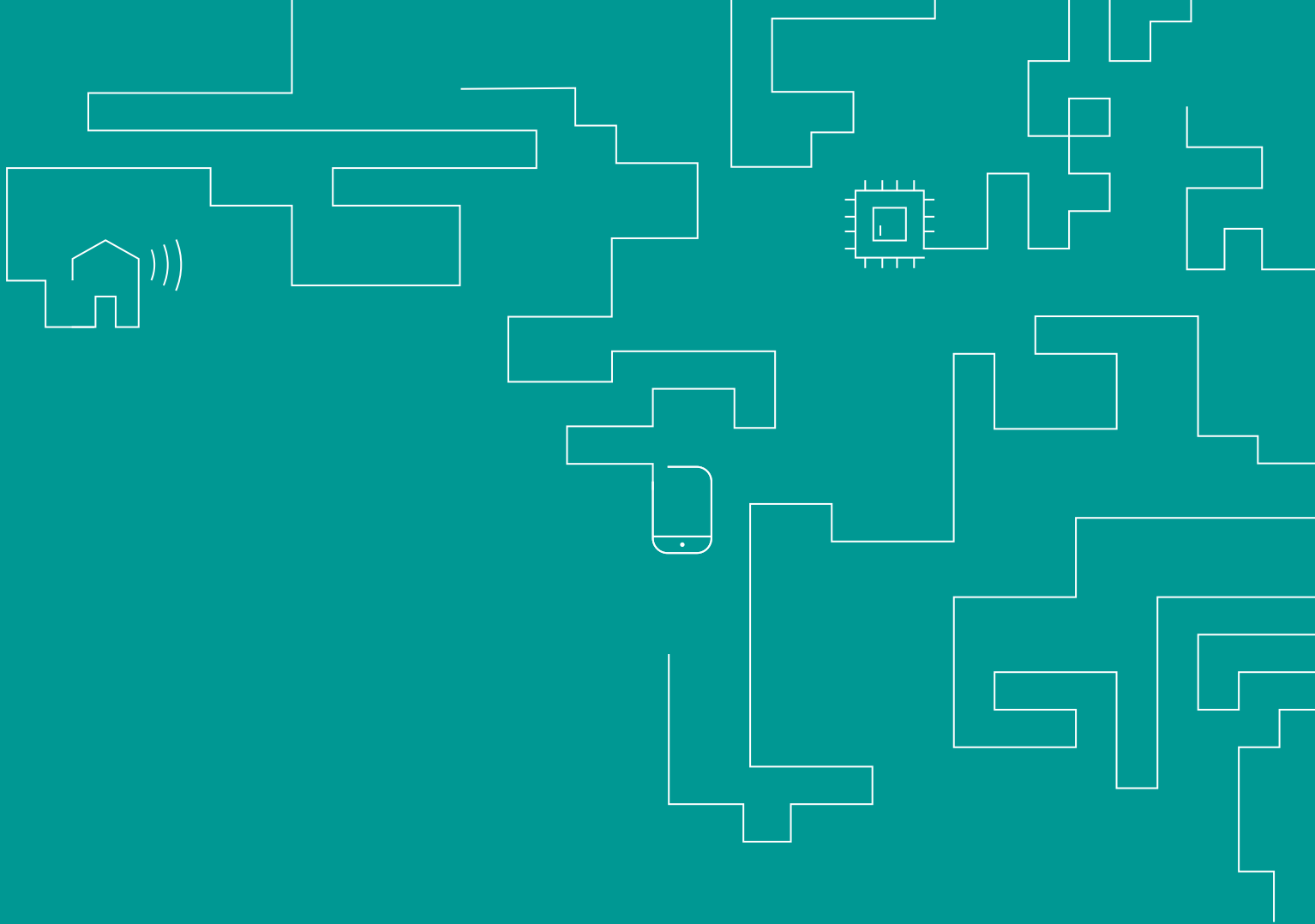
Since October 2023, efforts have focused on updating the course content, which includes around 250 videos, so that it meets the criteria for an official EPFL certificate. This also involves a major update of the other course materials, such as readings, quizzes and assignments. The programme regulations and syllabus will be officially approved by EPFL in January 2024.

COS has also been a pilot for innovations in digital education at EPFL, including the creation and use of an avatar of Jérôme Chenal to update videos of his previous MOOCs. Some of these videos were recorded more than 10 years ago, and it so happens that the

teacher has physically changed since then. Some of the content, such as statistics and political contexts, has also changed, although the issues and general concepts are still relevant. This method provides an effective way to update content without having to refilm entire videos from scratch. To date, over 140 videos have been updated, filmed or redone using the avatar. A further 110 or so videos are due to be updated between now and June 2024.



