

**LAPORAN AKHIR
PENELITIAN SKEMA PENELITIAN TERAPAN**



**COLLABORATIVE EVERYDAY ADAPTATION TO DEAL WITH
PEATLAND FIRES IN THE EAST COAST OF SUMATRA, INDONESIA**

Rijal Ramdani, S.IP., MPA (0506118901)
Susilo Nur Aji Cokro Darsono, S.E., M.R.D.M (0515049301)
Hefi Al-Hifdhi (20190520243)
Dr Obed Asamoah

UNIVERSITAS MUHAMMADIYAH YOGYAKARTA

Dibiayai Oleh Lembaga Riset dan Inovasi (LRI)
Universitas Muhammadiyah Yogyakarta
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UNIVERSITAS MUHAMMADIYAH YOGYAKARTA

Kampus terpadu: Jl. Brawijaya, Geblagan, Tamantirto, Bantul, Daerah Istimewa
Yogyakarta 55183

Telp. (0274) 387656 (hunting) Fax. (0274) 387646

PROTEKSI ISI LAPORAN AKHIR PENELITIAN

Dilarang menyalin, menyimpan, memperbanyak sebagian atau seluruh isi laporan ini dalam bentuk apapun kecuali oleh peneliti dan pengelola administrasi penelitian.

LAPORAN AKHIR PENELITIAN

Informasi Data Usulan Penelitian

1. IDENTITAS PENELITIAN

A. JUDUL PENELITIAN

COLLABORATIVE EVERYDAY ADAPTATION TO DEAL WITH PEATLAND FIRES IN THE EAST COAST OF SUMATRA, INDONESIA

B. SKEMA, BIDANG, TEMA, DAN TOPIK PENELITIAN

Skema Penelitian	Bidang Fokus Penelitian	Tema Penelitian	Topik Penelitian
Penelitian Terapan	Sosial Humaniora - Seni Budaya - Pendidikan	Pembangunan dan penguatan sosial budaya	Tatakelola dan pemerintahan

C. KOLABORASI DAN RUMPUN ILMU PENELITIAN

Jenis Kolaborasi Penelitian	Rumpun Ilmu 1	Rumpun Ilmu 2	Rumpun Ilmu 3
Kolaboratif Luar Negeri	ILMU SOSIAL HUMANIORA	ILMU POLITIK	Ilmu Pemerintahan

D. WAKTU PELAKSANAAN

Tahun Usulan	Tahun Pelaksanaan	Lama Penelitian
2021	2022	1

E. ANCOR RESEARCH

Anchor Research	Topik Anchor
Eko Priyo Purnomo, Prof., S.IP., M.Si.,M.Res., Ph.D.	Participative governance and the Institutionalization of government policy into local communities in the context of shifting dynamics of policy

2. IDENTITAS PENELITIAN

Nama	Peran	Tugas
Rijal Ramdani, S.IP., MPA	Ketua Pengusul	
Susilo Nur Aji Cokro Darsono, S.E., M.R.D.M	Anggota Pengusul	Membantu literature review, mengolah data, dan memberikan masukan terhadap naskah publikasi
Hefi Al-Hifdhi	Mahasiswa Bimbingan	1. Issuing the research permit 2. Data transcription from voice recording into texts on words 3. Data classification and management 4. Working on coding the data through the NVivo 12 Plus

3. MITRA KERJASAMA PENELITIAN (JIKA ADA)

Pelaksanaan penelitian dapat melibatkan mitra kerjasama, yaitu mitra kerjasama dalam melaksanakan penelitian, mitra sebagai calon pengguna hasil penelitian, atau mitra investor

Mitra	Nama Mitra	Kepakaran
University of Eastern Finland	Dr Obed Asmoah	Bioeconomy and Bioresources Governance

4. KOLABORASI PENELITIAN (JIKA ADA)

Mitra	NIDN/NIK	Instansi
Dr Obed Asamoah	HCOD0014	School of Forest Science, University of Eastern Finland

5. LUARAN DAN TARGET CAPAIAN

Luaran Wajib

Tahun	Jenis Luaran
1	Publikasi Jurnal Internasional terindeks SCOPUS,
1	Naskah Kebijakan

Luaran Tambahan

Tahun	Jenis Luaran
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6. KLUSTER

Kluster	Sub Kluster	Group Riset	Mata kuliah
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7. ANGGARAN

Rencana anggaran biaya penelitian mengacu pada PMK yang berlaku dengan besaran minimum dan maksimum sebagaimana diatur pada buku Panduan Penelitian dan Pengabdian kepada Masyarakat.

