Augmented participatory action research in the digital age

Guidelines for implementation in community-based peatland restoration and sustainable business development

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DOI: 10.17528/cifor-icraf/008967

Purnomo H, Puspitaloka D, Juniyanti L, Kusumadewi SD, Andrianto A, Okarda B, Basuki I, Muhammad A, Junandi B, Sutikno S, Kurniawan S, Qomar N, Jalil A, Rohadi D, Zulkardi and Tarsono. 2023. *Augmented participatory action research in the digital age: Guidelines for implementation in community-based peatland restoration and sustainable business development.* Bogor, Indonesia: CIFOR and Nairobi, Kenya: ICRAF.

English language editor: Mark Havard

Design by Publication, Digital and Editorial Team, COE, CIFOR
Image illustration by Komarudin
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Preface

This tool is the second part of the Toolbox for Community-based Fire Prevention and Peatland Restoration. It aims to provide guidelines for conducting Participatory Action Research (PAR) on community-based fire prevention and peatland restoration in the digital age. Forest and land fires on peatlands can be prevented by rewetting and revegetating peatlands, and by developing alternative livelihood sources for communities living in or around peatland areas. Without the involvement of these communities, peatland restoration will be ineffective. Such involvement is only possible if restoration efforts benefit the communities involved. Benefits can be achieved through the development of business models for peatland restoration where communities play key roles in their planning and implementation. This tool provides clear, step-by-step guidelines on implementing PAR, and how information and communication technology (ICT) can be used to leverage participation.

During the Covid-19 pandemic, it became impossible to conduct PAR in the traditional way through personal, direct engagement. Consequently, it was necessary to develop a new augmented form of PAR involving the use of ICT to enable non-co-located and remote participation. Augmented PAR improves on traditional PAR by replacing its loops of reflection, planning, action and monitoring with new loops of reflection and co-elevation, co-creation and planning, connected actions, and co-monitoring and learning. In augmented PAR, reflection is for gaining insight from studies and discussions for co-elevating communities and stakeholders' understanding of identified problems. They then work together to co-create solutions and establish clear plans for their implementation. Actions can be implemented collectively or individually in a connected manner. The outcomes of these actions are then co-monitored to provide lessons learned for improved implementation in the second loop of the augmented PAR process.

Internet-based technologies and platforms like Zoom, MS-Teams, Google Meet and WhatsApp became instrumental in facilitating virtual meetings and discussions. The initial challenge for PAR researchers was how to make digital interaction effective

in achieving the goals of restoring peatlands and developing and implementing business models. At first, communities in villages struggled with internet access, but later managed to organize themselves with shared internet connections. Face-to-face meetings between community members and local facilitators posed few problems, but online platforms became essential for communicating with researchers from other regions. The resulting augmented PAR succeeded in overcoming initial problems with non-co-located participation, and, ultimately, in deepening PAR processes.

This tool was prepared for local communities, business and private sector actors, civil society organizations (CSOs), governments, academics and researchers to provide insight and guidance on conducting PAR and developing business models in the digital age. It was written based on experiences we gleaned from conducting PAR on fire prevention and peatland restoration in Riau Province during 2017–2023. The research was funded by Temasek Foundation and managed by Singapore Cooperation Enterprise.

The authors would like to thank all the communities, regional governments, villagers and CSOs involved in this action research, and Temasek Foundation for supporting the development of this tool. We hope it can prove useful for fire prevention, peatland restoration, business model creation, and livelihood development efforts. In a wider sense, we also hope it can contribute to achieving sustainable development goals (SDGs), combatting the climate crisis, alleviating poverty, and fostering worldwide collaboration.

Bogor, 17 August 2023

The authors

Acknowledgements

This tool is a part of the Toolbox for Community-Based Fire Prevention and Peatland Restoration, and an outcome of Participatory Action Research (PAR) on Scaling-up Community-Based Fire Prevention and Peatland Restoration. We are grateful to all managers of the action arenas in Kayu Ara Permai and Penyengat villages in Siak Regency, and Dompas Village in Bengkalis Regency for their active involvement and participation. We would like to thank the governments of these three villages, as well as the governments of Sungai Apit Subdistrict, Siak Regency and Riau Province, and also the Tasik Besar Serkap Forest Management Unit (KPH). We would also like to thank the Peatland and Mangrove Restoration Agency (BRGM), Indonesia Research and Innovation Agency (BRIN) and all parties actively involved in PAR implementation and preparation of this tool. We extend further thanks to Temasek Foundation (TF) and Singapore Cooperation Enterprise (SCE) for funding and managing this research. Our thanks also go out to our research partners from the University of Riau's Centre for Disaster Studies and Sedagho Siak.

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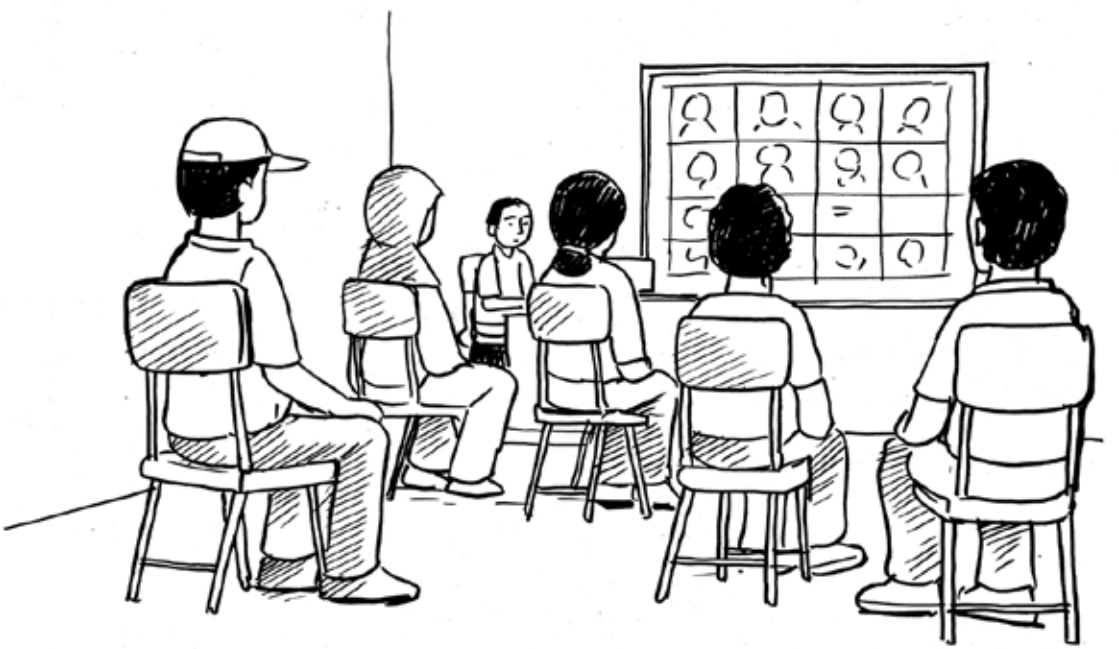
List of abbreviations

3Rs	Rewetting, Revegetation and Revitalization of livelihoods
ACM	Adaptive Collaborative Management
BCR	Benefit-Cost Ratio
BMC	Business Model Canvas
C&I	Criteria and Indicators
CBM	Canvas Business Model
CBRMS	Community-Based Restoration Monitoring System
CIFOR	Center for International Forestry Research
CO_2	Carbon Dioxide
DMPG	*Desa Mandiri Peduli Gambut* (independent peat care village)
FGD	Focus Group Discussion
FOLU	Forestry and Other Land Uses
FPIC	Free, Prior and Informed Consent
IDR	Indonesian Rupiah
IRR	Internal Rate of return
JFDC	Jepara Furniture Design Center
KAP	Kayu Ara Permai Village
MIT	Massachusetts Institute of Technology
MPA	*Masyarakat Peduli Api* (fire care community)
MPG	*Masyarakat Peduli Gambut* (peat care community)
NDC	Nationally Determined Contribution
NGO	Non-Governmental Organization
NPV	Net Present Value
ODK	Open Data Kit
PAR	Participatory Action Research
PAR CBFPR	Participatory Action Research on Community-Based Fire Prevention and Peatland Restoration
PBP	Payback Period
PGT	Penyengat Village

PSB UNRI	*Pusat Studi Bencana Universitas Riau* (Centre for Disaster Studies, University of Riau)
SMBC	Sustainable Business Models for Communities
SMEs	Small and Medium Enterprises
SWOT	Strengths, Weaknesses, Opportunities and Threats
TPAR	Traditional PAR

1

Participatory Action Research (PAR) theory and transformation



1.1 Philosophical foundation of PAR

Science has travelled from the Renaissance to the Enlightenment; from modernism to postmodernism. The Renaissance was a period of rebirth in art, science and culture, and is usually associated with Italy. With it came increased use of reason in the study of astronomy, anatomy and medicine, geography, alchemy, mathematics and architecture. It usually refers to the period in European history from the fourteenth to sixteenth centuries.

The intellectual movement of the seventeenth and eighteenth centuries, known as the Enlightenment, involved the emphasis and celebration of reason, where individuals sought to understand the workings of the universe and enhance their own circumstances. The aspirations of rational humanity encompassed the pursuit of knowledge, freedom and happiness. The Enlightenment culminated in modernism.

From the late nineteenth to early twentieth centuries, modernism promoted the idea of universal scientific truths in all aspects of life, with reason and science providing accurate, objective and reliable bases for knowledge. The rationale was that reason would lead to universal truths that could be embraced by all cultures. Science would provide an objective means of understanding nature, and its application could improve our lives. Truth existed apart from human consciousness and could be known through the application of reason.

Postmodernism, in contrast, challenges the idea that reason and science are universal, seeing them instead as ideologies created by humans. Reason is considered a specific Western tradition or ideology that competes with other traditions such as faith and cultural knowledge. While postmodernism acknowledges that truth may exist independent of human consciousness, it rejects the notion of an objective means for defining it. Postmodernism favours small narratives rather than the grand or universal narratives advocated by modernism (Purnomo 2022).

Natural resources and the people associated with them are as unique as they are common, so we need to take both a modernist and postmodernist approach to researching natural resource management. There are two possible positions for researchers. First, as outsiders external to natural resource systems; and second, as insiders entering the complexities of those systems. The first position necessitates objectivity in observing the system, as entering that system may introduce bias in assessing and improving it. The second position demands that real decisions taken to improve the system will not stem from responding to outside suggestions (Sayer and Campbell 2004). Lewin (1946) expressed the importance of being an insider by saying, “If you want to know how the system works, try to change it.”

Table 1 Differences between positive realism and constructivism (from various sources)

Position / Key element	Positive realism	Constructivism
Observed reality	Real and independent from interpretation	Socially and locally constructed
Strategic choice	Rational	Ideological actions
Organizational identity	Clear and coherent	Multiple and fragmented
Theories of measurement	Replication as the key to accuracy	Context as the key to perspective

The first position refers to positive realism which considers the universe described by science as real and independent of how it is interpreted by others. Positive realism is a positive epistemic attitude to scientific theories and models, where the observable and unobservable worlds can be explained by science. The second position refers to constructivism, which holds that existence depends on a perspective that is not determined by objective facts, where the perspective of a real person builds reality. Natural resource researchers must be able to navigate from positive realism to constructivism or vice versa to have evidence and influence in understanding and improving natural systems.

Prabhu et al. (2022) suggested that, among other things, a new paradigm in natural resource management would involve: (a) approaches based on systemic thinking; (b) better interaction between local and wider scales; (c) recognition that farmers and other rural populations have key contextual information, experience and knowledge that deserve respect (Figure 1); (d) recognition that marginalized groups exist within society and vis-à-vis other national and international actors; and (e) understanding how differences in power can have disastrous results when policies are (or are not) developed and implemented.

The Participatory Action Research (PAR) method satisfies this new paradigm and is implemented using an Adaptive Collaborative Management (ACM) approach. We believe this new paradigm underscores the importance of constructivism without neglecting positive realism.

Action research and PAR are methods proposed by Sayer and Campbell (2004) for protecting and preserving natural resources, that consider them to be interrelated to and inseparable from the communities that use them. While the behaviour of biophysical resources can be understood objectively, resource-owning communities must be approached differently with respect to how they perceive those resources.

Figure 1 Discussion with indigenous and local community group

1.2 Definitions of action research and PAR

Action research is a philosophy and research methodology commonly applied in social sciences and natural resource management. It seeks transformative change through a simultaneous process of doing research and taking action, linked together by critical reflection. Kurt Lewin, a professor at the Massachusetts Institute of Technology (MIT), originally coined the term "action research" (Lewin 1946), describing it as "comparative research into the conditions and effects of various forms of social research and action that lead to social action." Action research uses a "spiral of steps, each consisting of planning, action, and fact-finding circles about the results of the action." The term 'participatory' underscores the involvement of communities as the core researchers of their resources (Figure 2).

