Adaptive business model development for community-based peatland restoration in Riau

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Abstract. Livelihood on peatland often involves unsustainable practices such as drainage and extraction, causing peatland degradation. Indonesia's peatland restoration approach therefore includes interventions for livelihood revitalization and transformation. This paper describes lessons learned in facilitating sustainable livelihood transitions for restoring peatland using the Sustainable Business Model for Communities (SBMC) canvas as a tool. We utilized Participatory Action Research (PAR) methods, where we engaged in intensive focus group discussions, surveys and facilitation of the action or implementation of the business model. SBMC is a useful tool that facilitates the community mapping their ideas and exercising collective action for restoring peatland while generating green business for the community groups in Siak Regency, Riau Province. Our finding suggests that to successfully transform peatland practices and restore ecosystems, a business model should balance economic motives with restoration objectives, enhance community collective action, improve transparency, and increase adaptability. Embracing uncertainty and complexity in community-based peatland restoration can provide an opportunity for learning and improving the community's business model. Viewing business model development as an iterative process enables the community group to revisit and refine their model in response to landscape adaptation.

1. Introduction

The negative impacts, losses and irreversible damage are becoming more severe and significant due to the increasing frequency and intensity of extreme events caused by anthropogenic climate change. Despite development and adaptation efforts demonstrating a reduction in vulnerability, concerns persist over the disproportionate impact on vulnerable people and systems. Furthermore, extreme disturbances push the ecosystem to degrade on a large scale beyond its capacity to recover and adapt [1]. Such concerns have arisen in Indonesia, where irreversible human degradation of peatlands has exacerbated recurrent fires, in addition to other factors such as patronage networks [2], and socioeconomic and local policy [2][3]. A combination of effective adaptation options, community adaptation and livelihood diversification are required, along with supportive public policy and institutional feasibility [1].

Restoring peatlands to extinguish recurring fires has become a national agenda in Indonesia. To address this issue, the Indonesian Peatland and Mangrove Restoration Agency (*Badan Restorasi Gambut dan Mangrove*/BRGM) has developed a 3R approach, which includes rewetting, vegetation regeneration and livelihood restoration [4]. The latter goes beyond the standard ecosystem restoration concepts, often limited to ecological aspects. Including the human dimension in peatland restoration is critical because Indonesia's peatland ecosystems have faced great anthropogenic pressures for decades [5]. Commercial or subsistence activities that are exploitative and destructive, including mining [6], logging [6][7] and large-scale agricultural and plantation expansion [8], all of which involve drainage and extraction and leave peatlands degraded and susceptible to fire [9]. Restoring the livelihoods of peatland communities is an urgent priority in the context of restoration. This transformation should generate income and provide livelihoods for the community while supporting the restoration and fire prevention agendas.

Our paper aims to share lessons learned from CIFOR-ICRAF (Center for International Forestry Research-World Agroforestry Center) and research partner facilitation for indigenous people and local communities in business model development for peatland restoration. Business models are an integral part of business plans and describe specific processes for creating, delivering, and capturing value from producer to consumer [10][11]. They can be a tool for business pitching to investors [10]. Most importantly, they can be instrumental in identifying radical and systematic innovations that an enterprise may need [12]. Adapting [10], we have developed a Sustainable Business Model for Communities (SBMC) tool that incorporates the values needed for peatland restoration [13][14][22]. In developing SBMC, we considered the urgency for transformation towards sustainable business and practices, to protect the interests of the restored peatlands and the necessary restoration interventions, and to build collective action. Supporting the mobilization of voluntary efforts in peatland restoration and preventing peatland degradation is necessary. The SBMC tool facilitates participatory business development at the community level, especially in Kayu Ara Permai and Penyengat Village of Riau, with the aim of developing collective action for restoring peatland and preventing fires.

