Completion Report

KjuonGo, a digital revolution for sustainable fuelwood in

CAMBODIA

Grantee: UNEP DTU Partnership

Local Partner(s): Khmer Green Charcoal

Other Partner(s): GERES

Project start date: 01/09/*2019*

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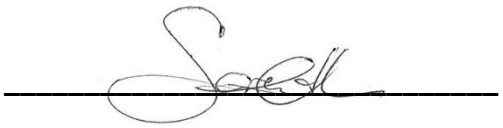

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1. Executive summary

The KjuonGo[1] project, initiated in September 2019, is focused on the establishment of a sustainable charcoal value chain as a commercially competitive alternative to charcoal produced from illegally logged wood in Cambodia's rainforest. Initially targeting community forests as the main source of sustainably harevestd wood resources, the project has engaged the National Forestry Administration as well as traditional charcoal producers to document the benefits of new income streams to local communities while securing collaboration from a sector that formally operates outside the law.

Despite severe market and logistical challenges during most of the project implementation period due to the Covid-19 pandemic, the project has achieved the onboarding of 20 community forests for the supply of wood, the documentation of a sound supply chain managed by a unique IT-based tracking system for systainably harvested wood, and the demonstration of a financially viable charcoal production that competes favourably with the traditional charcoal in the market. Through the involvement of the Forestry Administration, the KjuonGo project has achieved the inclusion of sustainable charcoal production in national plans for forestry development. At the end of the project, plans are developing for scaling up.

In that context, the project has also provided essential lessons learnt. While community forests are valuable partners for the development of a sustainable supply chain, they may not be sufficient for supplying the required amounts of wood for scaling up in the short to medium term. Neither are the improved kilns in the country side with minimal methane emissions adequate for the task. At the end of the project, KjuonGo faces serious supply constraints compared to a growing demand. Therefore, private plantations and more industrial charcoal production based on modern technology must be the backbone of upscaling, while the community forestry based supply chain develops in parallel. Essential is that all sources of supply are meticulously monitored through the KjuonGo IT-platform in order to document the sustainable harvest of fuel wood.

The community forestry-based supply cannot be abandoned. The project has documented that a well-managed community forest has significant adaptation benefits in relation to flooding. Recultivating degraded community forests therefore provides added value to communities which also see the additional revenue streams from fuel wood as an important source of income for vulnerable groups.

The perspectives for KjuonGo are immense, not only in Cabodia but anywhere where charcoal is the most important cooking fuel and where an immediate shift to zero-emission electricity is not an option. The test phase of KjuonGo achieved emissions reduction of 275 tCO2e. Globally, the potential is millions of tons annually.

[1] 'KjuonGo' shall be used henceforth as the abbreviation of the full project title 'KjuonGo, a digital revolution for sustainable fuelwood in Cambodia

2. ACHIEVEMENT OF RESULTS

2.1. ACHIEVEMENT OF OUTCOMES AND OUTPUTS

Expected outcomes and outputs	Indicator(s):	Achievement of outcomes and outputs:
Outcome 1: ***Kjuongo's supply chain is established and mature for expansion***		
Output 1.1: The supply chain model is validated with existing CFs and CPs	1.1.1. Community forests and charcoal producers formally engaged in sustainable charcoal production. 1.1.1.1. Approved registration documents for community forests and charcoal producers	KjuonGo **managed to establish a mature supply chain and expanded it even during the project.** 20 community forests and 6 charcoal producers were signed up for KjuonGo by the end of the project, although not all were actively supplying yet. Neither are all community forests equally suitable for supply of wood residues due to the state of degradation of their lands.
Output 1.2: The capacities of KjuonGo's supply chain actors are reinforced	Tons of sustainable charcoal sold. The quality of the charcoal is compliant with international standards Number of green business concepts tested	During the implementation of the KjuonGo pilot project, 74 tons of sustainable charcoal was sold. Sales are on-going and increasing at project termination. Through intensive training of supply chain stakeholders the amount and quality of sustainable charcoal eventually reached satisfactory levels, although it was realized that both the quality of the soil, and therefore of the wood, as well as the pricing mechanism for the charcoal producers at the outset were working against the set objectives. KjuonGo itself is one green business concept tested through the project. It consists of a sustainable value chain in which several actors play their role with their own part of the chain, thus in effect testing green business concepts for both charcoal manufacturers and community forests in addition to the KGC business case.
Output 1.3 - The conditions are gathered to expand the supply chain model to new suppliers	Plantation area supported by investments agree in principle	The initially planned investment model focused on 100 ha batches (reaching 10 batches and a total of 1000 ha) agreed with private investors fell flat as the ,market was expecting 5 million USD investment tickets as a minimum.

Outcome 2 - Kjuongo's operation is mature		
Output 2.1 - A value-proposition is validated for each targeted market segment	KjuonGo business plan	Customer segmentation has been significantly influenced by the Covid-19 pandemic as prime clients in street kitchens and restaurants had to close. Supermarkets became a key client instead as well as tank stations. Only at the end of the project restaurants returned at larger scale and quickly outstripped supply. Managing the supply constraints is now a key activity in the segmentation of the market.
Output 2.2 - The operations and internal processes are consolidated, documented and smoothly implemented	KjuonGo Business Plan	KjuonGo sustainable charcoal is now firmly integrated in KGCs operations. **KjuonGo's operations are well-functioning balancing supply and demand and securing cashflows to stakeholders according to expectation.** The dedicated KjunGo IT-system tracking the supply chain has documented its functionality and helps also determining the cashflows between supply chain stakeholders. An operations manual has been developed as part of the KjuonGo Business Plan.
Outcome 3 - Kjuongo's business model attracts investors		
Output 3.1 - A financing strategy for upscaling is designed and investors are identified	KjuonGo Business Plan	**KGC has been in dialogue with a series of interested investors without reaching final agreement with any yet.** The original financing strategy had to be abandoned as investors are looking for investment tickets of 5 million USD as a minimum. This is on the egde of KGCs absorption capacity. The challenge is to find middle ground. Also, in dialogue with investors, the initial focus for investment is the establishment of industrial scale charring facilities with European technology, aiming at increasing production capacity a factor 10 based on additional wood residues from commercial plantation.
Output 3.2 - In principle agreements with investors	Plantation area supported by investments agreed in principle	Following output 2, or the revision thereof, the idea of agreements with investors on the basis of the original plans was abandoned. Instead, lengthy negotiations with the Land Degradation Neutralization Fund (LDN) were upheld for the better part of two years. They ultimately led to a declination of investment, LDN having first proposed an investment of 3 million USD instead of their minimum of 5 million and pursuantly concluding that the amount was too small for their appetite. The negotiations were given up three months before project end, only allowing new potential partners to be identified, but not to materialize in any agreement at the time of project closure.