Figure 2 Participatory approach in research

Action research encompasses three interconnected components: research, action and critical reflection, with the ultimate goal of social action. It involves cycles of planning, taking actions and fact-finding about the outcomes of those actions. Action is an integral rather than external part of the research process. Through observation, action plans are formulated, and their outcomes monitored. Thus, action research necessitates actions at an appropriate scale. These actions should be based on hypotheses developed during the action research process. Actions serve as means for testing hypotheses, and can either validate or refute them, as it would be pointless for hypotheses to only be tested for truth.

Despite their popularity, there are many misconceptions about action research and PAR. Some research endeavours claim to be action research, but do not involve intentional, planned and observable actions on an appropriate and representative scale. Some may encompass traditional research with an additional training phase, while others may involve developing demonstration plots with practices for farmers to emulate. Neither of these, however, is action research. PAR, in particular, necessitates the active involvement of communities as core investigators in learning, acting upon, and monitoring collective actions. Collaboration is an essential element of PAR, and is emphasised to a greater degree than in conventional action research (Prabhu et al. 2022).

1.3 Impacts of Covid-19 on PAR

The Covid-19 pandemic changed the way we live and conduct research. Prior to the pandemic, intensive engagement with communities and stakeholders was possible. Purnomo et al. (2014a) conducted PAR in South Sumatra, Indonesia through four years of active engagement (2004–2008) to empower local communities and institutions, and develop a more equitable partnership with a large pulp and paper company. As conflicts had broken out between community members and between communities and the company, it was necessary and mandatory to establish a field house (secretariat) with a field facilitator in the vicinity. This field house served as a place for community members and stakeholders to meet, discuss problems and work together to find solutions.

Following four years of PAR in South Sumatra, a level playing field and improved partnerships between local communities and the company were established. The authors of the research report credited the success of the PAR to five factors: a clear local demand for intervention; support from all stakeholders throughout the entire process; institutionalization of a multistakeholder forum; better communication and interaction between stakeholders; and discussions on improving partnerships for acacia tree rotation into the future (Purnomo et al. 2014a). It was hard to imagine these being possible without face-to-face communication.

Another PAR conducted in Jepara Regency in Central Java from 2008–2012 was aimed at developing the institutional capacity of small-scale wooden furniture manufacturers and developing regional regulations to promote sustainable small-scale furniture industries that benefit local communities, the environment and women. The PAR team conducted intensive engagement with both male and female artisans to reflect on problems, find solutions and act together at different scales. A joint secretariat was established in the Jepara Furniture Design Center (JFDC) building to act as a contact point and meeting and discussion hub for those concerned with furniture issues. The PAR succeeded in influencing value chains and improving the livelihoods of small-scale furniture manufacturers. By forming a representative association, small and medium enterprises (SMEs) were able to strengthen their bargaining positions, connect to a wider market, and increase government trust and support. Many participants along the chain deemed the PAR a success, as demonstrated by measurable increases in income and an enhanced social network between small-scale producers (Purnomo et al. 2011, 2014b). Engaging with actors along the furniture value chain in and around Jepara to build trust and agreement was key to the success of the PAR. This would not have been possible during the pandemic.

During the Covid-19 pandemic, from early 2020 we changed the way we do PAR. As intensive engagement through face-to-face meetings, surveys and Focus Group Discussions (FGDs) in the field were rendered impossible due to government-imposed travel restrictions and social distancing, radical adaptation was necessary. This required a transformation whereby traditional occupational research processes, business models and workforce structures would have to undergo rapid change to prepare for the future (Ferrazzi et al. 2022).

Covid-19 led to the transformation of traditional PAR (TPAR) into a new incarnation aided by internet technology, remote connections and new ways of implementing collaboration. Internet-based technologies and platforms such as Zoom, MS-Teams, Google Meet and WhatsApp became instrumental in facilitating virtual meetings and discussions (Figure 3). The term 'Zoom' is now commonly used to generalize internet-enabled non-co-located meetings. Facilitators and community members can now convene and engage in discussions at their convenience. These new technologies have posed certain challenges, however, particularly in places where internet connectivity is unreliable. Many people in the field rely on cellular phone signals, and may need to find certain spots in their villages to secure stable connections to participate in online meetings.

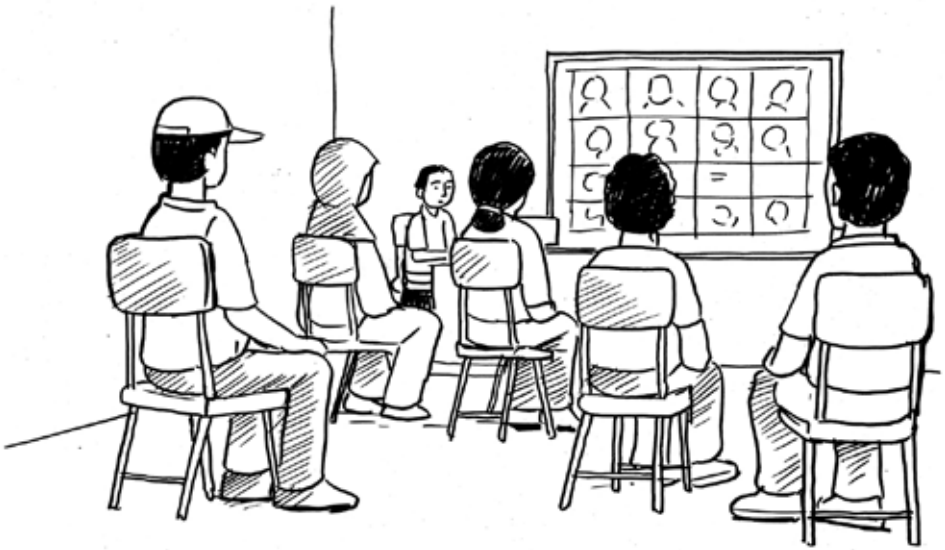


Figure 3 The use of technology in discussion with local community

Over time, people have adapted and become used to using such technologies. Meetings and discussions with and within communities can now take place despite travel restrictions. While Zoom cannot replace the depth of face-to-face interactions, it does offer several advantages. In post-pandemic life, often called the 'new normal' or digital age, these internet technologies remain an integral part of PAR, and will continue to do so as people have become accustomed to the convenience they afford. WhatsApp groups between researchers and communities and within communities continue and serve as cheap, easy and efficient means for communication.

2

Augmented PAR and guidelines

2.1 Augmented PAR

Traditional PAR primarily focuses on local communities through direct interaction and communication with co-located community members. As planning and actions are only possible through direct, in-person engagement, traditional PAR can have limited geographical coverage, and collective action is limited to those able to meet directly. It is highly dependent on the knowledge of facilitators and local community members. In contrast, augmented[1] PAR is influenced by knowledge from diverse sources connected through digital technology. Digital social media platforms have had a more significant impact than ever before since the pandemic. While social media can be beneficial, it can also pose challenges by creating noise or threatening PAR processes through distractions, misinformation or misunderstandings. Table 2 illustrates the differences between traditional and augmented PAR.

Table 2 Comparing traditional and augmented PAR

Aspect	Traditional PAR	Augmented PAR
Situation	Pre pandemic - normal	During and post pandemic - new normal
Facilitator interaction	Direct and face-to-face	Assisted by digital technology
Communities	Co-located	Co-located and non-co-located
Scale	Small	Small to medium
Action	Limited collective action	Connected group and individual actions
Knowledge use	Commonly from community and facilitator	• From everywhere • Combinations with other methods, such as a Business Model Canvas and value chain
Noise or threat	Small to medium	Medium to high
Digital social media influence	Low	High
Steps and terms use	• Reflection • Planning • Action • Monitoring	Reflection and co-elevation Co-creation and planning Connected actions • Co-monitoring and learning

1 Made greater, larger or more complete (https://www.merriam-webster.com/dictionary/augmented)

Figure 4 Collaboration during the co-creation process

Instead of just using the word "reflection", which literally means "to think about something carefully", we now use the words "reflection and co-elevation". Co-elevation means how thinking about something can elevate the understanding of those participating in the PAR process. This co-elevation is accomplished by sharing data, perspectives and understanding through the principle of non-dominance. The term "planning" in traditional PAR has been updated to "co-creation and planning".[2] Co-creation is "making or discovering something new together with one or more other people". Here, co-creation means creating ideas and models followed by planning. The co-creation element involves collaboration and co-designing of ideas and models (Figure 4).

"Action" in traditional PAR, which generally meant collective action, has been updated to become "connected action". Connected actions can be performed between individuals or groups. The complexity of reality and opportunity constrains collective action. "Collective action" means "actions taken by a group (either directly or on its behalf through an organization) in pursuit of the shared interests of its members." While "connected actions" are actions carried out by individuals or groups – separately or jointly – to pursue common interests. Individuals do not need to be in the same place at the same time to perform connected actions. The key is how to connect and synergize individual actions (Figure 5).

2 https://dictionary.cambridge.org/dictionary/english/co-create

Figure 5 Synergizing collective action

Instead of using "monitoring", in augmented PAR we use "monitoring and co-learning". Monitoring means "routine, often episodic measurement, performance analysis, or monitoring of processes, activities, or functions for the purpose of detecting and correcting changes or deviations from desired levels".[3] Co-monitoring means that monitoring must be carried out jointly by those participating in PAR and by relevant stakeholders, which means it cannot be done partially (Figure 6). Meanwhile, "learning" is "the process through which individuals gain knowledge, skills and attitudes through experience, reflection, study, or instruction."[4] Learning should take place after joint monitoring. The outcomes of this learning are acted upon in the augmented PAR spiral (Figure 7).

3 https://www.oxfordreference.com/display/10.1093/oi/authority.20110803100205753

4 https://www.oxfordreference.com/display/10.1093/oi/authority.20110803100056295

Figure 6 Community-based restoration monitoring

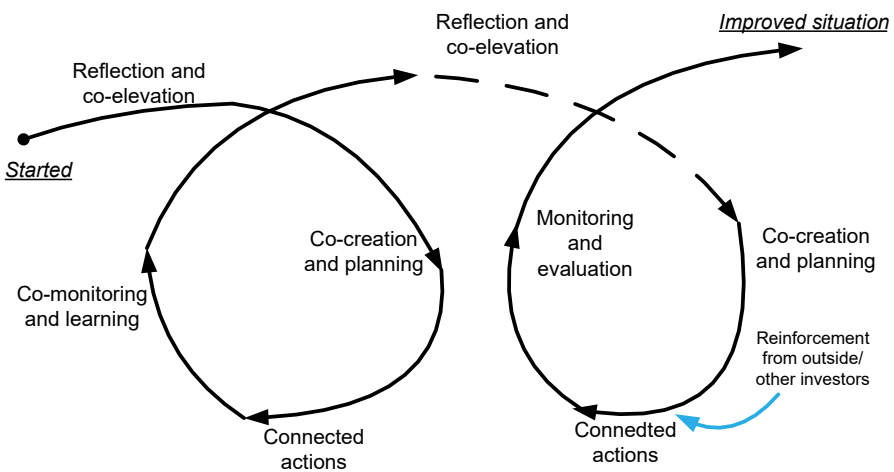


Figure 7 Augmented PAR spiral

Augmented PAR consists of a spiral of (a) reflection and co-elevation; (b) co-creation and planning; (c) connected actions; and (d) co-monitoring and learning phases. The spiral in this sense is continuous and involves the gradual betterment of a situation relative to the condition at the outset. When an augmented PAR process is about the environment and livelihoods, it involves improving environmental and livelihood conditions through the repetition of steps of (a), (b), (c), (d), (a), (b) . . . etc. External reinforcement can strengthen actions and improve augmented PAR processes. This can be facilitated by connecting the augmented PAR with external parties through the help of internet technology. Outsiders can be in different regions, provinces or countries as long as they share a common interest with the problem and interest of those who run the augmented PAR.

2.2 A guide to augmented PAR

First, those who run and participate in an augmented PAR process must be clearly identified and explicitly disclosed. These participants are called co-researchers, and may comprise scientists, facilitators, community members, village leaders and others. These research colleagues should be treated and respected as equals and have a concise agreement on issues and objectives they wish to achieve. Second, they must commit to carrying out the augmented PAR for a specified period of time to improve an environmental and/or livelihood situation by applying the phases in the spiral.

Phase a. **Reflection and co-elevation**: The aims of this phase are to identify and agree upon issues and relevant stakeholders, and to increase the levels of understanding of those participating in the augmented PAR process. A "problem" is defined as the gap between an ideal situation and reality. While ideals depend on people's perspectives and general rationality, the reality on the ground can be measured in more objective ways. This reality can be determined through surveys and the mapping of biophysical, social and economic conditions. Examples of biophysical surveys are of peatland vegetation and water tables (Figure 8). Livelihood, market and value chain surveys can be conducted to understand people's well-being, and markets for products and services. Various stakeholder mapping and social network analysis methods can be used to understand which stakeholders are relevant to the "problem" that constitutes the target of the augmented PAR. Such surveys can be conducted either through face-to-face interviews or online. A baseline study is conducted during this phase to deepen understanding of the problem, and to serve as a means for gauging results. Comparing the ideal situation stakeholders wish to achieve with the existing reality will help in determining what problems they are facing.