2. Methods

Business model development is a process within Participatory Action Research (PAR) that focuses on community-based fire prevention and peatland restoration in Riau. PAR consists of reflection, planning, action or intervention, and monitoring loops [15][16]. PAR supports increased adaptability through a participatory process of diagnosing and identifying environmental issues and strategies [17]. It facilitates social, economic and political change [18] and promotes self-organization and collaborative learning [19]. PAR is a way for researchers to understand the root causes of issues while facilitating local stakeholders to identify options for resolution [20]. CIFOR-ICRAF employed PAR at Kayu Ara Permai and Penyengat Village, Sungai Apit Subdistrict, Riau Province, to accelerate peatland restoration efforts from 2021 to 2023. Our spatial analysis indicated that Kayu Ara Permai has 1,716 ha and Penyengat has 45,898 ha of peatland (Figure 1). About 23% of the peatland in Kayu Ara Permai has experienced fires. In Penyengat, approximately 5% of its area has a history of fires (Figure 2). Under the PAR framework, we facilitated the community to identify and test alternative solutions to peatland restoration and fire prevention using a participatory process.

We conducted a series of intensive discussions, facilitation of capacity building, and facilitation of business model development and implementation. We used the SBMC tool [22], which has parts for pricing, key activities (before, during, and after production), key partners, essential resources, cost structure (direct and indirect costs), cost sharing, revenue stream (from tangible and intangible goods and services), and benefit sharing (Figure 3). Using guided questions, we encouraged the community to identify and fill in the components. The components are interrelated and help the community organize their business ideas through a solid narrative. Most importantly, the SBMC encourages the community to reflect on how the proposed value within their business model is aligned with sustainability principles and how it resonates with the shared vision. We commence the research by collecting baseline data on institutions, households, businesses in the village, value chains, commodities, and biophysics in the Reflection and Baseline Phase (October 2021 to January 2022). Formulating the on-paper business model and action plan was conducted during the planning phase of PAR from January to April 2022. We implemented the model and plan during the Action Phase, which occurred from April 2022 to March

2023. We monitored the progress and outputs during and after implementation in the Monitoring Phase. The business model and action plan were implemented on public and private lands, referred to as 'action arenas'. The action arenas were managed by participating indigenous people and local communities at Kayu Ara Permai and Penyengat, with various business models, commodities of focus, and restoration objectives.

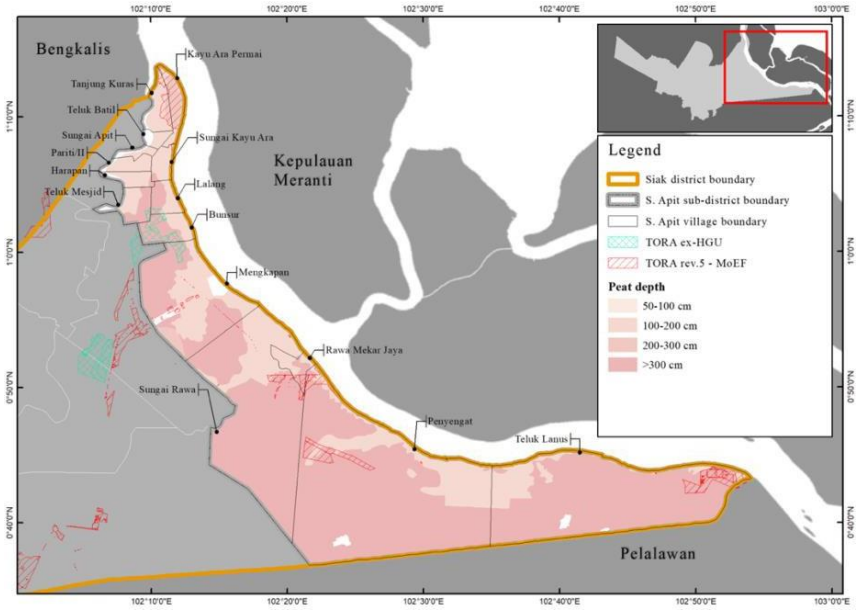

Figure 1. Map of peat depth

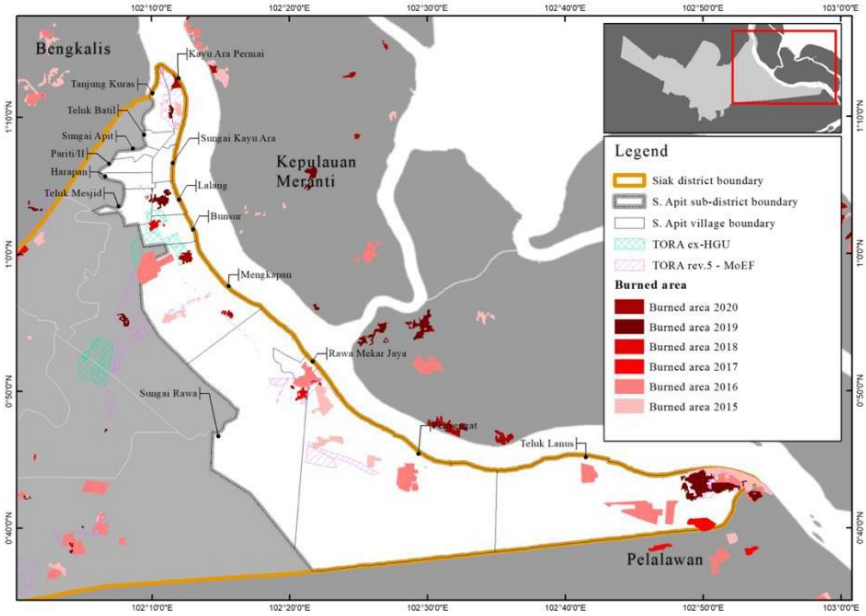

Figure 2. Map of history of fires occurrences

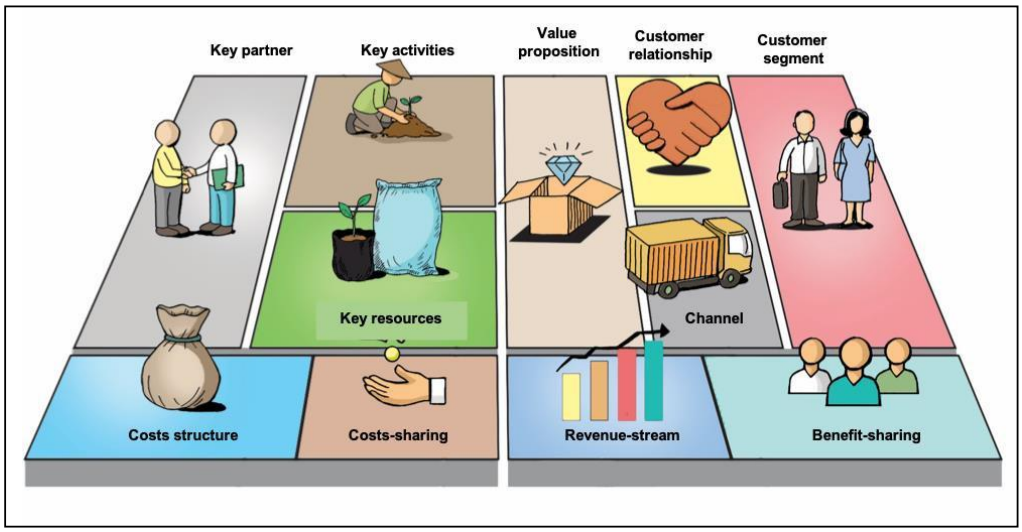

Figure 3. Sustainable Business Model for the Communities [22]