see "COS" chapter, p. 46



“E-Learning in low connectivity contexts” project

in partnership with



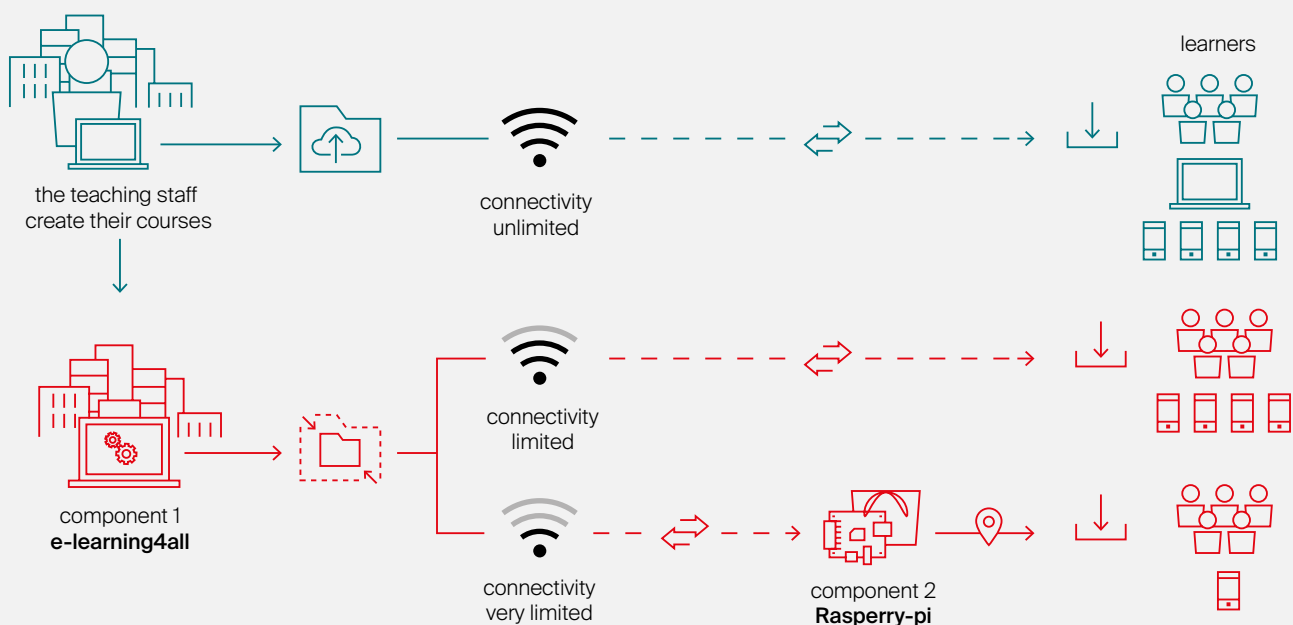
Proposed solution

As part of the “E-learning in low-connectivity contexts” project, the EXAF Centre has been working since 2022 with Unité (an association of 13 Swiss organisations active in development cooperation) to develop a sustainable digital education system in areas with poor Internet connections.

This project was co-financed by the Swiss Agency for Development and Cooperation (SDC) as part of its programme contribution to Unité.

The project ended in 2023. EXAF developed a web application, called “e-learning4all”, to compress and optimise the size of files used in digital education. A solution using a microcomputer was also proposed in order to create a local intranet network when the Internet connection is too weak to envisage e-learning, despite the compression of educational files (graph 6).

Graph 6
Structure of the chosen technical solution.



Pilot projects and lessons learned

In 2023, this solution was tested in pilot projects with varying degrees of connectivity: in Côte d'Ivoire (poorest connectivity); in Egypt (intermediate connectivity) and in Kenya (best connectivity). Missions were organised to Côte d'Ivoire and Egypt, where members of the EXAF team were able to assess the relevance and effectiveness of the proposed solution. In Kenya, tests were carried out by a Unité partner association.

The first lesson to be learnt from the feedback is that trainers can send smaller files to their learners, thanks in particular to the reduced use of



Use in Côte d'Ivoire of the learning solution developed by EXAF.

bandwidth. This reduces connection times and therefore learning costs. What's more, the pilot projects have confirmed the choice of developing a web application, which can be easily converted into a smartphone application at a later date, as well as providing free access to the source code. However, the compression tool alone would not have been sufficient to enable distance learning in certain contexts, particularly in the Egyptian and Ivorian pilot projects.

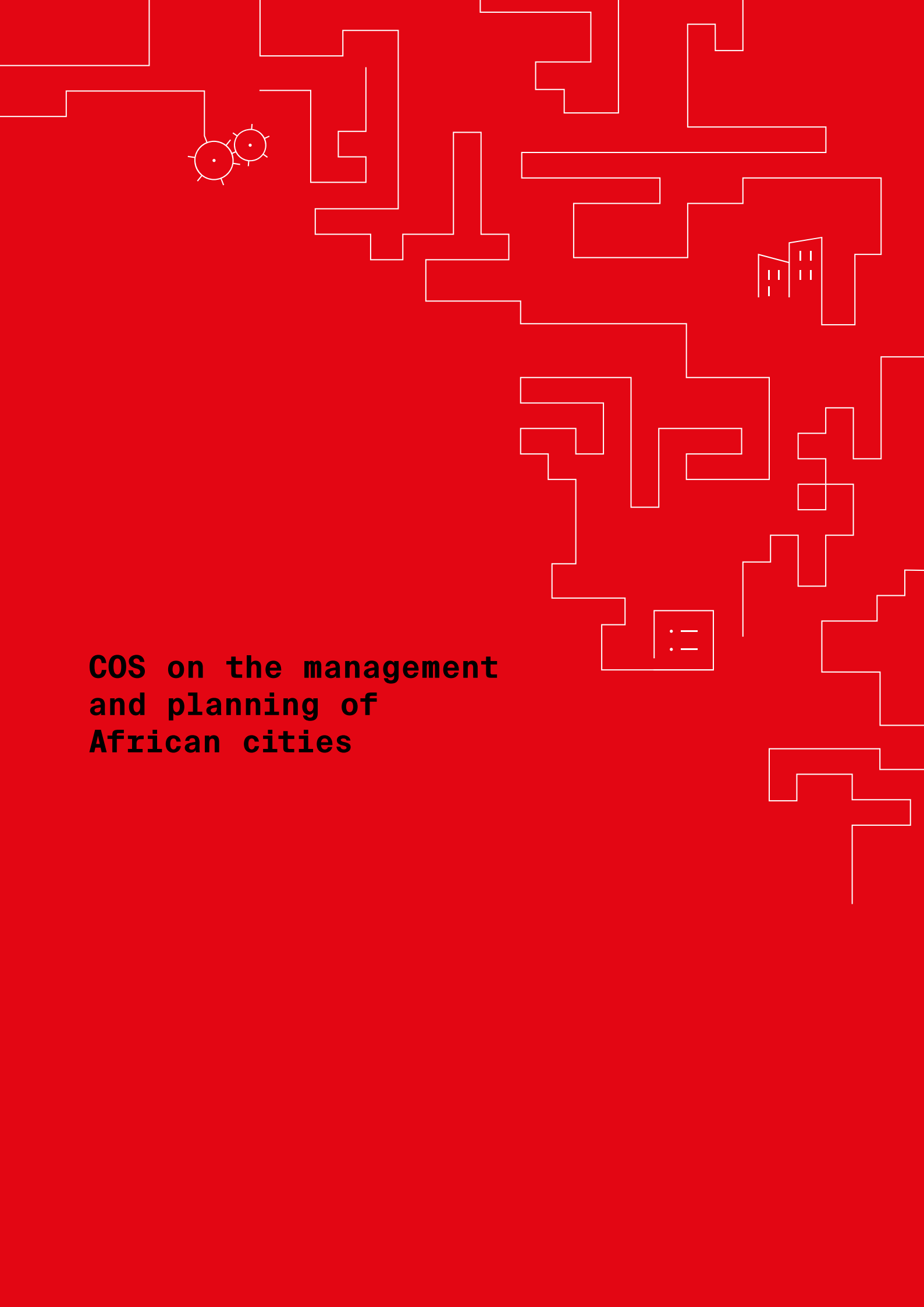
The second part of the solution was to use a microcomputer to create a local intranet at the training locations. The microcomputer chosen by the EXAF team was the Raspberry Pi, because it is inexpensive, easy to use, energy-efficient and can run on a portable battery or USB power supply. These characteristics proved highly appropriate during the pilot projects.