Co-elevation can be done through online and/or in-person meetings and focus group discussions (FGDs), where baseline studies and survey results can be shared. Those who have more information on and understanding of a problem can share it transparently with others by recognizing that co-researchers have different backgrounds, and may

Figure 8 Biophysics survey

have different perspectives, rationales and interests. It is important to avoid blaming stakeholders, e.g., the government or private sector in this process, and rather to gain a more in-depth collective understanding of the problem and aims. This co-elevation process is not easy, and must involve a lot of discussions. Local or tacit knowledge must also be scrutinized and must not be underestimated. By the end of this phase, the co-researchers should have reached agreements on problem and aims, and these agreements should be backed up by relevant data, information and knowledge. Agreements should extend to which stakeholders need influencing and are impacted by the problem, as well as potential solutions.

Phase b. **Co-creation and planning**: This phase is aimed at creating solutions and developing plans together. Planting peatlands and mangroves, developing new businesses or protecting nature can be solutions for the environment and livelihoods. In-person FGDs are a great way to co-create solutions and plan how to achieve them. Online FGDs using tools such as Miro or Mural digital boards[5] can reach co-researchers in different locations more easily. Inviting participants to online FGDs is often easier and cheaper than conducting FGDs in person.

5 Miro https://miro.com/ and Mural https://www.mural.co/

Co-creation can be assisted by various tools in line with the problem and solutions being pursued. For green business model development and peatland or mangrove restoration we suggest utilizing the Business Model Canvas (BMC) introduced by Osterwalder and Pigneur (2010). The BMC consists of nine elements (Figure 9). At its core, it aims to identify and understand customers, enabling businesses to ascertain the value they are willing to pay, and to benefit from that knowledge. Details on how to use this BMC framework are discussed in Section 3.

Co-creation with BMC should be followed up with planning to establish "who does what, when, where, and how". The Gantt Chart tool, which can help visualize, organize and determine agreed action plans, is discussed in Section 3 below. In the context of augmented PAR, such plans act as hypotheses to be tested. Criteria and indicator (C&I) sets for monitoring that are sensitive to changes resulting from actions should also be developed during the planning stage. Criteria are standards by which something can be judged or decided, while indicators are qualitative and quantitative measurements that can show trends if monitored regularly, and can measure outputs, outcomes and impacts. Outputs are tangible documents or regulations; outcomes are changes in behaviour; and impacts relate to biophysical, economic, and social evidence such as water quality and quantity, vegetation cover, reductions in CO_2 emissions, and people's incomes. Benchmarks or reference numbers for achieving goals or successes can be represented in the C&I set.

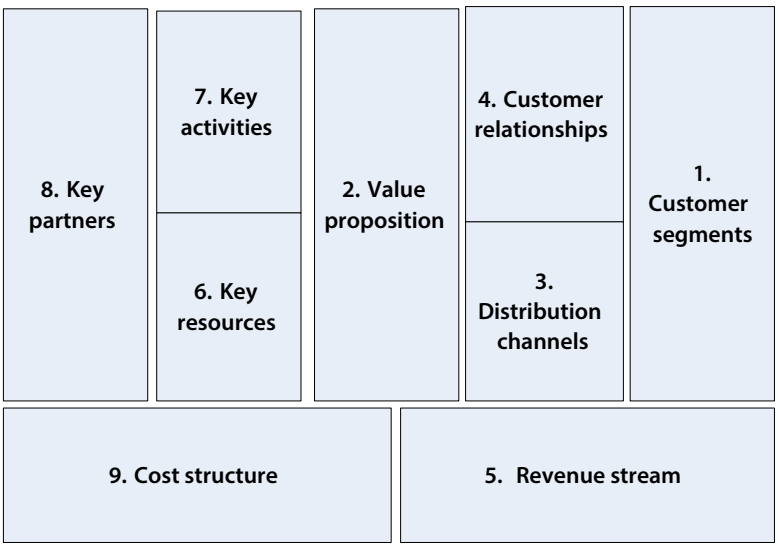


Figure 9 The nine elements of BMC

Source: Adapted from Osterwalder and Pigneur (2010)

Phase c. **Connected actions**: The plans resulting from the collection, analysis and discussion of data should be implemented through various interconnected individual and group actions. Actions defined in planning do not need to be placed together, but are arranged to achieve common goals. If a plan constitutes a business as defined in the BMC, the action involves executing the Key Activity using the Key Resource together with the Key Partner to create the Proposed Value, then sending it to the Customer to earn Revenue. In-person and online meetings can facilitate discussions about how certain actions are carried out. Linking planned individual and group actions is as important as collective action. It may also be more appropriate in the post-pandemic digital new normal, where connecting dots is more likely to produce greater results than having a single, large dot.

Phase d. **Monitoring and co-learning**: Action research is doing research and acting, linked together by monitoring and critical learning. In this phase, actions are monitored by co-researchers and relevant stakeholders. C&I sets for monitoring are observed on an annual or semi-annual basis, and monitoring results are then gauged against benchmarks of success. Gaps between reality and the ideal situation should be ascertained and studied to ensure further planning and actions can close those gaps.

3

Iterative process for developing sustainable business models for communities

3.1 Background and objectives

Dry and degraded peatlands are susceptible to fire (Turetsky et al. 2015; Miettinen et al. 2016; Osaki et al. 2016). One means for stopping recurring fires is the restoration of degraded peatlands; an approach that has become a national agenda in Indonesia. To address this issue, Indonesia's Peatland Restoration Agency or *Badan Restorasi Gambut* (BRG) has developed a 3Rs approach, comprising Rewetting, Revegetation and Revitalization of livelihoods (BRG 2016). The latter falls outside standard restoration concepts, which are generally limited to ecological aspects. BRG's inclusion of a human dimension to peatland restoration is rational since Indonesia's peat ecosystems have faced intense anthropogenic pressures for decades (Puspitaloka et al. 2020). Extractive and destructive business or livelihood activities, including mining (Dommain et al. 2016), logging (Dommain et al. 2016; Hergoualc'h et al. 2017) and expansion of agriculture and large-scale plantations (Page et al. 2011), have all involved drainage and extraction, and left peatlands degraded and fire prone (Joosten et al. 2016). In the context of restoration, livelihood transformations for communities living in peatland areas are essential. Any such transformations should be capable of generating income and providing livelihood options for communities, while simultaneously assisting the recovery of degraded peatlands and preventing recurring fires (Figure 10).

Figure 10 Livelihood on peatlands

CIFOR and partners incorporate business models as tools for developing sustainable alternative livelihoods on peatlands. Business models form integral parts of business plans, and describe specific processes of creation, delivery and capture of value from producer to consumer (Osterwalder and Pigneur 2010; Teece 2010). They can provide comprehensive illustrations to help pitch businesses to investors (Osterwalder and Pigneur 2010). Additionally, they can be tools for identifying radical and systemic innovations that businesses may need (Boons et al. 2013).

Adapting Osterwalder and Pigneur (2010), we developed the Sustainable Business Models for Communities (SBMC) tool, which incorporates values needed in peatland restoration. We observe the needs for a transformation to sustainable practices; for advocating the benefits of restored peatlands and necessary restoration interventions; and for exercising collective action. All of these are vital in supporting the mobilization of voluntary efforts in peatland restoration, and halting further degradation on peatlands. The SBMC tool is tailored to facilitating participatory business development at the community level in the hope of developing collective action among community members. It upholds and builds upon the pillars of participation, sustainability and transparency (Puspitaloka et al. 2020, 2022).

In contrast to the conventional Business Model Canvas, SBMC accommodates a cost-benefit sharing component to ensure the division of responsibilities and rights is agreed between all parties involved. It also encourages the identification of pre- and post-production activities for goods or services to facilitate brainstorming on sustainable production practices on peatlands that also minimize waste. Land preparation (a pre-production activity) on peatlands, for example, should avoid drainage and use of fire, while organic waste can be composted and used as fertilizer (a post-production activity). In addition, it acknowledges the direct and indirect costs associated with business development for peatland restoration. For example, a business developed in a community to restore a degraded peatland may require additional costs for canal blocking. In such a case we would expect the tool to be used to trigger discussions on the intangible benefits of the peatland that might provide revenue streams to the community, e.g., from carbon sales and/or tourism. With this, we hope to motivate the community to look at the benefits the restored peatland would provide.

This tool was initially developed in the Participatory Action Research on Community-Based Fire Prevention and Peatland Restoration (PAR CBFPR) project in Dompas Village, Bengkalis Regency, Riau Province.[6] We then tested and refined it in PAR on Community-Level Business Models in West Pinang Sebatang Village, Siak Regency and Kesuma Village, Pelalawan Regency; both in Riau Province.[7]

6 Puspitaloka et al. 2020

7 Puspitaloka et al. 2022

This section describes the refined process of business development using SBMC drawing from our recent experience in Phase 2 of PAR CBFPR with Indigenous Peoples and local communities in Kayu Ara Permai and Penyengat villages, Siak Regency, Riau Province.

The tool describes an iterative process of business model development at the community level, where exercising alternative livelihood options on peatlands can support peatland restoration and community welfare improvement. Users might include, but not be limited to, local facilitators assisting communities in developing livelihoods and businesses; community groups managing peatlands; and local governments implementing livelihood and peatland restoration programmes.

3.2 Sustainable Business Model for the Community: A how-to guide

3.2.1 Establish a group, a shared vision and an understanding of context

Prior to developing a business model, the community needs to have a group or groups, a shared vision and an understanding of context. The community group(s) will provide key human resources capital in planning, managing and implementing multi-objective businesses for peatland restoration. Such groups should consist of community members who share similar interests and ideas and have a common purpose. Having an organized group is often a prerequisite for receiving programmes, facilitation and grants. In the fire prevention and peatland restoration context, the government encourages the development of voluntary Fire Care Community or *Masyarakat Peduli Api* (MPA), Peat Care Community or *Masyarakat Peduli Gambut* (MPG) and Independent Peat Care Village or *Desa Mandiri Peduli Gambut* (DMPG) groups for enabling mobilization of resources and rapid response to fire incidents. To different extents, these groups also participate in fire suppression, fire prevention and peatland restoration. Depending on the situation and community consent, we could either strengthen an existing community group or establish a new one as necessary.

It is essential to encourage group members to have a shared vision before a business model and any further activities commence. This shared vision should be a depiction of an ideal situation the group wishes to attain in the future. This process is expected to foster a sense of belonging and provide a coherent basis for guiding plans and activities within the group. In the context of peatland restoration, it is important to foster the development of shared vision that focuses not only on economic benefits, but also on advocating or promoting the achievement of well-being from the peatland ecosystem through restoration. It is also important to reiterate this shared vision during all stages and processes to embed it coherently in guiding activities and planning (Figure 11).

Figure 11 Community work together realizing their common vision

As peatland soils are specific and different to mineral soils, an understanding of context is key to successful peatland restoration. Another critical step is determining what goods and services to develop as these will influence the practices employed in managing the peatland, e.g., whether they will necessitate drainage. As different peat depths may necessitate specific uses, referring to Najiyati et al. (2005) and Agus et al. (2016), we compiled four different peat type and depth typologies : 1) shallow alluvial peat with depths of 0.5–1 metre and containing sulphides that can be used for farming; 2) shallow alluvial peat with depths of 0.5–1 metre with no sulphides that can be used for annual horticulture, upland rice, grains, pulses and tubers, medicinal plants, annual crops, plantations and forestry; 3) peat with depths of 1–3 metres that can be used for horticulture, plantations and forestry; and 4) peat with depths exceeding 3 metres that should be conserved and utilized for forestry trees. Further references on suitable commodities for different peat types and depths can be found in Ministry of Environment and Forestry Decree No. P16/2017 on Technical Guidelines for Peatland Ecosystem Restoration, and the Peatland Restoration Agency's guidelines for revegetation or replanting on peatlands (Wibisono and Dohong 2017). Literature on different agriculture and forestry commodities is also available for guiding sustainable peatland management (Najiyati et al. 2005; Giessen 2013; Uda et al. 2020).

Figure 12 Market opportunity

Factors in choosing goods and services for a business model include: economic aspects (market opportunity, scale, potential revenue stream) (Figure 12); social aspects (community interest, knowledge and capacity); technical aspects (availability of sustainable practices on peatlands); and environmental aspects (ecological suitability of cultivation on peatland, peat depth considerations). In some cases, other factors, such as land ownership, may prevail in determining goods and services. For example, a community group in Dompas Village working on co-managed land[8] tended to favour short-term crops in addition to long-term crops and tree planting. As the co-managed land was not owned by the group, and was subject to a time-bound management contract, its members considered short-term crops providing immediate benefits to be more beneficial.