Outcome 4 - the adaptation benefits of improved community forestry are realized by local communities		
Output 4.1 - Assessment of climate change resilience improvement through community forestry	Socio-economic report on drivers for community forestry	The assessment of the resilience improvement from community forestry has been done performing soil sample analysis of four test sites representing different levels of soil degradation and planting levels reflecting the plantation plans developed under KjuonGo. The assessments confirm that well-managed community forests have tangible adaptation effects. It also confirms that the main factor is the quality of the soil, which in some cases is too degraded to support efficient plantation.
Output 4.2 - Determining the resilience value improvement as a tangible driver for efficient community forestry	Socio-economic report on drivers for community forestry	The socio-economic analysis shows that there is acceptance among the majority of the communities that a well-managed community forest has value as a protective measure mainly against flooding

2.2. DEVIATIONS FROM THE PLANNED OUTPUTS AND ACTIVITIES

Most of the KjuonGo project has been implemented under significant influence of the Covid-19 pandemic, and very few activities have been unaffected.

On the other hand, all activities have been implemented, although with significant delays, which is reflected in the approved lengthening of the project duration by one year.

As explained above, the main revision of the project compared to original expectation is the financing model which no longer is based on small scale investments of 250,000 USD each as such are not commensurate with investors' expectation. In lengthy dialogues with the LDN Fund targeting the first large scale investment, the financing strategy was refocused on the one commercial entity in the project set-up – KGC – as the only relevant counterpart for professional investors with capital offers of minimum 5 million USD.

The revised investment strategy that targets KGC is thus focused on the charcoal manufacturer and shifts the bulk of the sourcing of sustainable wood to residues from large scale commercial plantations. Such agreement has been established. This on the one hand reduces the relative role of the traditional charcoal producers and community forests in the supply chains, but it increases the potential for a longer term financing model for plantation in community forests that includes commercial plantation companies.

The conclusion from the project is that the supply chain is not either-or but rather both-and, and that the two parallel sourcing avenues will support each other.

2.3. ACHIEVEMENT OF NCF INDICATORS

NCF core indicator	Results (quantitative)			Clarifications/Means of verification
Number of beneficiaries reached	women		4333	The villages that own community forests that are participating in the KjuonGo project are generally benefitting from the extra income from the sale of sustainably harvested wood. How the villages are organizing the work around the forests is difficult to map. All benefit, however, from increased resilience once the community forests are regenerated. Here are added the charcoal producers that have increased income, but are not living in the villages
	men		4555	
	total		8888	
Number of people with increased resilience to climate change	women		4291	Same as above, although not including the charcoal manufacturers
	men		4533	
	total		8824	
Number of people with improved livelihoods	women		4333	Same as above. It is acknowledged that the improvement of livelihoods does not equally affect all villagers, but it is difficult to assess how the new harvesting activity affects different individuals.
	men		4555	
	total		8888	
New decent jobs created	full-time	women	2	The full-time jobs are created with KGC, whereas the part-time and seasonal jobs are created in the local communities. The numbers are recent counts and will fluctuate – and generally grow significantly – with onboarding of further community forests.
		men	3	
		total	5	
	part-time	women	93	
		men	85	
		total	178	
	seaso-nal	women	14	
		men	48	
		total	62	

3. CLIMATE CHANGE

Quantitatively, the KjuonGo did not meet its declared goal of reducing 3062 tCO2e during its implementation period. The one explaining factor for the shortfall is the disturbancecs to the entire supply chain for sustainable fuel wood that was caused by Covid-19 – from market and restaurant closures to transport and travel bans. Without these complications, the project would have met its expected results.

The revised calculation following the methodology used shows that the emissions reduction has reached 275 tCO2e, to which about 100 tCO2e could be added by considering the sequestration in the community forests. It is difficult to assess if this is satisfactory given the circumstances.

In a broader context, however, the project has served as proof of concept in some respects as well as a pointer to elements of the concept that can be improved to optimize the impact of KjuonGo. In this respect, the most important outcome is that through the project, a viable model for continuing the production of sustainable charcoal has been established. What remains outstanding is the expansion of production. Also on this point, KjuonGo has established essential input to the further development of the activity by rendering the original expectation of small-scale investment packages unviable. While this compromised the original expectation of raising funding already during the first two years of operation, it put KjuonGo on the right track for raising larger scale financing for significant expansion.

4. DEVELOPMENT IMPACTS AND CROSS-CUTTING ISSUES

KjuonGo has had significant influence on the National Forestry Administration's approach to sustainable charcoal production as an element in the strategy to combat illegal logging and thus reverse the current deforestation trends. As a result, sustainable charcoal production is now mentioned in Cambodia's 2020 NDC.

KjuonGo has also provided insights into the state of the community forests. It has been demonstrated that not all community forests are immediately relevant as suppliers of sustainably harvested wood. Some are on soils that are too degraded for viable plantation and requires upgrading of soils before plantation can succeed.

