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# Designing the Special Pilot Economic Zone: An Alternative Approach to Revitalize Livelihoods on Peatlands

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***Abstract.*** *Peatland restoration projects in tropical countries could prevent environmental disasters such as peat fires. In Indonesia, one of peatland restoration activities is the revitalization of the livelihoods of communities around peatlands. Nevertheless, this activity is still lacking in reducing the environmental pressures from the communities on peatland. We aim to find a comprehensive strategy to design a sustainable bioeconomy on peatlands. This study draws on spatial, qualitative, and quantitative data from the literature, project and policy documents, open-source web application, observations from the field and meetings; and interviews with key stakeholders at national level and three Indonesian provinces. We found that an ecosystem-based special pilot economic zone (SPEZ) is a potential proposal that can provide a framework for a sustainable peatland bioeconomy. We suggests seven phases for planning and implementation of the SPEZ; 1. Preparing its spatial planning to support its legal aspects; 2. Field observation to derive biophysical information of the location and determining peatland suitability; 3. Identifying target group, paludiculture commodities and alternative livelihoods; 4. Analyzing the value chain, market demand and conducting a cost-benefit analysis; 5. Natural capital accounting; 6. Designing social innovation to trigger investment and market chain; and 7. Community engagement. From our study in Riau, South Sumatra, and Central Kalimantan, each of the phase present different challenges and opportunities especially in terms of regulation for land permit, institutional arrangement, market chain for peat products, remuneration of external benefits, and perception and capacity of community for cultivation on peat.*

***Keywords****: Livelihood, peatland, paludiculture, special pilot economic zone, Indonesia.*

## 1. Introduction

The peatland ecosystem is an important ecosystem in sustainable development, particularly in the land use sector. It provides multiple ecosystem services for rural livelihoods, and plays a vital role in stabilizing water flows, preventing devastating peat fires, enriching soil nutrients, providing clean water, and offering carbon storage for climate change mitigation (Bonn *et al*., 2016). Indonesia harbors some 36 percent of the world's tropical peatlands, which makes the country holds the second-largest peatland area in the world (CIFOR, 2019; Warren et al., 2017). About 5.8 mega hectares (Mha) of peatlands is under business permits for industrial plantations and palm oil cultivation (Murdiyarso *et al.*, 2011). Large-scale developments in peatlands are generally justified for poverty reduction. However, some of the developments will have negative socio-economic and environmental impacts. Many development schemes by the government and the private sector have been accused of trespassing on customary (*adat*) rights and have been resulted in peat fires and smog. As a result, local communities

are greatly affected by high rates of respiratory diseases, losses of crops, impacts on transport and tourism, and losses of natural resources (Silvius & Diemont, 2007; World Bank, 2020). This situation has contributed to poverty for the communities around peatlands. Therefore, serious attention is required to the local economy and environmental protection of tropical peatland, to create a role model for sustainable peatland management.

Integrating sustainable peatland management with the local economy requires strategies that fully integrate socio-economic factors as they influence pressures on peatlands, help interpret the impacts, and justify suitable interventions to deliver the sustainable management of peatlands (Mäkipää *et al.*, 2018; Rawlins & Morris, 2010). This idea is related to the notion of inclusive economic growth in order to provide alternative and/or sustainable livelihoods for the communities around the peatlands. In some Indonesian provinces (such as Riau and South Sumatra) that have large peatlands, the ratio of population dependency is estimated to become optimum by 2022-2025 (BPS, 2019). Considering this situation, the acceleration of the revitalization of people's livelihoods in the peatlands is required.

Following Government Regulation of Indonesia No.71/2014 regarding peatland protection and management, the Peatland Restoration Agency (BRG) was established in 2016 to restore degraded peatlands in seven priority provinces. One of these restoration activities is the revitalization of people's livelihoods in surrounding peatlands, thereby reducing the pressure that they exert on the peatlands. Until 2019, the BRG and NGOs have implemented more than 600 units of livelihood support for the communities surrounding peatlands (PRIMS, 2020). However, studies in Riau, South Sumatra, and Central Kalimantan found that many of those units were not delivered to the communities that derive their livelihoods from peatland but, rather, benefited village government officers and their peer group (Daeli, 2020; Januar, 2020; Kartodihardjo et al., 2018; Pantau Gambut (2018). Thus, restoration activities have not yet revitalized the livelihoods of the people who depend on peatlands (Budiman, 2019b; Kartodihardjo *et al.*, 2018; KPRGSS, 2018). Therefore, many local people still put environmental pressures on peatlands that make the area vulnerable to fires (Budiman, 2019a; Medrilzam *et al.*, 2014). This study aims to explore alternatives and comprehensive strategies to revitalize people's livelihoods in (the areas surrounding) peatlands, using the adaptation of the Special Pilot Economic Zone (SPEZ) concept, based on the sustainable management of the peatland ecosystem.

## 2. Material and Method

### 2.1. Conceptual Framework: The SPEZ for Sustainable Development

The SPEZ is one of the types of Special Economic Zones (SEZ). An SEZ is a zone or an area that has the excellence in geo-economics and geo-strategy to accommodate economic activity. The development of SEZs focuses on the strategy of business collaboration (Farole & Akinci, 2011). Four characteristics define the SEZ concept. (1) It is a geographically delineated area, usually physically secured; (2) It is regulated by a single management agency or administration; (3) It offers benefits to investors within the zone; and (4) It has a separate customs area (duty-free benefits) and streamlined procedures (UNCTAD, 2019). Additionally, the SEZ shares the following features (*see* Figure 1):

a. Special regulatory regime: zones normally operate under foreign investment;
b. Public service: zones are normally serviced with efficient customs, fast-track registration and licensing, often through "one-stop shop" services.
c. Infrastructure: zones have much better and more reliable infrastructure such as roads, power, and water, as compared to the domestic economic environment; and
d. Fiscal incentives: the zone's investors, particularly its anchor investors, often enjoy capital freedoms and certain levels of tax incentives and subsidies (UNCTAD, 2019).

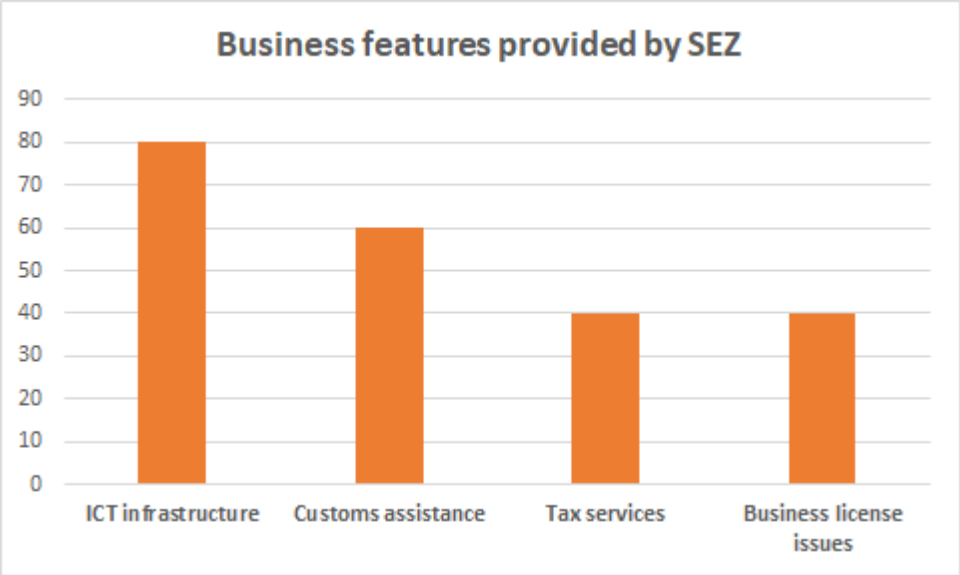


**Figure 1.** Business features provided by 100 Special Economic Zones (SEZ) Worldwide (Source: Adapted from UNCTAD, 2019).

There are several types of SEZs (see Table 1). This study explores the particular model of SEZ that pays special attention to small-and medium-scale business activities. We found that the SPEZ can be an option for the establishment of a sustainable economic zone. Recent changes in international trade rules, and the growing interest of international businesses in issues related to corporate socio-environmental responsibility, means that SPEZ management have an opportunity to explore investment-promotion strategies that relate to social, environmental, and governance performance and sustainability. Adaptation of the SPEZ for the sustainable development has previously been done in the case of coastal ecosystem-based management (Nobre & Ferreira, 2009).

