Czech-UNDP Challenge Fund
Milestone Reporting

CZECH REPUBLIC
DEVELOPMENT COOPERATION

Project Title: Interlocking bricks for Kashitu – implementation of brick-making machines in building practices in Zambia

Milestone number		**4**
Innovator		**RCTU -The Rectorate of the Czech Technical University in Prague**
Local Partner		**New Renato Community Society**
Project Locations		**Zambia, Kashitu**
Start date – End Date		**30. 10. 2022 – 30.10.2023**
Funding (total USD)	**UNDP Award**	**Co-Funding**
80.937	**40.000**	**40.933**

I. SUMMARY

The executive summary is a concise brief on the progress towards the expected results during the reporting period. The section should include context and key developments of the project; progress against expected results; key challenges and risks faced in the implementation (and what has been done to mitigate them); lessons learned as appropriate; utilization update - mention the total project budget (as proposed in the application); report on cumulative utilization (indicating the % utilization in brackets) on utilization during the reporting period; key recommendations. Suggested length – 1 page maximum

Road to the last milestone was mostly targeted on the construction of the workshop building, which should be used as a training centre for the new technology of the unburn interlocking bricks stabilized by cement. For this purpose, the most important feature of this part of the project was delivering the cargo from the Czech Republic, where the block making machines and other important tools was placed. Despite our best efforts and lot of time spent by urging the shipping company to get our cargo to Zambia on time, the delay was in the end almost two months in total. Because of this problem, we have to modify the intended construction system of the workshop building and make it from the whole wall system constructed by interlocking blocks to concrete column system. The concrete beams and columns become the prior load bearing construction, where the bricks were placed in between the columns to create the partition walls. In this way, we could start production of the blocks on the traditional blockmaking machines, where the work was slow and very physically demanding. Therefore, the volunteers that we planned to train in the way of making the block by our technology could experience the local way first and then compare it with the new innovative technology. We started the workshop building construction in the beginning of the July with foundations excavation and the concrete foundation strips. We hired a local contractor with six workers for the skilled work and reach to ten local volunteers, who would be trained with the process of making blocks and preparation of the mixture that will safeguard their quality. After we finished the foundation with a concrete slab, we obtained the missing block making machines, that was late almost for two months. But because of the utilization of the project design, we developed first 3000 blocks with the traditional block making machines, but the mixture for their manufacturing was done as intended with interlocking blocks, with 5% cement additive. Because of this additive, the blocks are stronger, more moisture resilient and better protected for the termite biodegradation. After the arrival of the new block making machines, we started with the volunteers training for the block making and machine maintenance. After 16 day, all 6000 block were manufactured and all volunteers ware fully independently working on their production. In the blocks production phase, Zambia minister of Foreign Affairs was visiting our construction site and was instructed about project main features and development. The construction of concrete beams and columns was done by the reusing of the formwork from foundation construction. After finishing this main concrete structure, we started with brick laying. Both local volunteers and contractor were involved in this procedure to ensure quick and firm continuation of the construction, where the time was the key factor. Cement blocks were placed in the outside walls to ensure their longer lifespan and greater load bearing capacity. Blocks without cement were laid to the inner partition walls and the construction under the windows and above them as a ventilation feature. Last walls were made on the traditional blocks made firstly in the time of absence of Czech block making machines. Thanks to this, volunteers and the contractor experienced the difference in the brick laying of the traditional and innovative type of the blocks. After the walls were finished, roof construction was developed from the timber truss beams and the metal sheet roof covering. The finish of the construction was done in the end of September and the workshop building opening ceremony was held 27th of September with the presence of the Czech Ambassador Mr. Pavel Procházka and the deputy commissioner Mr. Francis Hasalamo and other members of the local government officials and the local community.

All deliverables present in the UNDP contract were fulfilled and the Block making machines, tools and equipment and the workshop building were hand over to the local partner organization New Renato Community Society for the future scale up developed by the training programmes for this technology (100% cumulative utilization). Total budget was exceeded more than 6.000 USD, finance was provided by the Czech partner NGO Přátelé New Renato.

