



ecoconcrete



PROJECT BRIEF

DEVELOPMENT OF LOW CARBON/ GREEN CEMENTS
FOR THE CONSTRUCTION INDUSTRY IN UGANDA

Eco Concrete Limited is a Ugandan engineering company revolutionizing the construction industry in Uganda and Sub-Saharan Africa. Eco Concrete Ltd is dedicated to developing innovative, sustainable building materials by harnessing local material resources and place-based innovation strategies.

Eco Concrete began as a concrete research-based organization in 2016 aimed at addressing the market needs for cost friendly, environment friendly and end use tailored concrete works and products. Over the years, the company has grown into a cement-based materials producer, a reliable civil engineering contractor and an innovator in the construction industry.

In 2021, Eco Concrete Limited began research into production of greener binders in Uganda. Eco Concrete partnered with a Belgian laboratory, Resourceful and Concreet Projectmanagement B.V., a company based in the Netherlands to conduct a technical feasibility of alternative cement binders using Volcanic ash found in Rubanda and Kaolinite Clay from Rakai. Laboratory experiments revealed that strengths of up to 70 MPa were achieved in concrete products made using these new binders.

The company is currently piloting the production of alternative binders (green cements) in Rubanda District, western Uganda. This pilot project is aimed at producing construction materials using cement manufactured from volcanic ash and kaolinite clays. These minerals are abundant in Uganda, especially in the Central and Western regions.

The green cement being developed by Eco concrete is approximately 40% cost effective and moreover, eco friendly than the popular ordinary Portland cement.

INTRODUCTION

This is attributed to its low embodied energy and carbon at the time of its production.

The manufacture of traditional Ordinary Portland Cement (OPC) is a carbon and energy-intensive process and results into enormous amount of Carbon dioxide (CO₂) gas emissions. According to the International Energy Agency (IEA), up to 0.6 tonnes of CO₂ is generated during the production of 1 tonne of OPC. Therefore, in the production of the world's 4.1 Gigatonnes of cement, 2.5 Gigatonnes of CO₂ is emitted, accounting for 7% of the world's total CO₂ emissions. And, according to UBOS, in 2022, Uganda produced 4.7 million tonnes of cement. This implies that the average annual CO₂ emissions from cement production in Uganda is over 2.8 million tonnes. The World Bank estimates Uganda's annual CO₂ emissions at 6 million tonnes. Cement production alone therefore accounts for over 40% of the country's total CO₂ emissions.



Concrete blocks produced out of zero-cement binders being piloted on site in Rubanda

INTRODUCTION



Local government support; The mayor of Rubanda Town, Mr. Norman Tushabe regularly visits us on site to track progress of the green cement project

INTRODUCTION

To contribute towards reduction of CO₂ emissions, cement producers worldwide are faced with the challenge of developing low carbon cements. The common approach with traditional cement producers being partial replacement of clinker in the cement with pozzolanic materials, clinker still dominates the chemistry of these cements, so their limitation on how much CO₂ emission reduction can be achieved. Moreover, the clinker which is used by the cement manufacturers in Uganda is still substantially imported into the country. Clinker is the major driver of the high cost of cement which makes construction expensive and unattainable for many Ugandans.

The realities of our rural landscapes in Uganda are characterised by non-climate resilient homesteads built out of mud or soil blocks.



One of the many volcanic ash deposits in Rubanda district, and within proximity of the plant site



Alternative binders trial mixes on site

INTRODUCTION

The 2014 National Population and Housing Census revealed that 56% of houses were built using temporary materials such as mud and pole, unburnt bricks bonded with cement mortar, unburnt bricks bonded with mud, etc. One of the reasons for the poor-quality housing especially in rural Uganda is the high cost of construction materials such as cement and burnt clay bricks or concrete blocks.

With low cost and low carbon cements, access to low carbon quality housing and other productivity enabling agricultural infrastructure and technologies in rural homesteads will be realized. And this will enable climate resilience and sustainable economic growth of the nation considering that rural homesteads are the primary drivers of economic productivity of our nation.