8 In this instance, the co-managed land was privately owned by a villager outside the group (landlord). The community group managed the land collectively under a time-bound management contract that specified profit-sharing between the community group and the landlord.

Box 1 Guiding questions for co-researchers: Shared vision and understanding of context

- What are the critical environmental, social and economic issues you would like to focus on?
- What would you like to accomplish in the long term?
- How do you envision the future of the environment, community and economic conditions in your area?
- What are the potential goods and services that could be developed on peatlands?
- How do those goods and services fit with economic, social, technical and environmental aspects?

3.2.2 Develop the business model using the SBMC tool

The SBMC framework comprises eleven components derived from the nine Business Model Canvas elements developed by Osterwalder and Pigneur (2010). These components are: 1) value proposition; 2) customer segment; 3) customer relationship; 4) channel; 5) key activities (pre-, during and post-production); 6) key resources; 7) key partners; 8) costs structure (direct and indirect costs); 9) costs sharing; 10) revenue stream (from tangible and intangible goods/services); and 11) benefit sharing (Figure 13). This framework positions value proposition as the most critical component in business model development. Value proposition describes the value that the business/goods/services will offer to the customer. In peatland restoration, it is important to encourage the community group to develop a value proposition that acknowledges sustainability as a competitive advantage.

The following are guiding questions for using the SBMC framework for business model development:

1. **Value proposition**
   What is the value that the customer needs and wants to pay for? Are the sustainability principles and practices reflected in the proposed value?
2. **Customer segment**
   Who is the targeted customer? Does the customer want to pay a premium for sustainably managed products? What is their preference?
3. **Customer relationship**
   What are the actions and strategies needed to maintain a good relationship with the customer?
4. **Channel**
   What channel can be utilized to reach the customer?

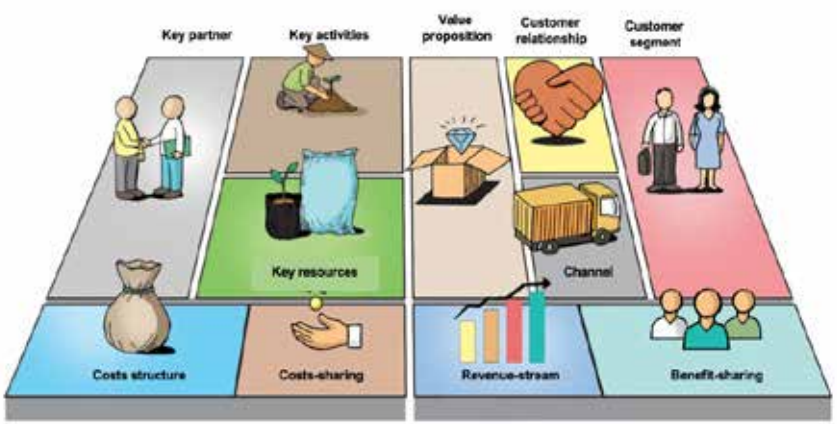


Figure 13 SBMC framework

5. **Key activities**
   What are the pre-, during and post-production activities required to produce the goods/services? What are the implications of these activities on the environment? Is there any potential activity that can minimize or optimize the use of waste resulting from the production process?

6. **Key resources**
   What are the key resources to implement the key activities? Are there any threats that may affect the sustainability of the supply? What is the action or plan to ensure efficient and effective use of resources?

7. **Key partners**
   Who are the key partners? What are their roles?

8. **Cost structure**
   What are the direct costs associated with the business? Are there any indirect costs that may be incurred to support the business operation? How can you mitigate any social and/or environmental risks to the business (e.g., fire and haze, destruction of facilities by resistant parties, costs involved in engaging the wider community to secure consent for the restoration project)?

9. **Cost sharing**
   How are the costs shared within the group and among its key partners? Are there any potential partners or funders to support financing the project?

10. **Revenue stream**
    What are the tangible and/or intangible goods and/or services that can generate revenue?

11. **Benefit sharing mechanism**
    What are the financial and non-financial benefits generated by the business? How are profits shared and disbursed equitably?

Box 2 Guiding questions for co-researchers: SBMC development

- How is the proposed value and business model aligned with the sustainability and circularity principle, socio-economic context and peatland restoration objective?
- How does the business model and its proposed value resonate with the shared vision?

3.2.3 Translate the business model into an implementation roadmap

To realize the business model, it is necessary to develop an implementation roadmap. It should summarize necessary activities to be performed or milestones to achieve. It has to specify a timeline and expected output or target (Figure 14). A Gantt Chart can be used as a tool for developing an implementation roadmap (Table 3).

Figure 14 Implementation roadmap helps the community achieve the target

Table 3 Example of a Gantt Chart for an implementation roadmap

Activity	Outputs/Milestones	Timeline for Implementation			
		Q1	Q2	Q3	Q4
Land preparation - phase one	Two hectares of land cleared and necessary engineering work (e.g., canal blocking) done				

Box 3 Guiding questions for co-researchers: Implementation roadmap

- What is your next step?
- When are you going to start the activities?
- What support do you need from the key partner(s)?
- How can progress be tracked?

3.2.4 Use the sustainable business model as an iterative process to foster an adaptive approach

Business model development should be seen as an iterative process that allows the community group managing the business to revisit and refine the model continuously as a response in adapting to the changing context (Figure 15).

Our experiences with communities in Kayu Ara Permai and Penyengat villages helped us to embrace uncertainties and complexities, and to use them as opportunities for learning and improvement. In Action Arena 3 in Kayu Ara Permai, for instance, the community group initially intended to develop an agroforestry system with rubber, coffee and ginger. However, the arena was affected by heavy flooding during the rainy season due to the degraded peatland having lost its water holding capacity. As a consequence, the group modified its plan and offered the ginger to a women's group to plant in an alternative location. Meanwhile, in Action Arena 1 in Penyengat, as there was growing interest in the community to cultivate longan, the group revisited its business model and action plan. It reflected on the change, and made the necessary adjustments to the planting design. These experiences illustrate the importance of monitoring and evaluating progress in implementing business models.

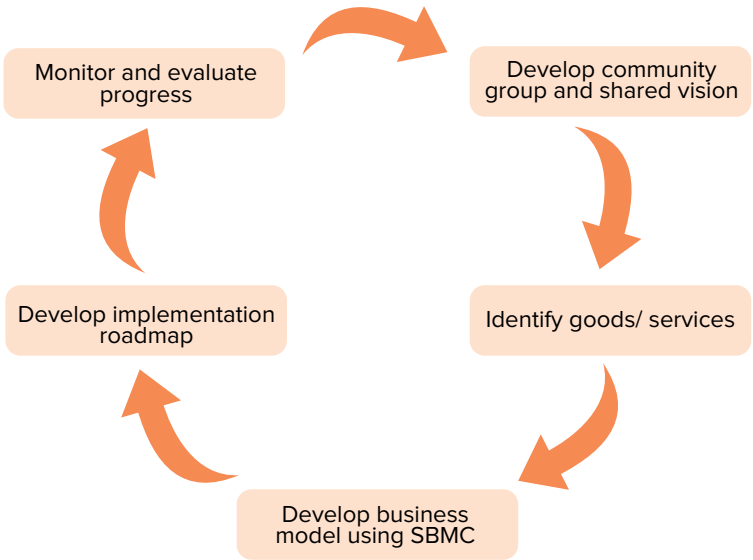


Figure 15 Business model development as an iterative process

Box 4 Guiding questions for co-researchers: Iterative process for an adaptive approach

- What progress have you made?
- What is working well? What would you do differently?
- What obstacles are in your way?
- What would be the next step to adapt to the changing context?
- How can your business model be improved?

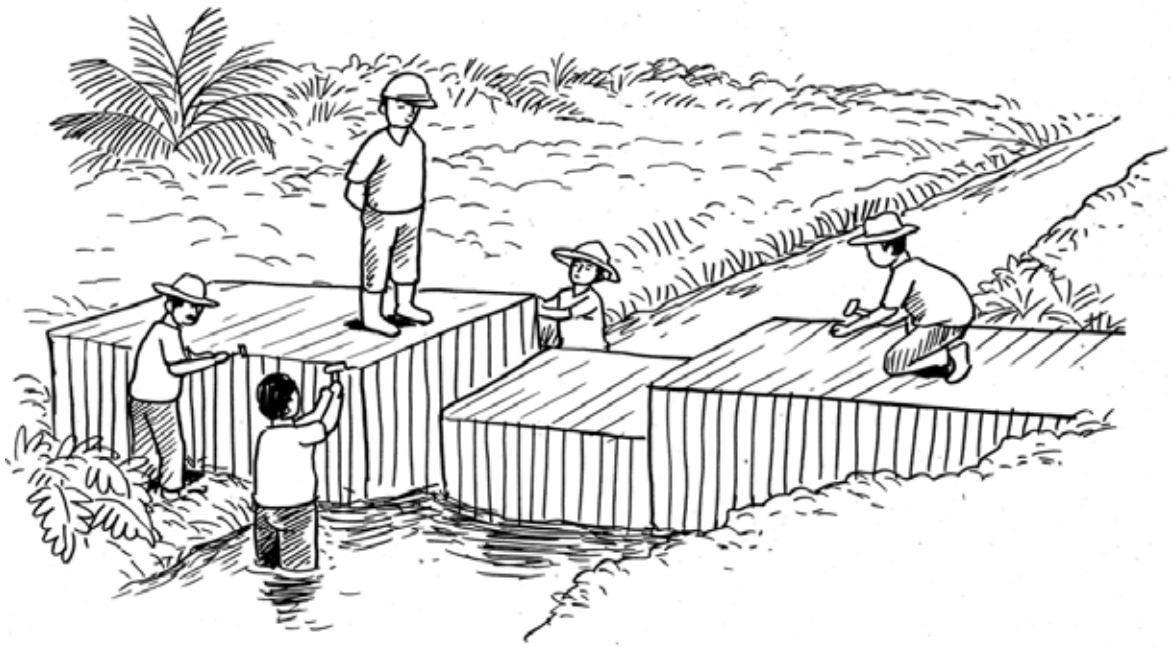
Figure 16 Further development on business model into business plan

3.3 Further development of the business model

As the business model will be part of the business plan, consider performing further financial, external factor and risk analyses (Figure 16). Financial analyses are for calculating cost and benefit components within the business cycle while considering discount rates. The components should then analysed against business feasibility criteria such as Net Present Value (NPV), Benefit-Cost Ratio (BCR), Internal Rate of Return (IRR) and Payback Period (PBP). External and risk analyses can be approached using SWOT (strengths, weaknesses, opportunities and threats) analyses to identify internal and external factors relating to the business.

4

Implementing augmented PAR for fire prevention and peatland restoration



4.1 Introduction

Augmented Participatory Action Research (PAR) has been ongoing in Kayu Ara Permai and Penyengat villages in Sungai Apit Subdistrict, Siak Regency, Riau Province since 2021. Peatland restoration activities in the villages are focused on nine action arenas covering a total of 8.45 ha across the two villages, with an additional four action arenas in community home gardens. On-the-ground activities are implemented within an augmented PAR framework consisting of four phases: reflection and co-elevation; co-creation and planning; connected actions; and co-monitoring and learning. The main objective of the augmented PAR in these two villages is to reduce fires by restoring peat and to improve community well-being.

4.2 Village selection process

Determining prospective PAR locations was a challenge due to government-imposed restrictions on mobility as a direct result of the Covid-19 pandemic. Nevertheless, CIFOR and research partners agreed to continue the process of determining prospective locations through proper procedures by conducted a series of online consultations from higher, down to site levels, to ensure legitimacy and secure Free, Prior and Informed Consent (FPIC) from key stakeholders. We also deployed Riau-based local facilitator to support the PAR process. FGDs held with regency government agencies in Siak were aimed at securing information on priority locations. Criteria used in doing so were: fire history; size of peatland area; village development indices; accessibility; and level of conflict. This process resulted in Sungai Apit Subdistrict being proposed as a prospective location.

Discussions with the Sungai Apit Subdistrict Government using the same criteria resulted in five villages being recommended. Initially, we narrowed these down to three villages by adding two more selection criteria: level of priority from government; and presence of similar activities by other institutions, then finally agreed on the villages of Kayu Ara Permai and Penyengat. We then held discussions with governments and community leaders in both villages to request their FPIC for PAR. Both villages responded enthusiastically and welcomed the idea.

Kayu Ara Permai is a new village resulting from the division of Sungai Kayu Ara. It has 1,716 ha of peatlands, 389 ha of which were affected by fires from 2015–2020. Penyengat is populated by an indigenous community, and has 45,898 ha of peatlands, 2,223 ha of which were affected by fires during 2015–2020. Maps showing peat depths and fire histories are presented in Figures 17 and 18.