Alongside the technical development of the solution, a sociological analysis was carried out to assess its impact on reducing socio-demographic inequalities. To do this, a questionnaire was submitted to users. They emphasised that the solution developed by EXAF not only gave them access to quality education and greater inclusion in the world of work, but also had other positive impacts, such as improved access to health awareness and prevention information.

The following elements have been identified to improve access to and use of the solution developed by EXAF:

- A better visual presentation of the application would help to make the site more accessible and encourage its use.
- Creating an offline version of the web application would enable it to be used in extremely fragile contexts, where even trainers do not have a good enough network to download their course files onto the online application.
- Adapting the application in the form of a Telegram Bot could be useful for trainers who do not have a learning platform or laptops. This would enable them to use their smartphones for digital education purposes.
- The implementation of Artificial Intelligence (AI) algorithms could greatly improve the compression process.

In conclusion, the pilot projects have demonstrated the relevance of the technical solution developed by EXAF for e-learning in contexts with poor connectivity. The success of this implementation will encourage other organisations to explore these solutions to meet distance learning needs in similar contexts elsewhere in Africa or Latin America.



**COS on the management
and planning of
African cities**

COS on the management and planning of African cities

Despite the rapid growth of urban areas in French-speaking Africa, there are few courses dealing with urbanisation issues in the region, and even fewer in French. Among the main ones are the five MOOCs previously developed by Dr Jérôme Chenal in partnership with four African urbanisation teachers.

To broaden the offer, EXAF has started developing a “Certificate of Open Studies (COS) on the management and planning of African cities” in spring 2023. It builds on previous MOOCs and offers learners an official EPFL certificate equivalent to 10 ECTS credits. To apply what they learn, participants are encouraged to use an African city of their choice as a case study for all learning activities and assignments.

EXAF reviewed all the MOOCs and began updating or creating new content, including educational videos, readings, quizzes and work in partnership with colleagues from EPFL's Communauté

d'Études pour l'Aménagement du Territoire (CEAT). By 2023, over 70 videos had been updated or filmed for the COS. The programme's regulations and study plan have been officially submitted to the EPFL.

During its conception, COS broke new ground at EPFL. Not only is it the first COS in French, it is also a fully online official course tailored to an African audience and other professionals working on the urbanisation of African cities. The COS has also been a pilot for innovations in digital education at EPFL, notably through the creation and use of

¹ They were approved in January 2024.

an avatar of Dr Jérôme Chenal to update his previous MOOC videos. This method makes it easier to update obsolete content without having to refilm it entirely. EXAF is also using COS to develop a new approach to the course promotion through digital marketing, as well as more traditional forms of promotion.

The COS will open in the second half of 2024

Example of avatar created for COS update.

Quelques chiffres EPFL

Pays	Pop. Urbaine	Pop. rurale	Pop. totale	% urbain
Ethiopie	22 328	85 207	107 535	20.8
Côte d'Ivoire	12 647	12 259	24 906	50.8

Source: World Urbanization Prospects: The 2018 Revision

EPFL

COS
Certificate of Open Studies
Gestion et planification des villes africaines
Dr. Jérôme Chenal

Approfondissez vos connaissances en gestion et planification des villes africaines.

Développez vos compétences pratiques avec de nombreux outils, concepts essentiels et approches clés en prenant en compte les spécificités des villes africaines.

Analysez et repensez l'urbanisation d'une ville de votre choix, en l'utilisant comme cas d'étude tout au long de ce COS.

Contact : exaf@epfl.ch
go.epfl.ch/info/cos-villes-africaines

Diplôme EPFL :
Certificate of Open Studies (COS)
10 crédits ECTS
entièrement en ligne



Communication

Connect and engage: the multi-channel communications strategy in 2023

The year 2023 was marked by the EXAF Centre's successful multi-channel communications strategy. This approach has strengthened our connections with institutional partners, donors and academic players across Africa.