II. BACKGROUND

This section should provide a short introductory of the project, including an overview of the situation analysis, objectives and changes in the context/situation. It should be kept brief, expand only on key changes that might affect implementation. This part should include brief background of project and its rationale; context including linkage to other ongoing projects/programs; Project Approach, including Project Set up and management and coordination arrangements; listing of the main responsible parties. Suggested length - half a page maximum

Project of brick making machines for Kashitu answers on the demand or affordable, easy to built and durable construction material for housing in the rural part of Zambia in Kashitu. Local people are struggling to build their houses in efficient way to ensure all basic standards and comforts for building inhabitants. Technology of the interlocking bricks stabilized by cement is implemented to traditional building technology of brick making machines. Traditional brick making machines was improve in design and functionality by Czech engineers to make modified brick more durable and easier to make with interlocking features. To ensure quality of the brick machines, we decided to create first machines in Czech conditions and transport them to Zambia. To implement this technology, more then 10 volunteers from Czech republic will be train in brick making process and then will pass their knowledge and skills to local workers in Kashitu area. Final chapter of the project is about construction of a workshop building, that will be used as a storage space for the brick making machines and the building material storage for its manufacture and space for the crafting of carpentry and metal fabrication products. In total almost four moths will be used for collaboration on this construction of the building between Czech volunteers and volunteers from the local community with presence of the contractor company, ensuring all the standards of the construction. After the project is concluded, the building will be used as a training centre for the new interlocking technology of the unburn bricks stabilized with cement not only to provide the building material for the future high school but also for providing the knowledge and know how to the locals hot to build better, quality houses for them.

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III. MAIN ACTIVITIES AND KEY RESULTS

This section should focus on results backed by evidence of achievements. Give an overall and clear sense of the 'before-and-after' of the project intervention. Describe and analyse activities but emphasis on linking them more solidly to expected results by also including references and evidencing how the total number of activities helped to reach the results within reporting period. Suggested length – 1-3 pages.

Final aim of the last stage of the project was a construction of the workshop building. Before this could have been achieved, all necessary tools, building materials and equipment have to be obtained and placed at the construction site. In June, the first three volunteers for Czech Republic arrived on the target area in the Kashitu countryside.

The month of June was dedicated to the preparation phase of the construction. The most important was to receive a shipment from the Czech Republic with two brick making machines and other equipment. Unfortunately, this cargo was delayed due to the shipping company mismanagement. We also needed to purchased all necessary tools and equipment for the foundation phase of the building mostly in Lusaka. We were also in the contact with the Czech Republic Embassy in Lusaka and thanks to their staff, we could meet with the Czech minister of Foreign Affairs on the reception in the hotel Intercontinental in Lusaka, where we introduced our project to him. Our initial stay in Kashitu was pleasant, where the whole team was accommodated in the community centre run by our partners, NGO New Renato Community Society. In this month, we started to prepare a construction site for the excavation by surveying the land and start the negotiations with the right suited local contractor.

The next month we greed another four Czech volunteers and the main goal was to finish the construction of the foundation. We established a contract with the local construction company with the labour – based system of the work and we also put together group of ten local volunteers, that would work for the integrity of the construction works. The contractor company was based in Kabwe and in average, they supply us with six skilled construction workers, where the majority of their labour was in brick laying, concrete pouring and framework making. The local volunteers were entrusted with the task of producing bricks. Unfortunately, the shipping company was not able for the whole month of July deliver us the desired shipment, so we had to utilize building plans to change the whole brick construction system to the system of concrete columns and beams, where the bricks are placed in between the columns. In this way, we decided to start making bricks with the traditionally used brick making machines, where the local people have plenty of experience with their making. We did the field test of the soil and sand and perform a training of the right mixture with cement stabilization, to create brick with desired properties and traditional shape. In that way, we produced 3000 traditional blocks, and the 10 local volunteers had the firsthand experience, how the traditional brick making are produced in preparation for the training on new innovative interlocking ones.