Zero-cement precast blocks and pavers made with new binders on site in Rubanda. The materials produced will be used in developing a climate resilient and functional rural homestead for a member of the local community

Eco Concrete Ltd has developed unique alternative binder (green cements) that are made from naturally occurring minerals like volcanic ash, clay, and limestone, and waste materials such as blast furnace slag, fly ash, and rice husks. The materials are ground and mixed with activators such as lime and alkali solutions to form environmentally friendly binders that can be used as cements for all construction purposes. The manufacturing process for these binders is a lot less energy intensive compared to the process of manufacturing traditional Portland cements. The products also make use of vastly available raw materials in the country. It was reported by Arthur Holmes in 1935 that the volcanic deposits in Southwestern Uganda are of quantities that can build ninety cities the then size of New York, USA. Consequently, the binders are abundant, greener, and less costly.

RECIPES AND STRENGTH POTENTIAL

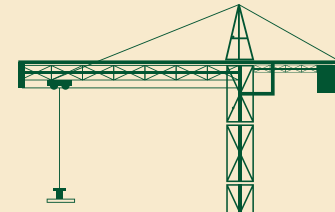
- Adequate for both low strength and high strength concrete applications with strength ranging from 4MPa to 70MPa.
- Offer greater chloride ion resistance
- Offer better water resistance properties (Performs better in resisting efflorescence and rising damp that are currently common with traditional Portland cements)

The builders of African cities.

Building legacies of high rise buildings,
Leading with Knowledge and innovation
to Make Property Development
Affordable for Africans.



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Laboratory experiments revealed that strengths of up to 70 MPa were achieved in concrete products made using these new binders. In 2022, a commercial feasibility study to produce concrete products using these alternative cement binders was conducted, funded by the Dutch Fund for Climate and Development (DFCD) through WWF- Bankable Nature Solutions Project.

It was found that the alternative cement binders can be produced at a price 40% cheaper than the market price of Ordinary Portland Cement (OPC).

This year, Eco Concrete and Build to Impact domiciled in the Hague, in the Netherlands are undertaking a pilot project to develop green concrete blocks from volcanic ash and Kaolinite Clays sourced from Rubanda and Bushenyi Districts. This pilot project is funded by European Union under the INNOWWIDE Eureka Network. These blocks shall be used to construct a climate resilient and functional rural homestead for one of the residents of Rubanda District.