KjuonGo has therefore provided essential input for the planning of a sustainable charcoal sector in Cambodia and the differentiated inclusion of community forests.

The project has also demonstrated that the community forests and the affiliated charcoal production hold potential for gender balanced job creation despite some of the functions being hard labour, especially around the main harvest season. This gender balance was not anticipated at the outset, but seems to be a general quality of the activity seen across the participating community forests and charcoal manufacturers.

5. ASSESSMENT OF THE RESULTS AND IMPACTS OF THE PROJECT

a. Relevance

The project was designed with the knowledge that illegal charcoal production is the biggest factor in the rapid deforestation of Cambodia. Stated Government objectives are first to halt deforestation and then to reforest the country to eventually bring forest cover back to 60%. Documenting the economic viability of sustainable charcoal production in competition with the illegally logged alternative is a major achievement with the utmost relevance for Cambodia's reforestation ambitions. If scaled up, it will further facilitate the policing of existing regulations that prohibit illegal logging of the rain forest, hence opening the potential to bring illegal loggers into sustainable supply chains based on community forests and commercial plantations.

The project partners, and particularly Khmer Green Charcoal, has been able to establish an additional income stream from sustainable charcoal in addition to its sustainable briquettes. The project has not only demonstrated the viability of sustainable charcoal but also that the sustainable charcoal production has the potential to grow tenfold without exhausting immediate demand – presuming that financing can be raised for a productive investment.

b. Effectiveness

KjuonGo targeted all central elements of a sustainable value chain for charcoal. It ensured VAT exemption for KjuonGo charcoal to level the playing field in competition with the informal charcoal in the market. Such exemption is now routinely applied. Equally so for transportation permits. It established the IT/app-based tracing mechanism, which is the backbone of documenting the sustainable origin of the wood. It brought on board both the national and local units of the Forestry Administration to ensure buy-in and understanding of what KjuonGo was working to achieve, and built strong backing in the process. It brought more than the originally expected numbers of community forests on board as well as local charcoal manufacturers and built their enthusiasm for KjuonGo as a potential revenue stream for the local communities. It tested species, developed plantation plans and assessed soil qualities in community forests, thus establishing the platform for strategic expansion of the supply chain. And it established dialogues with financiers on the model for investment, balancing between forestry investment and sustainable charcoal production capacity.

In doing all of the above, KjuonGo has effectively addressed every single element of a sustainable value chain for charcoal production. Its comprehensive agenda has documented the viability of the KjuonGo concept in a learning process backed by concrete implementation. It has also, unfortunately, documented that the initial assumptions on how to achieve a scale-up through small investment tickets of 250,000 USD is not feasible as investors expect much larger investments and rarely less than 5 million USD. In practice, this effectively sets a minimum standard for

project promoters as they need to be able to absorb this kind of funding. In that context, a 'conglomerate' of community forests is not a feasible counterpart. Attempts at raising financing through KGC are on-going at project closure.

KjuonGo has been implemented under unusual circumstances which renders a common effectiveness assessment impossible. Every aspect of the project has been influenced by the Corona pandemic. The project manager at UNEP DTU was unable to visit the project for two and a half years. The project managers in Cambodia were quarantined. The markets were closed. Transport of charcoal interrupted and approval of quotas for community forests' harvesting of fuel wood halted or delayed.

c. Efficiency

That all the elements encompassed by the project were finally delivered under unusually difficult circumstances is a testament to the efficiency of the team implementing the project, particular the project partners in Cambodia. This is despite the extension of the project by 12 months necessitated by the lockdowns in Cambodia and the general disruptions of global collaboration during the pandemic.

It is difficult to imagine alternatives in the given context. KGC as the commercial operator in the project kept its production going to the extent possible, which was the anchor of the project. As there are no other sustainable charcoal/briquette producers in Cambodia, alternative implementation modalities would have to be considered without such concreteness, meaning that any alternative would have been a theoretical exercise.

At the same time it must be stressed that the NCF funding has been indispensable for driving the activity forward. Without it, there would simply be no sustainable charcoal in Cambodia, as KGC would have had to resort to its briquette business as a matter of survival.

d. Impact

It is apparent from the above that there would have been no KjuonGo sustainable charcoal without NCF. It is also apparent that without KjuonGo and KGC there would have been no documentation of an economically viable alternative to Cambodia's current unsustainable charcoal production. And the National Forestry Administration would not have had the substantiation of this alternative as input for its future development of the forestry sector, including responses to the Government's reforestation ambitions.

The project has engaged traditional charcoal producers from the outset, i.e. charcoal producers that before the introduction of KjuonGo were producing charcoal from illegally logged rain forest. It was a deliberate choice, securing collaboration from incumbent producers rather than considering them as competitors to new sustainable entrants, and it was a safety measure to alleviate any risk that the supply chain would not be providing sufficient wood for a viable 100% sustainable charcoal

production. With the IT-tracking system, the sustainable fraction of the production could always be traced. A condition for traditional charcoal producers joining KjuonGo's supply chain was, however, that they adopted improved kiln designs. The kilns are one of the main challenges in traditional charcoal production due to their significant methane emissions. Particularly in the circumstances generated by the corona pandemic, the supply of sustainably sourced wood has been insufficient to secure a livelihood of the charcoal manufacturers. Hence they have continued their unsustainable charcoal production in parallel. Their entire production, however, now succeeds on improved kilns with significant methane emissions reduction. Beyond its original scope, KjuonGo has therefore helped spreading sustainable kiln design to a part of the unsustainable charcoal manufacturing – a fraction which is probably considerably larger than the sustainable charcoal production.

As mentioned earlier, KjuonGo has also inspired Cambodia's Forestry Administration to adopt sustainable charcoal in its visions for a national reforestation programme. Although causality is difficult to prove, the Forestry Administration has been an active and central stakeholder in several processes of KjuonGo's implementation. The impact of the project may therefore be significant in the longer term and far beyond the project partners.