2023 has been synonymous with success for the EXAF Centre, thanks to a bold multi-channel communications strategy. This approach has enabled us to strengthen our links with our valued institutional partners, donors and academic players across the African continent.

Website: Africa just a click away

Our website was the cornerstone of our communications in 2023, reaching the entire African continent, albeit unevenly (see graph 7). One notable feature was that the Chrome family of browsers was the most widely used, well ahead of Apple and other browsers. Our calls for projects have been extremely successful, attracting high-quality applications and strengthening our position in the field.

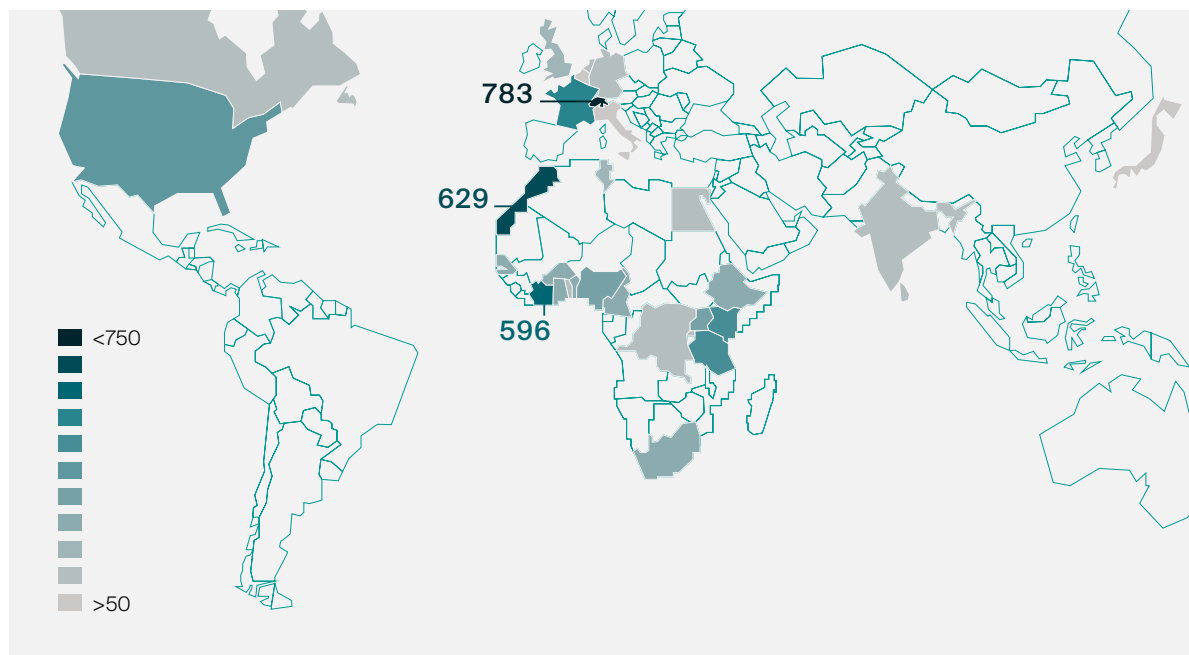
Social networks:

LinkedIn at the top

Among the social networks, we had the greatest impact on LinkedIn. Geographical examination of visits to our EXAF site revealed a significant concentration in cities that correspond to our political, academic and financial partners. This trend can be explained by our research-led partnerships and academic institutions located in these important urban centres. This year also saw a steady increase in the number of subscribers on LinkedIn, Twitter and Facebook, demonstrating our continued growth.

Outstanding performance

In 2023, our communication strategy produced some exceptional performances. Calls for projects, such as the second call for projects "100 PhDs for Africa" in March 2023, were very successful, attracting high-quality applications. We also published paper



and digital reports, such as “The SDC's added value in urbanisation contexts”, reinforcing our expertise in this field. Our presence at conferences such as the African Cities Lab summit 2023 in May 2023 also marked our commitment to research and development in Africa.

Fruitful meetings

An essential component of our year 2023 has been meetings with our partners, the beneficiaries of our programmes and our donors. Travelling across Africa, from Nigeria to Morocco, via Tunisia and Ghana, has enabled us to work closely together and organise major events. The workshop in Abidjan in March 2023 and the meeting of the African Cities Lab steering committee in Cotonou in May 2023 were key moments for strengthening our partnerships and exchanging promising ideas for the future.

An ongoing commitment

2023 will be remembered as a successful year for the EXAF Centre. Our multi-channel strategy enabled us to effectively connect and engage our institutional partners, donors and academic stakeholders in Africa. In 2024, we will continue to strengthen these connections, generate interest in our projects and promote excellence in education and research on the African continent.

Press review



L'African Cities Lab 2023 Summit se déroulera les 23 et 24 mai en « phygital » à Cotonou et à Ben Guerir

Par: La Nation

La première édition de l'African Cities Lab 2023 Summit se tiendra les 23 et 24 mai sur les campus de Sèmè One à Cotonou au Bénin et de l'université Mohammed VI Polytechnique à Ben Guerir au Maroc. Parallèlement, auquel on peut également participer en ligne sur une plateforme dédiée, est organisé par African Cities Lab, une entité panafricaine dont l'objectif principal est de former des générations d'acteurs au service des villes africaines de demain, en partenariat avec sept universités d'Afrique et d'Europe. Cette première édition aura pour principal thème « Datafication : exploiter la puissance des données pour repenser la conception et la construction des villes africaines ».