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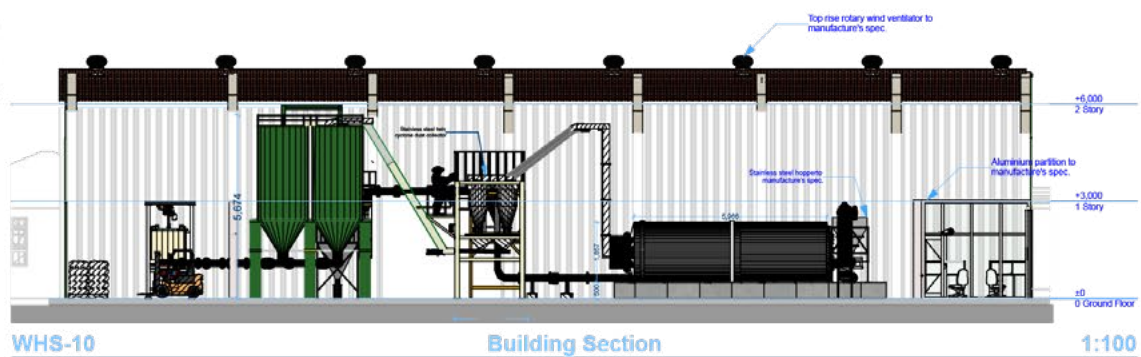
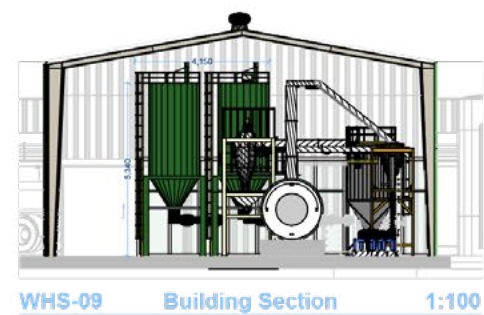
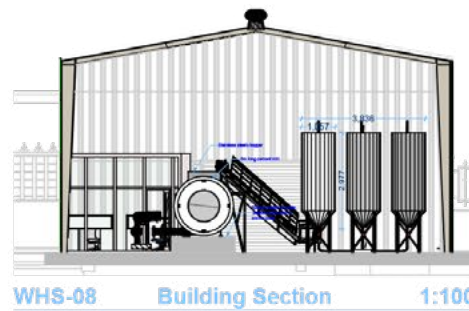
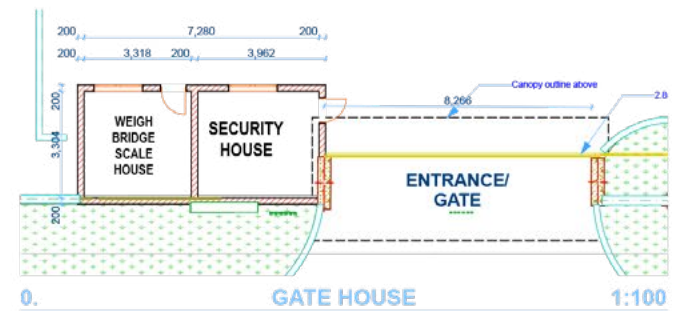
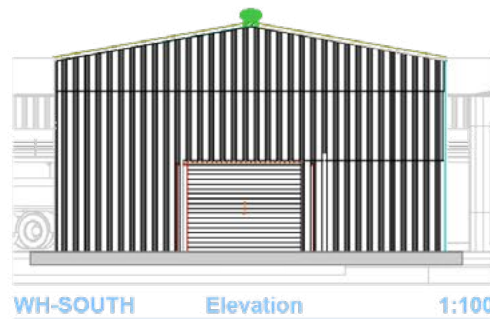
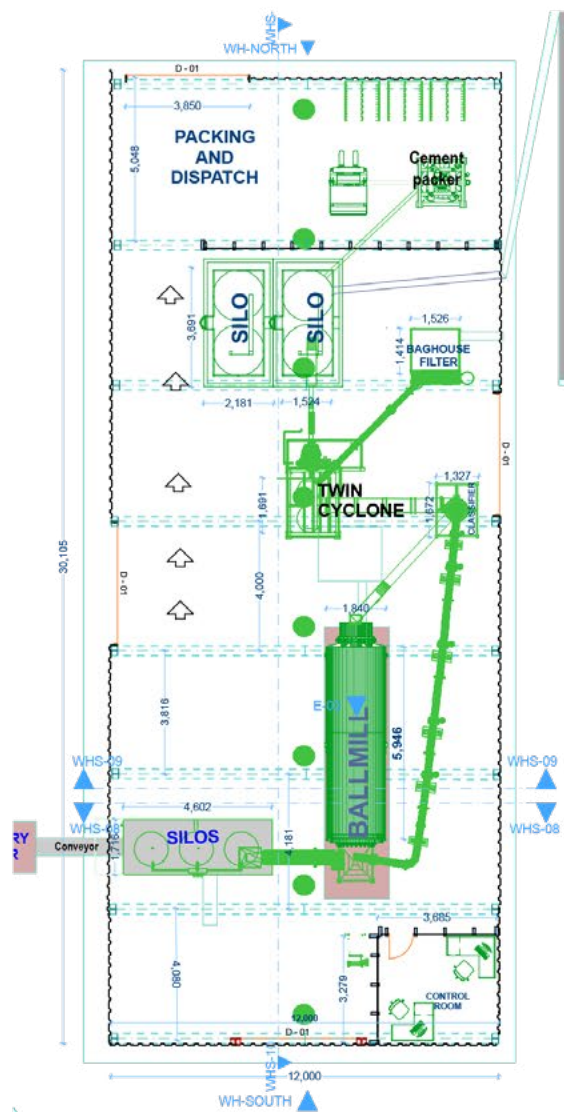
SCALING PRODUCTION

Eco Concrete plans to establish a factory in Rubanda with a production capacity of 120 tons per day of binder material from Volcanic ash. The estimated cost of the project is USD 3 million.

The factory will produce enough binder material for making 30,000 blocks enough to build 12 to 15 rural homes each day. In the second phase of scaling, Eco Concrete also plans to establish a second factory in Lyantonde town on Masaka-Mbarara highway with a production capacity of 600 tons per day of binder material from Kaolinite Clay, Limestone and Clinker (LC3) in Rakai under its license.

This Lyantonde town factory is estimated to cost USD 2 million.





Technical drawings for a USD 1 million plant developed for installation in Rubanda District

GREEN CEMENT PLANT SITE IN RUBANDA DISTRICT



Sixty acres of land Eco Concrete Ltd has secured in Rubanda District, Southwestern Uganda for our first green cement plant.