KjuonGo has also documented the gender balanced job creation that community forestry seems to deliver. This was a hope at the outset, but not at all guaranteed given the nature of the work involved. Also, KjuonGo has documented that well-managed community forests have tangible adaptation qualities particularly with respect to protection against flooding.

It is a finding rather than an impact that the project has revealed significant differences in the quality of community forests and that some of these forests are in such a stage of degradation that they can neither produce usable fuel wood for charcoal production, nor can they benefit from the plantation models that have been developed because the soils cannot support them. Therefore, ultimately, they cannot hope to reap the adaptation benefits of improved community forestry. These forests need soil restoration before they can join a structured wood supply chain and such soil restoration requires additional budget.

e. Sustainability

KjuonGo was established as a side-activity of the existing commercial activities of KGC in order to facilitate its continued operation also after the closure of the NCF funded programme. During the programme, the sustainable charcoal production has proved itself to be commercially viable – at least as long as the VAT exemption is maintained (which is standard for KGCs sustainable char briquette production). The small scale KjuonGo charcoal production is therefore likely to continue, perpetuating the positive effects realized throughout the supply chain.

Realistically, however, to secure its commercial relevance and hence also its commercial sustainability, a scale up of production is necessary, ultimately also to sustain the environmental, social and economic benefits of the activity.

From a supply side perspective, a sustainable supply of wood harvested in community forests is not a given. Community forests are oftentimes neglected as a resource by local communities and sustaining the interest in securing a stable supply of sustainably harvested wood for charcoal production may be a challenge, particularly if other and better paying alternatives exist or emerge. It is a challenge that to some extent is alleviated by adding the commercial plantations as a source of supply, which – at least in the shorter term – will overshadow the supply from community forests. In time, as community forests in KjuonGo's value chain grow in number, and planting increases organically, a more industrial approach among the community forests may evolve.

f. Coherence

KjuonGo is in itself a succession of projects that have gradually conceptualized and implemented sustainable charcoal focused ideas and approaches which have ultimately produced the ultimate proof of concept through the NCF-funded programme. The main applicant, UNEP DTU Partnership, has been part of this journey since 2014. However, over those eight years, UDP developed no further related activities, neither in Cambodia or elsewhere. KjuonGo has been considered the core activity from which, if successful, future scale up and replication would emerge.

For Geres, on the other hand, Cambodia has been a centre of activity for many years and with specific focus on forestry in the country. In one way or another, all Geres' activities in Cambodia are interrelated, either on substance or on counterparties, particularly national and local authorities, or both.

6. INNOVATION

The idea of tracing the sustainable sourcing of wood as amounts rather than logs through an app-based IT-system was the core innovation of KjuonGo and a central feature introduced with the project, facilitating the inclusion of small quantities of wood from community forests in supply chains for sustainable charcoal.

The IT system also allowed the mixing of wood in the sense that whatever was documented as sustainable input at a given charcoal manufacturer would also figure as sustainable output. But the manufacturers would not depend solely on the sustainable supply and thus could still make a living from charcoal manufacture. In this way, traditional charcoal manufacturers were turned from antagonists to collaboration partners that also adopted much improved kiln designs in the process, improving working conditions considerably.

The KjuonGo IT system was not only the backbone of the KjuonGo supply chain, that facilitated the inclusion of poor and vulnerable communities; it will also remain essential for its expansion.

7. POTENTIAL FOR SCALING UP AND FOLLOW-UP INVESTMENTS

The KjuonGo project was implemented under extremely difficult conditions, hit by the corona crisis throughout its prolonged implementation period of three years – a risk that was not considered at the time of proposal and the consequences of which were impossible to foresee, even as the crisis unfolded. Project management and interaction from the Nordic partner was hampered by travel bans and approval of harvesting quotas and training of CFs and CPs were made hindered by local transport restrictions. Markets were closed and demand for charcoal was severely hit. Without the support from NCF, KjuonGo would not have survived.

Clearly, NCF support was not designed as life support, but as support to a proof of concept and a scale-up plan for the supply of sustainable charcoal to the Cambodian market. Remarkably, despite the worst thinkable conditions, the project has managed to deliver both.

Implementation beyond NCF support may follow three different pathways depending on the success of the partners in the pursuit of options.

1) KjuonGo may continue its organic growth and supply sustainable charcoal to the Phnom Penh market based on the steady increase of participating CFs and CPs. This is not the preferred option and it will only gradually make any inroads into the charcoal market with little impact on Cambodia's deforestation challenges. But even without further support, it might grow steadily.
2) KGC may be able to secure the necessary loan and/or equity financing to expand its charcoal production capacity and shift its main source of sustainable wood to commercial plantations' residues. This strategy will also entail a beginning plantation activity and thus could put Cambodia on a path to decisively change the source of supply for charcoal production.
3) The Cambodian Government may engage in a nation-wide strategy for sustainable charcoal production based on larger scale grant support to secure a parallel development of community forests as stable wood suppliers combined with an expansive plantation strategy on areas owned by the government. Support for this strategy, preliminarily discussed with the Ministry of Environment, may be sought from the NAMA Facility or the Green climate Fund.

Among these options, the preferred option is 2). It seems, however, that the absorption capacity of KGC in terms of capital injection does not match the common development investor's requirement for size. It is therefore also a risk that KjuonGo may end up in the 'valley of death', despite well documented investment budgets with clear short-term profitability projections that require no further grant funding.

8. RISKS

At the outset, there were several risks affiliated with the project, although most were considered less severe. The tables inserted below reflect those risks that pertain to lack of understanding among the local Forestry Administrators in the provinces, weather risks largely due to flooding – which improved community forest practices are expected to help mitigate – and pricing risks. All risks identified up-front were considered to have a low impact on the project.