**Table 1**. Types of special economic zones.

| Selected Economic Zone | Description |
|---|---|
| Industrial zone or industrial estate | Facility promoting colocation and clustering of industrial activity through the provision of low-cost land, infrastructure, and on-site services. Usually covers industrial and service sectors, and targets both foreign and domestic investors, providing an array of incentives and facilities. |
| Export processing zone | Specialized industrial estate located outside the customs territory; predominantly oriented to export production. Enterprises located there are allowed to import capital equipment and raw materials free from duties, taxes, and other import restrictions. |
| Free zone (*e.g.*, free industrial zone, free trade zone) | A designated and secured area in which commercial and industrial activities are carried out. Investment projects often benefit from incentives, and usually are for export purposes. Customs checkpoints control the movement of goods at entry and exit points. Zones can also cover commercial, trading, and entrepot trade activities. Many are located near a port. |

| | |
|---|---|
| Science and technology park | Facility in an area that supports and promotes technological development, including through research and attracting technology-based companies. The purpose is to facilitate innovation and knowledge-based economies. Such parks provide an environment and ecosystem (*e.g.*, proximity to research institutes, universities) that is conducive to innovation, knowledge-based work, and research and development (R&D) activities. |
| Special pilot zone | Designed to experiment with economic reform measures and provide demonstrative effects. |
| Border special economic zone | An SEZ located in an area bordering neighboring countries to facilitate investment, trade, services, and production linkages. |
| Regional economic corridor | Large economic area involving a number of contiguous states or provinces. Their development draws on the sectoral and geographical strengths of the constituent areas to support economic clusters. |

Source: Adapted from ASEAN Secretariat and UNCTAD (2017) in UNCTAD (2019).

In Indonesia, the government is targeting 17 SEZs that are divided into two sectors: tourism and industry (*i.e.*, energy-mineral resources and fisheries). This plan focuses on large-scale industries and stimulating massive economic growth. This kind of SEZ is concerned about oppressing the land tenure of the community. In addition, there are also lax environmental indicators regarding SEZs (Sihombing *et al.*, 2015). Therefore, the SPEZ proposes to fill these gaps, particularly regarding the socio-environmental outcome of the SEZs. The SPEZ for sustainability can attract international investors that are interested in establishing sustainable businesses and promoting a circular economy. This SPEZ can potentially address market failures or binding constraints faced by peatland products (Budiman et al., 2020; Goib et al., 2019), to support revitalization of rural livelihood.

There are two benefits and key success factors for SPEZs, relating to organizational and economic factors. From the perspective of organizational success factors, an evidence-based approach should be used to demonstrate why the area constitutes an appropriate form of policy intervention. A legal and regulatory framework should specifically consider investor requirements. The formulation of working groups can be a key tool in ensuring that the full range of issues and opportunities that an SPEZ generates is captured as well as ensuring lateral support from relevant stakeholders. How the SPEZ will be governed and how investors will be attracted and serviced should be clearly defined. This may include the establishment of an oversight body. Investment promotion agencies or 'one-stop shops' are an effective tool for targeting inward investment in SPEZs and for facilitating a more attractive environment for potential investors (Carter & Harding, 2010).

For economic success factors, a robust feasibility study is required to ensure that the comparative advantages of the region or site are fully utilized. That particular study should also consider the key challenges and risks. When designing an SPEZ, consideration should be given to trade policy, strategic and sectoral focus, zone typology, policies on domestic participation, and policies regarding access to the local market to ensure favorable conditions for facilitating backward and forward linkage between the SPEZ and the domestic economy. The success of the SPEZ is increasingly intertwined with the state of the local economy. To fully benefit from zone programs, governments and zone management need to consider local comparative advantages as they target priority sectors. There should be a clear vision from the inception of an SPEZ on which economic impacts are being targeted and the extent of their

impacts. These should be monitored on a regular basis to ensure that targets are continually being met (UNCTAD, 2019).

The SPEZ can support local economy on peatland through the paludiculture practices. Paludiculture is the sustainable cultivation in rewetted peatland. One of the challenges of paludiculture is a lack of market demand for its products (Wim Giesen, 2015; Wim Giesen & Nirmala, 2018; H. L. Tata, 2019). Establishment of the SPEZ on peatlands has potential to support the market creation of paludiculture products.

Successful SPEZs use a "holistic" or "systematic" approach. This requires strong government support and well-coordinated government commitment as part of the long-term national development strategy. It should be a prototype design for broader national reforms toward sustainability. The main stakeholders must establish sound legal and institutional frameworks that are both strong and long term. Policy continuity and the adequate provision of various public goods and services must also be ensured. At the same time, the close coordination between the central and provincial/local governments and clarity regarding their respective roles are very important for the smooth implementation of the various programs. Such protection and certainty for developers and investors will promote attracting the proper investments (UNCTAD, 2019).

A strategic location with sound infrastructure is needed, equipped with buffer zones to protect from unpredictable risks, such as political setbacks or interference and land speculation. The SPEZ should have strong commercial viability and significant economic and social returns, as well as an awareness of potential environmental concerns, likewise a willingness to address them in order to create an environmentally sustainable operation. Finally, the establishment of an SPEZ should lead to the establishment of businesses with social and environmental standards (Carter & Harding, 2010).

### 2.2. Methodology

This study employs a mixed method between spatial, qualitative and quantitative data from literature reviews, document reviews (policy documents, project reports), open-source web application, interviews with key stakeholders, and direct observations in the field and in meetings related to the topic of this study (*see* Table 2). This research utilizes the case study methodology to examine peatland management in the Indonesian provinces of Riau, South Sumatra, and Central Kalimantan. These three provinces have a large area of peatlands and have become a prioritized area by public and private stakeholders for the establishment of sustainable peatland management. Data collection such as observation and interviews were done with key stakeholders in national level and in case study areas, such as peat experts, policymakers, non-governmental organizations (NGOs), concession holders, and the communities surrounding peatlands.

**Table 2.** Data Collection

| Method | Sources | Topic List |
|---|---|---|
| Literature Review | Journal articles and book chapters | SPEZs, sustainable peatland management, paludiculture, livelihood revitalization |
| Document Review | Policy documents, project reports | Protection and management of peatland, peatland restoration |
| Interviews | Key stakeholders in national level and case study areas | SPEZs, sustainable peatland management, paludiculture, revitalization of livelihood, peat care village program/*Desa Peduli Gambut (DPG)* |
| Direct Observation | On peatlands and meetings about peatland management | SPEZs, sustainable peatland management, paludiculture, livelihood revitalization |

Data analysis utilizes an interpretative approach to multiple forms of data collected (Creswell & Creswell, 2017). Various data from different sources were organized to prepare the structure of the evidence. These data were organized through transcription, scanning materials, and typing-up field notes to gain a general understanding and sense of the evidence. Later, in order to conduct a more detailed analysis, a coding process was undertaken to generate a description of the situations and themes for analysis based on the SPEZ framework utilized in this study.

The coding process is a core activity of the research (Silverman, 2015). In this study, the coding was done using NVivo software. Collected data were organized into several keywords based on the research objectives and conceptual framework. The first coding was performed on interview transcripts, observation notes, policy documents, and program/project reports in order to analyze the general model for designing an SPEZ on peatlands, based on the SPEZ concept, sustainable peatland management, and lessons learned from previous peatland management in Indonesia. Afterwards, this process was continued with a second coding, performed in order to analyze the suitability of the model to be implemented in three case studies of three specific provinces which are South Sumatra, Riau, and Central Kalimantan. The final phase consisted of the data interpretation, which resulted in the ultimate research findings.

## 3. Results and Discussion

This section is divided into two parts. The first part analyzes the general model for the strategy of designing a SPEZ for the purpose of sustainable peatland management, particularly for the revitalization of rural livelihood. The second part is testing the model in the context of real peatland situations in three provinces: Riau, South Sumatra, and Central Kalimantan.

### 3.1. Special Pilot Economic Zone (SPEZ) for Sustainable Peatland Management

This part is divided into two sub-sections. The first sub-section analyzes two planning phases of the SPEZ on peatlands. The second sub-section analyzes the five phases of implementation of the SPEZ.