Lire aussi : Sèmè City : la cité du savoir et de l'innovation du Bénin

25 April 2023
www.wearetech.africa

26 April 2023
www.agenceecofin.com



Jeunesse, esprit d'entreprise et start-up : une confédération nationale des Youth Banks à Sèmè City ?

Par: KADIN LOOKONE

Le Bénin se prépare à accueillir l'African Cities Lab – 2023 SUMMIT. Les 23 et 24 mai 2023, African Cities Lab réunira des décideurs, des leaders d'opinion, des professionnels de l'urbanisme, des universitaires, des entrepreneurs, des acteurs publics et privés et des jeunes du monde entier pour redynamiser le développement des villes africaines.



Start-up : l'African Cities Lab et le Cairo Growth Stage au programme pour mai 2023

Agence Ecofin

La 1^{ère} édition de l'African Cities Lab Summit se tiendra les 23 et 24 mai 2023 sur les campus de Sèmè One à Cotonou, Bénin et de l'Université Mohammed VI Polytechnique à Ben Guerir (Maroc). Parallèlement auquel, [qui est possible de participer en ligne sur une plateforme dédiée](http://www.africancitieslab.org/fr/acc-call/c), est organisé par African Cities Lab, une entité panafricaine dont l'objectif principal est de former des générations d'acteurs au service des villes africaines du futur.

African Cities Lab @AfricanCitiesLab

African Cities Lab - 2023 Summit, sollicite des propositions d'ateliers et tutoriels pour enrichir la recherche sur les villes numériques et intelligentes africaines.

[Soumettre ici : summit.africancitieslab.org/fr/acc-call/c](https://summit.africancitieslab.org/fr/acc-call/c)

[#africancitieslab2023summit #summit:5africafrica/forcontributions](https://africancitieslab2023summit/#summit:5africafrica/forcontributions)

African Cities Lab @AfricanCitiesLab

African Cities Lab - 2023 Summit, is accepting proposals for workshops and tutorials to enrich the research focus on African Digital and Smart Cities.

[Submit here : summit.africancitieslab.org/submit-call/c](https://summit.africancitieslab.org/submit-call/c)

[#africancitieslab2023summit #summit:5africafrica/forcontributions](https://africancitieslab2023summit/#summit:5africafrica/forcontributions)

Call for workshops

3 October 2023

dailynews.co.tz

Home Habari Michezo Siasa Afya Biashara

TICKER MAGAZETI HABARI KUBWA KWENYE MAGAZETI YA LEO JUMATATU MACHI 25, 2024

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KITUO CHA ELIMU KIDIGITALI CHAZINDULIWA NELSON MANDELA

emmanuel mbatilo October 03, 2023

Kituo cha kidigitali kwa walimu chafunguliwa Arusha

Arusha, Tanzania ya Afrika ya Kiyani na Teknolojia ya Nelson Mandela imerindha kituo cha elimu kwa njia ya kidigitali (CoDE) ambacho kinagharimu zaidi ya dola 100,000 na litatumika kwa ajili ya walimu kuandaa vijidini amboryo vitahudhuria kidigitali.

Haya yameteserera leo Oktoba 2 jijini Arusha na Makamu Mkuu wa Tanzania hiyo, Profesa Masilia Kipanyala wakati akiongomaa katika uzinduzi huo ambapo amesema kituo hicho litatumika kufundisha walimu na wakufanai kutoa ryanu mubadilishi mbalizi kwa ajili ya kuwajengea umma wa kufundisha kidigitali.

1st October 2023

www.mwananchi.co.tz

Tanzania on course to become regional digital hub

ARUSHA, TANZANIA is poised to become a digital hub within the East Africa Community (EAC) following the inauguration of the Centre of Competence in Digital Education (Co-DE).

Hosted by the Nelson Mandela African Institution of Science and Technology (NM-AIST), the centre is established within the framework of the Excellence in Africa initiative, collaboration between Mohamed VI Polytechnic University (UM6P) of Morocco and Ecole Polytechnique Fédérale de Lausanne (EPFL) of Switzerland.

It is specifically designed to support the transformation of training and educational practices through digital tools and technologies in Tanzania and the EAC region.

With a construction cost of over 100,000 US dollars (about 200bn), the state-of-the-art facility will be equipped with a professional studio complete with cameras, lighting, internet access and soundproof materials.

This setup will enable live streaming and recording of educational content.

Speaking during the centre's inauguration on Monday, the Director of Science, Technology and Innovation at the Ministry of Science and Technology, Professor Ludwick Pinyo underscored the role of the facility in advancing education provision in Tanzania.

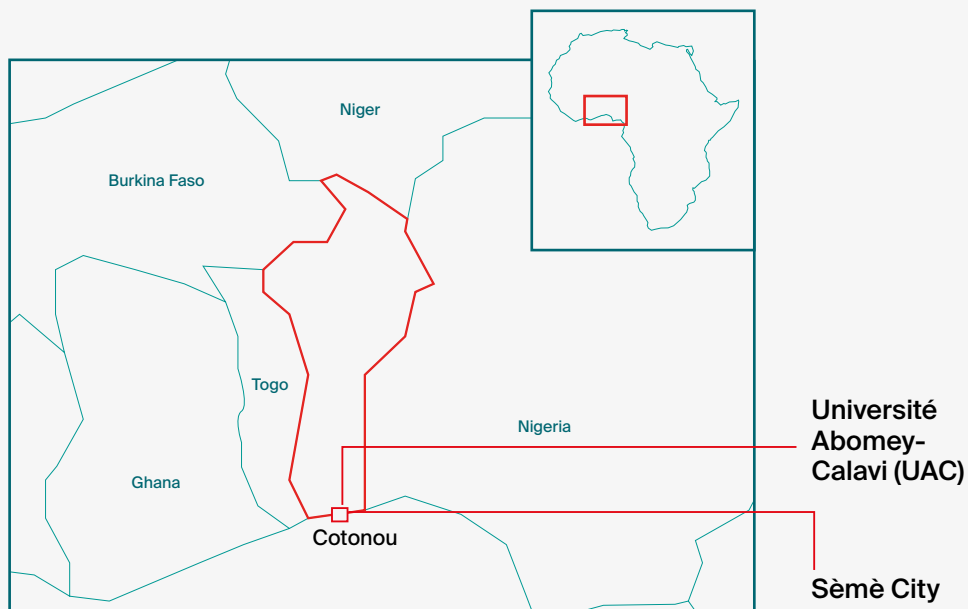
He said that embracing technologies and coping with rapid technological advancements had