3. Results

Prior to creating a business model, we facilitated the community to build a shared vision and understanding of the context of peatland restoration and fire prevention. The community groups at Kayu Ara Permai and Penyengat shared a similarity in envisioning their common vision. They expected to economically empower the village and its people by reconciling the needs of ecosystem conservation or restoration and economic development. The community's groups translated their common vision into the business model and action plan, where they outlined their ideas in the SBMC canvas and Gantt chart of implementation. Initially, we supported the development of six business models at Kayu Ara Permai and Penyengat. All community groups were interested in various agroforestry types, e.g., agrosilvofishery and home garden agroforestry. Penyengat Fire Care Community Group, which managed Action Arena #1 planned to develop matoa *(Pometia pinnata)* on public land owned by the government. The Indigenous Community Group of Anak Rawa, which managed Action Arena #2 planned to develop hybrid coconut *(Cocos nucifera L.)* agroforestry in their home garden. The Youth Group, which managed Action Arena #3 planned to develop *tampoi (Baccaurea macrocarpa)*, banana *(Musa paradisiaca)* and longan *(Dimocarpus longan)* agroforestry on public land. In Kayu Ara Permai, the Independent Conservation Group, Fire Care Community and Mekar Indah Farmer Group, which managed Action Arena #1 planned to develop *geronggang (Cratoxylon arborescens (Vahl.) Blume)*, ginger *(Zingiber officinale)*, taro *(Colocasia esculenta)* pineapple *(Ananas comosus)* and native peat fish such as giant snakehead *(Channa micropeltes)*, catfish *(Clarias batrachus)* and others on public land. Mahkota Permai Farmer Group, which managed Action Arena #2 planned to develop pineapple and hybrid coconut on private land. Naga Permai and Permai Bertuah Farmer Group, which managed Action Arena #3 planned to develop liberica coffee *(Coffea liberica var. Liberica)* and ginger on a rubber *(Hevea brasiliensis)* plantation owned by the government. Although they developed varied business models, they agreed that the business model's value proposition should accommodate the environmental aspect and vision of a restored peatland function. Hence, their business model also incorporated the construction of the water reservoir (embung) and canal blocking in all action arenas at Kayu Ara Permai and one action arena at Penyengat.

In the implementation or Action Phase, we facilitated the local community to revise the business model and action plan, considering the refinement of biophysics assessment and seed procurement or availability. The growing interests of the community and local community observation when testing and trialing the model and plan influenced significant changes in the model and action plan. For example, with the growing community interests, we accommodated another three community groups developing

business models. Those were the Bina Harapan Women Farmer Group in Penyengat and Permai Indah Satu and the Duo Women Farmer Group in Kayu Ara Permai. Bina Harapan planned to develop hybrid coconut, rambutan *(Nephelium lappaceum)* and areca nuts *(Areca catechu)*. Permai Indah Satu planned to develop a hybrid coconut and areca nut. Permai Indah Duo planned to develop red ginger *(Zingiber officinale. Rosc.Var.Rubrum)*, avocado *(Persea americana)* and guava *(Syzygium malaccense)*. These women farmer groups' business model was located in the home garden, except for Permai Indah Duo, which allocated a patch of land in addition to the home garden cultivation. Permai Indah Satu and Duo's arena fell under the category of mineral land (non-peatland). Another example was the manager of Action Arena #1 at Penyengat, who observed longan's market potential at the nearby local market. Hence, they refined the model and plan to accommodate longan cultivation. The manager of Action Arena #3 observed that continuous inundation in their action arena has inhibited the growth of the coffee seedlings. After thorough discussions, they also cancelled the plan to cultivate ginger due to the land's suitability. They handed over the procured ginger seedlings to the Permai Indah Duo women group. In Penyengat, we faced difficulties in procuring *tampoi* seedlings for Action Arena #3. Furthermore, other group decisions influenced the community's decision to cultivate matoa. After discussing it with another group, they discovered that matoa could be cultivated as a potential commodity in their arena. In another case, with the refinement of the biophysics assessment of the action arenas, there were changes in the proposed action area as surveyed in the Planning Phase compared to the Action Phase. For instance, the canal blocking, which was initially constructed in all action arenas of Kayu Ara Permai, was mandatorily constructed for Action Arena #1 and #3 of Kayu Ara Permai only due to the history of recurring fires and hydrological conditions. By the end of the research, we had facilitated the development of nine business models that spanned more than eight hectares (Table 1), reflecting these changes in the business model.

Table 1. Profile of action arenas in Kayu Ara Permai and Penyengat Village, Riau Province

Action Arena (AA)	Property Rights	Land Size (ha)	Implemented Business Model
Kayu Ara Permai Village			
AA1	Public land	2	Agrosilvofishery of *geronggang*, pineapple and snakehead murrel
AA2	Private land	1.9	Agroforestry of pineapple, hybrid coconut and *matoa*
AA3	Public land	2*	Agroforestry of rubber and liberica coffee; homegarden agroforestry of liberica coffee
AA4	Private land	Varies**	Homegarden agroforestry of hybrid coconut and areca nut
AA5	Private land	0.25***	Homegarden agroforestry of avocado and guava; and cultivation of red ginger on a patch of land
Penyengat Village			
AA1	Public land	2	Agroforestry of *matoa* and longan
AA2	Private land	Varies**	Homegarden agroforestry of hybrid coconut and *matoa*
AA3	Private land	0.3	Agroforestry of *matoa*, longan and banana
AA4	Private land	Varies**	Homegarden agroforestry of hybrid coconut, rambutan and areca nuts