#### 3.1.1 (Spatial) Planning of an SPEZ on Peatlands

The SPEZ on peatland requires a landscape based SPEZ that is managed and governed based on the boundaries of a particular landscape, such as peat hydrological unit in Indonesia. This approach has been adapted for sea use management and was started by preparing a spatial plan. Over the past 10 years, the evolution of (marine) spatial planning and ocean zoning has become a crucial tool for making ecosystem-based sea use management a reality (Douvere, 2008). In the context of Indonesian peatlands, we propose two following steps to plan the SPEZ;

*a. Selecting location based on the status of the area, its hydrological unit, and its ecosystem function;*

Peatland spatial planning is often overlapping with land use and forest spatial planning. In Indonesian forest spatial planning, one of the classifications is a state forest area (or *Kawasan Hutan Negara*), which means that Ministry of Environment and Forestry is the government authority that has control over this land. The Ministry decides the types of utilizations allowed and not allowed and controls the process of obtaining legal access to utilize such lands (Afiff, 2015). Some peatlands are located in state forests. In general land use planning, deep peat areas (more than 3 meters) are categorized as protected areas and shallow peat areas (less than 3 m) are used for cultivation or production. The latter can be potentially utilized for an SPEZ.

Spatial planning of the SPEZ on peatland should also consider its peatland hydrological units (PHU/KHGs). A PHU used to consist of the multiple peatland ecosystems that have multiple uses of the land that often contain risk of conflicts among users and the environment. Some peatland

ecosystems may be appointed as production area, but attention to the need to conserve ecologically and biologically sensitive parts in the area must be taken into account in selecting location for the SPEZ.

A consistent term, such as sustainable peatland management or the SPEZ on peatland, is required for this planning phase. It must be decided how it will be defined, what its core objectives are, and how livelihood revitalization as part of the plan. It is important to make the plan seriously considered at the highest levels of policymaking and decision-making at multiple administrative levels. It requires strong government support and well-coordinated government commitment as part of the long-term national development strategy. Larger jurisdictions can provide important conflict resolution mechanism (Ostrom *et al.*, 2012).

Planning the SPEZ within a PHU is a continuous, iterative, and adaptive process. This spatial planning has the potential to provide a more practical way to implement sustainable peatland use management, most importantly because it recognizes the heterogeneity of peatland ecosystems, focuses on influencing the behavior of humans and their activities over time, provides a management framework for new and previously inaccessible scientific data, mitigating conflicts, makes compatibilities among human uses more visible and therefore comprehensible, and has the potential to guide management toward integrated peatland use management.

Planning an SPEZ for peatlands can be integrated with restoration planning based on peatland hydrological units, that is implemented by authorities such as the Peatland Restoration Agency (BRG) and Ministry of Environment and Forestry (KLHK) in Indonesia. This integration can potentially make the SPEZ able to improve and to integrate existing restoration activities in the country, such as the revitalization of livelihoods and peat care village program that also provides livelihood support for community.

Furthermore, the SPEZ location must be strategic with sound infrastructure, equipped with buffer zones to protect from unpredictable risks, such as political setbacks or interference and land speculation.

*b. Identifying peat suitability for cultivation based on its biophysical profile.*

The strategic location for the SPEZ also has to be matched with paludiculture concept or sustainable cultivation on peatland. After the determination of the location from spatial planning, identification of biophysical profile of the peatland is required. This phase is important to have biophysical information such as type of peat, its pH, soil fertility, and water management system in the area. This information is necessary for determining peatland suitability and selecting potential commodity or paludiculture species to be cultivated on the SPEZ.

These two steps will provide evidences to demonstrate why the area constitutes an appropriate form of policy intervention of SPEZ.

### 3.1.2 Phases in implementing the SPEZ

After determining a suitable location for the SPEZ, we propose five phases to implement the SPEZ on peatland that consider the trade-off between its economic potential and the peatland ecological services. These phases are adapted from the framework of the SPEZ and lessons learned from existing restoration activities (revitalization of livelihoods and Peat care village or DPG programs) in Indonesia. The order of these phases is flexible and can be adjusted according to the capacities and capabilities of local stakeholders in the area. In some places with greater local capability, the first phase can be community engagement. But, in the following explanation, we assume that the local community still has a low capacity to design the SPEZ, thus the community engagement is reserved for the last phase.

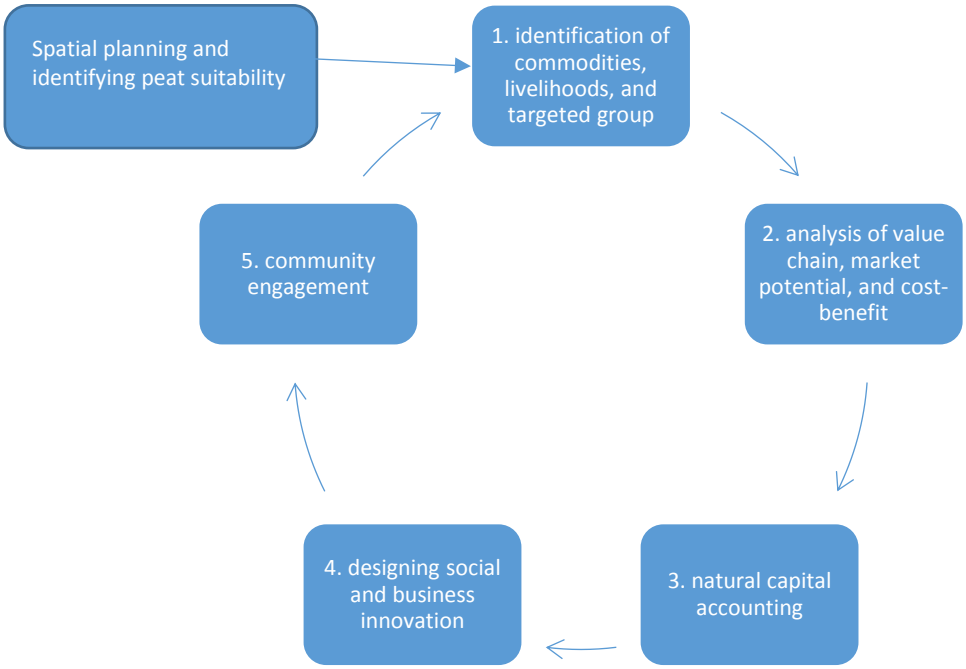


**Figure 2.** Phases of strategy to design special pilot zone for bioeconomy on peatlands.

*a. Identification of target group, commodities, and alternative livelihood*

The first phase is the identification of the target group. The target groups could be part of the local community who rely on the peatland for their main source of income. This group will be approached and be prepared to manage the SPEZ. The profile and capacity of the target group become consideration for the following step: to identify suitable commodities or species to be cultivated for livelihood of the target group. This commodity selection must follow the paludiculture principles that are aligned with the concept of peatland restoration. The listing and mapping native peat species is required (Budiman et al., 2020; Wim Giesen & Nirmala, 2018). Beyond paludiculture, alternative livelihoods, such as fishing, could also be identified. These efforts can be coordinated with existing livelihood revitalization activities being carried out by the competent institutions for peatland restoration such as government, NGOs, and private companies. In South Sumatra, Jambi, Central Kalimantan, and Papua, annual planning (RTT) of peatland restoration has listed potential alternative livelihoods for the communities around peatlands. Rice farming with zero burning land clearing technique is listed as one of alternative livelihoods. In the RTT of South Sumatra, a seasonal calendar is also prepared to provide information about the cultivation and harvest periods for each commodity (KPRGSS, 2018). Data about paludiculture species in Indonesian provinces is available on the PRIMS platform and Figure 3.