3 October 2023

www.sayarinews.co.tz

EPFL projects in Benin

Partner universities



EPFL academic partnerships in Benin

2014

Collaboration agreement with Abomey-Calavi University, Cotonou.
Academic collaboration agreement.

2016

Running a MOOC scriptwriting and production workshop with Abomey-Calavi University, Cotonou.

2017

Construction of a MOOCs production studio with the University of Abomey-Calavi, Cotonou.



January 2023
Visit to the École
polytechnique
d'Abomey-Calavi.

Collaborative projects

- African Cities Lab
- Capacity Building in Digital Development for ACE Impact Centres
- MOOCs 4 Africa
- Excellence in Africa: Digital solutions for sustainable cities in West Africa

Official missions

Mission 1

Chiara Ciriminna,
Teniola Philipps
23-26.01.2023
Cotonou
Abomey-Calavi

- Meet the Swiss Cooperation Office in Cotonou.
- Meet the partners of the Excellence in Africa: Digital solutions for sustainable cities in West Africa and African Cities Lab projects.

EPFL privileged contacts

SCHRANZ

Björn

Deputy Head
Swiss Cooperation Office
in Benin (SDC)

LALEYE

Gérard Babalola

Regional Councillor Governance
Swiss Cooperation Office
in Benin (SDC)

GERBER

Renaud

Head of Finance, Personnel
and Administration
Swiss Cooperation Office
in Benin (SDC)

ADISSO HOUESSE

Nadège

Head of Operational Finance
Swiss Cooperation Office
in Benin (SDC)

AVAKOUDJO

Sènan

General secretary
Order of Architects and Town
Planners of Benin

FIFATIN

François-Xavier

Deputy Director EPAC
Abomey Calavi Polytechnic School

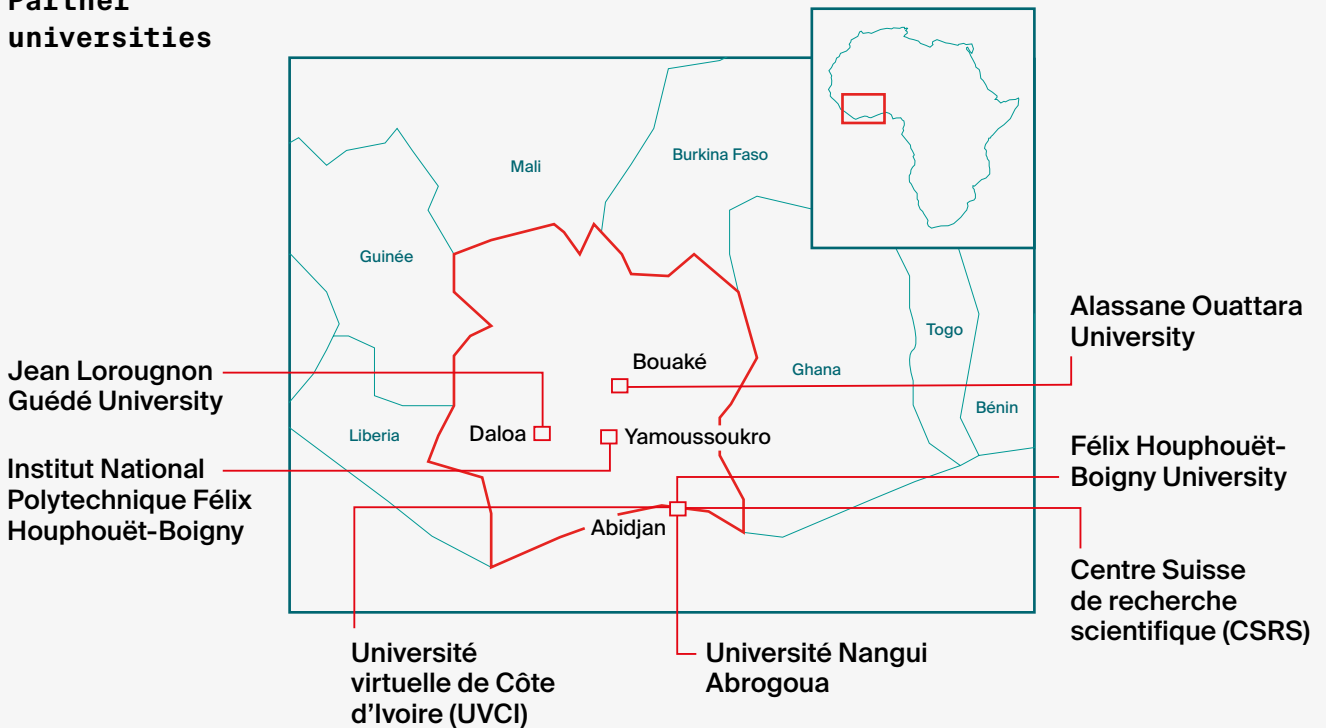
ODIDI

Edmond

Chief Executive Officer
Benin National Spatial Planning Agency

EPFL projects in Côte d'Ivoire

Partner universities



Collaborative projects

- Scientific Committee
- Conference
- Excellence in Africa (100 PhDs)
- L'Agence Universitaire de la Francophonie
- Excellence in Africa (C-CoDE)
- MOOCs 4 Africa
- RESCIF
- Excellence in Africa: Digital solutions for sustainable cities in West Africa
- "E-Learning in low connectivity contexts" project (Unité)

March 2023,
Workshop in Abidjan.



