Final Report

Climate Resilient low-cost buildings in Marsabit County, Kenya

NCF5

Grantee: Häme University of Applied Sciences (HAMK)

Local Partner(s):
Strathmore Energy Research Centre (SERC),
United Nations Human Settlements Programme (UNHabitat),
County Government of Marsabit (CGM)

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1. EXECUTIVE SUMMARY

The project "Climate resilient low cost buildings in Marsabit County" aimed to build local capacities in sustainable housing design and Energy Efficiency/Renewable Energy technologies, to develop a sustainable building industry among the construction sector, and to create a local legal framework that support sustainable building in hot and arid climates in Kenya.
The project objectives were:

- Provide the technical capacities to the private and public sector in order to boost a sustainable building and energy efficient/renewable energy industry in Marsabit county
- Contribute to reduce and replace the consumption of fossil fuels for energy supply by renewable energies and create a legal framework on energy and building that contribute to keep the trend towards sustainable construction and energy efficiency in the long term.
- Influence the construction and energy market in other counties in the country.
- The project was to facilitate the construction of 5 demonstration units and the county 95, bringing the total of 100 units

The project was to train at least 400 construction and energy related experts in sustainable building design, energy efficient technologies and green business management in Northern Kenya. Local capacities were to be built among architects, engineers, developers, contractors, masons, young and women entrepreneurs related to the construction and energy sector, and model energy efficiency housing units with energy efficiency technologies adapted to the local climate will act as pilot projects in Marsabit County. The Government of Marsabit committed to build and finance 100 low cost housing units for civil servants. 60% of the houses were planned for selling to civil servants under the Civil Servants Mortgage Scheme and the remaining 40% to be for renting to low income people, including civil servants from certain categories. The selection of beneficiaries was to be done through an open call and then randomly select among the applicants based in economic and social conditions.

The sustainable building technologies were to use local building materials, natural lighting, natural ventilation and passive cooling, energy and resource efficient appliances (for energy and water supply), efficient cook stoves, renewable energies like solar and water saving technologies. By doing so it was hoped the buildings will reduce energy and water consumption by at least 60%.

This pilot project was aimed to become a training field and showcasing of sustainable construction and energy efficiency technologies for future building projects by both the public and private sector throughout the country and even to be upscaled in other Counties in the region. The need for this kind of pilot houses is obvious in Kenya and larger in East Africa. In Kenya the Affordable Housing Programme (AHP) aims to construct 500,000 housing units across the country by 2022 as one of the key pillars of President Uhuru's Big Four Agenda.

However, the project managed never to proceed to the construction phase. First, the County Government of Marsabit (CGM) struggled for years to allocate the land for the Project construction and secondly, when the issue of land was settled, CGM was not able to do the financial commitment in due course to allow construction to be started. This forced the partners to request the project termination.

The project consortia managed to complete the activities scheduled to happen prior the construction. The summary of the project activities is as follows:

Baseline data collection and SIA/ EIA	Completed
Development of technical information on the project including design	Completed
Capacity development and training on sustainable building design and RE Technologies	Completed
Technical support to architects and fabrication of 5 low-cost housing units	Not completed
Deployment of 95 housing units, sustainable business plan and curricula development & communication	Not completed

The main results of the project are:

- Technical notes and a manual on sustainable building for hot and arid area prepared.
- Trainings organized and training materials prepared on Sustainable building in hot and arid climates (total number of participants 37, 11F/26 M); trainings organized but no training materials prepared on Solar PV technology 1 and Solar PV Technology 2 (total number of participants in the solar trainings 23, 1F/22M).
- Architectural drawings and a housing site planning developed with a landscaping design that will contribute to improve the thermal comfort in the hot and arid area prepared: 5 pilot units of different sizes (1 to 4 bedrooms) in 38x32 meter plots, and Bill of Quantities for the five housing units calculated.
- At least two counties in Kenya have shown interest on sustainable construction and affordable housing, and results of this project can be utilized when UN-Habitat cooperates with these counties

All the material prepared are open access, thus CGM and other counties or constructors in Kenya and ASAL may benefit from the project results.