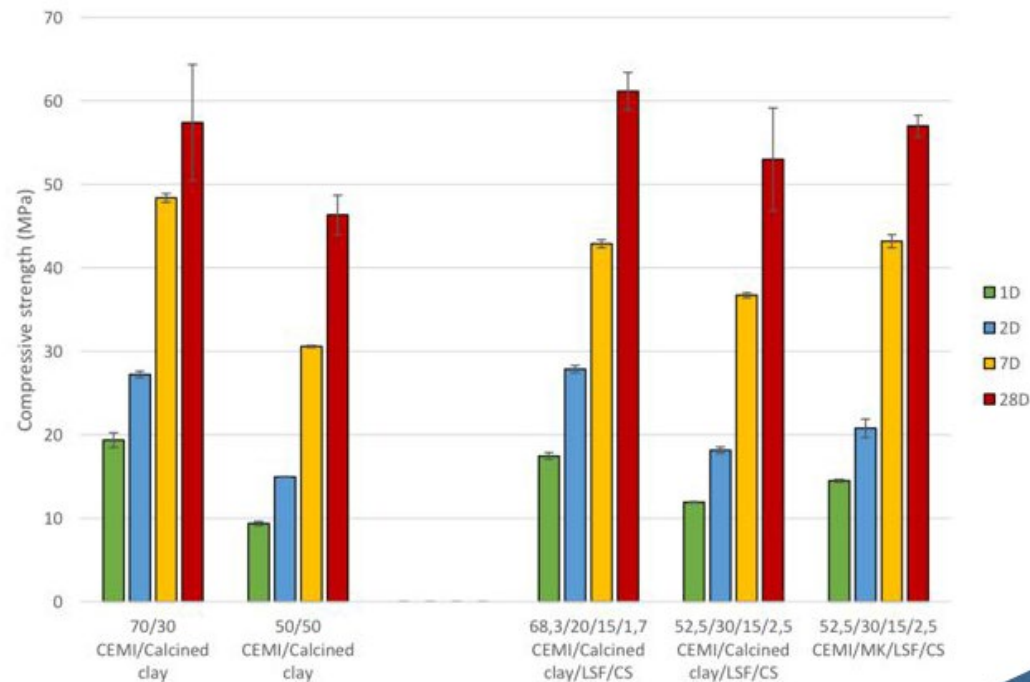
ACCESS TO RAW MATERIALS

Eco Concrete Ltd has taken steps to secure access to good quality kaolinitic clay and natural pozzolana deposits which will be sources of the raw materials needed in the production of the green cement. It should be noted that, on commissioning of the Rubanda green cement plant, the company will be taking advantage of its kaolin deposits in Rakai to develop another plant that will be committed to the production of LC3 cement.

The location of Lyantonde town has been identified as an ideal location for an LC3 cement plant given its access to a bigger market and the proximity of this location to LC3 input resources