Official missions

Mission 1

Frédéric Meylan

13-17.03.2023

Collège Lumière

Azagué

Azagué

Implementation of the “E-learning in fragile contexts” solution in the Ivory Coast pilot project.

EPFL privileged contacts

KOUMAN Kouassi Gédéon

Director

Collège Lumière Azagué

TREMBLEY Léo

Councillor

Swiss Embassy for Côte d'Ivoire, Burkina Faso, Guinea, Liberia and Sierra Leone

Mission 2

Chiara Ciriminna

Teniola Phillipps

12-17.03.23

Abidjan

- Organising the workshop as part of the Digital Solutions for Sustainable Cities in West Africa project in Abidjan.
- Organising the conference, a follow-up to Num-Urb Dakar, in the context of the city of Abidjan.
- Meet stakeholders and institutional partners before the two events.
- Bringing together the focal points from the four cities for team-building and support in organising the workshop.

EPFL privileged contacts

YOBUE Véronique

Vice-Chairman

Félix Houphouët Boigny University

KOUPPO Gneleba

Technical Advisor, Minister's Representative

Ministry of Construction, Housing and Town Planning

BOAH Jean-Pascal

Director of International Cooperation and Sustainable Urban Development

Ministry of Construction, Housing and Town Planning

M'BRA Georges

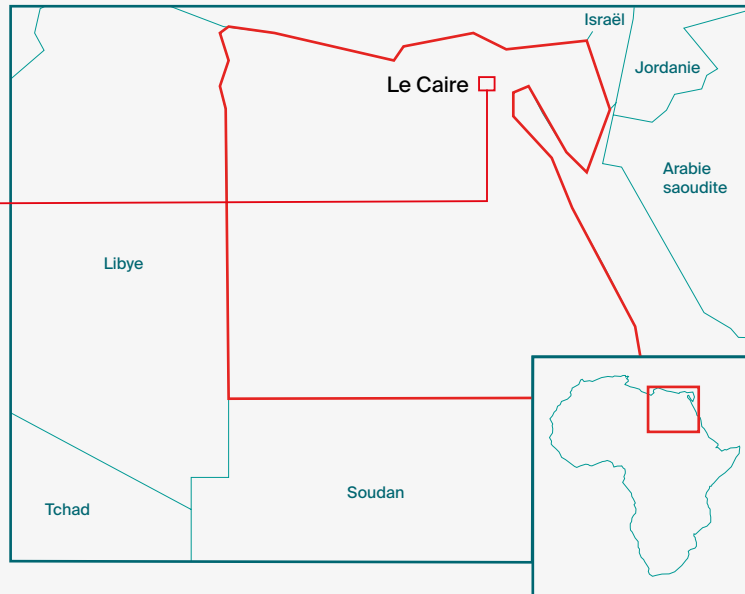
Managing Director

Ministry of Communication and Digital Economy

EPFL projects in Egypt

Partner universities

The American
University in Cairo



Collaborative project

- Excellence in Africa (100 PhDs)
- “E-Learning in low connectivity contexts” project (Unité)

March 2023,
Presentation of the
100 PhDs initiative
and project,
The American
University in Cairo.



Official missions

Mission 1

Andres Gomez

06 - 09.03.2023

Nile Hospital

Naqada,

Naqada

Implementation of the “E-learning in fragile contexts” solution for our partner.

EPFL privileged contacts

ADEL SOLIMAN Emad

CEO Hospital

Nile Hospital

Naqada

Mission 2

Frédéric Meylan

10.03.2023

The American

University in Cairo,

Le Caire

Detailed presentation of the “Excellence in Africa” initiative and the 100 PhDs for Africa project to AUC students, illustrating the opportunities it offers during a seminar.

The mission provided an opportunity to take stock of the EXAF project, 100 PhDs for Africa, currently being implemented at the AUC by PhD student Shimaa Heikal, under the supervision of Prof. Mohamed Salama (AUC) and the co-supervision of Prof. Hilal Lashuel (EPFL).