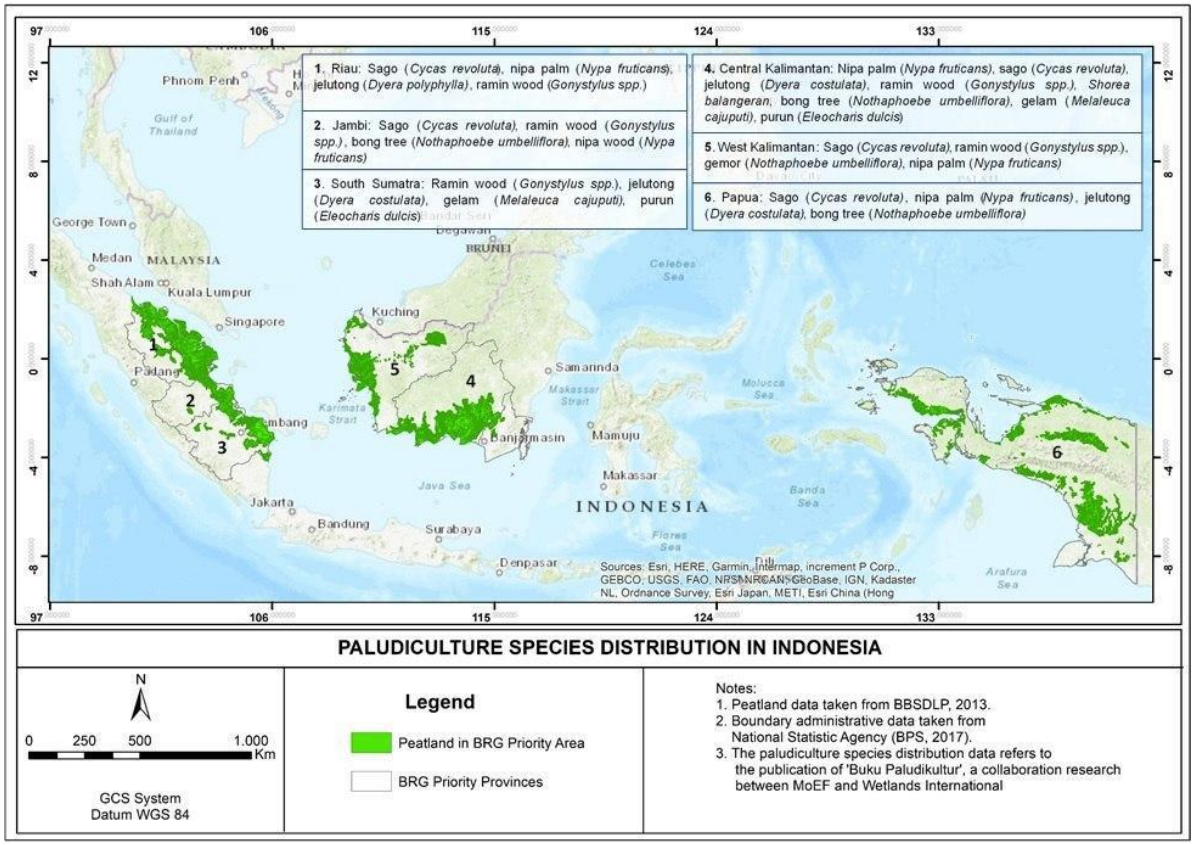


**Figure 3.** Distribution of paludiculture species in Indonesia (Source: Hesti Lestari Tata & Susmianto, 2016).

*b. Analyzing the market potential, value chain, and cost-benefit analysis*

The second phase is to analyze the market potential, value chain, and cost-benefit analysis of the selected commodities and alternative livelihoods. Market potential can be observed from research about willingness-to-pay from consumers and other actors along the products' value chains. In Jambi and Riau, sago (*Metroxylon sagu*) is an example of a paludiculture species with high economic value. In Central Kalimantan, *jelutung* (*Dyera polyphylla*) is a commercial species with high economic value from its wood. These potential products can be combined with another potential alternative livelihoods in the area, such as eco-tourism or local fishery, which have market potential to supply food for local culinary businesses.

During the first and second phase, it is important to carefully select suitable paludiculture species and assess their markets, value chain, and its cost-benefit analysis. In South Sumatra and Riau, pineapple is often considered a suitable species on the peatlands. Yet, according to paludiculture principles, the pineapples is not a suitable species for sustainable peatland management because its cultivation drains peat (W. Giesen, 2013; Wim Giesen, 2015). Pineapple cultivation on peat in South Sumatra is also found to cause the oversupply of the pineapple product and reduce its market price by 50%.

*c. Natural capital accounting*

Despite its potential benefits, the SPEZ on peatlands also have the risk of triggering over-exploitation of production on peatland. To mitigate this risk, the third phase conducts a natural capital accounting of the SPEZ. Natural capital accounting is the process of calculating the total stock and flows of natural resources and services in a given ecosystem or region (Hein *et al.*, 2016). Accounting for such goods can be done in physical or monetary terms, to count projected conservation and economic

values in the project area. This phase aims to balance the economic goals pursued by the SPEZ with restoration or conservation goals as part of sustainable peatland management. The result of natural capital accounting will be to provide basic information to design a detailed plan for an SPEZ on peatlands. It will determine the specific commodities and livelihoods to be developed in the SPEZ, in sustainable way. This natural capital accounting completes feasibility study of the SPEZ to ensure that the comparative advantages of the region or site are sustainably utilized.

*d. Social (and business) innovation*

The fourth phase is to design social innovation to run the SPEZ. Social innovation is a combination of business innovation with community initiatives and local best practices (Budiman, 2018; Van der Have & Rubalcaba, 2016). Detailed business processes and strategies, as well as its risk management, are required for the development of paludiculture and selected alternative livelihoods in the area. Started from investment, investment promotion agencies or 'one-stop shops' can be an effective tool for targeting inward investment in SPEZs. For business strategies, the development of paludiculture and selected practices or designed best practices. Particularly: fiscal incentives, infrastructures, and public services. Meanwhile, foreign investment should also be pursued within a relaxed regulatory regime. This, however, should be proceeded with caution, to ensure regulatory measures are well designed and implemented, thus provide positive implication to the conservation of peatland ecosystem and community welfare (Kartodihardjo, 2020). This implies that pursue for social and business innovation should also call for monitoring and supervision on the relevant social and environmental indicators.

Social innovation needs an institutional arrangement. Development of the business model for the SPEZ requires multi-stakeholder institutional arrangement. It involves two characteristics: (1) Strengthening multi-stakeholders' partnerships and local/community organizations to govern the SPEZ; and (2) Participative schemes for integrated monitoring and evaluation. Institutional arrangements for the SPEZ must link larger and smaller units of institutions. Large units are important in providing accurate scientific information to the smaller units; as well as providing technical assistance in partnership and mechanisms for monitoring and evaluation (Ostrom *et al.*, 2012). The bottom-up and top-down approach should be combined.

Multi-stakeholders' partnerships can be in forms of a working group that involves local communities, concerned non-profit organizations, private sectors, and government actors. The partnership could utilize the existence of existing restoration activities, such as DPG (Peat Care Village) in Indonesia. It helps to build connections between the government and civil society groups to mainstream the peatland restoration agenda and build the awareness of sustainable peatland management amongst members of the society. Data about DPG and its stakeholders are available on the PRIMS platform.

The government can also support the innovation by providing fiscal and non-fiscal incentives for the SPEZ. Fiscal incentives involve tax incentives and financial support for sustainable cultivation. This scheme must be equipped with monitoring and evaluation mechanisms amongst the stakeholders. Non-fiscal incentives should include legal certainty regarding the issuance of land permits, and easy access to loans for small-medium businesses and local farmers.

*e. Engagement in the wider community*

The last phase is ensuring the active participation of the (wider) community in managing, developing, and monitoring and evaluating (M&E) the SPEZ. This can be done by providing assistance for building the technical and organizational capacity of farmers' groups and local cooperatives. This idea can also be linked to existing programs that have the same objectives, such as DPG (BRG, 2016). The SPEZ and DPG can provide workshops about paludiculture, livelihood innovations, and

organizational/business management for community organizations. Such content should include decision-making learning from grassroots communities. These workshops should be done for long term period and supported with regular assistance from NGOs to community organizations. Inclusive participation of the community in managing and conducting M&E might potentially support the sustainability of the SPEZ. The communities will benefit from developing knowledge and behavioral changes simultaneously through a series of co-learning processes with multiple partners (CIFOR, 2020).

In implementing all the phases detailed above, a different local context must be considered by the stakeholders. Each phase must be completed with cultural sensitivity in order to gain social acceptance and to avoid conflicts. To upgrade the content of the SPEZ, the five phases in this framework can be completed in cycles. Then, a robust exit strategy for all stakeholders who assist the community is required to ensure the sustainability of the SPEZ's impact. The exit strategy must be accompanied with comprehensive monitoring and evaluation that ensures the comparative advantages of the SPEZ are sustainable. To scale up, knowledge from success stories and adaptive learning of the SPEZ can serve as benchmarks to design another SPEZ in other peatlands.

### 3.2. Challenges and Opportunities to Design the SPEZ

This section analyzes feasibility of designing the SPEZ in three provinces: South Sumatra, Riau, and Central Kalimantan (Table 3). This concept testing is analyzed by looking at challenges and opportunities to implement above mentioned phases from various aspects such as economy, technology, environment, and social politics. In the three provinces, the environmental challenge is to modify existing water management system for paludiculture practices. While Riau is found as the most challenging area to implement overall phases of the SPEZ.