Calcined clay: LC³ system

- Mortars with 3/1 Sand/Binder and W/B = 0,5

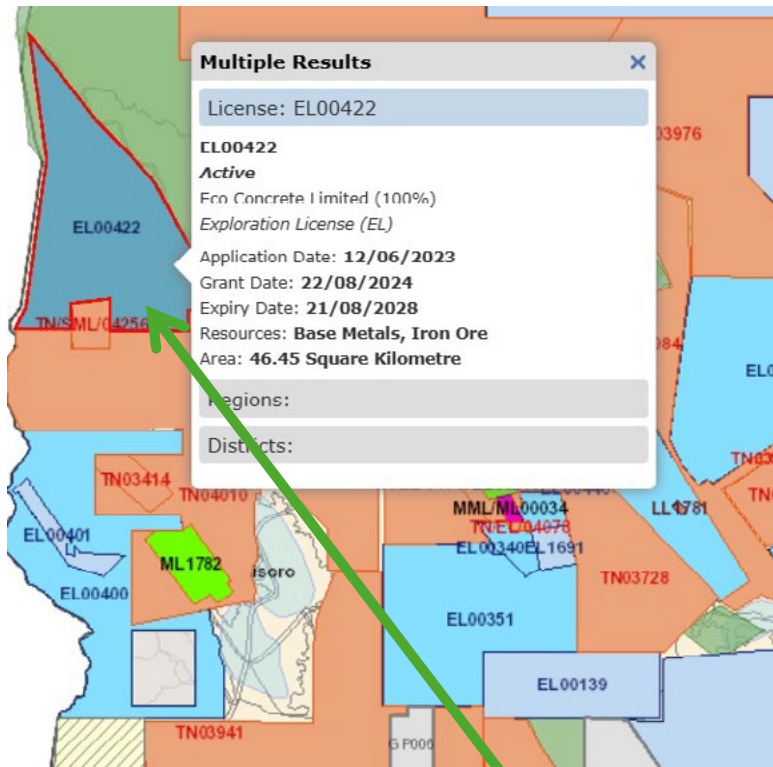


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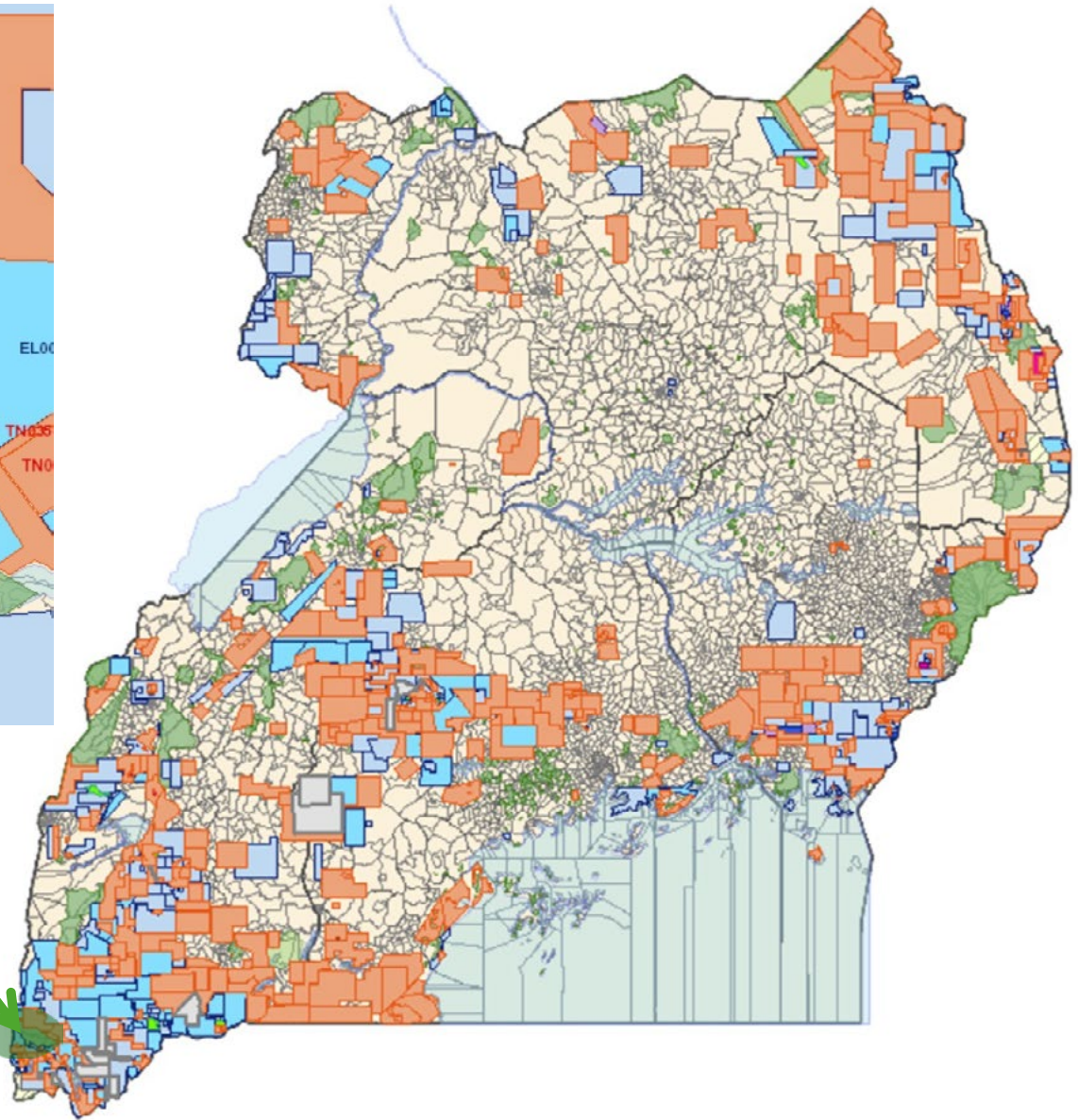