Upfront risk concerns:

Project risk description	Mitigating measures and responsibility
Lack of well-established and well-understood administrative procedures combined with vested interests result in undue delays to issue necessary authorizations and certificates. This may lead to delays in issuing harvesting quotas approval certificates resulting in delays in wood harvesting and charcoal production	• Development of a 6 months action plan and early preparation of charcoal production sites for 2021. • Initiation of approval processes that cover the entire project period. • Development of a parallel sourcing strategy including the private sector, which does not operate under the same approval procedures.
Weather hazards and irregular supply hinder charcoal producers from adopting sustainable production methods	• Definition and implementation of charcoal quality control procedures by KGC and Geres, all along the charcoal production chain. Regular follow-up from Geres on wood harvesting and charcoal production activities.
Restrictions and economic slow-down related to the COVID-19 pandemic impacts enterprises and households' economics, increases preference for immediate income opportunities. Hence, community engagement in sustainable forestry activities is subject to competition with other possible income sources	• Training and stable revenues provided to all participants in the supply chain. • Emphasis on capacity development, autonomy and long-term co-benefits and the prospect of additional income has already led to an increase in communities' interest in participating in KjuonGo.
Community Forests requiring price increases for the sustainable wood	• KGC increased the price by 12.5 % in order to ensure the flow of sustainable wood production and the business profitability for the Community Forest.

Charcoal Producers requiring price increases for the sustainable charcoal	• KGC increased the price by 3.5 % in order to ensure the production of sustainable charcoal and the business profitability for the Charcoal Producers.
The quality of the charcoal coming from the CFs and CPs could impact the sales performances.	The following measures will be put in place: • CPs separate the big from the small pieces of charcoal in different bags. • CPs name each charcoal bag with their own id number in order to monitor potential different charring performances. • Avoid that the transportation can compromise the charcoal quality braking it in small pieces, especially during the loading and unloading operations. • Last but not least, the collaboration with the private plantation is a relevant risk differentiation factor, as the wood will not come only from CFs anymore. • KGC and Geres teams are responsible for monitoring the implementation of such measures.
Implementation of field activities remains highly dependent on FA's agenda and variable priorities. Impacts the timely implementation of field activities. (this was considered a medium risk)	• Contracting of consultants to ease the collaboration with FA at both national and local levels (already implemented through UDP). • Geres coordinates closely with consultants and the Forestry Administration to jointly and regularly update action plans.
Significant degradation of the CFs engaged in KjuonGo and a consequent delay in the establishment of productive CFs for sustainable wood fuel sourcing. Slower materialization of SD benefits.	Redirection of sourcing to increasingly include commercial plantations. Developing 'cross-fertilization' investment plans for the benefit of the CFs.

But what became the main detriment to the project was not foreseen at all. Covid-19 hit 6 months after project start and 3 months after project inception meetings in Cambodia. It came to influence the project throughout its implementation. The impact of the risks that were gradually adopted in the risk matrix were generally assessed as medium, but ultimately the impacts were felt on all parts of the project:

Project risk description	Mitigating measures and responsibility
Prevention of Covid-19 community outbreaks in Cambodia may lead to restrictions in gatherings. Delay of wood inventories, harvesting, training and approval of documents. Worst case distribution of charcoal could be at risk	• Careful activity planning and close monitoring of the development of the local situation should allow gatherings to be maintained in small committees and with respect to sanitary precautions. • Effective and regular communication with project partners and among the team should allow meetings and activities to be performed or monitored remotely.
The Covid-19 pandemic continues to impact society with restrictions on gatherings, travel and tourism throughout 2021	• The support of NCF is a crucial risk mitigating factor for the continuation of activities, allowing particularly KGC to devote resources to continued development despite limited sales and increased payments to CFs and CPs. • The current shortfall in sales has benefits in terms of building up storage buffer for seasonal fluctuations in charcoal production. KGCs current storage capacity is sufficient to accommodate this, which will put KGC in a better sales position post-Covid.
Lack of well-established and understood administrative procedures combined limited availability of FA officials due to the pandemic result in undue delays to issue necessary authorizations and certificates.	• Decision taken to support CFs and CPs to access local wood fuels market.
Further spread of Covid-19 and actions to contain it, implying larger gatherings, close group collaboration have been cancelled, thus	• Alternative approaches involving gathering of smaller groups have been implemented. • Communities have been supported in identifying garment factories interested in

also ultimately affecting the woodfuels demand throughout the country.	purchasing legal wood fuels to overcome the impact of Covid-19 on the catering sector.
Lack of appetite for smaller scale investments among impact investors has left the project with proof of concept, but lack of scale-up finance.	• A continuous reach-out to financiers has partly helped realizing the considerable risk of not being able to scale-up the activity, while at the same time identifying the errors in project representation. This has helped shaping the financing concept, increasing the chance for overcoming this essential barrier.

The project ultimately weathered all materialized risks, partly through a 12 month extension of the project and partly through immense efforts from all stakeholders involved in Cambodia.

9. MONITORING AND EVALUATION

The prime purpose of KjuonGo was to develop a commercially viable production of sustainable charcoal. As such, the market has provided its share of M&V: Customers are satisfied with the quality of the product and are buying at a price that leaves a profit for all commercial stakeholders in the supply chain.

The Gold Standard Foundation did provide external evaluation of the project as a candidate for Article 6 development under the Paris Agreement and considered it a 'complicated project with many moving parts', but otherwise considered it both relevant and eligible for Article 6 development.

Third party verification of other parameters of importance for the project, including the NCF indicators, have not been monitored or evaluated throughout the project beyond what project partners have been able to do by themselves. This is mostly due to the restrictions on travel imposed as a result of Covid-19. At the end of the project, however, UNEP CCC has produced a socioeconomic evaluation in a separate report with a main emphasis on the communities and community forests participating in KjuonGo. The report is attached in its entirety to this Final report and is based on interviews conducted as part of the final project visit made possible just weeks before project closure.