#### 3.2.1 South Sumatra: Market chain of *Purun (Eleocharis dulcis*) and Natural capital accounting for agro-sylvofishery

In South Sumatra, we found that the SPEZ can potentially be established in peatland ecosystem in the peatland hydrological unit (PHU) of Sugihan-Lumpur, Sibumbung-Talangrimba, and Burnai-Sibumbung (*see* Figure 4). In this PHU, there have been several livelihood activities such as *purun* business and agro-silvofishery that can be improved with the SPEZ.

*a. Purun weaving*

Linked to the phases to develop the SPEZ, two spatial planning phases and the first implementation phase of identification of the target group, commodities, and alternative livelihoods have been done partly by stakeholders in South Sumatra using previous studies and projects related to *purun.* Those identified data can be utilized to finalize the first phase of the SPEZ in its related peatland ecosystem.

In PHU Burnai-Sibumbung (Pedamaran village), Sugihan-Lumpur (Meranjak, Pangkalan Lampam, Pampangan village) and Sibumbung-Talangrimba (Tanjung Lubuk village) in the OKI regency, *Purun* has been utilized by communities to produce woven mats and other products. This means that *purun* is a potential commodity for the SPEZ. In those villages, there have been about 30 community groups for *purun*. They are divided into two types of group: (1) Farmer groups and (2) Weaver groups. Farmer groups consist of farmers who collect *purun* on peatlands. This group sells *purun* to the weaver group to be woven into mats and other products such as slippers and bags (Goib *et al.*, 2019).

**Table 3.** Challenges and opportunities to implement the SPEZ in three provinces in Indonesia

| | South Sumatra | Central Kalimantan | Riau |
|---|---|---|---|
| Peatland Hydrological Unit (PHU) | Burnai-Sibumbung | Katingan-Mentaya and Kapuas-Kahayan | Siak-Kampar |
| Potential commodity and alternative livelihood | • *Purun* (*Eleocharis dulcis,* • *Shorea belangeran,* • *Ipomoea aquatica* (kale) • Inland fishery with *Helostoma teminckii* | • *Melaleuca sp* • *Calamus caesius Blume* | *Metroxylon sagu* |
| Challenges | • Developing market chain • Natural capital accounting • Adopting full paludiculture principles | • Socio-political constraints, land conflict • Legal permit | • Lack of knowledge and interest to paludiculture species • The community preference of conducting monoculture practices • Uncertain market price situation |
| Opportunities | Existence of various 'compromised' paludiculture projects and livelihood supports | Existence of multi-stakeholder arrangement for restoration activities | Local community used to practice commodity swap, thus there is potential to re-swap to paludiculture species |

From the value chain perspective, methods of *purun* collection need to be improved. Currently, *purun* is still gathered from the wild on peatlands. This method makes the operational costs high and timely for *purun* collection by farmers. The managed cultivation of *purun* is does not exist yet. More research is required to study the feasibility of *purun* cultivation in order to increase the efficiency of the operational cost of *purun* collection. This research gap links to the second implementation phase, to analyze cost-benefit of *purun* related products.

A bunch of *purun* is sold for about 5,000 Indonesian rupiah (IDR) and can be woven into two sheets of mat. The price of a mat is about 35,000 IDR. The sale of *Purun*-woven products currently still depends on purchases by the government. Only a small amount is sold to the open market. This challenge threatens the sustainability of communities' incomes. A comprehensive assessment of market demand and the market chain of *purun* products are required. Beyond woven products, *purun* also has the potential to be produced as an organic drinking straw. Currently, there is an initiative from the Peat Care Village *(Desa Peduli Gambut* - DPG) project called '*Rawang* peatland'. This initiative aims to support the marketing of peat products. This initiative can be linked to the *purun* business.

The SPEZ of *Purun* still needs to work more on establishing social and business innovation. Its current model is still business as usual. The *purun* weaver group in the villages used to facilitate training and technological and financial support for weavers. The group often receives donations from national and international funds. The group also has opportunity for knowledge transfer amongst *purun* weavers,

through the internship programs by the government. The existence of these arrangements is an opportunity to engage with the wider community to boost the further development of the *purun* business. The challenge in this situation is ensuring equal access for each weaver in the village to receive the support delivered by the group. In some cases, the group is dominated by a peer group of village government officers. This power relationship issue needs to be solved by promoting transparency in management at the local level.

Furthermore, the third implementation phase (natural capital accounting) still need to be conducted for *purun* business to be a potential SPEZ. Risk management should be considered. There is a risk that *purun* farmers can trigger fires during their *purun* gathering on peatlands during the dry season. Specific intervention is required to mitigate this risk.

*b. Agro-sylvofishery*

Besides *purun*, another potential concept for the SPEZ in South Sumatra is agro-sylvofishery. Agro-silvofishery merges adaptation of the concept of paludiculture with fishery practices (Bastoni, 2019). This concept is developed by the Balitbang LHK (Research institute by The Ministry of Environment and Forestry) Palembang in Pedamaran sub-district, OKI regency. Currently, Balitbang LHK has three demonstration plots of agro-silvofishery, using paludiculture species such as *belangeran* and kale. Balitbang LHK argued that this concept is an example of integrated peatland restoration.

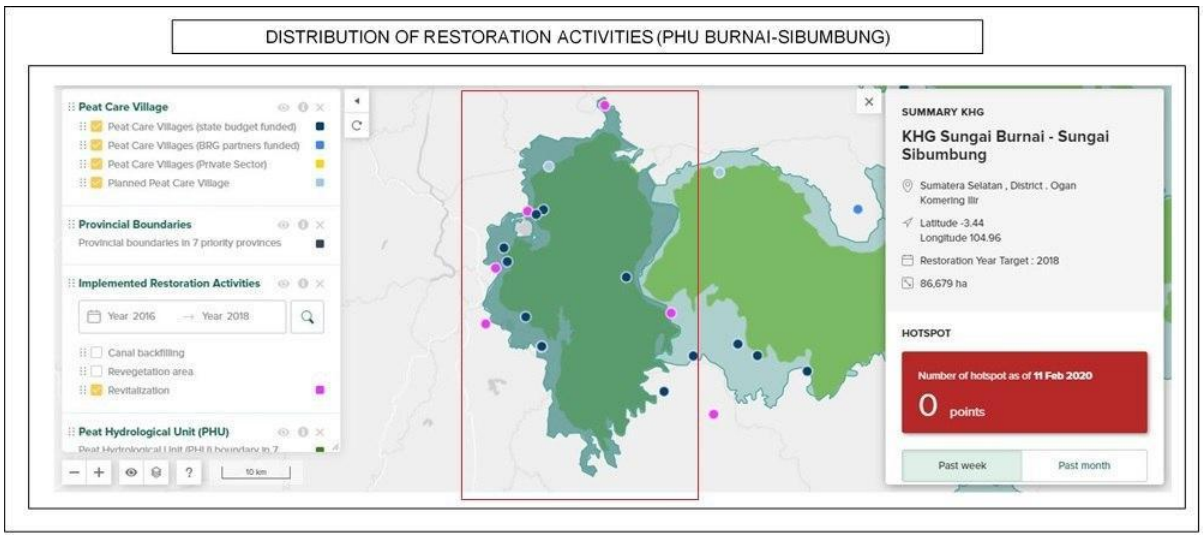


**Figure 4.** Potential SPEZs of agro-silvofishery and *purun* can be linked to the existence of the DPG and livelihood revitalization activities in a peatland ecosystem, *e.g.*, in The Peatland Hydrological Unit (PHU/KHG) of *Sungai* Burnai – *Sungai* Sibumbung in the South Sumatra Province (Source: PRIMS).

The agro-silvofishery project has done two spatial planning phases of the SPEZ and the first implementation phase (identification of the target group, commodities, and alternative livelihoods). Yet, there is still an information gap in the second implementation phase, to analyze the value chain, market demand, and conduct a cost-benefit analysis of agro-silvofishery products. More studies are required to fill these information gaps.

Regarding the third phase of natural capital accounting, several environmental risks from agro-silvofishery practices have been identified. The creation of new canals or ponds for fisheries might contribute to draining the peatland. The SPEZ must consider ecological principles of peatlands that have to be wet. Therefore, the adoption of agro-silvofishery by the SPEZ should not create new

canals/drains for fisheries. Fishery practices can utilize existing canals that have been blocked. Detailed natural capital accounting for agro-silvofishery practices are needed.