Some results from technical viability studies

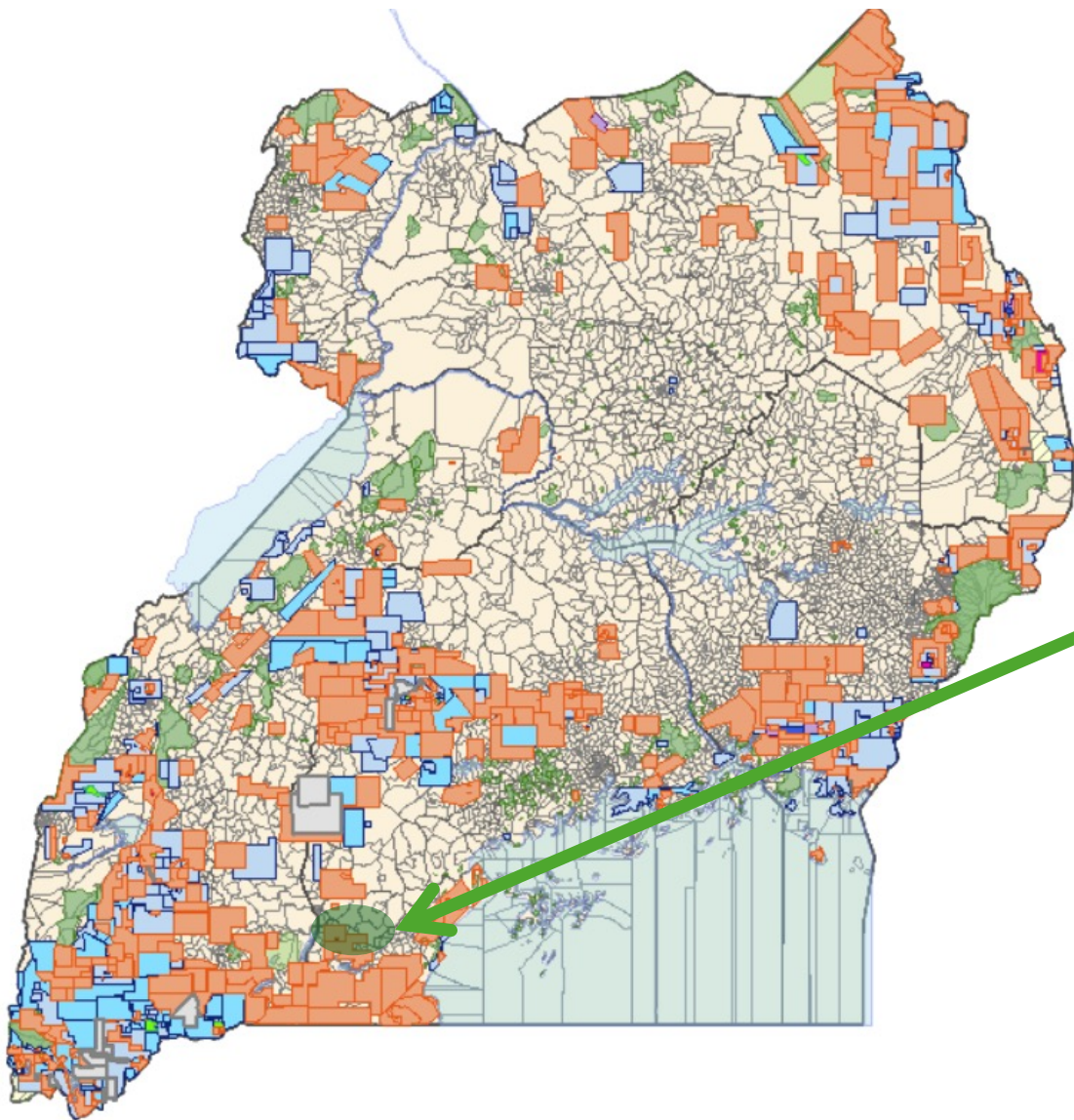
MINERAL EXPLORATION LICENSES BY ECO CONCRETE LTD



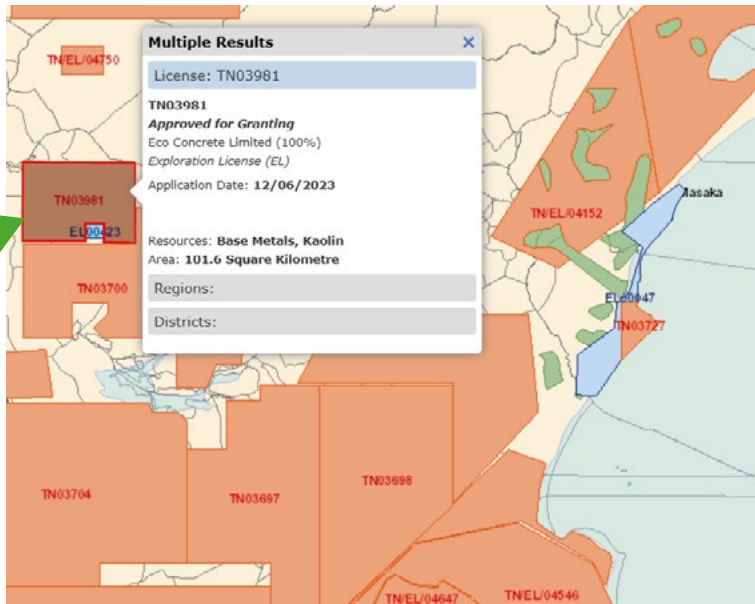
Uganda Mining Cadastre
eGov Portal, Oct. 2024



MINERAL EXPLORATION LICENSES BY ECO CONCRETE LTD