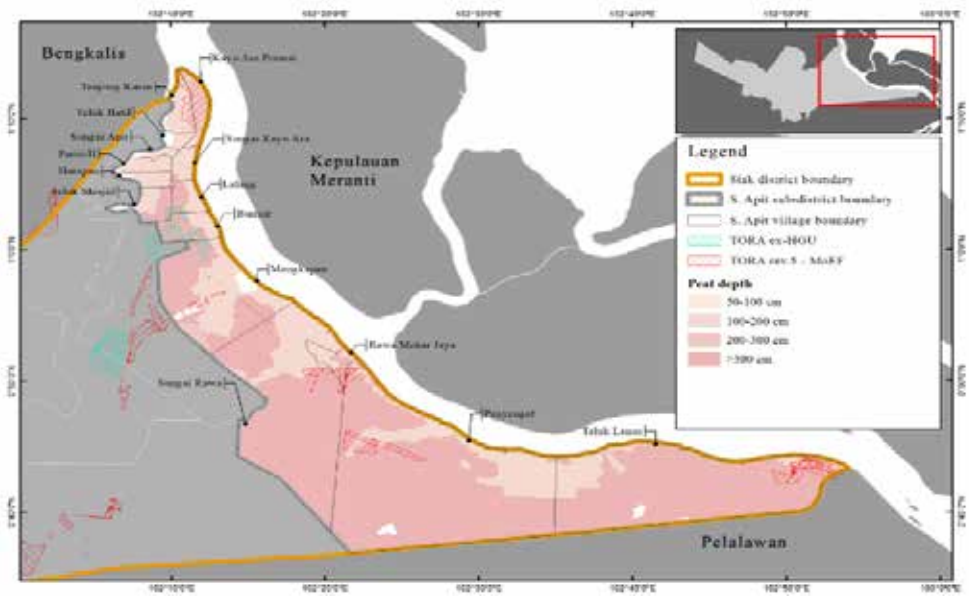


Figure 17 Peatland distribution in Sungai Apit Subdistrict

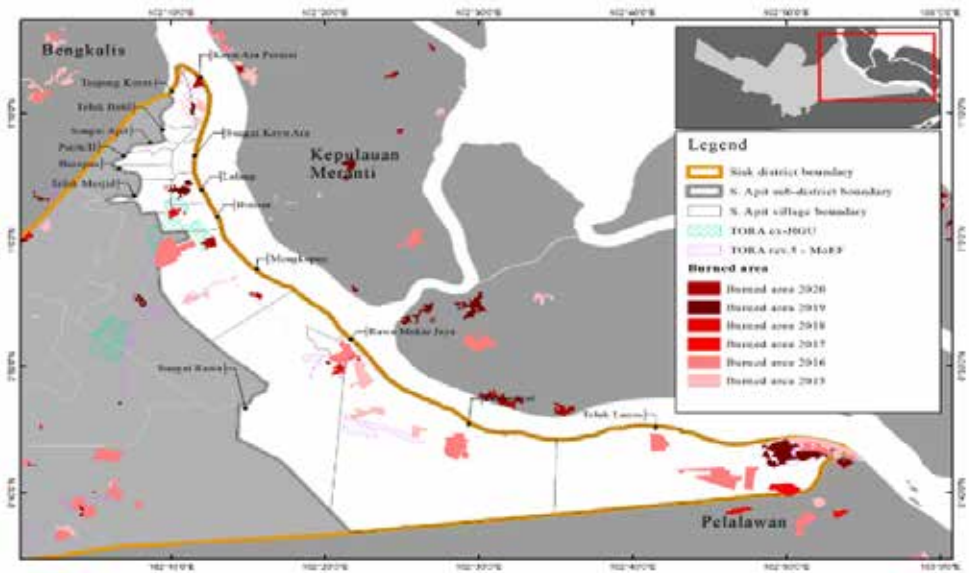


Figure 18 Fire occurrence in Sungai Apit Subdistrict

4.3 Reflection and co-elevation phase

Activities began with communities reflecting on current conditions, problems and potential solutions through co-elevation to secure a more holistic understanding. To ensure all co-researchers had a comprehensive understanding of the prevailing situations, we collected baseline data and information by conducting interviews and surveys of institutions, households, commodities and business potential, value chains, and biophysical conditions in the peatland ecosystems. The results of these baseline studies provided input for carrying out the subsequent phase.

Paperless/digital **institutional and household surveys** were carried out in both villages using Koboform and Open Data Kit (ODK) open-source mobile data collection platforms that need to be used complementarily (Figure 19).[9] One of the main advantages of these platforms is their ability to store data locally, which can then be uploaded to a server once internet access becomes available. This feature is invaluable for data collection in remote areas with limited internet access. These platforms can also store data in various forms, including text, images and location.

Figure 19 Paperless, digital survey

9 https://getodk.org/vs-kobo/

We used snowball sampling for **household surveys** by targeting respondents in two 'rings'. Ring 1 was defined as members of institutions surveyed in the institutional surveys, who would potentially be participating and involved in the planning phase and beyond. Ring 2 was defined as villagers not involved with the surveyed institutions. Those in both Ring 1 and Ring 2 were involved to some extent in land-based activities. Data resulting from the household surveys were analysed based on research questions on **fire and peatland restoration related issues**, and **livelihood assets/capital** comprising **human**, **social**, **natural**, **physical and financial capital**. These five assets were the modalities used for measuring vulnerability and access to assets.

The research team developed a database of recommended commodities suitable for cultivation on peatlands. The list, which contained 123 commodities, was sourced from scientific publications, government manuals and applicable regulations (Najiyati et al. 2005; Giesen 2013; Wibisono and Dohong 2017; Uda et al. 2020). From this list, the team conducted **commodity surveys** and shortlisted commodities based on their **development status**, **state of supply**, **source of supply**, **demand**, **overall market opportunity**, and **interest** from the communities (Figure 20).

Figure 20 Criteria for commodity selection

We then carried out **business profiling and value chain surveys** as a part of our consideration for Revitalization of livelihoods (the third of Peatland Restoration Agency's 3Rs) in peatland restoration and fire prevention intervention. During the business profiling surveys we mapped and profiled businesses in the villages by focusing on numbers of workers, sources of capital, etc. In the value chain surveys, we selected several focus commodities based on shortlists, consultative discussions with partners, discussions with community groups and village governments, and preliminary field observations.

4.3.1 Main findings of baseline studies

Kayu Ara Permai

Kayu Ara Permai is located near the coast, and has sloping topography and shallow peat with depths of less than three metres. Results of the institutional survey in the village showed most community groups being relatively new, having been established less than five years earlier. Group members were predominantly ethnic Malay with a few Javanese, and most groups were funded either by membership fees or the state. Only one farmer group was funded by membership fees and business proceeds. Community group members had relatively high levels of formal education, and many of them had also undergone training organized by the government.

The highest livelihood asset values for respondents in Ring 1 were horticultural sources and oil palm plantations, with other livelihood sources being rubber plantations, timber, fisheries and ecotourism. Other businesses with significant economic potential were honey farming and mangrove ecotourism, both of which would be likely to succeed as they were supported by the necessary physical infrastructure and an extensive network of farmer groups.

Generally, community members still used fire in preparing land for farming, a traditional practice they refer to as "*memerun*". Despite the inherent risk of land fires and being aware of regulations prohibiting the use of fire for land clearing, they still practiced *memerun* saying it makes peat soil fertile, and is easy and cheap.

Figure 21 Shrimp aquaculture in Kayu Ara Permai

With the exceptions of aquaculture (Figure 21) and rubber plantations, most businesses in Kayu Ara Permai had been established less than five years earlier. Nevertheless, these agricultural, industrial and service-based businesses were all growing. These included small enterprises with capital of under IDR 100 million, medium enterprises with capital of IDR 100 million to IDR 1 billion and large businesses with capital of more than IDR 1 billion.

Penyengat

Most community groups in Penyengat had been established five to ten years earlier, with only a few being any younger. We identified ethnic Batak, Nias and Malay peoples in the village, together with the more predominant indigenous '*Anak Rawa*' or 'children of the swamp'. Most groups had no funding, though some were either funded by the state or reliant on membership fees. Most of the population were of productive age, with formal education to elementary school level, and a few who had graduated from high school. Few villagers had previously attended any form of informal training. Generally, respondents in Ring 1 had high livelihood asset/capital values, while respondents in Ring 2 had medium asset/livelihood capital values.

Peatlands in Penyengat were mainly covered with horticultural crops and oil palm (Figure 22), with around 90% of farmers in the village cultivating pineapples. Many businesses were small to medium-scale agricultural enterprises that had been running for more than eight years, none of which had received any bank funding.

Figure 22 Pineapple cultivation in Penyengat

The number of respondents still using fire or practicing *memerun* for land clearing was higher in Penyengat than in Kayu Ara Permai, despite most being aware of regulations and advisories prohibiting the use of fire. Those still practicing *memerun* said they did so because it was a form of local wisdom, was beneficial for the land, and was fast, easy and cheap.

During **biophysical surveys**, we ground checked peat and measured peat depths. The resulting peat depth maps of Kayu Ara Permai and Penyengat are presented as Figure 23. During these surveys, we also investigated potential sites for action arenas in the two villages (Figure 24).

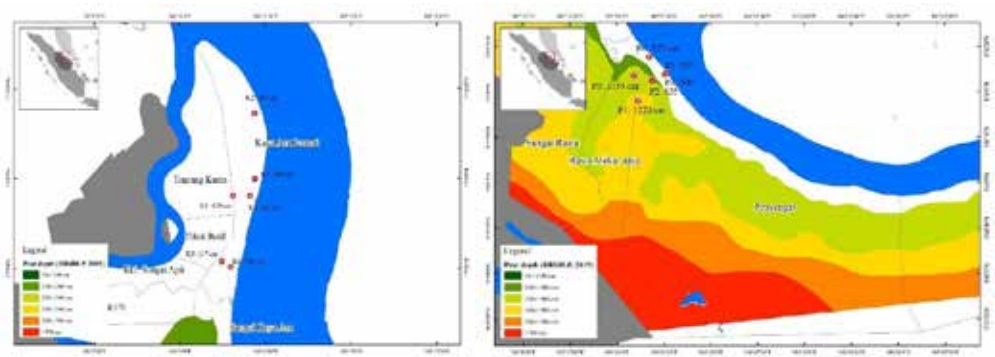


Figure 23 2019 peat depth maps of Kayu Ara Permai (left) and Penyengat (right) - red circles denote ground check points

Figure 24 Community members conducting a biophysical survey facilitated by the research team

4.3.2 Reflection and elevation towards collective action

Following the baseline studies and discussions with co-researchers in the two villages, all agreed to take action to restore degraded peatlands by developing sustainable business models that could bring economic benefits to the communities. Types of land identified as having potential to become action arenas were: degraded public land; degraded cultivated land (public and private); and degraded private land (home gardens/house lots).

4.4 Co-creation and planning phase

This phase employed **focus group discussions (FGDs) with the following themes**: developing a shared vision; selecting action arenas and action arena managers; developing landscape/biophysical engineering plans; developing business models and cost-benefit sharing mechanisms; and developing activity timelines. These FGDs took place online as well as in person. Most participants were connected virtually, though we also provided meeting points to facilitate those with technical constraints such as poor internet connections or software difficulties. We used the video conferencing application Zoom and online discussion tool Miro (Figure 25). Prior to commencing this phase, we also set up communication groups to facilitate scheduling, sharing of materials and discussions through the messaging application WhatsApp. The FGDs were supplemented with field visits and interviews for follow-up and data collection (Figure 26).

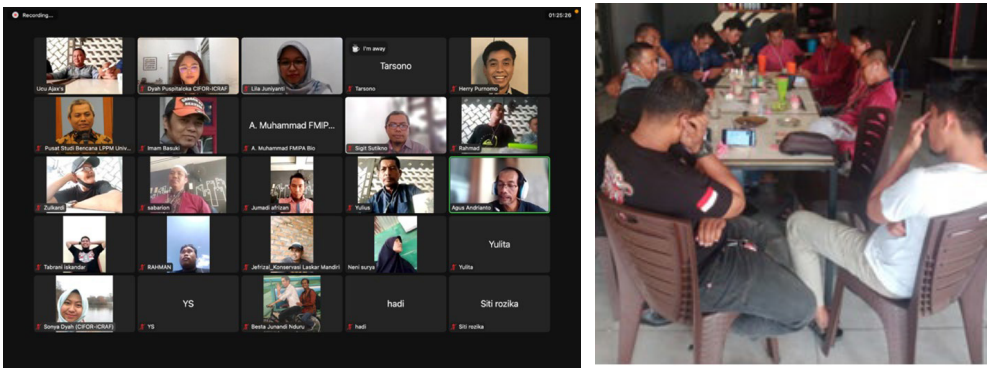


Figure 25 Participants attending online (left), and from a team-facilitated meeting point (right)

Figure 26 Action arena overview and selection process in Kayu Ara Permai

Prior to the co-planning process, we facilitated community discussions to help the groups **develop their shared visions**. These visions, which described the ideal future situations the community groups wished to achieve, were developed collectively to encourage a sense of belonging and provide coherent foundations for group activities. These discussions took place online using Miro, an online workspace for innovation that enables teams of any size to create concepts in real time.[10] The community in Kayu Ara Permai collectively agreed on "Protected peatlands, a prosperous community" as their vision (Figure 27), while the community in Penyengat collectively envisioned their village becoming "Developed, modern, independent" while "Conserving the customary forest".