For the fourth and fifth phases, designing social and business innovations with active community engagement, these can be built up by integrating the agro-silvofishery with *purun* business within the SPEZ. Currently, these initiatives have been existing in the province and each project has its own design, such as the agro-sylvofishery by Balitbang LHK and the *purun* project by the Purun Institute, a local NGO in the Pedamaran sub-district in the OKI regency. These designs need to be developed further and to be integrated with existing peatland restoration activities within the PHU (*see* Figure 4). Possibility for these integrations rely on political will of related stakeholders.

### 3.2.2 Central Kalimantan: Socio-political constraints in PHU Katingan-Mentaya and Dryland species in PHU Kapuas-Kahayan

*a. The Katingan-Mentaya project*

A potential SPEZ in Central Kalimantan exists in the PHU of *Sungai* Katingan – *Sungai* Mentaya, within the regency of Katingan and East Kotawaringin (Figure 5). The majority land classification in the Katingan regency is a state forest, which is approximately 77.2% of the total land area. The government divided this state forest area in Katingan into three major zoning functions which consist of: production forest (approx. 37.1%), protection and conservation forest (approx. 43.8%), and conversion forest (approx. 19.1%) (Pemda Katingan, 2014 in Afiff, 2015). This zoning is utilized by The Katingan Mentaya Project for planning a restoration project. The Katingan Mentaya Project is a best practice of bioeconomy activities on peatland in Kalimantan. In Katingan regency, the project itself is located in two sub-districts, which are Mendawai and Kamipang (Afiff, 2015). This project had been partly through the spatial planning phases of the SPEZ.

The Katingan Mentaya Project was established by PT. RMU (Rimba Makmur Utama), a concession holder. This project attempts to explore landscape restoration, including peat. The goal of the Katingan Project is to develop a sustainable land use model through the reduction of deforestation and land degradation, habitat and ecosystem restoration, biodiversity conservation, and growing economic opportunities for the local people. This goal is aligned with the goal of the SPEZ.

The first implementation phase, to identify the target group, potential commodities, and livelihoods, was already done by the project. The project has total beneficiaries of the partnership with about 840 households. Potential commodities include a sustainable wood product (*Melaleuca sp*.) and a non-timber forest product. The livelihood activities cover agro-ecology farming and developing coconut sugar and rattan-based products (CIFOR, 2014; Indriatmoko et al., 2014).

The second phase, to analyze the value chain and market demand, has also been done by the RMU in partnership with the community and other stakeholders. The livelihood activities connect to the broader market because the RMU collaborated with a non-profit organization to execute activities such as supporting quality improvement of the peatland commodity, providing value-added products, and being an off taker of local products and innovation.

The Katingan-Mentaya project does not only focus on economic outcomes, but also providing environmental services. The project pays attention to several environmental aspects such as climate and biodiversity (Figure 6). First, through the climate aspect, this project primarily continues to reduce greenhouse gas (GHG) emissions by integrating ecosystem restoration into carbon trading, so the project also derives financial outcomes from the carbon market. This can be seen as a business innovation for the SPEZ. Second, to protect the indigenous biodiversity of the landscape, PT RMU, as the holding project, is actively engaging with research and development (R&D) activities and biodiversity conservation and protection. To date, this project has protected and restored approximately 149,800 ha of peatland forest ecosystem (Indriatmoko *et al.*, 2014). Data from these activities can be

utilized for detailed natural capital accounting (the third implementation phase) for this project's future development as an SPEZ.

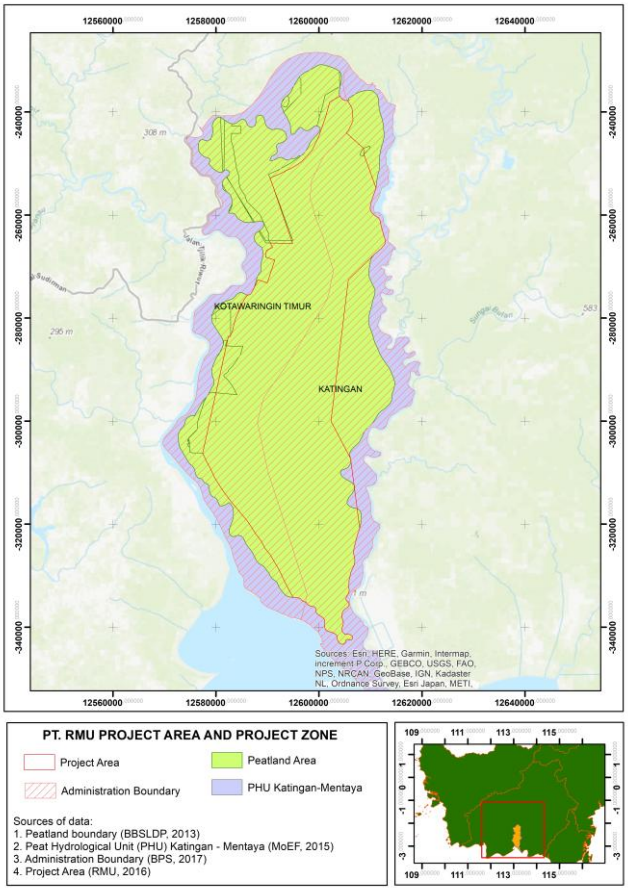


**Figure 5.** Potential SPEZ from the village forest in the KHG Sungai Katingan – Sungai Mentaya (Source: Darusman, 2018).

For the fourth and fifth implementation phases, the Katingan-Mentaya project has done some social innovations and stakeholders/communities' engagements. The project also has been successfully inducing many parties such as the local government, NGOs, and civil society groups to implement sustainable peatland management. It helps to create resilience for livelihoods from the sustainable cultivation of the peatland landscape. The project has been permitting a certain group of people to protect, restore, use, and cultivate a certain peatland ecosystem.

The Katingan project has established its baseline and objectives with the aim of developing and implementing a sustainable land use model. They integrate climate, community, and biodiversity aspects to create an inclusive and sustainable ecological condition (*see* Figure 6) in the Katingan-Mentaya region. By assisting society in escalating a sustainable and ecosystem-friendly commodity, they also reduce GHG emissions through the restoration activities at the degraded ecosystem in the region. The framework below explains the objectives, activities and goals of the Katingan-Mentaya project that are also aligned with the purpose of SPEZ. It integrates biophysical aspects (implementation of canal blocking infrastructure) and improving people's livelihoods thus building resilient communities around peatland areas through a landscape-based approach.

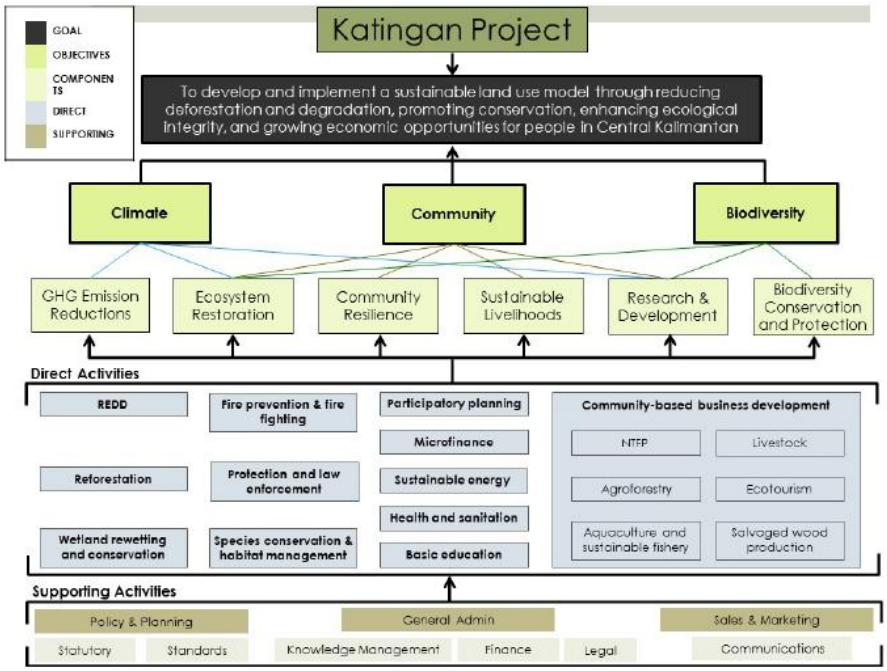


**Figure 6.** The Katingan Mentaya project framework that is aligned with the SPEZ framework (Source: PT RMU, 2017).

To improve social and business innovation in the project, more collaboration among stakeholders is required to establish a marketplace for the society to sell and distribute the peatland commodities. This initiative can be connected to existing peatland restoration activities in the surrounding area (*see* Figure 7). To date, there have been more than 20 activities related to peatland restoration in the area, such as providing alternative livelihoods and capacity building about peatland management.