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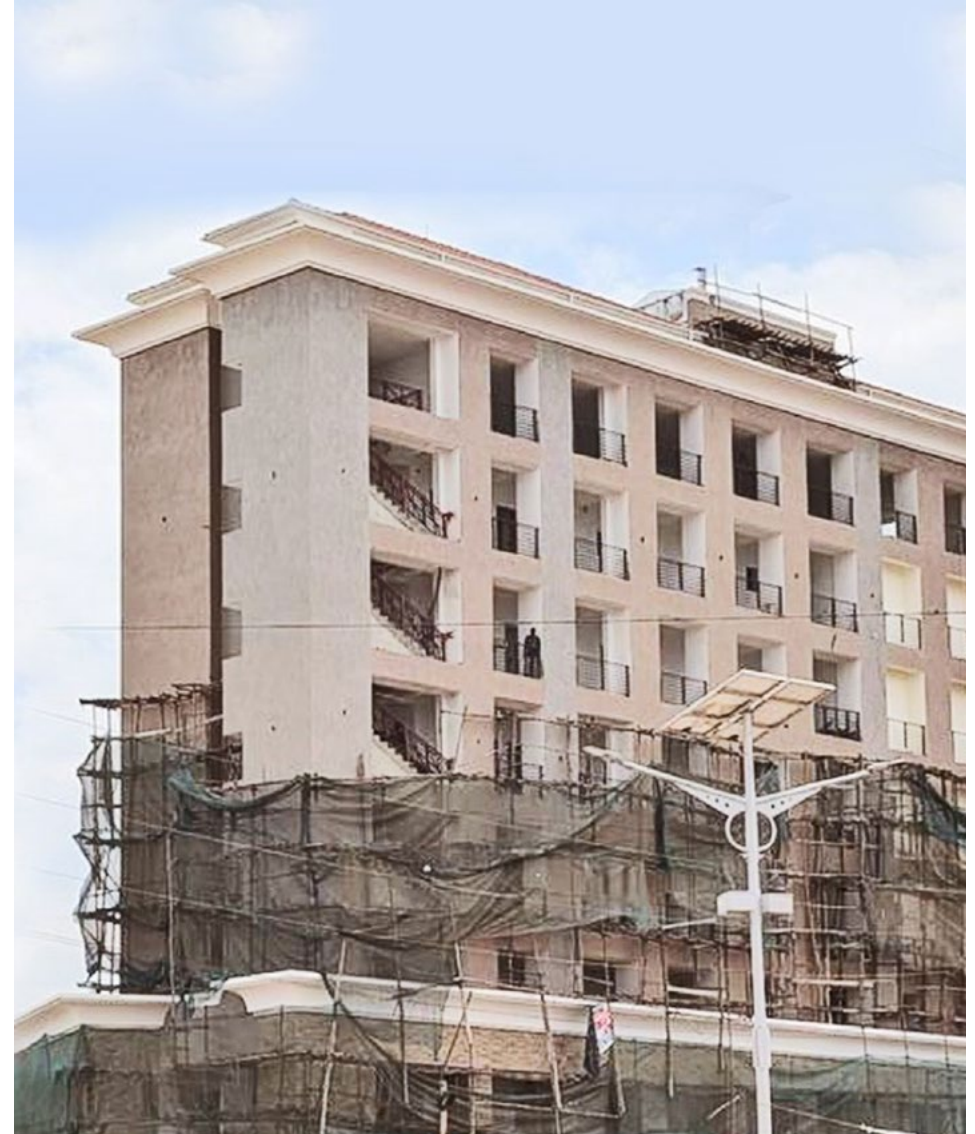
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THE PROJECT IMPACT

The green cement and concrete products made from this project shall be used to develop: a) a low-cost housing solution for Ugandans; and b) a net-zero housing construction solution.