CIFOR and partners – the Riau University Centre for Disaster Studies (PSB UNRI) and NGO consortium, Sedagho Siak – facilitated restoration activities in six action arenas in Kayu Ara Permai and Penyengat villages covering a total area of around 8.5 hectares (ha), excluding home gardens. Most of these action arenas constituted fire-prone abandoned land dominated by dry scrub. This phase resulted in the following **agreements on the management of action arenas** in Kayu Ara Permai: the Fire Care

10 https://help.miro.com/hc/en-us/articles/360017730533-What-is-Miro-

Community group, a conservation group and farmer group would manage 2 ha of public land as KAP-Action Arena 1 by employing ecotourism and agrosilvofishery business models; one farmer group would manage 1.9 ha of private land as KAP-Action Arena 2 using an agroforestry business model; and another two farmer groups would manage a further 2 ha of public land as KAP-Action Arena 3 through an agroforestry business model that involved enriching an existing rubber plantation (Figure 28).

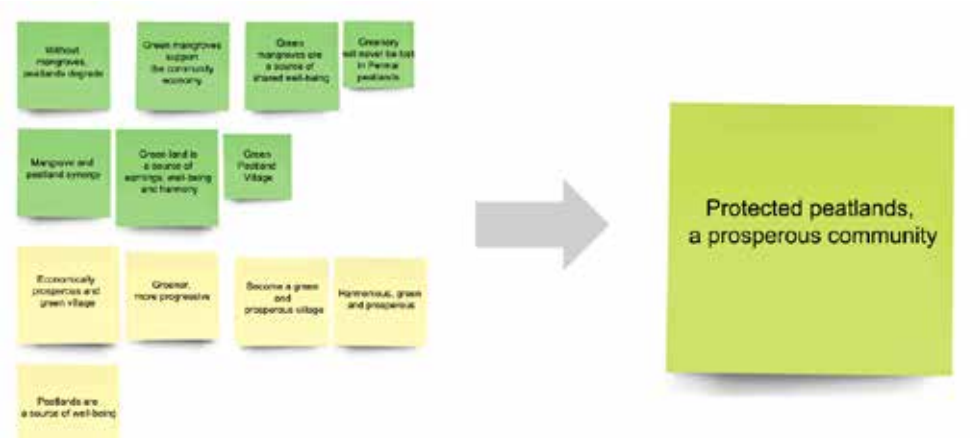


Figure 27 Shared vision for Kayu Ara Permai

Figure 28 Illustration of agroforestry on peatlands

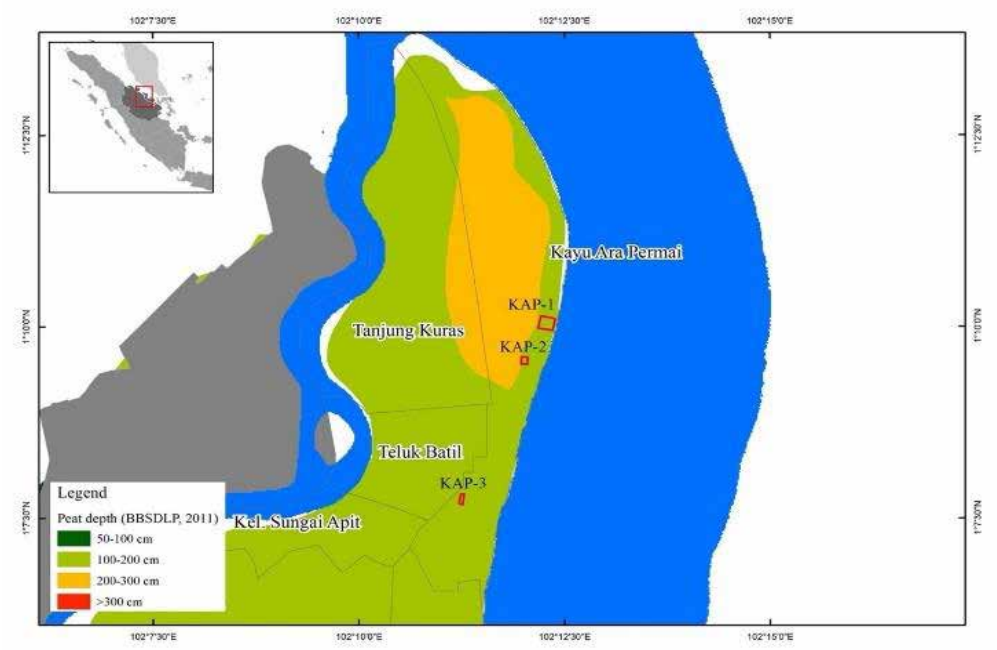


Figure 29 Map of action arenas in Kayu Ara Permai

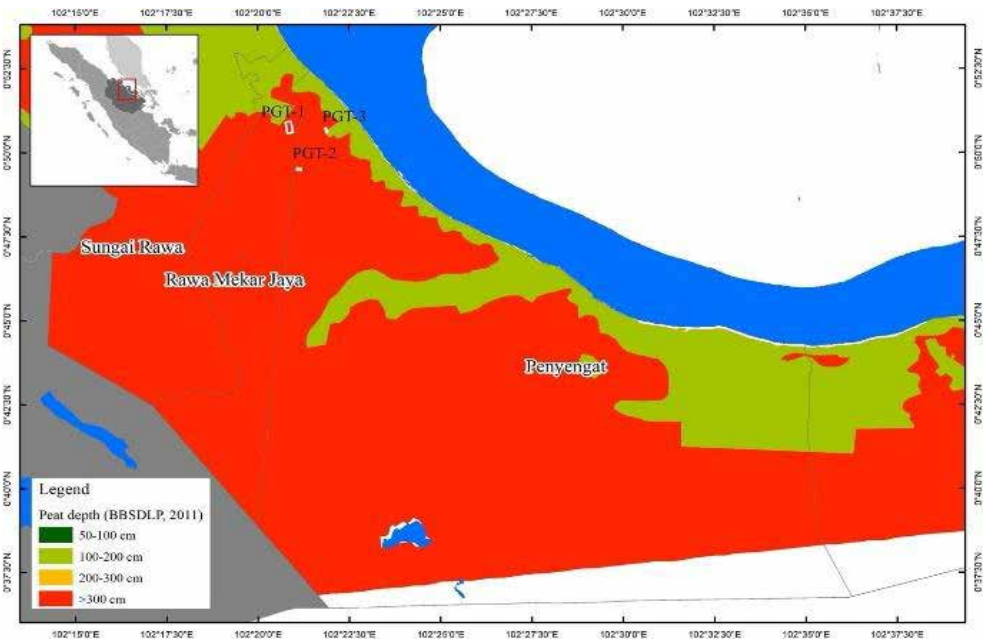


Figure 30 Map of action arenas in Penyengat

In Penyengat village, it was agreed that the Fire Care Community group would manage 2 ha of public land as PGT-Action Arena 1 employing a forestry business model; more than twenty Indigenous customary institution members would manage their home gardens as PGT-Action Arena 2 developing various agroforestry business models; and the indigenous customary youth organization would manage 0.6 ha of public land as PGT-Action Arena 3. Maps of action arenas in both villages are presented as Figure 29 and Figure 30.

As each community group had its own interests in developing livelihoods, we facilitated the **selection of commodities** for each to develop (Figure 31). We also explained the results of market surveys, topographical mapping and peat depth surveys conducted around Siak Regency, asking the community groups to identify and select commodities or services they would be interested in developing further in their action arenas. Each group realized the importance of understanding and considering economic, social, technical and environmental aspects. The discussions and decision making on goods or services selection involved stimulating questions relating to value proposition for further in-depth exploration in preparing the business models.

Figure 31 Illustration of commodities

The community groups in Kayu Ara Permai agreed to plant different combinations of timber and non-timber commodities on peatlands. The Fire Care Community, conservation and farmer groups managing KAP-Action Arena 1 chose pineapple, taro and ginger; the farmer group in KAP-Action Arena 2 chose hybrid coconut and pineapple; and the farmer groups in KAP-Action Arena 3 chose to enrich their monoculture rubber plantation with liberica coffee and ginger.

The groups in Penyengat also agreed to plant combinations of timber and non-timber commodities. The Fire Care Community group managing PGT-Action Arena 1 chose '*matoa*' (*Pometia pinnata*) trees (Figure 32); the indigenous institution in PGT-Action Arena 2 chose hybrid coconut; and the customary youth organization in PGT-Action Arena 3 chose to plant '*tampoei*' (*Baccaurrea borneensis*), longan and banana.

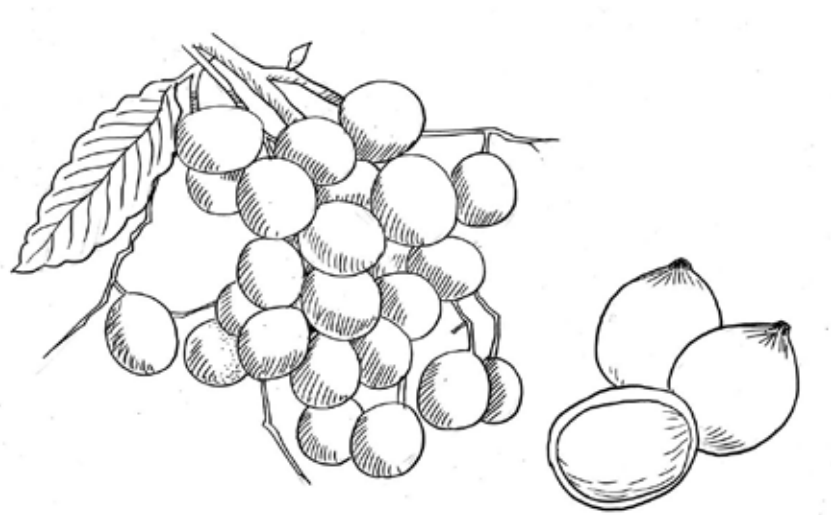


Figure 32 Matoa

After agreements were reached on choices of goods and services, the facilitators began explaining business model concepts. Together with the community groups, we adapted Osterwalder and Pigneur's Business Model Canvas (BMC) for planning the sustainable business models. Guided by the facilitators, the groups identified and filled in each BMC component. Their ideas were organized around eleven key components (see section 3) to make it easier for them to understand the bigger picture for the models and to formulate action plans.

The groups formulated different business models to apply and learn from in their action arenas. Despite these models being far from perfect, especially in terms of consistency

between components, they do illustrate that given the right motivation and assistance from facilitators, people in rural areas can develop presentable business models. The online and offline business model development processes employed are shown in Figure 33 and 34.

Figure 33 The business model development process in Penyengat using a Miro board

Figure 34 Facilitators and managers discuss the business model for Action Arena 2 in Kayu Ara Permai

Ecotourism business model

The managers of Kayu Ara Permai Action Arena 1 suggested ecotourism as an additional option for the village's peatlands. They proposed planting hardwood trees, and propagating and utilizing native peat fish species (value proposition); targeting local communities and school children who demand local, attractive and educational ecotourism spots (customer segment); reaching potential customers through mouth-to-mouth marketing (customer relationship); and utilizing social media for engagement (channel).

They envisioned the business model generating revenue from admission tickets or ecotourism, outbound activities, nature education and fishing fees, with additional revenue generated from kiosks and fishing equipment rental (revenue streams). Profits would be shared between managers and members based on attendance and performance (profit sharing).