EPFL privileged contacts

HEIKAL Shimaa

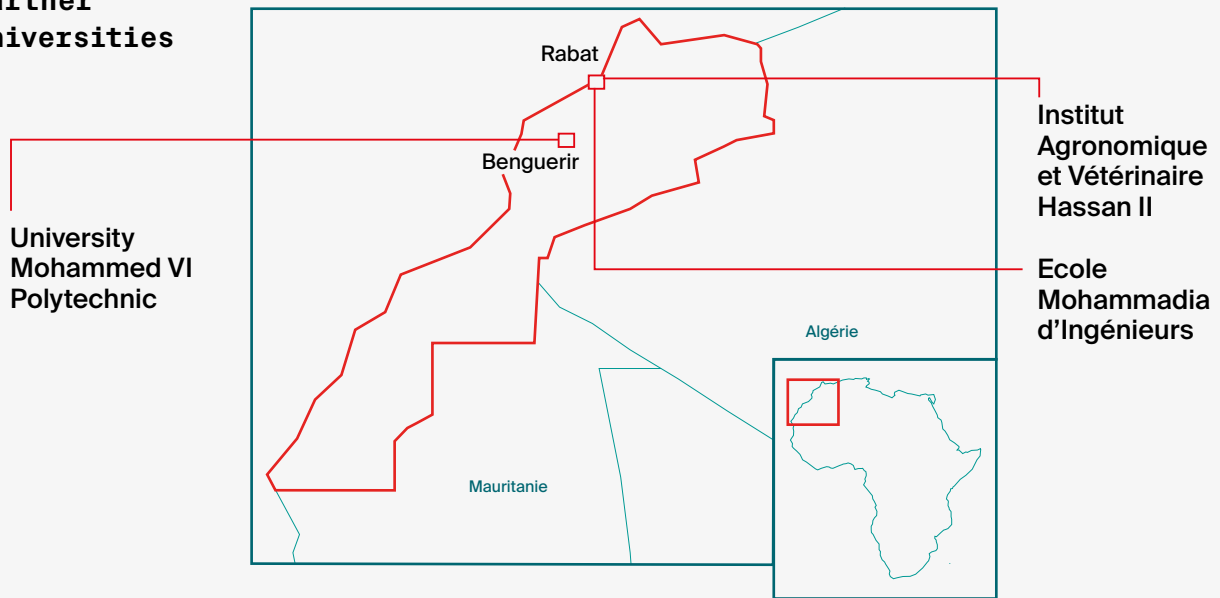
AUC

Prof. SALAMA Mohamed

AUC

EPFL projects in Morocco

Partner universities



Collaborative projects

- Excellence in Africa (JFD)
- African Cities Lab
- RESCIF
- Excellence in Africa (100 PhDs)
- Num-Urb

2010

As a member of the Réseau d'Excellence des Sciences de l'Ingénieur de la Francophonie (RESCIF), EPFL has been collaborating with Morocco since 2010.

Since April 2020,

41 EPFL MOOCs have been made available free of charge to students at UM6P and all Moroccan engineering schools.

Since June 2020,

The "Excellence in Africa" initiative has been launched.



July 2023,
Hicham El Habti,
President of the
University Mohammed VI
Polytechnic
(UM6P) to EPFL.

Official missions

Mission 1

Frédéric Meylan,
28.03.2023
UM6P
Ben Guerir

On the occasion of the Meeting of Delegates of the French-speaking Network of Excellence in Engineering Sciences (RESCIF) organised in Marrakech on 29 and 30 March 2023, the EPFL RESCIF Delegate paid a visit to UM6P. The EPFL RESCIF Delegate is also Project Manager for the 100 PhDs and JFD programmes at EXAF.

- Inventory of JFD and 100 PhDs projects with beneficiaries. Consultation with UM6P to set up project management mechanisms (e.g. reporting, summer schools, etc.).

EPFL privileged contacts

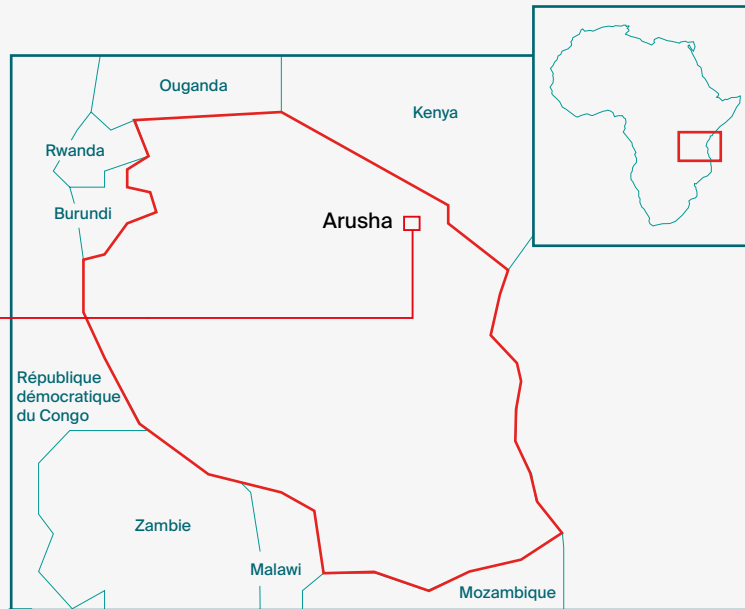
LAZRAK Ahmed
UM6P

IAZZI Badreddine
UM6P

EPFL projects in Tanzania

Partner universities

The Nelson Mandela
African Institution
of Science and
Technology
(NM-AIST)



Collaborative projects

- Excellence in Africa (C-CoDE)
- Excellence in Africa (JFD)

Official missions

Mission 2

Dr Jérôme Chenal,
Lisa Myers,
Frédéric Meylan

02-03.10.23

NM-AIST,
Arusha

- Inauguration of the C-CoDE and Biofuel Workshop (JFD)

EPFL privileged contacts

Dr MARWA Janeth
NM-AIST

KANYENGELE Octavian
NM-AIST

Prof. KOMAKECH Hans
NM-AIST

Excellence CHASSOT Didier
Swiss Ambassador to Tanzania

TAUSCH Holger

Deputy Head of Mission and Head of International Cooperation
Swiss Embassy in Tanzania

SULEIMAN Ally Sheila

Head of Communications
Swiss Embassy in Tanzania

Dr HAULE Michael

Admin Manager at NM-AIST

Dr TERRA Júlio

Postdoc, Luterbacher Group at EPFL



October 2023,
Inauguration of the
C-CoDE,
NM-AIST Arusha.