* At least 2 ha and exclude the homegarden size
**Land size varies because the action arena was in the homegarden
***At least 0.25 ha and exclude the homegarden size

4. Discussions

Developing a shared vision at the beginning of the business model and action plan fosters a sense of belonging and provides a basis for guiding plans and activities within the group. In restoring peatland, the community should understand that the development and practices on peatland should consider sustainability principles by balancing the economic drive motives and the awareness to restore the functions of peatland ecosystems. It is essential to reinforce this shared vision at all levels of the business model and action plan development. Besides, because peat soils are uniquely different from mineral

soils, understanding their existing conditions and trajectory pathways is one of the keys to successful peatland restoration. This will influence which products, services and business models to develop. As the production process is linked to the cultivation practices and whether drainage is required, referring to government regulations, literature reviews, market surveys, value chain, and biophysics becomes critical. [21] found that different peat depths have specific applications or functions, such as cultivation for horticulture or preservation and cultivation with forestry trees.

While guidelines are necessary, we should shift the perception from treating the business model and action plan as "fixed" guidelines. We propose viewing business model development as a flexible process that encourages community groups to continuously reflect, refine, and adapt the model to changing circumstances (Figure 4). Our experience in Kayu Ara Permai and Penyengat village communities taught us to embrace uncertainty and complexity and use them as opportunities for learning and improvement. A careful observation, monitoring and testing or trialing experience helped the learning process and improved adaptability, which can be projected into improved outcomes in the future. The necessary adjustments or changes to the planting design reflected these processes. In this case, reflecting on existing contexts, such as progress, obstacles, and approaches, becomes essential. We should continuously question our models: "What can we do differently?" and "How can the business model be improved?".

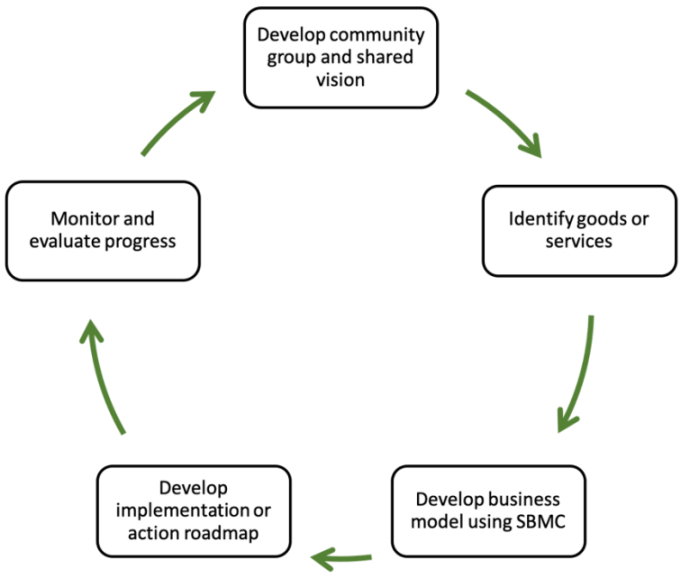

Figure 4. Adaptive approach to business model as an iterative process

5. Conclusions

Recognizing the human dimension in peatland degradation influenced Indonesia's peatland restoration approach to revitalize the community's livelihood on peatlands. The SBMC tools for business model development are an excellent exercise to organize business ideas, translate ideas into action plans and guide the plan's execution. For a successful transformation of practices in peatland and restoration, the business model should reconcile economic motives and restoration objectives while building or strengthening the community's collective action, improving transparency in a collectively managed business and increasing the adaptability of the community to the ecosystem. The local communities in Riau use SBMC as a useful tool to formulate their business model. Developing the business model should be seen as an iterative process that encourages the community to revisit and refine the model as they adapt to the changing context and landscape while providing guidance. Monitoring progress and continuous reflection on the extent of success of the approach and adjustments for improvement become critical components embedded in the process.

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