The construction of the building of the workshop started at 6th of July with foundation excavation. The group of ten volunteers with the contractor assistance dug all necessary foundation excavation and construction company continued with pouring of the concrete. Difference between the initial design and the final state of foundation construction was, that to support the concrete collum system, also foundation strips had to be

reinforced by the reinforcement steel bars. This solution was more expensive than the initial one, because there were more concrete, and the steel bars then previously expected. Because of the change of the construction system, we also had to buy a formwork boards for the concrete formwork construction, which are very expensive but necessary. In order to prepare the construction site for the concrete and brick laying works, we had to ensure source of water and electricity. The source of water was obtained by laying of pipeline from the community centre and placing an accumulation tank on the construction site for the water storage. The pump in the community centre was used for the pumping the water all the way to the construction site. As a source of electricity, we didn't have an option to join the main grid of electricity, because that would be possible only by developing a grid transformer by the grid electricity supplier, which is very expensive to do. Instead, we bought a gasoline engine generator, that provide us with the needed electricity for the electric tools and appliances. Lastly, we purchased a concrete 400l mixer, that was used for all concrete and mortar related tasks. We finished the foundation construction without the concrete slab in the month of July with 3000 traditional blocks stabilized by cement done to that date.

In August, another Czech volunteer arrived and the other returned back home, leaving approximately 8 volunteers participating on the project. On the 5th of August, the shipment with block making machines had arrived in Lusaka depot, but due to the inconveniences in the transportation process, the custom clearance of the cargo was far harder to obtain. Thanks to the local NGO, we reach out the to ministry of the Foreign Affairs in Zambia to ask for help in this matter and arranged a meeting with the minister of the Foreign Affairs Stanley K. Kakubo, M.P. After two weeks of the custom clearance procedure, we finally brought our shipment to Kashitu at 22th of August. Without a day, precisely two months later then originally estimated by the shipping company. After the brick making machines assembly, the training of the ten volunteers begin. The volunteers learned how to place the mixture to the machine, how to produce a blocks and also how to make an utilizations in the dimensions of the bricks. They maintenance of the machines and possibilities repairs were demonstrated in the training. In the end of the brick making period lasted 16 days, total of 6000 unburn interlocking blocks was manufactured with and without the cement stabilization (3000 each). The initial production of 400 blocks a day by two block making machines was brought up to 800 blocks a day on two machines. We also were deeply interested in the quality of the blocks in the goal, that all the blocks had to have the same dimensions not changing even in 2 mm in any dimension.

Ather then the block production, with the Czech volunteers and the construction company we continued the most technologically difficult part of the construction – the concrete slab. The concrete pouring of the slab was done in four days by the concrete mixers with the capacity of 400l, there the slab was separated from the soil by the hydro protective PVC foil. After the slab was cured for a week, the construction works continued at the concrete column formwork. The formwork was done by the concrete formwork boards reused from the foundations construction and supplemented by the reinforcement steel in the middle for the right function of the concrete. The columns were poured one by one and joined by the concrete beams, also created by formwork boards.

The last month of September was all about finishing works, mostly walls, openings and roofing. In the beginning of this month, we had an official visit from the Zambian minister of the Foreign Affairs in the