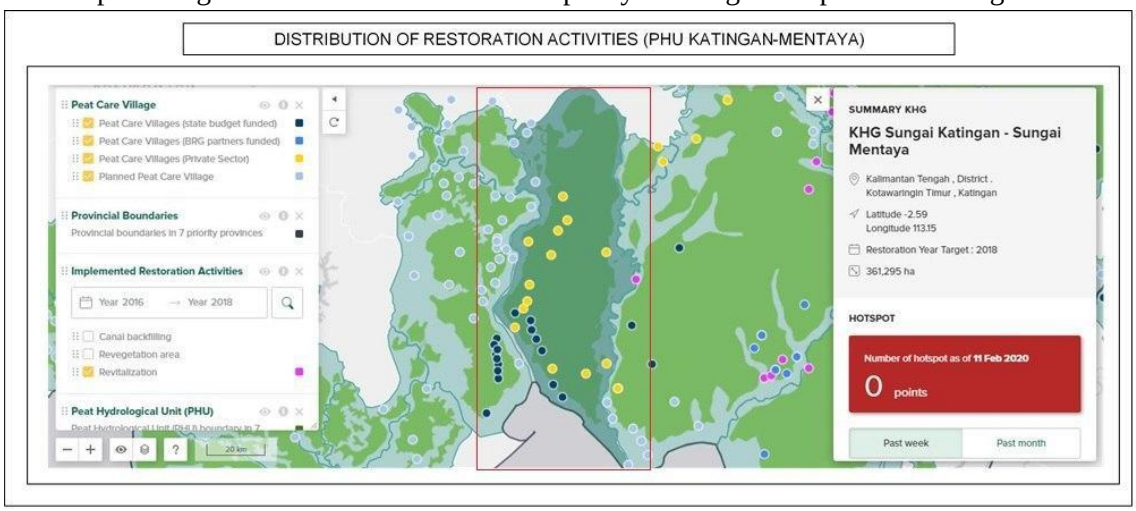


**Figure 7.** Potential collaboration for a SPEZ, between the Katingan-mentaya project with existing DPG and livelihood revitalization activities in the Peatland Hydrological Unit (PHU/KHG) *Sungai* Katingan – *Sungai* Mentaya in Central Kalimantan Province (Source: PRIMS).

However, socio-political constraints remain for the project. Based on the law No.18/2013, no settlements or farming activities can exist inside state forest areas. This regulation demands that even local communities who live inside and adjacent to the state forest area must obtain a permit from the Ministry of Environment and Forestry to access the land, extract timber, or benefit from forest

resources. Thousands of settlements are located inside state forest areas and some indigenous communities have land rights claim within state forest areas. Conflict with local communities emerged because they were not often properly consulted during the demarcation process of state forest boundaries. Therefore, based on state forest law, all these activities (settlements, farming, buildings, plantations, etc.) are illegal. This issue implies that there was a potential error that was done in spatial planning phases of the project. The location is not equipped with buffer zones to protect from risks of land speculation. Errors in initial spatial planning phase are found to have serious consequence to the project implementation.

From the legal perspective, most of the Katingan district has been designated as a state forest area, which means that all permits for development projects within this area must be obtained from the Ministry of Environment and Forestry's national office in Jakarta. The local government, such as the Katingan district, does not have the legal right to provide permits for companies who want to establish plantations or mining in land inside state forest areas. After the autonomy law was passed in 2011, however, the demand for decentralization brought some changes in the process for obtaining permits. Although the Ministry of Environment and Forestry still has full control over permit provision, a company must first get an endorsement from the local government (Afiff, 2015). Providing the SPEZ status to the project may potentially help solve these legal constraints.

*b. Vanilla cultivation*

In another PHU, Kapuas-Kahayan, an alternative livelihood of vanilla cultivation could also has potential for an SPEZ. The local peatland restoration team (Tim Restorasi Gambut Daerah - TRGD) in Central Kalimantan claimed that one of the best practices for the revitalization of peatland community livelihoods is through vanilla cultivation. This activity is done in Anjir Kalampan village. It is done as part of agroforestry and horticulture practices in the village, that are combined with the ecotourism concept (Nurlaili, 2019). In several areas of Central Kalimantan, vanilla is cultivated using different techniques, such as mixing with rubber plantation in Kapuas Kahayan and heterogeneous media in South Barito.

This vanilla idea is still partly in the first phase of SPEZ development. Some scholars have different opinions regarding the suitability of vanilla cultivation on peatland which does not belong to paludiculture species and may require drainage (Budiman et al., 2020; Wim Giesen, 2015; Wim Giesen & Nirmala, 2018; H. L. Tata, 2019). Further research is required regarding vanilla suitability, its value chain and market demand for vanilla products in the area, and natural capital accounting for its ecosystem.

Social and business innovation, and community engagement for this idea also remains absent. There are two challenges for the vanilla cultivation. First is a lack of assistance for the project. Currently, support from the TRGD (local restoration system) is lacking. The TRGD only gathered several farmer groups to be trained in vanilla cultivation and persuaded to switch to vanilla. More continuous assistance by other stakeholders such as the forest management unit (KPH) is hence needed. Second is distance issues between vanilla cultivation area with market that challenges value chain and market chain of the product.

### 3.2.3 Riau: Commodity Swap in PHU Siak-Kampar

PHU Siak-Kampar has the potential for the establishment of an SPEZ. The PHU Siak-Kampar is located between the Kampar River in the South and the Siak River in the North, with an area of approximately 722,929 ha (PRIMS, 2020). There are around 26 villages involved in the DPG (Peat care program) and livelihood revitalization programs in this PHU (*see* Figure 8). The DPGs were initiated in several

villages such as, among others, Kota Ringin, Benteng Hulu, and Penyengat. This assessment is considered as an initial spatial planning phase for the SPEZ in the PHU Siak-Kampar.

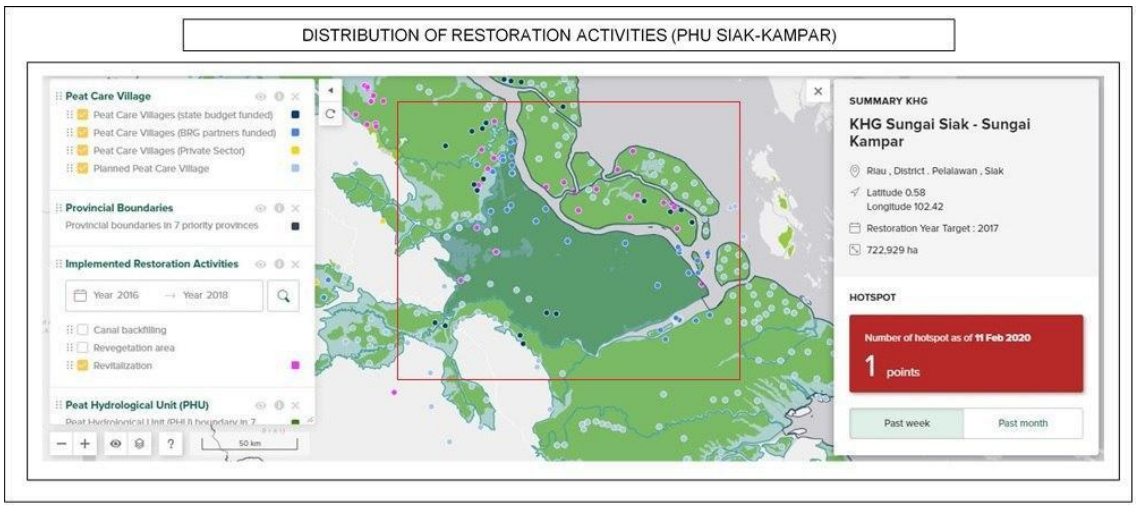


**Figure 8.** Potential collaboration for the SPEZ, between community initiatives and existing DPG and livelihood revitalization activities in the Peatland Hydrological Unit (PHU/KHG) Sungai Siak – Sungai Kampar in Riau Province (Source: PRIMS).