10. LESSONS LEARNT

The most important lesson learnt from KjuonGo is that the commercial scale-up of the activity must be brought on board from the very beginning. Although it was discovered already during the first 3 month of the project – at an investor forum in Amsterdam – that the proposed investment model was erroneous, it would have been a significant advantage, if a realistic investment model had been incorporated in the project design from the outset. The revision and pursuit of a more realistic model was severely hampered by Covid-19 due to travel restrictions.

Contributing to this was also that a more commercial and large scale approach was at odds with the sustainability criteria set for the project with the community forests at the forefront, leading to a balancing of KGCs pursuit of a productive investment with the need to build up a supply chain of smallholders in pursuit of sustainable development.

When developing commercial activities, it is generally challenging with too many evaluation criteria that need to be satisfied, particularly if there is no hierarchy. It contributes to a diversion of focus, and so it did in the case of KjuonGo too, where from a project management perspective there was not sufficient focus on the needful (a redefinition of the required productive investment) compared to the sustainable development benefits defined for the project.

11. OUTREACH

As with everything else, Covid-19 also affected the news streams, simply because events were few and far between.

Considering only international dissemination, UNEP CCC (and before that UNEP DTU) has reported on KjuonGo on several occasions:

Sustainable charcoal saves rainforests in Cambodia - UNEP-CCC (unepccc.org)

UNEP Copenhagen Climate Centre on Twitter: "We are visiting our partners in #sustainable #charcoal in #Cambodia. The KjuonGo charcoal replaces #illegallogging with #sustainableforestry in #community forests, and is produced with smaller #carbonfootprint than traditional charcoal. https://t.co/TlwxQceQW3 https://t.co/FluA2xZF2N" / Twitter

Milestone for sustainable charcoal in Cambodia - UNEP-CCC (unepccc.org)

It's time for sustainable barbecues - UNEP-CCC (unepccc.org)

Locally, on the 8th of February 2022, a workshop was organised with the support of the NGO RECOFTC, to share experience on community-based forest products supply chain and plantations. Geres presented the main lessons learned of the project, as

well as the recommendations and remarks voiced by local stakeholders regarding the simplification of the national guidelines for legal wood fuels production, transportation and commercialisation.

In March and April 2022, Geres also organised a series of interviews of stakeholders involved in the project (CF members, representatives of FA, wood fuels distributors), to inquire on their perception of the production chain piloted, its governance and environmental impact. This work will be used in Geres' external communication and knowledge sharing activities in 2022 and 2023.

KGC is embarking on a 'social media strategy', realizing the particular qualities of KjuonGo to activate the general public. A social media campaign will be supported by UNEP CCC from November 2022 onwards.

12. FINANCIAL SUMMARY

Table 1. Project financing per partner

Expenditures, EUR	NCF	UNEP DTU Partnership	KGC	Geres	Total
UNEP DTU Partnership	91.328	34.411			125.740
KGC	181.440		87.472		268.912
Geres	178.664			143.906	322.570
UNEPCCC	37.908				37.908
Total	**489.303**	**34.411**	**87.472**	**143.906**	**755.094**

13. CONCLUSIONS AND RECOMMENDATIONS

KjuonGo has been a learning experience in several ways. Most importantly, the team behind the project were able to demonstrate and document, through revisions and adjustments throughout the project, that the concept underpinning KjuonGo is not only feasible, but also viable. It is possible to compete favourably with unsustainable charcoal if a sustainable value chain is established and managed well and with the necessary support from national authorities to secure a level playing field through VAT exemption and transport permits.

What remains to be proven is that the concept is also bankable. Despite lengthy deliberations with many financiers, the outcome so far is that the operation established with the support of NCF is too small to stir sufficient interest by impact investors. The most important lesson learnt, and the most important recommendation to NCF based on the KjuonGo experience, is that initiatives like this cannot be left to their own devises to raise the capital that will bring them to the next step.

NCF has nurtured a concept and a dedicated group of stakeholders who could make a tremendous impact not only in Cambodia, but everywhere where unsustainable charcoal is central to household's livelihoods and cooking habits – indeed that remains the ambition of the project partners. But NCF misses the opportunity to really make it happen. It takes more than 500,000 EUR over two years to develop and scale up a concept, unless the plan is to grab those concepts that really show significant potential and boost them to a level that can secure the attention of other, larger investors.

Consider NCF an incubator, invest further in those ideas that can make the big impact as a second step, and then help those further developed commercial activities to raise commercial or impact investor interest and investment. In that way, NCF would secure that the initial incubator investments are offered the best possible chances to make real impact and achieve their full potential.

Annex 1 Project completion fact sheet

Project Name:	**Kjuongo – a digital revolution for sustainable wood fuel in Cambodia**		
Project no.			
Country:	Cambodia	**Financing:**	
		EUR	**%**
Nordic Partner:	UNEP DTU Partnership	34.411	5%
Local Partner:	Khmer Green Charcoal	87.472	11%
Other Partner:	Geres	143.906	19%
	NCF grant disbursed	489.303	65%
	Total		**100.00**
Classification:	Mitigation-Adaptation Combination		
Project cycle:	Project start date: 01.09.2019 Original closing date: 31.08.2021 Actual closing date: 31.08.2023		
Short project description:	Cambodia is still a country with significant forest cover, but it is under strong pressure due to rapidly growing demand for fuelwood, partly from an expanding textile industry, partly from traditional cooking with charcoal. 77% of fuelwood is considered non-sustainable and 40,000 ha-equivalent of deciduous forest is destroyed annually, felling 3.5 million tonnes of wood-equivalent for the production of about 300,000 tons of unsustainable charcoal. The KjuonGo project has helped reversing the trends by replacing illegal logging with controlled and organized production of sustainable fuel wood in community forests. In collaboration with local communities and existing charcoal producers and char briquettes manufacturer and distributor Khmer Sustainable Charcoal (KGC), the KjuonGo project produces and sells sustainable charcoal in Phnom Penh, displacing the unsustainable supply at competitive prices. This is achieved through efficiency gains throughout the value chain, supported by a smartphone-based IT system that keeps track of the sustainable fuel wood from harvest to charcoal sale.		
Project performance:	**Expected Outcomes and Outputs**	**Achieved**	**End-of-project status**
	Outcome 1: Kjuongo's supply chain is established and mature for expansion	Yes	More than 20 community forests and charcoal producers have formally joined the KjuonGo supply chain
	Outcome 2 - Kjuongo's operation is mature	Yes	KGC has established distribution and off-take channels that is ready to purchase the full production potential fro the current supply chain
	Outcome 3 - Kjuongo's business model attracts investors	Partly	Dialogues, sometimes lengthy, with several potential investors have succeeded, but so far no investment has materialized
	Outcome 4 - the adaptation benefits of improved community forestry are realized by local communities	Yes/partly	A socioeconomic analysis among the CFs has documented an understanding of the importance of the CFs

Climate change outcomes and impacts:	KjuonGo has demonstrated the commercial viability of sustainable charcoal production, which if pursued vigorously has the potential to practically halt illegal logging for charcoal production in Cambodia – and in other comparable countries – in a matter of 10-15 years. The climate impact of such development would be measured in the millions of tCO2e. Organic growth of such business would, however, never produce such outcome. It requires dedicated investment. KjuonGo has demonstrated how this could materialize as a commercially viable activity.
Development outcomes and impacts:	KjuonGo has also documented the potential for development of the community forests as productive assets for local communities, and it has documented the local adaptation benefits of healthy community forests. It has also demonstrated, through the inclusion of charcoal producers from the illegal charcoal production sector, that introduction of sustainable charcoal will not be a source of conflict among the social classes that make a living from charcoal production. It was also a source of positive surprise to see an almost fully balanced gender representation in the project (see table below), which was not foreseen at the outset.

NCF core indicator	*Cumulative progress (number)*			*Clarifications/Means of verification*
Number of beneficiaries reached	women		4,333	Beneficiaries are wood collectors, charcoal producers and people involved in the management of acacia plantations, any CF member benefiting from trainings on sustainable forest management, efficient charcoal production or on the legal procedures, people benefiting from improved livelihoods as well as customers purchasing 100kg per month on average.
	men		4,555	
	total		8,888	
Number of people with increased resilience to climate change	women		4,291	Number of people with increased resilience to climate change are all villagers in the CF were wood collection activities have already started, as well as charcoal producers who are not CF members.
	men		4,533	
	total		8,824	
Number of people with improved livelihoods	women		4,333	People with improved livelihoods and income generation opportunities are all members of the CFs involved in the sustainable charcoal supply chain and new decent jobs created.
	men		4,555	
	total		8,888	
New decent jobs created	full-time	women	1	Full-time jobs created are part of the charcoal producers and Geres' field officers involved in community engagement and coordination of all actors along the charcoal production chain. Part-time jobs created are wood collectors currently involved in the production chain and the remaining charcoal producers. Seasonal jobs created are people working on the maintenance and monitoring of acacia plantations, as maintenance operations are very seasonal.
		men	4	
		total	5	
	part-time	women	16	
		men	163	
		total	179	
	seasonal	women	42	
		men	20	
		total	62	

Annex 2 Results Framework

Expected outcomes and outputs	**Indicator(s):**	**Achievement of outcomes and outputs:**
Outcome 1: ***Kjuongo's supply chain is established and mature for expansion***		
Output 1.1: The supply chain model is validated with existing CFs and CPs	1.1.1. Community forests and charcoal producers formally engaged in sustainable charcoal production. 1.1.1.1. Approved registration documents for community forests and charcoal producers	KjuonGo **managed to establish a mature supply chain and expanded it even during the project.** 20 community forests and 6 charcoal producers were signed up for KjuonGo by the end of the project, although not all were actively supplying yet. Neither are all community forests equally suitable for supply of wood residues due to the state of degradation of their lands.
Output 1.2: The capacities of KjuonGo's supply chain actors are reinforced	Tons of sustainable charcoal sold. The quality of the charcoal is compliant with international standards Number of green business concepts tested	Through intensive training of supply chain stakeholders the amount and quality of sustainable charcoal eventually reached satisfactory levels, although it was realized that both the quality of the soil, and therefore of the wood, as well as the pricing mechanism for the charcoal producers at the outset were working against the set objectives.
Output 1.3 - The conditions are gathered to expand the supply chain model to new suppliers	Plantation area supported by investments agree in principle	The initially planned investment model focused on 100 ha batches (reaching 10 batches and a total of 1000 ha) agreed with private investors fell flat as the ,market was expecting 5 million USD investment tickets as a minimum.
Outcome 2 - Kjuongo's operation is mature		
Output 2.1 - A value-proposition is validated for each targeted market segment	KjuonGo business plan	Customer segmentation has been significantly influenced by the Covid-19 pandemic as prime clients in street kitchens and restaurants had to close. Super markets became a key client instead as well as tank stations. Only at the end of the project restaurants returned at larger scale and quickly outstripped supply.

		Managing the supply constraints is now a key activity in the segmentation of the market.
Output 2.2 - The operations and internal processes are consolidated, documented and smoothly implemented	KjuonGo Business Plan	KjuonGo sustainable charcoal is now firmly integrated in KGCs operations. **KjuonGo's operations are well-functioning balancing supply and demand and securing cashflows to stakeholders according to expectation.** The dedicated KjunGo IT-system tracking the supply chain has documented its functionality and helps also determining the cashflows between supply chain stakeholders. An operations manual has been developed as part of the KjuonGo Business Plan.
Outcome 3 - Kjuongo's business model attracts investors		
Output 3.1 - A financing strategy for upscaling is designed and investors are identified	KjuonGo Business Plan	**KGC has been in dialogue with a series of interested investors without reaching final agreement with any yet.** The original financing strategy had to be abandoned as investors are looking for investment tickets of 5 million USD as a minimum. This is on the edge of KGCs absorption capacity. The challenge is to find middle ground. Also, in dialogue with investors, the initial focus for investment is the establishment of industrial scale charring facilities with European technology, aiming at increasing production capacity a factor 10 based on additional wood residues from commercial plantation.
Output 3.2 - In principle agreements with investors	Plantation area supported by investments agreed in principle	Following output 2, or the revision thereof, the idea of agreements with investors on the basis of the original plans was abandoned. Instead, lengthy negotiations with the Land Degradation Neutralization Fund (LDN) were upheld for the better part of two years. They ultimately led to a declination of investment, LDN having first proposed an investment of 3 million USD instead of their minimum of 5 million and pursuantly concluding that the amount was too small for their appetite. The negotiations were given up three months before project end, only allowing new potential partners to be identified, but not to materialize in any agreement at the time of project closure.
Outcome 4 - the adaptation benefits of improved community forestry are realized by local communities		
Output 4.1 - Assessment of climate change resilience improvement	Socio-economic report on drivers for community forestry	The assessment of the resilience improvement from community forestry has been done performing soil sample analysis of four test sites representing different levels of soil degradation and planting levels reflecting the plantation plans developed under KjuonGo.

through community forestry		The assessments confirm that well-managed community forests have tangible adaptation effects. It also confirms that the main factor is the quality of the soil, which in some cases is too degraded to support efficient plantation.
Output 4.2 - Determining the resilience value improvement as a tangible driver for efficient community forestry	Socio-economic report on drivers for community forestry	The socio-economic analysis shows that there is acceptance among the majority of the communities that a well-managed community forest has value as a protective measure mainly against flooding

Annex 3 Pictures

All photos credit to Matthieu Albert, GERES

An improved charcoal kiln designed and built according to advice and instruction by the GERES team of experts. Compared to open pit charcoal production, this design practically eliminates methane emissions and shortens production time by about half, thus improving the capacity and reducing the workload for the charcoal producers.

The advantage of working with existing, illegal charcoal producers is that also the illegally logged wood is now run through these efficient kilns, thus also improving the production method on the illegally logged wood – a small, but important additional contribution to emissions reduction, which the project has no way of assessing.

The community forests are under strict regulation based on an annual assessment of the condition of the forest and the allocation of harvest quotas accordingly. These quotas are set by the local Forestry Administration office. The photo is from one of these sessions in the Pursat region.

Sustainable KjuonGo charcoal is loaded on a truck for transportation from the charcoal producer to Khmer Green Charcoal's storage facility in Phnom Penh, where it will be repacked in smaller bags for retail sale. Transportation permits is another means of control of the charcoal sector, which was holding up deliveries in the beginning of the project. Illegal producers operate without such transportation permits.

Community forests are oftentimes neglected as an asset in local communities. KjuonGo has worked with local communities, providing training, information and guidance on how KjuonGo can help generating additional income and adaptation benefits. The photo is from one of the dozens of meetings that have been held to introduce KjuonGo. It is one of th early sessions, evidenced also by the absence of masks, which later became compulsory, until Covid-19 made these meetings impossible altogether.

The KjuonGo project is well-known in the areas where it is active and has expanded its reach to more than local 20 communities. The poster here introduces briefly the project and its benefits. In addition to NCF and the project partners, the inclusion of AFD on the poster refers to additional support granted to GERES for the support of forestry activities in Cambodia.

Annex 4 Other supplementary deliverables/documentation/links

As outcome 4, KjuonGo set out to document the adaptation benefits of healthy community forests. In order to document this scientifically, a programme of soil testing was established. It was combined with a socioeconomic analysis, trying to establish whether local communities were aware of the forests ability to protect them better from flooding if the soils were healthy. While proof of the latter is more sketchy, the scientific results are unquestionable. They are documented in a separate report attached to this final report, as it has not otherwise been reported in the project milestone reports.

Annex 5 Impact story

In September 2019, the KjuonGo project was launched with the goal of creating a sustainable charcoal value chain as a substitute for illegally logged charcoal in Cambodia's rainforests. The project aimed to engage the National Forestry Administration and traditional charcoal producers, and target community forests as the primary source of sustainably harvested wood. Despite the challenges posed by the Covid-19 pandemic, the project achieved several significant milestones. 20 community forests have joined the project to supply wood, a robust IT-based tracking system was implemented to ensure sustainable supply chain management, and a financially viable charcoal production was demonstrated that was competitive with traditional charcoal in the market.

Thanks to the involvement of the Forestry Administration, the KjuonGo project has been included in national plans for forestry development and is now poised for scaling up. However, the project has also highlighted the need for private plantations and industrial charcoal production based on modern technology to complement the community forestry-based supply chain. All sources of supply must be monitored through the KjuonGo platform to ensure sustainable harvesting of fuel wood.

The community forestry-based supply is also essential, as it provides multiple benefits to local communities. Mr. Sot Ton from the Pursat community forest explains, "Thanks to the additional income generated from the sales of sustainable wood, we can employ more people to patrol and protect the forest." In addition to providing new income streams, the project has also educated local communities on the importance of sustainable practices. Mr. Ton Sarim, an inhabitant of the community forest, says, "We were happy to be part of this project also because we received a training on climate change. Now we know what it means to the planet."

The perspectives for KjuonGo are immense, not only in Cambodia but anywhere where charcoal is the most important cooking fuel and where an immediate shift to zero-emission electricity is not an option. The test phase of KjuonGo achieved emissions reduction of about 1000 tCO2e. Globally, the potential is millions of tons annually.