The arena managers would utilize human resources, land, seedlings, supporting equipment and construction materials in applying their business model (key resources). They would carry out land preparation, planting, maintenance and harvesting; construct small reservoirs, canal blocks (Figure 35), kiosks and huts; and design and establish outbound plans, a nature school and an arboretum (key activities). Costs incurred

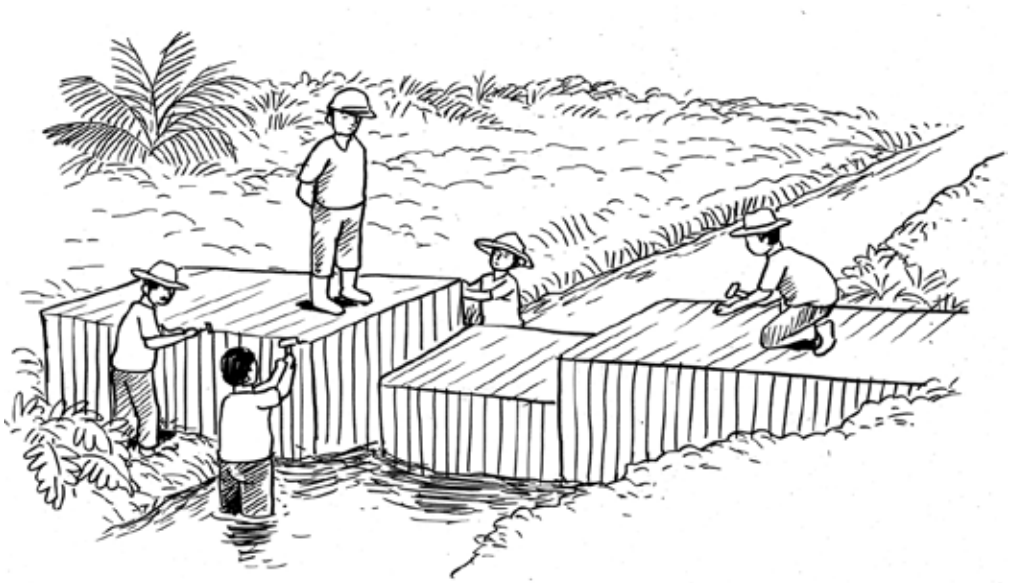


Figure 35 Construction of canal blocking

for these activities would include the procurement or purchasing of seedings and supporting equipment; costs for land preparation, planting, maintenance and harvesting; construction costs for support facilities; and operational costs (cost structure). CIFOR would help in covering some of these costs for the duration of the project, while the action arena managers would contribute to costs and labour (cost-sharing).

Finally, to realize the business model, the managers planned to partner with the government tourism office and education office, CIFOR, companies and the university (key partners). The ecotourism Business Model Canvas for Action Arena 1, including its cost-benefit sharing mechanism, is shown in Figure 36.

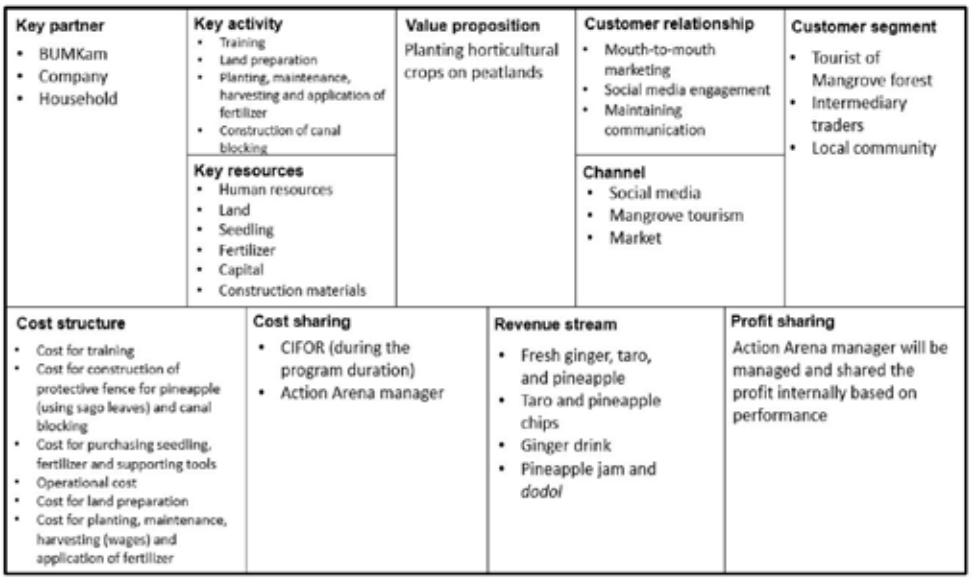


Figure 36 Business model and cost-benefit sharing mechanism for ecotourism

Agroforestry business model

The Action Arena 3 managers in Penyengat planned to plant banana and fruit-bearing trees including *tampoei* and longan (value proposition). They would sell harvested fruits to the local community and villagers beyond Penyengat (customer segment) through markets and by utilizing social media (channels), and would establish partnerships with merchants and intermediaries to reach and maintain relationships with customers (customer relationship).

The managers envisioned the business model generating revenue from selling banana, *tampoei* and longan fruits (revenue streams). Profits would be shared between the managers and members based on attendance and performance (profit sharing). Capital, land, human resources, seedlings and fertilizer (key resources) would support land preparation, planting, maintenance, harvesting, fertilizer application, and canal blocking (key activities).

Cost would include those for land preparation (Figure 37); training; purchasing seedlings, fertilizers and support equipment; costs for planting, maintenance and harvesting; construction costs for canal blocking; and operational costs (cost structure). CIFOR would help cover some of these costs for the duration of the project, while the action arena managers would cover any remaining costs (cost sharing).

Figure 37 Land preparation without burning

Finally, to realize the business model, the managers planned to partner with households, farmer groups and the village government (key partners). The agroforestry Business Model Canvas for Action Arena 3, including its cost-benefit sharing mechanism, is shown in Figure 38.

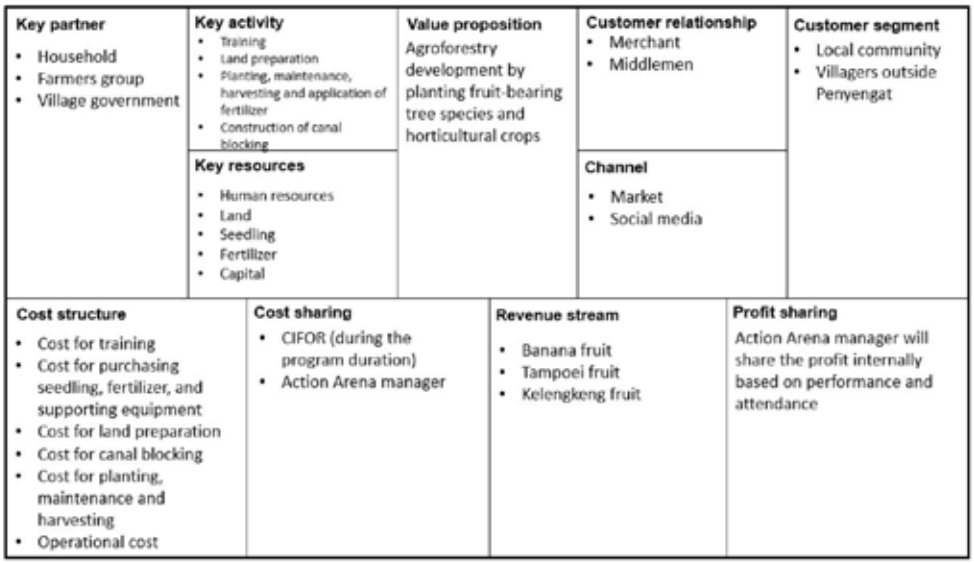


Figure 38 Business model and cost-benefit sharing mechanism for agroforestry

These two examples show social media being the communities' chosen channel for promoting their products and businesses. In today's all-digital era, social media plays an essential role in marketing businesses as it helps them reach a wider audience than conventional methods are able to. Digital marketing is also more cost-effective and scalable.

By using a participatory approach, the communities could convey their aspirations, reflect on who they considered important actors and partners, determine their respective roles and responsibilities, and identify potential challenges or obstacles, and solutions for dealing with them. The most important thing was that these discussions resulted in commitments between village governments, landowners and community members, with CIFOR and PSB UNRI as facilitators.

The groups could then establish action plans and schedules. The essence of good business models and action plans lay in how they could be implemented, monitored and evaluated on an ongoing basis for further reflection and refinement.

4.4.1 Results from the co-creation and planning phase

Table 4 summarizes the results of co-creation and planning phase activities in the two villages.

Table 4 Summary of results from the co-creation and planning phase

Type of land and description	Results from co-creation	Results from planning
KAYU ARA PERMAI **KAP-Action Arena 1**		
• Degraded public land • Village land of 10 ha, not being managed • Peat depth: 3 m • Distance to nearest canal: 250 m • Surrounding lands are owned by migrants for plantations • The land is frequently burned and fires are difficult to extinguish due to limited sources of water • Far from public settlements	• Collaboration of volunteer groups to manage village land (the Fire Care Community, conservation, and farmer groups) • To make 2 ha out of 10 ha of village land productive • To protect the land and prevent fires • To attract other community members to participate in managing communal land	Business models: • Agriculture • Aquaculture • Forestry • Ecotourism Activities: • Cultivation training • Establishment of a forest species nursery • Restoration of 2 ha of land for agroforestry • Hydrology improvement and provision of water reservoirs for the dry season • Utilization of reservoirs as sources of income for managers • Establishment of a formal farmer group that is registered and recognized as being able to implement activities in state forest estate
KAP-Action Arena 2		
• Degraded cultivated land • Private land - 2 ha of less productive land owned by the community • Peat depth: 2 m • Distance to canal: 150 m • Crops/pineapples cultivated, but unsuccessfully • The surrounding land is often burned • Located far from the settlement area	• The Mahkota Permai farmer group aims to increase land productivity by applying agroforestry • To diversify cash crops: pineapple, snake fruit • To combine cash crops with annual/tree species: hybrid coconut, areca nut, *matoa* trees	Business model: Agroforestry Activities: • Training • Provision of seeds • Land preparation • Planting • Maintenance • Monitoring

continued to the next page

Table 4 Continued

Type of land and description	Results from co-creation	Results from planning
	KAP-Action Arena 3	
• Degraded cultivated land • Village land area of 2 ha • Peat depth: 2m • Distance to canal: 5m • Often inundated/flooded • Low topography, flat land	• To strengthen existing farmer groups: Naga Permai and Permai Bertuah – the majority of members have rubber plantations • To improve practices by applying agroforestry on their land by combining rubber with liberica coffee	Business model: Combination of rubber and coffee agribusiness Activities: • Training • Provision of seeds • Land preparation • Planting • Maintenance • Monitoring • Ditch cleaning • Canal blocking
	KAP-Action Arenas 4–5	
• Degraded private land • Home gardens • Managed by women farmer groups: Permai Indah Satu and Permai Indah Duo	• To encourage active participation of women's groups in environmental and economy activities • To increase the productivity of home gardens while maintaining peat sustainability	Business model: Agribusinesses for red ginger, medicinal plants and fruit trees Activities: • Training • Provision of seeds • Land preparation • Planting • Maintenance • Monitoring
	PENYENGAT **PGT-Action Arena 1**	
• Degraded public land • Has convertible production forest (HPK) state forest estate status	• Fire Awareness Group together with the village apparatus to plan a village office and various public facilities with a green and environmentally friendly concept,	Business model: Forestry and agroforestry

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Table 4 Continued

Type of land and description	Results from co-creation	Results from planning
• Around 18 ha of the land area was the planned location of the new village office and several public facilities • Community members have planted some of the land with pineapples • Peat depth: 11 m • Land surrounded by canals	• To produce fruits in the village • To enrich biodiversity of pineapple with tree species.	Activities: • Training • Land preparation • Creation of nursery • Planting wood species and fruit trees suited to peatlands in several areas • Plant maintenance • Monitoring • Canal blocking • Establishment of a formal farmer group that is registered and recognized as being able to implement activities in state forest estate
PGT-Action Arena 2		
• Degraded private land • Status as other use area (*Areal Penggunaan Lain*) • Utilized as a community settlement area, spread out with large yards that mostly constitute bare land	• The Indigenous group plans to have productive home yards • To maintain water and prevent drought during the dry season and flooding during the rainy season	Business model: Agribusiness Activities: • Training • Land preparation • Planting fruit trees • Plant maintenance • Monitoring • Canal blocking
PGT-Action Arena 3		
• Degraded cultivated land. • Manage 1 ha of village land.	• The *Karang Taruna* youth association plans to make the pineapple plantation more productive with a combination of banana, longan and *matoa* trees	Business model: Agroforestry Activities: • Training • Land preparation • Planting fruit trees • Plant maintenance • Canal blocking • Monitoring

continued to the next page

Table 4 Continued

Type of land and description	Results from co-creation	Results from planning
	PGT-Action Arena 4	
• Degraded private land • Status as other use area (*Areal Penggunaan Lain*) • Utilized as a community settlement area, spread out with large yards that mostly constitute bare land • Community members commonly use their yards for growing vegetables	• Women in the village plan to be more active in the women's group • To get additional income from home yards every year, in addition to growing vegetables	Business model: Agroforestry Activities: • Training • Land preparation • Planting fruit trees • Plant maintenance • Monitoring

4.5 Connected actions phase

Activities to be carried out in the action arenas included the 3Rs: **Rewetting** through the construction and repair of canal blocks; **Revegetation (replanting)** through cultivation training and building nurseries, clearing land without burning, and planting selected trees and commodities; and **Revitalization of community livelihoods** through the implementation of goods- and services-based business models (Figure 39).