The uniqueness of this project was to showcase the low-cost green buildings in arid and semi-arid area. The need for this kind of pilot houses is obvious in Kenya, and even larger in East Africa. There has been a lot of research work done on the smart and green construction, but to construct such houses is rare; the pilot houses in Marsabit were to serve as demos for wider community demonstrating green construction on the ASAL areas. In Kenya this is important because Government of Kenya (GoK) has allocated funds for all 48 counties for low-cost housing, and the Marsabit pilot houses were hoped to prevent the "business-as-usual" in the massive construction to happen in Kenya in the coming years. Marsabit County itself is to build 2 000 housing units as part of GoK Affordable Housing Programme (AHP) of the Big Four Agenda. The Marsabit Project cooperated with AHP and the pilot houses constructed in this Project were expected to facilitate integration of green technology with carbon saving objectives to the AHP. The first lesson-learned was that the need for the project is still valid.

Despite the recognized need for putting up new houses, securing the land for construction in Marsabit appeared to be extremely complicated. The other lesson-learned is that cooperation with politically driven entity can end up a gridlock and it becomes extremely challenging to get any official decisions needed to support the project activities. Part of challenges were the 2018 elections when the governing party in Marsabit changed. On the other hand, some of the lessons learned were positive: it was possible to find local materials and solutions for green building. Also, interest of various actors, including NGOs and civil society is there and importantly, women are able to be part of construction business and housing business would thus be able to give them income earning possibilities. Lastly, it is to be

recognized that even if the project does not reach out to its objectives, even partial results can be utilized for the benefit of next project or activities. All connections and networks built are usable in the fourth-coming activities.

2. ASSESSMENT OF IMPLEMENTATION OF THE PROJECT

2.1 Achievement of Outputs and Objectives

Planned Objectives and Outputs	Indicator(s):	Achievement of the objectives and outputs:
Objective 1: Provide the technical capacities to the private and public sector in order to boost a sustainable building end energy efficient/renewable energy industry in Marsabit county		
Output 1.1: M1: Baseline report delivered on energy production and use specific to the local housing and construction sector, businesses sector and other crosscutting issues in Marsabit County. Report based on the project and extended fieldwork research and stakeholder's consultation.	- *Produced data tools* - *Baseline report*	Achieved
Output 1.2: M2: Training and awareness raising material developed: Manual on sustainable building and EE/RE technologies appropriate for hot and arid areas in Northern Kenya. Technical notes on sustainable building, EE/RE and green business management, artisans and energy technicians developed	*M2* - *Manual and technical notes on sustainable building for hot and arid areas and EE/RE technologies* - *Technical advice on sustainable building of preliminary designs of ongoing public housing units delivered (to public officers during the trainings)* - *Preliminary designs of low-cost housing units done according to sustainable building*	*Achieved*
Output 1.3. At least 400 people related to the construction sector, local vocational centres and polytechnics trained in the various methods of sustainable building and EE/RE technologies with at least 50% of women participation. 100 of these trainees will focus on business management related to sustainable building and EE/RE technologies. The selection of the trainees will be based on skills level requirement, the competence and the interest shown in the application (cover letter). Skills on sustainable construction and EE/RE technologies of local masons Awareness on the environmental, social and economic benefits of sustainable building and	- *Participation of at least 400 trainees in the trainings, 50% of them women.* - *Materials for trainings created* - *Reduced use of charcoal and/or wood for cooking among the participants (400 families) by 60%* - *Green businesses increased by double (at least) by the end of the project.* - *Increased the interest and knowledge about the benefits of EE/RE among the population of Marsabit* - *Increased the number of women entrepreneurs with knowledge in*	Partially achieved

EE/RE technologies raised among the community of Marsabit, public and private sector related to the construction and energy sector.	*EE/RE technologies and sustainable construction*	
Objective 2: Contribute to reduce and replace the consumption of fossil fuels for energy supply by renewable energies and create a legal framework on energy and building that contribute to keep the trend towards sustainable construction and energy efficiency in the long term.		
Output 2.1. Local building regulations and by laws influenced in favour of adopting sustainable building design and EE/RE technologies. Recommendations and enforcement plan delivered to the Government of Marsabit	*M5:* *5.1. Sustainable building design and EE/RE technologies regulations approved and integrated in local building and energy regulations and by-laws.* *5.2. Housing and energy officers in the GoM with good knowledge to enforce the sustainable building and EE regulations* *5.3. 25% of the new buildings approved by the County (building permit delivered) with sustainable design by the end of the project.* *5.4. Increased use of the water saving technologies (water harvesting and water saving fittings) and adoption of EE and RE in sector of construction in the County by 25% at the end of the project in new buildings.*	Not achieved
Objective 3: Influence the construction and energy market in other counties in the country.		
Output 3.1. A scaling up plan of the pilot project to address sustainability and EE/RE in building in different counties and sectors – residential buildings, public facilities and commercial buildings will be developed. The potential markets mapped and financing models developed. Marketing material showcasing the pilot project as a business model that can benefit and be adopted by other county governments and developers developed and distributed- for possible piloting in other counties after completion of the project.	*M5* *-Marketing material showcasing the pilot project distributed among institutions, developers, real estate agencies, contractors, vocational centres and county governments, among others, in Northern Kenya*	Not achieved
Objective 4: The project was to facilitate the construction of 5 demonstration units and the county 95,		