By developing a sustainable and affordable cement alternative, decent housing is made more accessible in the country while reducing reliance on traditional, energy-intensive cement production methods that contribute to massive CO₂ emissions and the increased cost of construction.

The factory in Rubanda shall provide employment directly and indirectly to about 1,000 people in Rubanda and along the entire value chain. The project promotes value addition of local materials while providing more sustainable construction solutions.





07

OUR PARTNERS





Dr. Apollo Buregyeya,
Founder and CEO – Eco Concrete Ltd

- Dr. Apollo Buregyeya is the founder and CEO of Eco Concrete Ltd, a Ugandan based civil engineering firm with interests in iron ore, natural pozzolana and kaolin mining, production of green cement and cement-based construction materials, and real estate development.
- PhD in Engineering Materials, Wits University, Johannesburg, South Africa
- Over 18 years of civil engineering experience as a materials specialist, construction technologist, contract specialist, consultant, and project manager, both in East Africa and Asia
- Has a deep understanding of development minerals and materials, process technologies and development aspects that are fundamental to understanding and designing solutions that adapt to the African unique commerce narratives



Dr. Francis Runumi Mwesigye,
Project Advisor – Eco Concrete Ltd

- Dr. Francis Runumi Mwesigye Eco Concrete Ltd's Project Advisor responsible for community engagement and mobilisation.
- Dr. Runumu is a former District Chairman, Kabale District (Now divided into Kabale, Rubanda and Rukiga districts).
- He retired from public service as a Commissioner Health Services (Planning) at the Ministry of Health.
- He is a green construction technology enthusiast. He owns an 800 Sqm Eco Home made primarily from rammed Earth, first of its kind in Uganda, made innovatively using local materials including stone slates, pumice, basalt, sedimentary slates, lava ash, local timber.

PROJECT TEAM



Dr. Raine Isaksson,
Technical Advisor – Eco Concrete Ltd

- Dr. Raine Isaksson is a Chemical Engineer with about 20 years industrial working experience, mainly within cement production as process engineer, production manager, trainer and technical consultant working in various countries including +10 years in Africa
- Master in Chemical and Process Engineering, PhD in Technology, Associate Professor with +20 years in academia.
- Understanding sustainable development and how to create value for those needing it with focus on the Global South



Gloria Atwebembeire,
Production Engineer – Eco Concrete Ltd

- Bachelor of Science Civil Engineering, Makerere University
- Gloria Atwebembeire is a trained civil engineer with unique passion for civil engineering materials.
- She is the Production Engineer for Eco Concrete green cement project.



Earnest Atukunda,
Construction Engineer – Eco Concrete Ltd

- Earnest Atukunda is a trainee civil engineer with a passion for light and heavy building construction.
- He is undertaking a Bachelor's degree of Civil and Building Engineering from Kyambogo University after attaining a National diploma in civil engineering, Uganda Technical College Kichwamba.

PROJECT TEAM



Stephen Bigumirwa Senkasi,
Structural Engineer – Eco Concrete Ltd

- Stephen Bigumirwa Senkasi is a trained civil engineer with a passion for Structural design of buildings and project management
- He holds a Bachelor's degree of Civil and Building Engineering from Kyambogo University with vast experience in supervision, quality and cost control of civil engineering projects and Occupational Safety and Health management.
- He is the Project's Design Engineer.



John Geoffrey Olanya,
Project Manager – Eco Concrete Ltd

- John Geoffrey Olanya is the Project Manager for the pilot production of green cement in Rubanda District.
- Has over 15 years of experience in managing various projects.
- He is a Certified PRINCE2 Practitioner, ACCA (UK) Certificate in Accounting, and holds Master's in Business Administration degree from ESAMI.

COMMUNITY ENGAGEMENT

Strong community relations are essential for this project. It is important to understand the community's priorities and address them. We have frequently engaged the local community in Rubanda where we wish to establish the green cement plant.

Regular consultative meetings with local communities in Rubanda Town and around the project site





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THANK YOU