Kashitu construction site. The minister wanted to personally see the building process and encourage the local people with the support of this project. Thanks to this gesture, a group of local authorities was introduced to this technology. In this time, the interlocking bricks with cement were sufficiently cured and prepared for the brick laying. Walls from this material were constructed according to the design and reinforcement bars were placed with concrete to the places, where the bigger load was estimated. The walls with interlocking bricks were constructed by both construction company and the local volunteers. They were used for all three transverse walls and under the windows. The finish of the wall's construction was done by the concrete ring beam, that safeguards all the wall and column construction and creates a base construction for the roof beams. The roof construction was done from the timber truss beams, connected by the timber beams. The final roof covering was a metal sheet, installed in the last week of the operation. In addition, seven windows were fitted to the construction with steel bars for safeguarding, also two lockable doors were putted in the enclose space of the workshop building. Lastly, the construction company and local volunteers experienced the difference between laying of the traditional blocks and the innovative interlocking ones. The last walls were constructed with the traditional ones in the system, that enables ventilation. Also new interlocking blocks makes ventilation structure of the construction by placing the blocks on their side.

The building was finished on the 26th of September and the next day was officially open with the ceremony with the Czech ambassador Pavel Procházka and district commissioner Francis Hasalamo and other local politicians and the whole Kashitu community. In this ceremony, the local volunteers gave a demonstration of the block making procedure and excepted the diploma of their training from the ambassador and the commissioner. By that day, the Kashitu community had the new centre for the innovative interlocking brick making procedure, that can help not only with the future construction of the secondary school in Kashitu but also with the improvement of the civil and infrastructure building in this locality.

What has been achieved:

- *The two block making machines was shipped and delivered to the Kashitu community and they are now safely stored in the newly constructed building of the workshop.*
- *Ten Zambian volunteers was trained in the skill of producing new interlocking bricks, that don't need burning process and only very small addition of cement to make them durable and affordable.*
- *The tools transported to the Kashitu from Czech Republic was used in the construction of the workshop building and now are available to the trained workers in the workshop building for the producing carpentry, metal fabrication and brick laying products.*
- *The local community has the place, where the technology can be shared to provide the knowledge to insure improvements in the building technology of simple houses in the Kashitu area.*

IV. PARTNERSHIP AND SUSTAINABILITY

Briefly describe all partnerships, including new ones built in the course of the reporting period. Report on the major impact that these partnerships have on results. How stakeholders, counterparts and/or local communities are/were engaged in implementation of the project to ensure sustainability of the project. Suggested length – half a page

The partnership with the local NGO, who is our local partner has been extended by the continuous work on this project. From the less difficult task, that was done in the past like repayment of the primary school floor or the initial design of the future Kashitu school, now we collaborated tirelessly whole year in the preparation and execution of this project. The main improvement was achieved mostly in the four months' time of the implementation of the project in the workshop building construction, where the Czech volunteers was depended on the local NGO with the helping of obtaining construction building materials, transportation, choosing of the constructor and safeguarding the accommodation and the food in the community centre. The local community also provide us with ten volunteers, who was trained to manufacture quality blocks, that can be used for the construction purposes in the community. They were also depending on the Czech volunteers in the terms of the civil engineering expertise and supervision of the whole construction of the workshop building. Thanks to this project, the local community has now lot of partners in the construction company, building material stores and even local politics and government officials. For example visit of the Zambian minister of the Foreign Affairs was the first ever official government visit in Kashitu area and the impact of the visit was not only on the NGO but also on the ordinary local people, not connected to this project. Thanks to our common work, the project of this interlocking block production can be extended not only on this project, but even now is continuing in the form of new opportunities in the construction of the new buildings by the trained volunteers, mostly for the local people in the form of new family houses. Also building of the workshop is not used only for the storing of block making machines, but also enables the local craftsmen to use the tools we brought and improve work for the local carpenters and metal fabricators. Those craftsmen have now the building where they can easy produce their product and they can also share their skills to others.