bringing the total of 100 units		
Output 4.1. 5 pilot low cost sustainable housing units built as part of the hands on training workshops on sustainable building and EE/RE technologies. 95 sustainable low cost housing units built in Marsabit County as part of the low cost housing programme of the Government of Marsabit. The contractor will be selected from a public tender according to the Government Tendering Procedures of Kenya based on evaluation process, criteria being least cost but also the capacity, financial capability, quality of work and past experience. In addition the applicants will submit a basic proposal of principles they will use in the construction of the 100 sustainable and affordable housing units in Marsabit, where they will show their knowledge of the environmental and socio-cultural context as well as the requirements for sustainable building in this particular climate (appropriate building design and local building materials). The selected contractor will provide the technical team to be trained; the vocational schools will provide new entrants to the industry, while the casual labourers will be from within the locality 7. Job creation stimulated in sustainable and affordable construction industry as well as in EE/RE technologies. -	*M4* - *Full design of first model housing units* - *Mini workshop set up* - *Participation of the trainees in sustainable building and EE/RE trainings in the hands-on training mini workshop* - *5 pilot low cost sustainable housing units built* - *Improved housing design based on the implementation of the 5 pilot housing units* *M5* - *95 sustainable low-cost housing units built in Marsabit County* - *Beneficiaries are well adapted to the housing units, know how to use the EE/RE technologies and feel comfortable with them* - *Energy consumption in construction of the households reduced by at least 40% in the 100 housing units.* - *Energy consumption for operation and maintenance of the 100 housing units reduced by at least 60%* - *Consumption of wood to heat water reduced by 100% in the 100 housing units and in 25% of the new buildings at the end of the project* - *At least 100 local masons, artisans and energy technicians with developed skills on sustainable construction and EE/RE technologies by the end of the project.* - *About 40 jobs related to sustainable construction and EE/RE technologies created in Marsabit and surrounding counties by the end of the project.*	Partially achieved Not achieved

2.2 Deviations from the planned Outputs and Activities

Activities not completed:	**Reason why not completed**	**Notes**
Public tendering process published	The project was terminated before the construction process started	Originally planned to be done in milestone 1. Was transferred to be done in Milestone 4, when construction

		of the pilot houses would start.
WATSAN training and the training on effective cooking stoves	These trainings were to happen alongside the construction process to support the relevant actions.	Originally planned to be done in milestone 3 but were transferred to milestone 4 to happen alongside the construction process.
Contractor selected	The project was terminated before the construction process started.	Originally planned to happen in milestone 2, transferred to milestone 4 to happen when the construction process starts-
Milestone 4: 4.1. Set up of a mini workshop for the pilot projects 4.2. Five (5) pilot low cost sustainable housing units built 4.3. Trainings of at least 150 participants SSB manufacturing, WATSAN practical trainings and green business development and training of the potential inhabitants of the housing units	*Project terminated before milestone 4.*	This the list of original milestone 4 activities
Milestone 5: 5.1. 95 sustainable low-cost housing units built by the GoM 5.2. Sustainable building design and EE/RE technologies trainings included in the curricula of the local vocational centres and polytechnic schools 5.3. Local building/energy regulations and by laws revised and recommendations /enforcement plan *delivered to the Government of Marsabit* 5.4. Potential markets mapped for scaling up plan he project: and financing models developed. 5.5. Marketing material showcasing the pilot project as a business model developed and distributed 5.6. Long term monitoring and evaluation plan developed.	Project terminated before milestone 5.	

2.3 Achievement of NCF indicators

NCF indicators	Results
1. Number of beneficiaries reached (women/men)	Sustainable building in hot and arid climates: 37, 11F/26 M) Solar PV technology 1 and Solar PV Technology 2: in each of the trainings 23, 1F/22M. Total: 60, 12 F/48 M
2. Number of people with increased resilience to climate change (women/men)	60, 12F/48M
3. CO2e emissions reductions (actual at project completion and expected during the lifetime of the project's mitigation investments)	0
4. Number of green business concepts tested	0
5. Number of new decent jobs created (disaggregated by number of permanent (women/men) and seasonal (women and men))	0
6. Number of people with improved livelihoods/income-generating possibilities (women/men)	0
7. Number of multi-stakeholder partnerships developed	0
8. Amount of funds leveraged (actual project co-financing and possible secured future investments for scaling-up/replication)	0

3. CLIMATE CHANGE

The project did not reach out to the phase of construction; thus, the greenhouse gas emission calculations cannot be done.

However, trainings on sustainable building, sustainable urban planning and solar PV systems were implemented mainly for construction and energy private companies, masons, public officers in charge of public works and housing, and vocational centre students. These trainees will probably transfer their knowledge into the construction and energy projects they are leading. Unfortunately, there are no ways to measure these impacts with the available information. Two ongoing public buildings designs by the Government of Marsabit as well as several housing units and offices of private projects were assessed during the trainings to improve their sustainability features. Trainings included sustainable building design according to the local climate, sustainable urban planning, sustainable building materials, energy and water saving technologies, water saving fittings, rainwater harvesting technologies, solar lamps and solar PV housing systems. Thus, trainings and sustainable building assessments developed during the trainings and missions to Marsabit would have an impact on the following climate change adaptation indicators, according to the project document:

- Building according to the local climate will improve the living conditions of beneficiaries of sustainable housing by providing an indoor environment that protects from the extreme climatic conditions in the region

- Reduction of the energy and water consumption by 60% in operation of buildings will adapt lifestyles to the decreasing availability of natural resources
- Use of water efficient fittings and rainwater harvesting will contribute to adapt water use to the availability of resources reducing the use of underground water resources.
- Use of solar lamps and energy efficient lamps will also decrease amount of carbon emissions related to lighting by at least 60%
- The project will contribute to adapt energy and building related businesses to a context where energy and water supply from the ordinary sources is failing due to the hard-climatic conditions.

4. DEVELOPMENT IMPACTS AND CROSS-CUTTING ISSUES

The project did not proceed to the stage that the impacts would have been achieved as envisioned in the project plan. However, the project raised a lot of interest in Marsabit county and established cooperation with the national Affordable Housing Programme. Participation and stakeholder consultations was active, and the participants welcomed the project. Also, the CGM staff recognised the need and potential of the project. Further, inside CGM different departments were sensitized and expressed keen interest to cooperate. The local technical training institution was engaged to the project and their staff and students participated to the trainings organised.

The project put special focus on women which in the pastoralist communities have generally do not have much power. Out of the 400 trained, 50 % were to be women. The trainings organised gave trust that this would have been possible to achieve. In the training on Sustainable building 11 out of 37 persons were women. Women participation was over the expectations for this kind of topic, and they were actively involved on all the discussions. The gender balance was to be achieved during the remaining trainings which topics would have related closely to women. In Marsabit women have the role of building the traditional housing units, and in many cases, they are also in charge of building the modern family households. In the solar PV trainings, there was only one woman, but the topic is considered so technical that to attract women is difficult. There were some more trainings to come, such as the one on RE and the Sustainable Building design where female participation would have been a challenge. To compensate this possible lack of women participation some of the trainings were planned to be focused on women, such as the Interlocking Stabilized Soil Blocks, Efficient Cooking Stoves, Eco friendly Cooking Fuel and Water efficiency technologies. Women in Marsabit are not only in charge of building the family housing, but also in charge of anything related to cooking and on water collection and saving measures.

CGM was committed to mobilize the community to obtain 50% of women participation. Also, the project staff confirmed a broad interest in participating in these trainings from the women groups, businesswomen and the women working at the CGM. It was visibly to be seen that the link of the trainings to business development would have been an asset to encourage women participation. Further, the training schedules were adapted to the women general schedules (only mornings available) so they can attend to the training in the mornings and develop their other duties and businesses in the evenings.

Womens' participation was also encouraged by sharing good experiences. During the SB training, UN-Habitat invited the County Coordinator of the National Government Affirmative Action Fund (NGAAF) in Bungoma County to share their experience with women and

economic empowerment through trainings and business management on interlocking stabilized soil blocks. The NGAAF experience in Bungoma would serve as a model for the ISSB trainings and business management among women and youth in Marsabit, and the project will explore the possibilities of involving the county coordinator of Bungoma as part of it. The experience had a huge welcome and the CGM was keen to develop a similar approach in Marsabit to encourage women to develop business in the construction sector. The NGAAF team in Bungoma would have been part of UN-Habitat team to develop the hands-on training on ISSB and other building technologies so these trainings will be tailored for women groups, women under risk of exclusion and youth groups. The same approach was planned for efficient cooking stoves and water efficient technologies.

The CGM mobilized the communities to have balanced representation of all the tribes living in Marsabit County among the participants. Importance of this topic was well recognised and CGM took an active role in approaching the ethnicity issue in a constructive way.

5. ASSESSMENT OF THE RESULTS AND IMPACTS OF THE PROJECT

5.1 Relevance

The project objective was exactly in line with the Kenyan national objective to increase access to affordable quality housing. Housing is a burning issue in national level, and Government of Kenya (GoK) has allocated funds for all 48 counties for low-cost housing, and the Marsabit pilot houses were hoped to prevent the "business-as-usual" in the massive construction to happen in Kenya in the coming years. Marsabit County itself is to build 2 000 housing units as part of GoK Affordable Housing Programme (AHP) of the Big Four Agenda. The project established a link to the AHP and there would have been obvious synergy benefits.

Also, findings of the Social Impact Assessment confirmed the need for affordable housing options. Discussions with the local actors, including women, reinforced the same message: to develop contextualized housing solutions with integrated energy and WATSAN solutions is of urgency.

5.2 Effectiveness

Preliminary assessment of the energy, housing and construction sectors was achieved through the environmental and social impact assessment (ESIA) report with success. In the ESIA the environmental impact assessment emphasised protection of the Marsabit forest-ecosystem and the water issues. The originally planned construction site was close to a seasonal river which was to be the source of water for the new housing area but which at the same time needs protection. The most important cooking energy is fuelwood and because of this some species are disappearing. In addition to the environmental impacts, the health issues were expected to improve because of the changes in energy through utilization of solar energy. The most popular reason to support the project was the high need for improved, both quality and quantity of housing with energy and water saving technologies. Also, the possibilities for business development was recognised by the citizens. Based on the ESIA findings, the proposed household types and their distribution was recommended, and this guided the planning process.

Technical trainings, which represent 50% of the trainings planned, were implemented, with 25% of women participation, which despite representing half of the objective of the project it was a great achievement according to roles of women in the region. The remaining 50% of the trainings were supposed to take place during the construction process as hands-on training processes. The positive result of the trainings is that they were undertaken by heads of construction companies, practitioners, and public officers in charge of building design which can broaden the impact of the trainings due to their position.

Public and private building assessments on sustainable construction and energy efficiency was developed during the trainings and missions to Marsabit. The new offices planned by the CGM adopted several sustainable features in their design process, as well as several housing and offices projects by private companies that attended the trainings and asked for technical advice.

Sustainable building design of the 100 units and sustainable urban planning of the housing development were developed with the participation of the partners, the local architect, public officers at the CGM and the local community, in order to design the housing units according to the cultural practices and local needs. Women groups, youth groups, local architects, quantity surveyors and construction companies were part of the sustainable building design consultation with success. Due to the change of local government the change of the location of the project was a challenge, since urban planning and configuration of the housing units were required to be adapted to the new area.

The project was aligned to the Big Four Agenda of the National Government, which decided to take Marsabit housing project as a pilot project of their Affordable Housing Programme. The project counted with the support of the Coordinator of the AHP during the mission to Marsabit.

The project was not able to reach out to the construction phase. The main reason for this was that the Marsabit County Government had severe delays in allocating land for the project. The drawings of the pilot houses were done for the plot indicated for the project before 2018 elections. Elections as such caused a lot of delays in CGM because for the new ruling party it took quite a while to nominate the new officers. However, finally, the land for the project was allocated, and the drawings were revised and adapted to the new location. After that the fatal challenge emerged: CGM was not able to confirm their financial commitment in due time to allow the partners to continue the project which had been suffering from seriously delays throughout the implementation process.

The issue of land was considered to be a risk but the extend of the challenges related to it were far more serious than anticipated. The Marsabit county was one of the beneficiaries of the devolution process based on the new constitution of 2010 and at times the political making decision in a county with many ethical groups seems to be very challenging.

Due to the closure of the project before Milestones 4 and 5, outputs related to technical assessment on building and energy regulation and upscaling of the project in these Milestones has not happened. However, there is expressed interest to use this kind of low-cost sustainable housing approach in other counties in collaboration. UNHabitat has already received requests from 2 counties in Kenya that would like to develop low-carbon affordable housing. These are Makueni and Kajiado. Makueni would like to develop different typologies of affordable houses to be implemented gradually in small urban and peri-urban areas. Kajiado would like to modernise the Masai manyatta into a long lasting and less frequent maintenance homes.

Altogether, there have been several discussions with them and UNHabitat exploring different solutions. with the National Government which under the framework of the Big four Agenda. aims is to build 500,000 affordable housing units by 2022. Definitely, the experience of Marsabit will be very important. The project has also contributed to the on-going discussion with foreign private investors who are looking into the housing market for the bottom of the pyramid. Regarding the local production of building materials, there are discussions with a group of companies in Oslo that are interested in setting factories to produce local building materials. There are all elements that can really transform the housing market. In all of this, the lessons-learned in this project on local materials are useful.

The cost efficiency of the project is not possible to analyse because of the closure of the project. However, it is obvious that the remarkable delays in the project implementation caused extra costs when putting time and efforts in issues which should have flown without any special efforts.

5.3 Impact

The two main tangible outcomes of the project are: trainings organised, and the architectural plans prepared with site planning and bill of quantities calculations. The technical notes, the Manual on sustainable building for hot and arid areas and the training materials are all open access materials now available on the project website www.hamk.fi/marsabit. UNHabitat will coordinate publication of results, and these will be available as hard copy and on UNHabitat web-site during the year 2021. Similarly, the architectural drawings are open access and may be used/modified to benefit private or public constructions. The other outcomes of the project are raised awareness and understanding among the stakeholders of the local and contextualized possibilities on green and affordable housing options and energy efficiency technologies available in the country. Also, women have been encouraged to the business development on soil block production and are already doing so with the support of youth groups linked to the CGM with knowledge on stabilized soil blocks.

As a result of the project the housing development has been linked to the Big Four Agenda on affordable housing. The housing units have been designed and all documents and licenses are ready to start the construction process if the CGM releases the funds. Since the project is now linked to the AHP and with practitioners within the Programme with wide knowledge in sustainable building and stabilized soil blocks there are still chances that the project will be built at some point, which would have a great impact on the public housing panorama in northern Kenya and in other counties.

For the partnering organisations the project has been a learning experience on cooperation with politically motivated partners. The process was not expected to be easy, but the amount of challenges appeared to be even more than anticipated. For UN-Habitat the project has been a continuation of other experiences in sustainable building and energy efficiency in building in the region, and it has been part of a wider approach to sustainable building in East Africa. In this sense it has strengthen the Agency presence in northern Kenya as well as the relationship with the Government of Marsabit for other projects. UN-Habitat has started another project in Marsabit one on waste management and another on developing an Integrated Strategic Urban Development Plans (ISDP) for Moiale Town in Marsabit. This project was the link to these two projects.

5.4 Sustainability

Due to the fact that the project managed to proceed only partially, the sustainability of the results are also only partial. The trainings have increased capacity of the participants and these results remain and benefit the communities and the individuals. Knowledgeable and capable individuals are able to move things towards positive. The project seems to have raised knowledge and interest to UNHabitat expertise in affordable housing development; as the examples above state, there has been several communications for expert assistance from the counties.

The green building sector is able to benefit from the materials and architectural work. The ambitious aim of the project was to put the knowledge on green building into practise by putting up the pilot houses for benchmarking; need for this still remains, especially because the need for affordable housing is huge. The project has demonstrated that local materials are available, the integrated solutions can be developed with the beneficiaries and it would be possible to develop business models which also would benefit women.

6. POTENTIAL FOR SCALING UP AND FOLLOW-UP INVESTMENTS

The materials and architectural drawings with the site planning and bills of quantities calculations are with CGM, and the link to the national Affordable Housing Programme has been established. Construction licenses from NEMA and the CGM have also been issued. This all enables CGM to proceed to construction phase without the project frame. As indicated above, UN-Habitat has been able to utilize the project as a link to new projects and there is confirmed interest from two counties to develop green and affordable housing. Critically, following the GoK contraction plans, even CGM will enter construction at some point, and now they have land and drawings ready.

7. UNEXPECTED OUTCOMES

During the implementation the most positive realisations were the possibilities of business development for women and the possibilities to use local materials in construction. Interlocking stabilised soil blocks were already used in Marsabit, but if the project had had proceeded to construction, the housing units constructed would have been able to give boost for the use of local materials, which in fact are manufactured by women.

8. LESSONS LEARNT

The main lesson learned was probably that project risks can really massively realise. In this project almost all risks listed became reality and the mitigation measures could only address them partially; land issue was in the final end settled but the county's financial commitment to construction proecss never happened. However, even a project terminated mid-way can have

positive results. The partners are planning to publish the results by compiling the project process and the lessons learned in order to use them in other programmes.