Figure 39 Livelihood on peatlands

The community groups had already developed their shared visions during the co-creation and planning phase. To realize these visions, the groups in Kayu Ara Permai initially developed four business models and action plans for the village's three action arenas, while the groups in Penyengat developed a different business model and action plan for each of their village's three action arenas. As community interest grew, however, we accommodated two women's groups in Kayu Ara Permai and one in Penyengat to manage three additional action arenas. Consequently, during the connected actions phase, CIFOR and partners facilitated five action arenas in Kayu Ara Permai spanning nearly 5.9 ha not including villagers' home gardens, and four action arenas in Penyengat covering 2.6 ha of land excluding the home gardens in Action Arenas 2 and 4.

To commence actions with the implementation of action plans and business models, CIFOR and partners facilitated a **series of training sessions and discussions** on **sustainable cultivation on peatlands**, **fire-free land preparation**, and **canal blocking**. The training also focused on the commodities selected for cultivation in the action arenas (Figure 40, 41). Cultivation training in Penyengat focused on hybrid coconut, banana, longan, *matoa*, areca nut and rambutan, while in Kayu Ara Permai it focused on liberica coffee, red ginger, avocado, guava and taro, as well as snakehead murrel (*gabus*) propagation.

Figure 40 Training on longan cultivation in Penyengat

Figure 41 Training and discussion in Kayu Ara Permai

Discussions between facilitators and community members highlighted three fire-free land preparation techniques. Mechanical land preparation using heavy equipment was the most widely used technique by farmers with significant capital, especially in developing oil palm plantations. The heavy equipment clears undergrowth and piles up organic waste in rows in a process known as stacking. Another technique was manual land preparation, which is used for relatively small areas of land as it is highly labour intensive. Lastly, a widely used technique due to its effectiveness, affordability and perceived sense of safety, was herbicide application to eliminate understory growth. This required around five litres of herbicide priced at IDR 500,000, and labour costs of IDR 600,000 for each hectare of land, with the process repeated at least three times.
The facilitators always shared the results of discussions and training materials on commodity cultivation through WhatsApp groups set up for each village. This allowed people to discuss issues and exchange information anytime and anywhere. Screenshots of WhatsApp group interactions between community groups and facilitators in the two villages are shown in Figure 42.

Rewetting was carried out in several arenas, and involved pond construction and canal blocking. Three ponds/reservoirs, each measuring 5 x 50 metres, were constructed in KAP-Action Arena 1 (Figure 43) as the arena had a high risk of recurring fires. As the area drains to the coastline, we felt shallow ponds would be beneficial for storing water in anticipation of future peat fires. The ponds/water reservoirs were positioned in the lower lying part of the arena to ensure water availability during dry months, whereas during the wet season, they could be used for agrosilvofishery activities.

Figure 42 WhatsApp group interactions in Penyengat (left) and Kayu Ara Permai (right)

Figure 43 Pond/water reservoir construction in KAP-Action Arena 1

We built four canal blocks in the most fire-prone action arenas in the two villages: three in Penyengat in Action Arenas 1, 2 and 3; and one in Kayu Ara Permai in Action Arena 3. We built seven-metre-wide permanent canal blocks with spillways 40 cm below the peat surface to slow down the flow of water and keep peat wet during the dry season. Canal block construction in Penyengat is shown in Figure 44.

Figure 44 Canal block construction beside the main road in PGT-Action Arena 3

After community groups had received training on cultivating their chosen commodities, they undertook business model activities with **revegetation (replanting)**. These commenced with the construction of two nurseries in each village, which villagers could use as examples for any future independent nurseries, or for receiving seed assistance from different programmes and institutions (Figure 45).

Land preparation was carried out manually without burning, in combination with limited and controlled use of herbicides (Figure 46).

Figure 45 Nursery construction by community members in Kayu Ara Permai

Figure 46 Fire-free land preparation in KAP-Action Arena 2

Each group planted commodities they had selected for their business models during the planning phase. In KAP-Action Arena 1, for example, managers planted 2,000 '*geronggang*' (*Cratoxylum arborescens*), 5,000 pineapple and 1,000 red ginger seedlings, and used ponds to propagate snakehead murrel. The managers also built a hut to serve as a shelter for visitors to the action arena. Their actions will create a green open space for ecotourism. The planting layout in KAP-Action Arena 1 is shown in Figure 47.

Women's farmer groups in the two villages have also applied agroforestry-based business models by planting in their home gardens. The 15-member women's farmer group in Penyengat planted 30 rambutan, 30 areca nut and 30 hybrid coconut seedlings. Meanwhile, the women's farmer group in Kayu Ara Permai Action Arena 5 planted 60 avocado, 60 guava and 1,500 ginger seedlings on their own land.

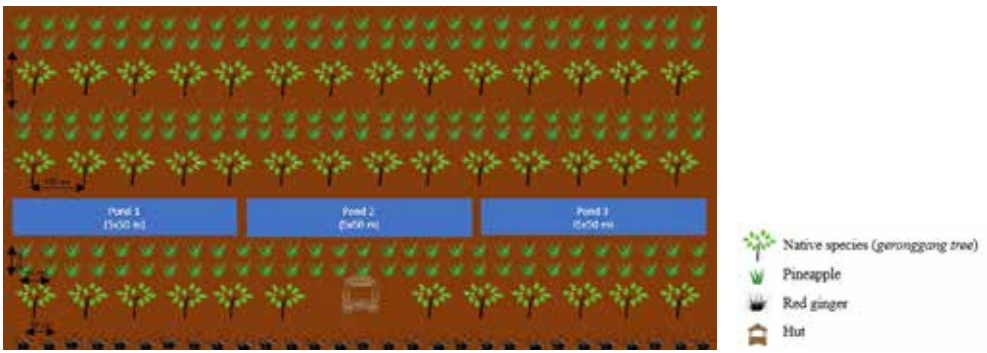

Figure 47 Illustration of the rewetting and revegetation layout in KAP-Action Arena 1

4.6 Co-monitoring and learning phase

The aim of the co-monitoring and learning phase was to monitor medium and long-term outputs and impacts. Groundwater monitoring requires tools for groundwater level measurement, while crop monitoring requires bar codes for plant inventories. The aim of groundwater monitoring was to compare water levels in action arenas where canal blocking had taken place with those in control (unblocked) areas. Crop monitoring, meanwhile, was aimed at determining plant numbers and survival rates. The online monitoring systems facilitated participatory monitoring with the community groups. CIFOR has developed an online platform for monitoring trees, peat and the environment called the Community-Based Restoration Monitoring System (CBRMS), which is discussed in a separate publication. Figure 48 shows water levels in an action arena in Penyengat where revegetation and rewetting interventions had taken place being higher than those in control land where no interventions had been applied.

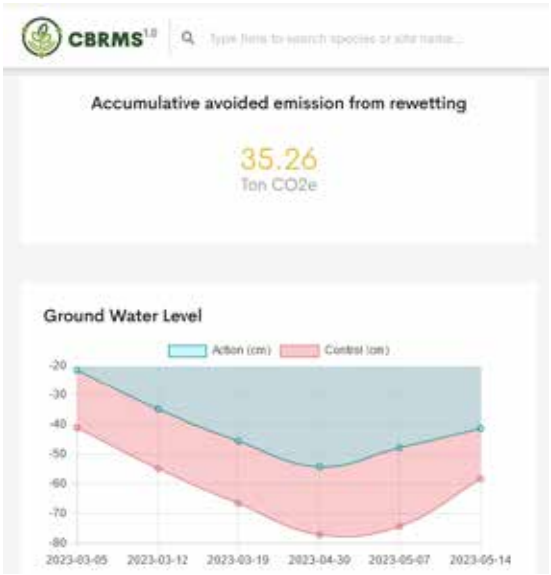

Figure 48 CBRMS monitoring in Penyengat

The research team and community groups also monitored community institutions and economic changes. The aim of institutional monitoring was to determine the impacts of PAR on institutions in each of the villages. Meanwhile, economic monitoring was aimed at calculating any additional benefits for managers after implementing business models in their action arenas.

During this phase, the research team and community groups involved in augmented PAR also 'learned' about any challenges or difficulties emerging in implementing the action plans. Obstacles encountered in implementation processes were due to **weather factors**, with the villages experiencing high rainfall during 2022, which caused flooding and waterlogged soil. As seeds planted in such conditions can rot, and any fertilizers applied will dissolve and drain away before plants can absorb them, managers frequently postponed planting and fertilizer applications to minimize risks.

Each group made **commodity adjustments** in the action phase for a number of reasons. In PGT-Action Arena 2, for instance, managers had not originally planned to plant *matoa* trees, but during the action phase, the managers decided to do so to establish an agroforestry system with trees that bear fruit that could be sold to provide additional profits. The groups in KAP-Action Arena 1 also made an adjustment in deciding to plant more *geronggang* due to its suitability to peat swamp conditions.

Pest infestations proved to be a significant challenge to revegetation by killing planted seedlings. This was the case with some of the red ginger planted by a women's group in Kayu Ara Permai. Another challenge arose with **recording numbers of seeds entered and planted**. In Penyengat, where there is a very strong sense of kinship between residents, particularly among the indigenous population, arena managers were reluctant to refuse others from outside the action arenas asking for seedings for fear of creating social envy. As a result, they would frequently have to recalculate seedling requirements.

Table 5 below provides summaries of PAR activities in the two villages.

Table 5 Summary of PAR activities in Kayu Ara Permai and Penyengat villages

Reflection and co-elevation	Co-creation and planning	Connected actions	Co-monitoring and learning
Using digital platforms (Koboform and ODK)	Mixed offline and online (Zoom, Miro and WhatsApp)	Mixed offline and online (WhatsApp)	Mixed offline and online (WhatsApp and the CBRMS platform)
1. Household, commodity, and institutional surveys 2. Business and value chain studies 3. Biophysical survey	1. Development of shared visions 2. Selection of action arenas and action arena managers 3. Development of landscape/ biophysical engineering plans 4. Development of business models and cost-benefit sharing mechanisms 5. Development of activity timelines	1. Training on cultivation, land preparation and canal blocking 2. Rewetting (water reservoirs and canal blocking) 3. Revegetation (nursery construction, fire-free land preparation and planting) 4. Revitalization of livelihoods (implementation of goods- and services-based business models)	1. Groundwater level monitoring 2. Tree and plant monitoring 3. Institutional monitoring 4. Economic monitoring

4.7 Lessons learned from augmented participatory action research

Covid-19 and the digital era have changed the way PAR processes are conducted. Where conventional PAR required face-to-face meetings, augmented PAR now utilizes digital platforms in the implementation of each of its phases. This has made PAR processes more efficient and effective

Augmented PAR has enabled communities to utilize digital technology, thereby proving that community-based peatland restoration processes do not necessarily have to be conducted face-to-face, but can be integrated using existing digital technologies.
The use of digital technologies in augmented PAR has proven capable of maintaining PAR's potential to encourage communities to become drivers of actions that provide environmental, economic and social benefits, and reduce fire risk.

A participatory approach is important for providing science-based and locally appropriate recommendations for sustainable practices on-the ground. The augmented PAR approach helps researchers capture local situations, needs and dynamics, as one size does not fit all.

The Canvas Business Model (CBM) is a helpful tool in developing integrated sustainable business models for communities. It can be applied in participatory settings, and helps make key aspects of business planning understandable for communities (Figure 49).

Figure 49 Planting fruit-bearing trees is a potential business model for the community

CBM helps communities to not only identify components of businesses, but also key enabling conditions and marketing options. Using CBM also ensures equality in identifying and agreeing upon cost structures and benefit sharing.

The peatland pathway can play a crucial role in Indonesia's efforts to achieve its Nationally Determined Contribution (NDC). By utilizing a combination of peatland restoration approaches, the country could nearly double its FOLU Net Sink 2030 emissions reduction target. Groundwater monitoring, which was utilized during the PAR co-monitoring and learning phase, contributes to a better understanding of rewetting processes and the potential for rewetting and revegetation to prevent repeat emissions.

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Participatory Action Research (PAR) is a tool for fostering a new paradigm in natural resources management. Combined with an Adaptive Collaborative Management (ACM) approach, in community-based fire prevention and peatland restoration, PAR facilitates transformative change through a simultaneous process of research and taking action, linked together by critical reflection. Covid-19 led to the transformation of traditional PAR to become a new incarnation aided by internet technology, remote connections and new ways of implementing collaboration. This new incarnation, which we refer to as augmented PAR, consists of a spiral of reflection and co-elevation, co-creation and planning, connected actions, and monitoring and co-learning phases. External reinforcement can strengthen actions and improve augmented PAR processes. This book, which constitutes part of the Toolbox on Community-based Fire Prevention and Peatland Restoration, presents case studies from Kayu Ara Permai and Penyengat villages in Riau Province, where PAR on community-based fire prevention and peatland restoration is taking place from 2021 to 2023. We hope it can serve as a reference for actors involved in sustainable peatland management and restoration in reconciling ecological, social and economic objectives.

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The Center for International Forestry Research (CIFOR) and World Agroforestry (ICRAF) envision a more equitable world where trees in all landscapes, from drylands to the humid tropics, enhance the environment and well-being for all. CIFOR and ICRAF are CGIAR Research Centers.

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