In relation to the first implementation phase for the SPEZ, we found that there is a swap in commodities that are the basis of community livelihoods. Commodities that have economic values and are often swapped are sago, oil palm, rubber, and pineapple. This commodity swap cannot be separated from the dynamics of oil palm as the main commodity of peat. The shift of commodity choices is caused by both market and development changes. This initiative to implement commodity swaps shows that, basically, the preference for planting economically valuable commodities on peat is based on market driven factors and political economy of commodity export. In the past, the oil palm was still low-priced, and middlemen carried out monopolies, which prevented price competition, and in order to sell oil palm they had to use boats to go to the nearest city via the river. This has changed recently, especially since construction have improved road accessibility. This demonstrates that the local community is accustomed to this commodity swap behavior, so it brings opportunity to become an entry point for promoting paludiculture commodities as livelihood. However, sago is the only paludiculture species among abovementioned commodities cultivated by the local community.

Regarding the phase of identification of cost-benefit analysis and social innovation, in Benteng Hulu and Kotaringin village, cooperatives that help distribute agriculture products have been established, and according to the local communities, this has greatly helped to stabilize incomes. Yet, they found that the selling price of oil palm and pineapple is far more stable compared to sago, even though sago is ecologically more suitable and sustainable for peat. In the past five years, the price of sago has been very volatile, thus many feels that they are likely to depend on oil palm in the future. In Penyengat village, even now they prefer to rely on income from the sale of the pineapple harvest. At present, they are slowly changing their commodity preferences from sago and oil palm to pineapple, as well as replacing land use for this crop. This case study in Siak (Riau) shows that its peatland community has not yet really identified paludiculture species and alternative livelihood in the area. Sago is their only identified paludiculture species but has relatively lower price, thus not preferred.

There are at least three main challenges that we identified to implementing an SPEZ in the PHU Siak-Kampar. The first challenge is minimal knowledge about the application of the practice of planting paludiculture commodities for sustainable peat management. Most local communities have been no

longer depend entirely on the use of fire in peatland management. But, some indications, in the form of commodity yields, still show a downward trend, and depletion of the peat layer indicates that there is a lack of knowledge about soil improvement methods and water management system. The second challenge is the habit of conducting monoculture practices, which would be a challenge to introduce paludiculture concept that includes agroforestry examples, for the SPEZ. The third challenge is the uncertain market price situation. The dynamics in contemplation of peat commodity preferences above have shown this, especially for sago that is getting unpopular among local people.

The opportunity to design the SPEZ in Riau is the community behavior on commodity swap. It provides chance to the SPEZ to introduce new commodities, that must come with stable market price and demand.

### 3.2.4 Building connectivity

Analysis in three above-mentioned provinces shows that beyond the technical challenges for planning and implementing the SPEZ, another challenges is political instability for and during the implementation, considering the long process of completing the phases. The SPEZ requires consistent regulations, rules, and programs that are not easily changed with the changing of the person who holds the position. This policy certainty is an important aspect for attracting investors. A successful SPEZ requires a very capable government and a well-functioning market system.

To deal with the challenges, first, the government should employ the cluster approach to build connectivity among business actors. It can be done by inviting credible investors that can develop a trickle-down economic effect to the regions in order to work with small and medium community businesses. This group of investors is interconnected among the actors. They can assess market signals and have a perfect understanding of the domestic comparative advantages and market situations, both domestic and international. They should be able to develop proper supply chain management (to anticipate the projected rise in demand for peat products) and related supporting industries to strengthen the market positioning of the cluster.

The cluster approach can also be done by inviting a business incubator for the small and mid-size enterprises that can analyze, identify and define the peatland commodities to be escalated into a broader market. This can help to trigger a well-functioning market system. This strategy is currently being conducted by Pantau Gambut (2018), a coalition between national and local CSO's concerning on peatland, for *purun* commodity central point in South Sumatra and Central Kalimantan, as well as sago cultivation central points in Riau. Their strategy includes processes of idea generating, resources access identification and market assessment; which follow the SPEZ framework.

Second, enough attention should be given to the connectivity among zone location, across the SPEZ within a regency or province. This connectivity will help with the cluster approach and with mapping actor networks in the region. In addition, it can also trigger collective action among actors to increase their capacities in governing; surrounding infrastructure within and across the zones, and the blend of incentive packages offered by the central and regional governments. Further research is required about stakeholder mapping and social network analysis to find suitable institutional arrangements for the SPEZ regime. These arrangements are important to increase the quality of governance toward and within the zone.

Third, an opportunity can be taken from building connectivity with international stakeholders that have more experience on planning and implementing sustainable peatland management and SPEZ. The partnership can be done by having business collaboration on peatland areas in Indonesia, particularly through paludiculture practices. Connectivity with European countries has the potential to support the SPEZ on peatland. The paludiculture concept comes from northern European countries like Germany. Peatland development in Indonesia is highly influenced by the Netherlands through projects and

advocacy through its NGO, Wetlands International. According to the ASEM Sustainable Connectivity Portal, research connection between Germany and the Netherlands is the top second, with more than 8000 collaborations. The research related to peatlands, specifically on paludiculture development, thus can relate to Indonesia, where Germany has done intensive bi-lateral cooperation, mainly through the GIZ (*Gesellschaft für Internationale Zusammenarbeit*) for climate action. Germany has experienced paludiculture development for about 30 years, from the production and utilization of suitable species, the use of green harvesting machines, measuring ecosystem services and agri-environmental costs, the legal recognition for providing subsidies, stakeholder (farmers or land owners) involvement, and increasing economic viability through integration with bioenergy production. With this experience, there is potential to strengthen the further connectivity between Germany, Indonesia, and the Netherlands to accelerate the development of the SPEZ of paludiculture on peatland in Indonesia.

## 4. Conclusions

We found that the concept of the special pilot economic zone (SPEZ) has the potential to be a strategy for revitalizing the livelihoods of the people surrounding peatland area. This livelihood revitalization can be accomplished in two ways; (1) By transforming traditional cultivation into a more sustainable process; and/or (2) By finding an alternative livelihood outside the peatland. The SPEZ on peatland provides an opportunity to develop a sustainable bioeconomy for communities on peatlands. These ways contribute to reduce anthropogenic pressures on the peatland ecosystem.

Planning an SPEZ on peatland must be started by;

1. Preparing peatland spatial planning (based on landscape approach) that can lead to the legal determination of a particular area as an SPEZ. This phase will provide a clean and clear border and the legal power for the implementation of the SPEZ.
2. The selection of the SPEZ location must be followed with field observation to derive biophysical information of the peatland. This information is important to determine peatland suitability for cultivation.

After the selection of the SPEZ location, five phases of implementation can be carried out.

1. Identification of target group, local paludiculture species, and alternative livelihoods around peatlands.
2. Analyzing the value chain, market demand, and cost-benefit analysis of identified species and alternative livelihoods.
3. Conducting natural capital accounting on natural resources related to selected species and livelihoods.
4. Preparing social and business innovation to develop institutional arrangements and business models that combine paludiculture species and/with alternative livelihoods. This can be done through cooperation of multiple stakeholders such as communities, local governments, NGOs, and concession holders in the area. This partnership will support increasing market creation of peatland products, *e.g.*, supporting exporting products or trading across (peatland) regions.
5. Strengthening the capacity of local stakeholders such as the community to self-govern in the SPEZ. It includes technical capacity, knowledge, and management skills.

Technical capacity involves paludiculture techniques and business operations. Knowledge transfer can be accomplished by adding content regarding paludiculture to farmers' field school programs. Furthermore, this knowledge and urgency about sustainable peatland management can also be integrated in local school programs, particularly, in vocational high school programs.

This study suggests that stakeholders including policymakers to test the SPEZ concept as integrated part of the peatland restoration activities, with landscape approach. The SPEZ framework can also be applicable to concession holders on peatland and to other tropical countries that have

peatland restoration agendas. It has the potential to support sustainable development goals on tropical peatlands. In the long term, collaboration between the SPEZ, paludiculture projects, and peatland restoration is expected to bring further ecosystem service markets, such as the carbon market. Changes in greenhouse gas emissions after restoration and paludiculture implementation can be measured. This potential climate mitigation benefits can bring significant investment opportunities through developing regional voluntary carbon markets from peatlands (Bonn *et al.*, 2014). Bonn (*et al*. 2014) has developed the necessary requirements for developing regional carbon markets to fund peatland restoration. This funding can also have the potential to support the SPEZ of paludiculture on peatlands.

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