V. KEY CHALLENGES LESSONS LEARNED AND RECOMENDATIONS

Mention key challenges encountered during implementation period and lessons learned as well as the way forward. For each of them, describe successful approaches taken to address challenges and highlight recommendations for future consideration in implementing the Project. This should include any modifications that needed or need to be made to proposed targets as well data collection and monitoring to track progress. Suggested length –1 page

The biggest challenge of the whole project was the transportation of the block making machines and other tools and materials from Czech Republic to Zambia. We tried to ensure the right transportation period by getting the quotation and signing the contract with the shipping company as early as possible. But even when we had a clear timetable and the shipping company had the information, where the cargo has to reach its destination, it doesn't ensure that the shipment will be there on needed time. There are o lot of problems that can occur and make the shipment late. The problems on the sea, the road transportation between the neighbouring states, the custom clearance or the problems or theft can make shipment to arrive later. And most of the time, the contract of the shipping companies don't ensure the targeted time of arrival. In our case, the problem was, that the shipping company that we signed a contract with has another subcontractor that was operating between countries in Africa, that was not able to meet the transportation requirements on time. And we as a client cannot do anything about that. The lesson from this situation is, that we have to double the time of the expected shipment duration to be on the safe side of the timetable of the project and don't be depended on the opinion of the transportation company.

Another challenge was the different work environment in Zambia, compared to the situation in Czech Republic. Zambian workers are used to work approximately eight hours a workday, but the quantity of the work resp. the amount of the work done in the day is very different from the European standard. There is less work done in this time and more problems can occur in the construction side. The contractor is fully depended on the client most of the time with tools, building materials and transportations. And the Zambian road systems is not reliable, where the cargo can come the same day, the next day or the next week not honouring the estimated time and date, negotiated by the seller. Therefore, the time table should provide more spare time to cover there time losses, but when the time table of the Czech volunteers is limited, you have to fit the construction somehow to this given time.

The last big topic is, how to work with the volunteers, where you have a timetable to follow but the people are not motivated by the salary. The people from the Czech Republic and the people from the community in Zambia was both enlisted to the building process as volunteer workers. For both parties, the advantage of this establishment was the know how transfer and experience with the working with each other. The problem is that in most of the time, the manager of the project has far less possibilities how to motivate and more importantly lead the construction, where the beneficiary and non-beneficiary options are depended only by written agreement not safeguarded by any material or financial reward. People in this condition are easier to be discouraged and in the bad mood when the situation is bleak, and the condition are not ideal. This set up gives more difficulty on the leaders soft skills, most importantly in the topics of risk and conflict management. Thanks to these experiences we now know that some of the professions in this project should be awarded by the salary, because it motivates the people in the leading roles to embrace more responsibility and enables the manager of the project more possibilities to lead the project and its people.

VI. MEDIA COVERAGE AND PUBLIC OUTREACH

(Please summarize the media coverage and public outreach; include links to relevant articles and media)

Our media coverage can be seen from these three sources:

The website of our partner: http://pratele.newrenato.org/

Facebook: https://www.facebook.com/stavimeskoluvzambii

Instagram: https://www.instagram.com/stavimeskoluvzambii

In this period leading to project conclusion, we presented our project in some lectures for the public at the faculty of Civil Engineering in 11.10. (in the cycle Development Wednesdays – Rozvojové středy in Czech more http://icwd.cvut.cz/rozvojove-stredy/) and also with the bigger event with our partner NGO Přátelé New Renato (http://pratele.newrenato.org/?p=5028) on the 28.10. We also had an article about our project in the Koktejl magazine and in one issue of the CTU university magazine Pražská technika.

VII. PROJECT'S FINANCIAL PERFORMANCE

Please attach original budget sheet and add report current utilization of budget to the email.

VIII. DELIVERABLES AND ANNEXES

Please include (attach to the email or share via online storage) deliverables listed in the Contract.

Please include any additional information such as articles, leaflets, publications, reports and drafts of studies developed during the project implementation.

Please include up to 3 photos relevant to the project implementation relevant for the current milestone.

IX. CHECKLIST

☒ *Deliverables described in the Contract included/attached*

☒ *Photos attached*

☒ *Budget sheet attached*

☒ *Invoice attached*

PREPARED BY:

Date: 31.10. 2023

Name of the responsible person: Petr Čanda (project manager)

Signature: