Completion Report

NCF-C7-067 Cambodia: Shifting the Market to Clean and Efficient Stoves and Fuels

Cambodia

Grantee: Differ AS

Local Partner(s): C-Quest Capital (Cambodia) Co., Ltd.

Other Partner(s): Prime AS; C-Quest Capital Malaysia Global Stoves Limited

Project start date: *15/09/2018*

Project end date*: 15/03/2021*

22/11/2021
Date

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1. EXECUTIVE SUMMARY

Differ AS (Norway), Prime AS (Norway), C-Quest Capital Malaysia Global Stoves Limited (Malaysia) and its fully owned Cambodian subsidiary, C-Quest Capital Cambodia Co., Ltd. (Cambodia) (the "Partners") have joined forces to shift the market to clean and efficient stoves and fuels in Cambodia, thus mitigating climate change by reducing greenhouse gas emissions from the displacement of non-renewable biomass. This grant has helped put in place a business partnership, leveraging private sector risk capital, that has covered the entire supply chain of bringing cleaner biomass stoves and sustainable fuels to market in Cambodia.

This grant has helped fund local production of pellet fuel, local assembly of stoves manufactured by Prime, and the expansion of CQC Cambodia's FASTFire stove and fuel distribution business to enable scaled distribution of the locally produced stoves and pellets. FASTFire is the brand name of CQC Cambodia's distribution business line. Within that business line, the Prime stoves and sustainable fuels have been distributed to 1,034 households, reducing 6,332 tonnes of carbon dioxide emission reductions.

The business will be scaled further through a carbon-financed business model that has started its preparation during the grant period. This will help to improve the affordability of the products to the end-user and sustain operational overheads. Under this model, the cost of the stove is not included in the monthly payments made by the customer. The customer only pays for the fuel. Most of the project's revenue comes from the household's monthly payment for the fuel; however the carbon revenues play an important role in this project. The carbon revenues increase the financial viability of the project to a point that the Partners are willing to invest and allows the Partners to make an attractive product offer to target customers.

2. ACHIEVEMENT OF RESULTS

Deliverables were revised at the end of Milestone 3 primarily due to the slower than anticipated sales of the stove and pellet bundle. The majority of indicators (production and sales, GHG reductions, NRB saved, Beneficiaries) depend on sales of the stove/fuel bundle. If sales are slow, all will be impacted. Sales were slow primarily because of affordability issues that the Partners later tried to address by reducing the cost of the bundle and recouping those lost revenues through a carbon finance supported business model. However, during the M3 period the situation was excarberated by the Covid-19 pandemic, not allowing us the ability to interface with prospective customers. The long pandemic period has not allowed us to catch-up to our targets.

During the M2 and M3 period, the Partners also changed their thinking regarding the approach on the decentralized pellet production model. Since sales were slower than projected, pellet demand (until end of M4) did not justify the need for more than one

production facility. Plus, considering the challenges the Partners faced with producing quality pellets at consistent volumes, they would have better quality control if they focused on one production facility.

2.1 Achievement of outcomes and outputs

Expected outcomes and outputs	Indicator(s):	Achievement of outcomes and outputs:
Impact 1.1: Reduction of GHG Emissions	57,327 tonnes of CO_2e – original 6,229 tonnes of CO_2e - revised	6,332 tonnes of CO_2e
Impact 1.2: Reduction of Non-Renewable Biomass Consumed	35,919 tonnes – original 6,839 tonnes - revised	6,954 tonnes
Outcome 1.1: Increasing local production capacity of advanced biomass cookstoves and renewable biomass fuels	1,606 tonnes – original 123.55 tonnes – revised 6,925 units – original 3,294 units - revised	129 tonnes 3,294 units
Output 1.1.1: Basic advanced biomass cookstove assembly line operational and Local Production of ABC	1 project - original	1 project
Output 1.1.2: Renewable Fuel Production Facilities Operational	4 projects – original 1 project - revised	1 project
Outcome 1.2: Increasing access to, and use of, modern energy services to households via advanced biomass cookstoves (ABC) and renewable biomass fuels	34,625 persons – original 5,085 persons – revised Note: original and revised targets were based on average of 5 people per household.	4,756 persons (1,034 household equivalents) Based on 4.6 people per household. Source: 2014 DHS Survey, Cambodia
Output 1.2.1: Sales of Advanced Biomass Cookstoves (ABC)	6,925 units – original 1,017 units - revised	1,034 units
Output 1.2.2: Sales of Renewable Biomass Fuels	1,606 tonnes – original 123.40 tonnes - revised	128 tonnes

2.2 Deviations from the planned outputs and activities

Deliverables were mostly revised to assess the carbon finance business model approach the Partners proposed during the M3 period and related sales and marketing approaches.

Deliverable	Indicator(s):	Achievement deliverable:
CDM Design Documents Prepared	2 documents	2 documents. A CDM PoA-DD and CPA-DD in the form of MS Word
Financial Model for Carbon Finance Supported Business Model	1 document	1 document in the form of MS Excel spreadsheet.

Memo on Marketability of CERs	1 document	1 document in the form of PDF
Determine Price Elasticity	1 document	1 document in the form of MS Word
Test Effectiveness of New Communal Sales Approach	1 document	1 document in the form of MS Word
Local Stakeholder Consultation for CDM Project Conducted	1 document	1 document in the form of MS Word in addition to 3 separate Annexes
Carbon Project Validation Report	1 document	1 document in PDF
Revised Deliverables for M4	1 document	1 document in the form of MS Word
Revised Budget	1 document	1 document in the form of MS Excel

2.3 Achievement of NCF indicators

NCF core indicator	Results (quantitative)		Clarifications/Means of verification
Number of beneficiaries reached	women	2,473	Average number of people per household (4.6*) multiplied by number of sales of improved cookstoves. 48% Males and 52% women per household*. *Source: 2014 DHS Survey, Cambodia [See footnote [1]]
	men	2,283	
	total	4,756	
Number of people with increased resilience to climate change	women	2,473	Average number of people per household (4.6*) multiplied by number of sales of improved cookstoves. 48% Males and 52% women per household*. *Source: 2014 DHS Survey, Cambodia [See footnote [1]]
	men	2,283	
	total	4,756	
Number of people with improved livelihoods	women	2,473	Average number of people per household (4.6*) multiplied by number of sales of improved cookstoves. 48% Males and 52% women per household*. *Source: 2014 DHS Survey, Cambodia [See footnote [1]]
	men	2,283	
	total	4,756	
	women	6	

[1] CQC Cambodia conducted a short survey on 30 randomly selected customers from their final sales report. Based on this survey, the average household size was 5.26 people (2.53 Female and 2.73 Male). Due to the small sample size, the national statistics are being used for household size and sex demographics of the household.

New decent jobs created	full-time	men	8	CQCC Employees as of March 15, 2021. Does not include employees that resigned prior to March 15, 2021. CQCC Employees (Full-Time): 6 F, 8 M, 14 Total Community Outreach Agents as of March 15, 2021: Community Outreach Agents (Part-Time): 25 F, 43 M, 68 Total + Dealers as of March 15, 2021.Dealers (Part-Time):20 F, 25 M, 45 Total
		total	14	
	part-time	women	45	
		men	68	
		total	113	
	seasonal	women	0	
		men	0	
		total	0	

3. CLIMATE CHANGE

The project provides Cambodia with renewable biomass and highly efficient stoves, significantly lowering greenhouse gas emissions from cooking, and saving non-renewable biomass. It is estimated that the sale of stoves and fuel to 1,034 households used over a 2.5 year period reduced 6,332 tonnes of carbon dioxide emission reductions.

4. DEVELOPMENT IMPACTS AND CROSS-CUTTING ISSUES

Health and Social - Reduction in household air pollution, hence health improvements for households, mainly women/children, in addition to other positive social effects (e.g. reduced soot damage to homes and cooking equipment). 65% of urban households in Cambodia cook indoor. In CQC Cambodia's short survey of 30 randomly selected households, 73% of respondents reported they cook indoors before and after they switched to the Prime Stove and pellet fuel. 63% of respondents reported they experienced health problems such as eye and respiratory problems related to smoke during cooking prior to switching to the Prime Stove and pellet fuel. 60% of respondents reported that after switching to the Prime Stove and pellet fuel their health problems have improved and 40% said they are same as before.

Economic - The net present value (10% discount rate) of a Prime stove purchased for 38.10 EUR with a 2.5-year life time, with pellet fuel, accounting for the quantifiable net benefits consisting of energy cost savings (charcoal), and the benefits of reduced GHG emissions (10 EUR/tCO2e) was estimated at 272 EUR. This implies a high level of cost effectiveness. This rate underestimates the total benefits of the stove and fuel combination, which includes health benefits that are difficult to quantify. In CQC Cambodia's short survey of 30 randomly selected households, all but one household reported that they experienced money savings by switching to Prime stove and pellets as compared to the way they used to cook.

Environmental - It is estimated that switching from charcoal to pellets will reduce 2.69 tonnes of non-renewable biomass/year/household. Reducing consumption of unsustainably harvested wood also has the benefit of decreasing GHG emissions (or reducing loss of carbon storage in vegetation). Switching from charcoal to pellets would hence reduce 2.45 tonnes of CO2/year/household in total.

Gender - Whilst economic savings generally benefit households as a unit, reductions in smoke and other harmful pollutants associated with incomplete fuel combustion typically generate much greater benefits for women/children as they are the ones mostly in the kitchen. In addition, the stove supply chain provides ample employment opportunities for women as distributors and promoters. The project employed 6 full-time female staff and 45 commissioned part-time female sales agents of stove and fuel.

Job Creation - The business concept created 14 full-time jobs during the grant Period. In addition to the full-time jobs, the stove/fuel distribution business activity created 113 part-time sales agent jobs.

5. ASSESSMENT OF THE RESULTS AND IMPACTS OF THE PROJECT

5.1 Relevance

The project has provided Cambodia with renewable biomass and highly efficient stoves, significantly lowering the emissions from cooking, and saving non-renewable biomass. These energy efficient gasifier stoves also reduce emission of black carbon & other short-lived climate forcers not quantified as part of this project.

Cambodia's INDC lists "[p]romoting (...) more efficient cookstoves" among its "Mitigation actions in key sectors" (Table 1, p 6), and links this effort to the implementation of its Climate Change Action Plan for Manufacturing Industry and Energy Sectors (2014-2018). Considering that our business produced pellets from rice husk and waste sawdust, it supports Cambodia's objective of reducing GHG emissions from "[p]romoting use of renewable energy and adopting energy efficiency for (...) rice mills", listed in the same table. Furthermore, the INDC aims to increase forest cover to 60%, which is linked to increased use of non-renewable biomass for e.g. cooking. It links this to its Action Plan for Agriculture, Forestry and Fisheries Sector (2014-2018) as well as its REDD+ strategy.

5.2 Effectiveness

The business concept has tried to overcome three main challenges in the current market for clean and fuel-efficient biomass stoves and sustainable biomass fuels in Cambodia, hence reducing greenhouse gas emissions from consumption of non-

renewable biomass. The business concept has been effective for the following reasons:

1) **Affordability**: The main drivers that made our stove/pellet fuel bundle more affordable are:

    i) Introducing a carbon financed business model that has allowed us remove the cost of the stove to the end-user and only charge them for fuel; and

    ii) Producing a renewable biomass pellet to go along with the stove, and selling it at a price that is significanty lower than charcoal. We retail pellet fuel at USD 0.20kg vs. USD 0.40kg for charcoal.

2) **Accessibility**: Providing our stove technology and renewable fuels to those that need it it the most.

    i) By building up distribution sales teams and commissioned sales agents covering areas in the country that would not have access to this higher quality cooking appliance and renewable fuels if it was not for this project/business concept.

3) **Availability:** Production has been localized to meet a growing demand by having a consistent supply.

    i) Local assembly of stoves and local production of pellet fuels has allowed for easier scaling up to meet growing demand of stoves/fuels. However, any further demand of pellets would require additional investments in pellet equipment.

5.3 Efficiency

To make this business model financially viable, we would need to sell about 400 new sales per month, while currently we are around ~75 sales. The COVID-19 pandemic has made it very difficult to achieve financial viability due to lack of access to communities and the lack of cost effectiveness in our sales approaches, and sales staff turnover is exacerbated. For example, having the cost of spending more time conducting multiple small events with limited staff as opposed to reaching more people in one large event in the pre-Covid era. And unfortunately, the Covid-19 situation is worsening in Cambodia with more cases and more deaths and restrictions on movement are increasing. Although vaccines maybe widely available in the country soon, it is expected to be a slow roll out. It has been difficult to show that CQCC can achieve sales at a financially viable level during all of this. Thus the operations have not been cost-efficient to date and not expected to until we reach a higher level of sales.

However, from a consumer perspective, the purchase of a Prime stove with pellets bundle provided by C-Quest Capital (Cambodia) pays for itself immediately if the consumer switches from charcoal, thus is a very cost-efficient purchase.

5.4 Impact

The positive impacts of the project thus far are small in comparison to the opportunity that presents itself. If we are able to scale-up and sell according to plan, we would like to achieve 10% market penetration of stoves and fuels in urban/peri-urban centres in Cambodia over the next 10 years, and to add other products such as solar lighting kits, providing a complete energy package to households in the face of unreliable and expensive electricity supply. We may also diversify by bundling larger (institutional) stoves and pellets. At this level, our positive environmental impact (GHG reductions and non-renwable biomass savings) would be significant and we would be seen as major competitor to charcoal in the market.

5.5 Sustainability

To ensure the sustainability of the project, we would require the following things:

i) A normalized, post-Covid-19 environment, where accessibility is not an issue and the economy and consumer spending is functioning similar to pre-Covid times.

ii) The project becomes registered under a carbon standard (Verra in this case) and that carbon buyers are identified, and underlying investment is raised to achieve scale.

iii) Investing in an additional pellet equipment to be able to meet projected demand.

iv) Diversification in stove technology such as including fan-driven stove models.

v) A skilled full times sales staff in addition to a small army of trained commissioned based sales staff located through out the country with little turnover.

5.6 Coherence

The number of market actors involved in advanced biomass cookstove distribution combined with renewable biomass fuels is still very limited in Cambodia. CQCC has worked very closely with African Clean Energy, supplying them with pellets so they can bundle them with their fan-driven gasifier stove model called the ACE-1.

6. INNOVATION

Differ, Prime and CQC Cambodia and Malaysia have been at the leading edge of developing the Cambodian market for advanced biomass stoves and cleaner fuels, both of which improve people's lives. The business concept helps improve the

availability, accessibility and affordability of stoves and fuel so that more people can take advantage of them, thus improving their livelihoods, and reducing greenhouse gas emissions and other negative environmental impacts.

More specifically, no other companies in Cambodia have consolidated the supply chain for advanced biomass stoves and fuels to improve economic efficiencies providing high quality, sustainable products at lower prices. Cooking as a service - providing both stove and fuel on bundled payment plan - has not been implemented in Cambodia earlier.

7. POTENTIAL FOR SCALING UP AND FOLLOW-UP INVESTMENTS

The Covid-19 pandemic has had a significant negative impact on project viability. It has made it even harder to achieve financial viability due to lack of access to communities and the lack of cost effectiveness in our sales approaches, and sales staff turnover is exacerbated. Unfortunately, the Covid-19 situation is worsening in Cambodia with more cases and more deaths and restrictions on movement are increasing. It has been difficult to show that CQCC can achieve sales at a financially viable level during the pandemic. This would need to be about 400 new sales per month (currently around ~75). Although CQCM and CQCC will continue to develop the carbon finance project and CQCC will continue to market stoves and pellets, a decision on whether to continue these business lines will be taken at the end of 2021.

8. RISKS

Materialized Risks

Description of Risk	Risk Level	Mitigation Measure
Although CQCC has achieved its M4 sales targets, sales are not at a level to achieve financial viability even under a carbon financed model.	HIGH	Increase the number of commissioned based sales agents in order to not increase salary overheads. Further investments in pellet equipment required to meet pellet demand.
Demand for pellets is exceeding production capacity	HIGH	CQC Cambodia (CQCC) is topping up any shortfalls they have by buying pellets from another pellet producer in a nearby province. CQCC does not want to purchase another small pellet mill and face the technical challenges they face now with the current machines. If sales were increasing at a steady rate and CQC saw more promise that they could become profitable, then they would want

		invest in a much larger mill. This would be a signicant investment. But at this point they are not willing to do that. So they will continue to buy from the other supplier of pellets until they make their go/no go decision to continue with the production/sale of pellets and stoves.
Covid-19 restrictions affect sales volumes	HIGH	We have increased number of community-based sales agents to try to mitigate this; however, Covid-19 restrictions on travel and gathering sizes are still in place.
Limited stove sales in urban and peri-urban areas around Phnom Penh. This was exacerbated by the COVID19 pandemic.	HIGH	CQC Cambodia has re-focused on peri-urban and some rural sales and increased number of community-based sales agents to try to mitigate the travel restrictions issue and at the same cost controlling operational overhead costs.
Difficult to recruit qualified sales officers. Sales members resigning due to lack of sales activities during COVID19.	HIGH	CQCC turned to look to recruit junior sales staff with more emphasis on training them up. In addition we have tried to increase the number of commissioned based sales agents that operate in the areas they live in order to not increase salary overheads.
Power cuts in Phnom Penh	LOW	At the time of the first power cuts, production of pellets fell behind, but we mitigated this by buying a diesel generator that can power the production equipment if there are continued power cuts.
Covid-19 restrictions increasing transaction costs and limiting sales	MEDIUM	We have increased the number of commissioned based sales agents in order to not increase salary overheads to better control costs.
Pellet Mill Technical Problems	MEDIUM	CQC Malaysia hired international consultant to manage the production of pellets and trouble shoot issues on an ongoing baseis. The equipment requires frequent repair and maintenance costing time and money. More emphasis on quality assessment of epuipment will be paid in any further procurements.

The pellet mill does not produce pellets at its rated capacity. The rated capacity of the machines is 325 kg/hour. With accessory equipment to optimize the production process, only 20-30% of this capacity has been achieved an hour. Therefore, the machine does not work to specification.	HIGH	Production has been optimized with the addition of accessory equipment. We expect that a larger mill with larger auxillary equipment of higher quality will deliver closer to namerate rated capacity To meet any additional demand, we will be required to invest in a higher capacity pellet mill and equipment or buy from other pellet producers in the country to top-up any production shortfalls.
The recipe to make a good pellet took much experimentation.	LOW	CQC Malaysia hired international consultant to spend one month in Cambodia to develop a recipe for pellets that can be replicated at scale. CQC Malaysia then hired this international consultant on a full-time basis to be based in Cambodia to be a technical and quality assurance and quality control advisor for pellet production and stove assembly.

9. MONITORING AND EVALUATION

The monitoring of results have been through a combination of records including, employment records, production and sales records of stoves and fuels by C-Quest Capital (Cambodia). A third-party carbon auditor has hired to access the technical design of the project and GHG impacts as part of their carbon validation work.

CQC Cambodia leveraged additional financing through SNV Netherland Development Organisation Canbodia's Results-Based Financing program for advanced clean cookstove stoves. Out of the 1034 stoves sold during the NCF grant period, 534 stoves were reported to SNV to receive RBF payments. Prior to SNV issuing an RBF payment, an Independent Verification Agent (IVA) hired by SNV telephone calls 20% of households per sales report that CQC Cambodia submits to SNV to ensure the stoves have indeed been purchased by those customers and confirming the price paid and whether the stove is in use. This is an extra layer of monitoring/inspection that CQC Cambodia's stove/fuel business has been subject too.

10. LESSONS LEARNT

1. The project has decided to assemble all-stainless stoves instead of stoves with an outer layer of galvanised metal plus powder coating. The project description highlighted the risk relating to the lack of powder coating facilities and

competence in Phnom Penh and highlighted all-stainless production as a means to mitigate this risk. Powder coating in Phnom Penh is costly (about 4 USD/stove), which put this at the same level as upgrading the stove material to stainless steel. Furthermore, transporting stoves back and forth to an external powder coating facility in Phnom Penh would add unnecessary cost, organisational risk and complexity to the process, and quality could not be guaranteed. Prior experience indicates powder coating is an important risk factor for Prime stoves quality, especially as the negative consequences of suboptimal coating, such as rust, would often not be visible prior to selling a stove.

2. The project has purchased a flat-die pellet mill and a hammer mill for pellet production, as per the approved budget. Producing pellets on a continuous basis with a consistent quality throughout the day is very challenging as originally there was no other equipment to make the production process more fluid. It was a very manual process and our technicians had to start and stop production on a batch basis. It was also found that the moisture content of the raw materials such as rice husk and sawdust must be within a certain tolerance level, which is a very narrow range. Therefore, recipes need to be very specific, making a manual process even more challenging while trying to achieve a commercial scale. The project therefore engaged an international consultant to help optimise production as well as fine tune recipes to minimise risk related to e.g. raw material characteristics and moisture content. The disadvantage of a flat-die pellet mill is that the gap between the roller and the die is tricky and needs to be adjusted according to the species of the raw materials and moisture content and there is more wear and tear on the dies. Flat-die pellet mills are used for small-scale production (80 to 1000 kg/h at most depending on what size machine you have) and have the advantage of being mobile and less noisy than the other type of pellet mill technology called Ring-die. Scaling up production would require a ring-die pellet mill, which can produce around 0.8 to 2 t/h depending on the size of machine you have. Ring die pellet mills experience less wear and tear than flat dies and are more energy efficient. To increase our chances that the equipment we purchase is high quality beyond reviewing technical specification sheets provided by suppliers, we will visit the equipment suppliers and more importantly to pellet producers using the supplier's equipment as part of due diligence.
3. There have been significant lessons learned on the technical side of producing biomass pellets, especially with rice husk. We have attempted many different recipes, ranging from different quantities of raw materials mixed together, different binders, constant adjustments to machines, finding ways to source raw materials such as bagasse in an efficient manner, dealing with greatly varying moisture contents of raw materials from the dry season to the wet season. 100% rice husk can be sourced with a fairly constant moisture content and doesn't require any additional processes such as drying or crushing. It can be put straight into the machine; however, it requires a binder. Previously bagasse was used. Bagasse is a cheap binder, but it is very difficult to collect in large quantities plus it has a very high moisture content during the wet season and requires drying and

crushing. So, there is a lot of work involved in preparing it, not making it very cost-effective in the end. CQCC has experimented with other binders that don't have such moisture content issues, such as corn starch and molasses. They can be purchased in bulk. Thus, we modified our pellet mill to be able to pump this into the machine in liquid form. We later switched to sawdust; however it comes soaking wet from the supplier. We then procured a screw press to dewater the sawdust and a dryer. The waste sawdust we collect is cheaper than rice husk, has a have a higher calorific value than rice husk and less ash content, and is easier on the machine in terms of wear and tear.

4. CQCC is implementing a complex business model that bundles together two products with varying payment plan schemes, and with the need to deliver fuel to households and collect money from these households. CQCC also tries to track potential customers that require follow-up calls and visits, in addition to trying to up-sale existing customers that also require follow-up calls and visits. CQCC has been trying to manage all of this via MS Excel Spreadsheets, however, they have outgrown this having more than 800 current customers that require continued actions and it has been unmanageable. They need a more dynamic system that allows them to engage their customers and potential customers more effectively, and that triggers them when they need to deliver fuel and collect money and to follow-up. This system is not in place yet, and would be necessary for scaling-up further.

5. CQCC historically has a difficult time recruiting well-seasoned sales officers. The majority of candidates are junior with little to no experience in sales. There has also been little interest of candidates to work outside all day at the amounts we pay them. And are unable to afford higher salaries for our sales officers. At one point, CQCC spent over 8 months trying to recruit sales officers without hiring a single one. We are forced to hire junior recruits with little to no experience. However, at the time we did not have a well-structured internal training program to build the recruits capacity over time, which was later put in place. We believe that if we invest in on-going training for our sales officers, we can on-board junior candidates that will become successful sales officers over time. The sales officers will appreciate this investment, and turnover of staff is expected to reduce as witnessed by other CQCC staff that have received periodic external/internal trainings, such as our financial officer and operations manager.

6. There was nothing to prepare us for the impacts of COVID19 on our business. We faced an almost complete business seizure during the first wave of the pandemic and have since put in place a sales strategy that includes new sales approaches to mitigate future waves of the pandemic including online sales and the hiring of salespeople at the commune level to focus on their own communes. They would be able to travel within their areas to conduct sales activities if travel restrictions were again put in place.

7. The pellet mill was purchased with the specifications to produce 250-350 kg/hr. With sawdust as the raw material, this would be near the higher end of the rated capacity of 350 kg/hr. Based on a 8 hour production day, this would be 2,800 kg/day. The actual production output was significantly less, on average 338 kg/day over the M4 reporting period.. Also, the pellet equipment purchased from China requires constant maintenance and the need for spare parts is much more than expected. Prior to purchasing anymore large equipment, visits to the equipment suppliers and more importantly to pellet producers using the supplier's equipment should be visited as part of due diligence.

8. Developing a sight seller book for the Prime stove and pellets and training all sales staff and agents on it has helped with sales. A sight seller book is a selling tool used by salespeople to walk prospective customers through the product's value proposition. It's also good in that it gives all sales staff/agents a clear and consistent message to prospective customers.

11. OUTREACH

No reports or publications were disseminated during the project period.

12. FINANCIAL SUMMARY

Table 1. Project financing per partner

	Financing, EUR						
Expenditures, EUR	NCF	Lead Nordic Partner: Differ	Local Partner: CQC Cambodia	Other Partner: CQC Malaysia	Other Nordic Partner: Prime	Revenues from the project	Total
Lead Nordic Partner: Differ	22,214.34	117,904.84	-	-	-	-	**140,119.18**
Local Partner: CQC Cambodia	309,028.50	-	184,438.41	-	-	-	**493,466.91**
Other Partner: CQC Malaysia	11,025.09	-	-	151,365.62	-	-	**162,390.71**
Other Nordic Partner: Prime	36,447.65	-	-	-	16,515.01	-	**52,962.66**
Total	**378,715.58**	**117,904.84**	**184,438.41**	**151,365.62**	**16,515.01**	**-**	**848,939.46**

13. CONCLUSIONS AND RECOMMENDATIONS

CQC Cambodia has sold over 1000 stove/fuel bundles; a significant portion of this towards the end of the M4 period, showing some promise that sales may continue

to increase over time. However, as they stand right now,sales levels are still not where they need to be to make this a profitable venture. Addressing the affordability issue by by lowering the price paid by consumers supported by the introduction of carbon finance into the business model is necessary to give this a chance to be successful. The market opportunity is definitely there for the taking in a post Covid-19 world. Consumer response is encouraging as the stove and fuel provide a number of benefits to the consumer, including cost savings, reduction in smoke, and a more convenient cooking experience.

Small-scale pellet production has been a major learning experience but we anticipate that with increased investment in higher quality, higher capacity machinery we can continuously produce at a scale to meet our projected demand, and at the same time reduce the production cost of the pellets on a per unit basis.

Building a sales force to meet the necessary sales level to achieve viability is another critical component we need to overcome.

Currently, CQC Cambodia's business line of selling improved cookstoves and renewable biomass fuels is still operating at a significant financial loss even after almost 5 years of operation. The pandemic has made it difficult to test and prove that different sales approaches and business models will work at scale to address pre Covid-19 business model issues, primarily affordability to the end-user. C-Quest Capital Malaysia Global Stoves (CQCM) and C-Quest Capital Cambodia (CQCC) will continue to develop the carbon finance project and sell stoves and fuel but CQC Head Quarters will make a decision whether to continue the the sale of stoves and pellet fuel at the end of 2021, which primarily depends on level of sales.

Annex 1 Project completion fact sheet

Project Name:	Shifting the Market to Clean and Efficient Stoves and Fuels		
Project no.	NCF-C7-067		
Country:	Cambodia	**Financing:**	
		EUR	**%**
Nordic Partner:	Differ AS	117,904.84	95%
Local Partner:	C-Quest Capital (Cambodia) Co., Ltd	184,438.41	86%
Other Partners:	Prime AS; C-Quest Capital Malaysia Global Stoves Limited	167,880.63	91%
	NCF grant disbursed	378,715.58	91%
	Total	**848,939.46**	**90%**
Classification:	Mitigation		
Project cycle:	Project start date: 15/09/2018 Original closing date: 15/03/2021 Actual closing date: 15/03/2021		
Short project description:	Differ AS (Norway), Prime AS (Norway), C-Quest Capital Malaysia Global Stoves Limited (Malaysia) and its fully owned Cambodian subsidiary, C-Quest Capital Cambodia Co., Ltd. (Cambodia) (the "Partners") haved joined forces under this project to shift the market to clean and efficient stoves and fuels in Cambodia, thus mitigating climate change by reducing greenhouse gas emissions from the displacement of non-renewable biomass. This grant has co-finaced local production of pellet fuel, local assembly of stoves manufactured by Prime, and the expansion of CQC Cambodia's FASTFire stove and fuel distribution business to enable distribution of the locally produced stoves and pellets.		
Project performance:	**Expected Outcomes and Outputs**	**Achieved**	**End-of-project status**
	Impact 1.1: Reduction of GHG Emissions	6,332 tonnes of CO_2e	6,332 tonnes of CO_2e
	Impact 1.2: Reduction of Non-Renewable Biomass Consumed	6,954 tonnes	6,954 tonnes
	Outcome 1.1: Increasing local production capacity of advanced biomass cookstoves and renewable biomass fuels	129 tonnes 3,294 units	129 tonnes 3,294 units
	Output 1.1.1: Basic advanced biomass cookstove assembly line operational and Local Production of ABC	1 project	1 project
	Output 1.1.2: Renewable Fuel Production Facilities Operational	1 project	1 project
	Outcome 1.2: Increasing access to, and use of, modern energy services to households via advanced biomass cookstoves (ABC) and renewable biomass fuels	4,756 persons	4,756 persons
	Output 1.2.1: Sales of Advanced Biomass Cookstoves (ABC)	1,034 units	1,034 units
	Output 1.2.2: Sales of Renewable Biomass Fuels	128 tonnes	128 tonnes
Climate change outcomes and impacts:	The project provides Cambodia with renewable biomass and highly efficient stoves, significantly lowering the emissions from cooking, and saving non-renewable biomass. It is estimated that the sale of stoves and fuel to 1,034 households reduced 6,332 tonnes of carbon dioxide emission reductions.		
Development outcomes and impacts:	• **Health and Social** - Reduction in household air pollution, hence health improvements for households, mainly women/children, in addition to other positive social effects (e.g. reduced soot damage to homes and cooking equipment). 65% of urban households in Cambodia cook indoor. In CQC Cambodia's short survey of 30 randomly selected households, 73% of respondents reported they cook indoors before and after they switched to the Prime Stove and pellet fuel. 63% of respondents reported they experienced health problems such as eye and respiratory problems related to smoke during cooking prior to switching to the Prime Stove and pellet fuel. 60% of respondents reported that after switching to the Prime Stove and pellet fuel their health problems have improved and 40% said they are same as before. • **Economic** - The net present value (10% discount rate) of a Prime stove purchased for 38.10 EUR with a 2.5-year life time, with pellet fuel, accounting for the quantifiable net benefits consisting of energy cost savings (charcoal), and the benefits of reduced GHG emissions (10 EUR/tCO2e) was estimated at 272 EUR. This implies a high level of cost effectiveness. This rate underestimates the total benefits of the stove and fuel combination, which includes health benefits that are difficult to quantify. In CQC Cambodia's short survey of 30 randomly selected households, all but one household reported that they experienced money savings by switching to Prime stove and pellets as compared to the way they used to cook.		

	• **Environmental** - It is estimated that switching from charcoal to pellets will reduce 2.69 tonnes of non-renewable biomass/year/household. Reducing consumption of unsustainably harvested wood also has the benefit of decreasing GHG emissions (or reducing loss of carbon storage in vegetation). Switching from charcoal to pellets would hence reduce 2.45 tonnes of CO2/year/household in total. • **Gender** - Whilst economic savings generally benefit households as a unit, reductions in smoke and other harmful pollutants associated with incomplete fuel combustion typically generate much greater benefits for women/children as they are the ones mostly in the kitchen. In addition, the stove supply chain provides ample employment opportunities for women as distributors and promoters. The project also employed 6 full-time female staff and 45 commissioned part-time female sales agents of stove and fuel. • **Job Creation** - The business concept created 14 full-time jobs during the grant Period. In addition to the full-time jobs, the stove/fuel distribution business activity created 113 part-time sales agent jobs.

NCF core indicators

NCF core indicator	Results (quantitative)			Clarifications/Means of verification
Number of beneficiaries reached	women		2,473	Average number of people per household (4.6*) multiplied by number of sales of improved cookstoves. 48% Males and 52% women per household*. *Source: 2014 DHS Survey, Cambo
	men		2,283	
	total		4,756	
Number of people with increased resilience to climate change	women		2,473	Average number of people per household (4.6*) multiplied by number of sales of improved cookstoves. 48% Males and 52% women per household*. *Source: 2014 DHS Survey, Cambo
	men		2,283	
	total		4,756	
Number of people with improved livelihoods	women		2,473	Average number of people per household (4.6*) multiplied by number of sales of improved cookstoves. 48% Males and 52% women per household*. *Source: 2014 DHS Survey, Cambo
	men		2,283	
	total		4,756	
New decent jobs created	full-time	women	6	CQCC Employees as of March 15, 2021. Does not include employees that resigned prior to March 15, 2021. CQCC Employees (Full-Time): 6 F, 8 M, 14 Total
		men	8	
		total	14	
	part-time	women	45	
		men	68	
		total	113	
	seasonal	women	0	Community Outreach Agents as of March 15, 2021. Community Outreach Agents (Part-Time): 25 F, 43 M, 68 Total
		men	0	
		total	0	

Annex 2 Results Framework

The results framework has been updated in the SmartME system's monitoring section and attached here.


Results Framework

Annex 3 Pictures

1. Sample photo from photoshoot for Marketing Prime Stove
2. Photo of Prime stoves that have been assembled.
3. Photo of pellet mill. Small pellets are screened out through the small holes while the larger pellets roll down into a bucket.
4. Photo of pellets before they are bagged.
5. Photo of bagged pellets
6. Example of sales materials CQCC would use at sales events and provided to community agents and dealers

Annex 4 Other supplementary deliverables/documentation/links

https://www.facebook.com/fastfireasia

Annex 5 Impact story

In 2019, a renewable fuel production facility was commissioned in Phnom Penh, Cambodia by C-Quest Capital (Cambodia) Co., Ltd., producing pellets from waste sawdust and agricultural residues such as rice husk. The purpose of establishing the production facility is to locally produce renewable, zero carbon emissions cooking fuel that can be combined with fuel-efficient cookstoves, in order for the consumer to have a cleaner and affordable cooking experience.

The pellets are sold as cooking fuel to over 1,000 Cambodian households who have also purchased the Prime natural-draft gasifier pellet cookstoves. Consumers purchase the gasifier pellet cookstove and pellet fuel bundle to switch from less convenient, less safe, inefficient and smoky charcoal and firewood cooking while also saving money. One consumer, So Chantheng purchased the Prime pellet stove and pellet fuel bundle in November 2019. She says "the stove is light and easy to place where I want. Using this stove with pellet fuel, I feel no longer afraid of any burning twigs falling out of my old stove or any risk from a fire accident. I also observed substantial fuel savings from using this stove. And I'm also happy to recommend this stove to others."

Implemented by Differ AS, Prime Cookstoves AS, C-Quest Capital (Cambodia) Co., Ltd., C-Quest Capital Malaysia Global Stoves Limited