Other lesson learnt is related to the importance of the composition of partner consortia and the role and commitment of each partner. The identification of the project partners, their capacities and roles are key issues to achieve a fluent working environment, and probably a misleading on the identification of roles led to a several challenges related to the efficiency of work.

In addition, the importance of presence in the area in order to make the project run has been identified in this area of the country where things work much better face to face. The project might have proceeded in a more successful way if there had been a person or partner in charge of project implementation on the site from the beginning. Running the project from distance, or even from Nairobi was not as effective as the partners thought at the beginning.

On the other hand, in certain areas of northern Kenya such as Marsabit, there are challenges related to tribal issues/politics that were expected to be there, but they were far more complicated and deep-rooted than expected. An initial identification of the scale and importance of these matters could have helped the project partners to overcome the main challenges faced.

Regarding dissemination, as above has been written, there is constant demand for green and affordable housing. So, the project results will be utilized in UN-Habitat current and forthcoming projects even though this project never proceed until the dissemination phase.

FINANCIAL SUMMARY

Table. Project financing per partner

	Financing, EUR					
Expenditures, EUR	NCF	Grantee	UN-HABITAT	SERC	Revenues from the project	Total
Grantee	89.140,78	22.978,82				112.119,60
UN-HABITAT	75.170,91		18.792,73			93.963,64
SERC	31.374,58			7.149,57		38.524,15
Total	195.686,27	22.978,82	18.792,73	7.149,57		244.607,39

9. CONCLUSIONS AND RECOMMENDATIONS

Along the project process it became very clear that sustainable and affordable housing is a need in Marsabit County. The dependence on building materials brought from other areas of the country, the inexistence of power grid and the periodic water draughts, as well as the scarce and expensive cooking fuel available make necessary an overall approach to affordable housing from a sustainable perspective.

In addition, through the trainings it was identified a great willing to learn new approaches to building, energy and resource efficiency from local authorities, constructors, women groups and youth groups. People want these kinds of programmes, and we believe they would be highly successful if the challenges could be addressed in the right direction and overcame.

In this area forgotten for many decades by the national government, the local government structures are new to the recent decentralization of duties that delegate in local governments competencies that were centralized in the national government just 10 years ago. Thus, the paths need to be drawn from scratch, with the additional challenges of tribal issues which makes every step overly sensitive to frictions.

Still, the work done, and learning acquired by the partners along this period will be used in other counties interested in sustainable and affordable housing in other areas with other characteristics. The networks created and the building technologies designed will probably have an impact in other counties where UN-Habitat is collaborating

For future programmes in this region of the country we would recommend learning from other experiences in similar fields in the County or bordering counties with comparable social and political conditions. We consider critical to study in depth the roots of the challenges found in order to understand the social and political context and find possible ways forward to mitigate the risks.

In this kind of project, we believe that involving the National Government and the Affordable Housing Programme in a more active way could also help to save the challenges. In addition, the identification of an appropriate partner on site with good connections with the local government would have been of great help, as well as stablishing from the beginning roles among partners that match their capacity.

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Annex 1 Project completion fact sheet

Project Name:			
Country/ Region:		**Financing:**	
		EUR	**%**
Nordic Partner: HAMK		**22.978,82**	9,39
Local Partner: SERC		**7 .149,57**	2,92

Other Partner: UNHabitat		**18.792,73**	7,68
	NCF grant disbursed	**195.686,27**	80,01
	Total	**244.607,39**	**100.00**
Classification:	Mitigation/ adaptation/ combination: **COMBINATION**		
Project cycle:	Contracted: 18.4.2016 Original Closing Date: 30.9.2018 Actual Closing Date: 14.4.2020		
Project description:			
Key results:	**NCF indicators**	**Results**	
	1. Number of beneficiaries reached (women/men)	13 F/70 M	
	2. Number of people with increased resilience to climate change (women/men)	12 V48 M	
	3. CO_2e emissions reductions (actual at project completion and expected during the lifetime of the project's mitigation investments)	not calculated	
	4. Number of green business concepts tested	0	
	5. Number of new decent jobs created (disaggregated by number of permanent (women/men) and seasonal (women and men))	0	
	6. Number of people with improved livelihoods/income-generating possibilities (women/men)	0	
	7. Number of multi-stakeholder partnerships developed	0	
	8. Amount of funds leveraged (actual project co-financing and secured future investments for scaling-up/replication)	0	
Project performance:	**Main Expected Outputs**	**Achieved**	**End-of-project status**
	EE/RE baseline	Yes	Achieved
	Manual and technical notes on sustainable building for hot and areas on EE/RE technologies	Yes	Achieved; open access
	Training of at least 400, 50 % of women	Partially	Numbers smaller and a problem with gender-balance but in case the project would have continued, the next trainings had a potential to have more female participants
	Training materials developed	Partially	For the UNHabitat trainings organised, the materials were developed as planned
	Architectural drawings, site plans and bills of quantitities	Yes	Available on the website and later 2021 in UNHabitat publication
	Construction of houses (5 pilots + 95 housing units)	No	Not achieved
Final beneficiaries:	Trainees; local women who are eager to develop their own soilblock business, students of the local TVET who can utilized the learning during their professional career and teachers of TVES to utilize the materials in their work		
Climate change impacts:	Not calculated (houses not build)		
Development impacts:	Human capacity building, open access technical notes and manual, training materials. Even though the numbers were not achieved as planned, the project succeed in influencing both women and youth, the two most vulnerable groups. Women in Marsabit are allowed to do construction business, and they got encouraged in their empowerment. For the youth, the up-to date solar trainings offered quality content and supplemented the regular programme. This learning is expected to benefit the region later thought the local professionals. The materials produced will be used later in UNHabitat work, there has already been expressions of interest from several counties.		

Innovation, technology and learning:	Availability of local construction materials, capacity building on locally based materials. The Project demonstrated the availability of local materials and this is expected to encourage the locals to believe in themselves and their localized development work. The knowledge as such as existed prior to the project, but there has been lacking respect and understanding of localized solutions.
Partnership:	Affordable housing programme (AHP) Kenya, National Government Affirmative Action Fund (NGAAF) in Bungoma County. The project has demonstrated the possibility of creating strong and supportive networks. Both on national and local level there are initiates that can support each others, and both individuals, companies, organisations and policy makers can upon their wish to benefit from these.
Sustainability and replicability:	Architectural drawings with bill of quantities available. The sustainability lies on the use the planning work done, this all can be utilized wider in Kenya in the other counties which already have expressed their interest. On the other hand, the trained people, even though the number were small, benefit and are advocates of the new practises.
Lessons learned:	Importance of partners roles, identification of social and political challenges, and continuous presence on the site. The project environment appreciated to be far more difficult than expected. In the future projects this should be considered seriously; cultural and political differences and ambitions can become serious obstacles for the project to move forwards. On the other hand solutions for these challenges might be beyond the powers of the project team. Hiowever, careful planning process, and good scrutinization of the situation is to be done. Partner coalition also needs to be built very carefully to be sure of the shared objectives.

Annex 2 Logical Framework Matrix

Not applicable

Annex 3 Pictures

Annex 4 Other supplementary deliverables/documentation

Not applicable

Annex 5 Impact story

When the Project started in the County of Marsabit there were no knowledge on what sustainable building was. The discussions with stakeholders, including women groups raised knowledge on green building methodology's impact on the environment, on people's health and quality of life as well as on the business potential of this kind of constructions, which in addition, can be almost fully built with local materials thus greatly reducing the cost of construction. As people started having news about these technologies arriving the county and their potential local officers, women and youth groups as well as constructors became really interested on learning. The training places on Sustainable building were covered immediately, and the county asked for additional trainings on this matter, since many people were interested and could not attend. Constructors, practitioners (architect and engineers) of the CGM, and especially women participated very actively on the training discussions and practical sessions. Some women even talked to the CGM to hire their interlocking stabilised soil blocks (ISSB) machines to start producing ISSB for their housing projects with the support of the experts of the county. We discussed with several ongoing projects (including two

projects of the County to extend their local offices) and made the necessary changes on the design as to increase their energy efficiency and sustainable features. They were really keen to learn, and a huge entrepreneurship potential was identified in these trainings.

In this hot and arid area building according to climate becomes critical regarding the quality of life of people. The imported models of construction are not appropriate for building in these areas and people realizes that indoors comfort is much better in traditional housing than in modern housing. In addition, materials for new buildings are brought from 500km away, thus building materials sometimes cost two to three-fold the price in Nairobi.

When we were talking about all this matters people were already aware of these problems but did not have solutions to reduce the cost of building while increasing the indoors comfort and energy and resource efficiency of building. This was probably because people do not trust in local materials such as soil. They doubt about its durability because of the intense maintenance required on the traditional housing made of mud. However, they were really willing to explore other ways of construction, energy and water supply, three elements that are expensive and scarce in this area.


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