

INVESTING IN SUSTAINABLE CONSTRUCTION MATERIALS

Zero Carbon Affordable Housing for Rwanda

In 2015, the Rwanda Green Fund (FONERWA) approved a grant of almost Rwf 160 million (approximately US \$200,000) to Zero Carbon Designs to support the development of zero carbon affordable housing in Rwanda. The investment resulted in the construction of low-carbon demonstration units of single and multi-storey housing solutions that can be prefabricated, mass-produced and constructed for a target cost of US \$250 per sqm. Through the fund's investment, it has been shown that environmentally friendly construction materials in Rwanda are not only better for the planet, but are more affordable. This is revolutionising the housing sector in Rwanda.

INVESTMENT OBJECTIVES

- To develop low-carbon, affordable dwelling units that will be acceptable to the target markets and that can be mass-produced.
- To demonstrate and evaluate the dwelling units through the construction of a prototype building.
- To engage with potential end-users and other stakeholders to explore the potential for adaptation to lower-income sectors through the use of incremental construction, co-housing sweat equity participation and other methodologies.
- To commission a detailed Life Cycle Analysis in order to verify the anticipated reduction in carbon emissions based on new construction technology.



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COMMUNITY DEVELOPMENT

The strawboard is derived from wheat and rice straw. The resource was once thrown away after the crop harvest, but today, this straw is being transformed into a profitable material used in house construction.

Moreover the collection of the wheat and rice straw has extremely impacted the lives of farmers.

"At full production in a year, we purchase US \$1 million worth of straw. These are funds that were not available to the farmers. But they now receive this money which has improved their lives," said John Onimbo.

In addition, Rwanda has benefited from the infrastructure brought about by the project, which will further assist to boost the construction sector by providing affordable and zero carbon houses for Rwandans.

“After harvesting the rice and wheat, the remaining materials were used for fertiliser or feeding cattle. However, up to 70% of these were basically thrown. We organise farmers and collect wheat and rice straws which we use to process our strawboard.”

John Onimbo
Head of Business Development
Strawtec Building Solutions Ltd

DEMONSTRATING GREEN BUILDINGS

The housing solutions, located in the Kigali Special Economic Zone, demonstrate the optimum use of locally manufactured building material and support efforts being undertaken under the National Green Growth and Climate Resilience Strategy, as well as the high-density requirements of the Kigali Master Plan.

Zero carbon affordable housing project has provided a solution for affordable and sustainable housing in Rwanda. The project by Zero Carbon Designs, built demonstration houses from usually discarded agricultural waste - straw - at the Kigali Special Economic Zone. The locally found materials are being used to reverse the effects of global warming through their property of low carbon emission, at the same time reducing the importation of the construction materials, which contributes to the green and circular economy.

Funded by Rwanda Green Fund, the low carbon emission housing project has developed a new construction technology in Rwanda, "strawboard" made by splitting straw and formed by adding adhesives and then hot compressing layers of straw in specific orientations.

ENVIRONMENTAL PROTECTION

Normally, before planting for the new season, farmers burn the biowaste from wheat and rice straw. This causes air pollution from the smoke emitted into the air.

"Our project came as a solution because we prevent the burning of the biowaste, and we rather use it to produce strawboard that contributes for a positive cause," said Mr Onimbo

Additionally, the strawboard has a cooling effect, which handles temperature change effectively, and it reduces the need for using air conditioning, thus use less electricity.

"Another quality of this strawboard is that it has fire resistance capacity of up to 30 minutes because it is compacted, and most of the oxygen is driven out. When a flame is applied to this board, it meets a layer that does not propagate the fire. Moreover, the strawboard does not transmit sound," said John Onimbo.

A number of companies have adopted the use of strawboard for building house units because they are protecting the environment.

"In our company, STRAWTEC, we have privileged the strawboard over the existing construction materials because it is environmentally friendly. It reduces carbon emission into the air. I think it is time to adopt materials that do not harm our environment because it is an emerging problem not only in Rwanda, but worldwide," said Yves Twizeyimana, Strawtec Site Engineer.



RETURN ON INVESTMENT

Single and multi-storey demonstration buildings constructed

Low carbon dwelling units designed

17

direct green job created - with many more secondary jobs created

Prefabricated elements and strawboard designed

50

tonnes of CO₂-eq prevented from being emitted into the atmosphere every year

Another quality of this board is fire resistance. An untreated board has a fire resistance of up to 30 minutes - it is rated F30. People usually wonder how this happens. It is because the straw is actually compacted and most of the oxygen is driven out.

GREEN JOBS

Since the project's inception, it has created more than 17 direct jobs to Rwandans, mainly Technical and Vocational Education and Training (TVET) students after training them about strawboard construction techniques.

Sylvie Uwizeyimana is one of the TVET students employed. She commends the job outcomes.

"This job has enabled me to support my family. I am assisting my mom to pay school fees for my younger sisters and brothers. Moreover, I am looking forward to using the skills gained from working with STRAWTEC to train others, in using this new technology, as the strawboard is a new material that was not used locally," said Uwizeyimana



CLIMATE BENEFIT

A study conducted in early 2017 on potential reduction in carbon emissions when building with strawboard panels in comparison with conventional construction methods in Rwanda (i.e. cement blocks and fired bricks), by Zero Carbon Design in collaboration with Institut für Energie- und Umweltforschung Heidelberg University, concluded that negative GHG emissions will result, if the material is recycled or the energy content is utilised by incineration. Under these conditions, a one square metre strawboard wall will result in -22 kg of CO₂-equivalent savings. By comparison, cement blocks and modern fired bricks will result in net emissions of +14 kg and +11 kg of CO₂-equivalent respectively.

“ I think I will use the strawboard to build my house in the near future because it is affordable, clean and smart. ”

Sylvie Uwizeyimana

RWANDA GREEN FUND

The Rwanda Green Fund is a national environment and climate change fund that invests in public and private projects that have the potential for transformative change and that align with Rwanda's commitment to building a green and climate resilient economy. Learn more at www.fonerwa.org or follow us on Twitter at @GreenFundRw.

FUND PARTNERS

This fund is thankful to our partners who have joined us on the journey to build a green Rwanda and we look forward to even greater impact in the future.



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