Total Keseluruhan RAB Rp. 20,000,000

Tahun 1 Total Rp. 20,000,000

Jenis Pembelanjaan	Komponen	Item	Satuan	Vol.	Harga Satuan	Total
PENGUMPULAN DATA	Biaya Telepon	Pulsa	OK(Kali)	5	Rp. 100,000	Rp. 500,000
PENGUMPULAN DATA	Tiket Transportasi	Tiket Jogja - Riau (2 Orang PP)	OK(Kali)	4	Rp. 1,300,000	Rp. 5,200,000
PENGUMPULAN DATA	Hotel/penginapan	Penginapan di Desa per Hari	OH	30	Rp. 100,000	Rp. 3,000,000
PENGUMPULAN DATA	Transportasi/BBM	Bensin Motor per Hari	OK(Kali)	30	Rp. 35,000	Rp. 1,050,000
PENGUMPULAN DATA	Biaya Konsumsi Harian	Makan per Hari (3 x 2 Orang) = 15.000 x 3 x 2:	OH	30	Rp. 90,000	Rp. 2,700,000
PENGUMPULAN DATA	Transportasi/BBM	Tiket Travel PKU - Bengkalis (2 orang PP)	OK(Kali)	8	Rp. 150,000	Rp. 1,200,000

Jenis Pembelanjaan	Komponen	Item	Satuan	Vol.	Harga Satuan	Total
ANALISIS DATA	Biaya Konsumsi Rapat	Konsumsi Rapat dengan Asisten Peneliti dan Tim Peneliti (5 orang x 10 Kali)	OH	50	Rp. 20,000	Rp. 1,000,000
PELAPORAN, LUARAN WAJIB, DAN LUARAN TAMBAHAN	Biaya Luaran Iptek lainnya (Purwa rupa , TTG, dll)	Native Proofreading untuk Article	Paket	1	Rp. 2,500,000	Rp. 2,500,000
PELAPORAN, LUARAN WAJIB, DAN LUARAN TAMBAHAN	Article Processing Charge (APC)	Open Access Journal Fee	Artikel	1	Rp. 2,850,000	Rp. 2,850,000

8. LEMBAR PENGESAHAN

HALAMAN PENGESAHAN LAPORAN AKHIR PENELITIAN SKEMA:

Judul : COLLABORATIVE EVERYDAY ADAPTATION TO DEAL WITH PEATLAND FIRES IN THE EAST COAST OF SUMATRA, INDONESIA

Peneliti/Pelaksana : Rijal Ramdani, S.IP., MPA

NIDN : 0506118901

Jabatan Fungsional : Asisten Ahli

Program Studi/Fakultas : Ilmu Pemerintahan

Nomor HP : 082242018807

Alamat surel (e-mail) : rijalramdani@umy.ac.id

Anggota

Nama : Susilo Nur Aji Cokro Darsono, S.E., M.R.D.M

NIDN : 0515049301

Jabatan Fungsional : Asisten Ahli

Program Studi/Fakultas : Ekonomi

Nama : Hefi Al-Hifdhi

NIM : 20190520243

Prodi : S1 Ilmu Pemerintahan

Mitra : University of Eastern Finland

Nama Mitra : Dr Obed Asmoah

Kepakaran : Bioeconomy and Bioresources Governance

Nama : Dr Obed Asamoah

NIK : HCOD0014

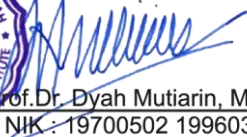
Institusi : School of Forest Science, University of Eastern Finland

Biaya : Rp. 20,000,000

Yogyakarta, 12 Agustus 2022

Mengetahui,
Kepala LRI,




Prof. Dr. Dyah Mutiarin, MS.i.
NIK : 19700502 199603

9. RINGKASAN

Due to the uncertain situation of climate change, multi-level actors such as civil society, private sector, national and sub-national government institutions as well as individuals are expected to have an adaptive capacity to face their vulnerability. This study analyses how the local community has used the collaborative approach as a strategical pathway in their everyday activities to adapt to the peatland fires and their vulnerability in situations where the fires impact their everyday lives. The research has been undertaken on the east coast of Sumatra, Indonesia, where the challenge of annual peatland fires has increased in the last 15 years. The research finding shows that the case study community conducted collaborative everyday adaptation through structural arrangements, co-creation of knowledge, and resource sharing in three stages, 1) anticipatory, 2) preparedness, and 3) response, through constructing canal blocks, conducting fire patrols and fighting fires, which enabled the community to reduce potential damage due to climate vulnerability. However, we argue that in order to support everyday adaptation, collaborative governance is needed to support building capability to act and not just concentrate capacities and activities to act.

10. KEYWORDS

Climate change; collaborative governance; everyday adaptation; peatland fires; Indonesia

11. HASIL PELAKSANAAN PENELITIAN

Anticipatory adaptation: constructing canal blocks and sharing knowledge

Up until February 2020, 32 canal blocks had been constructed in the village. The development process of the canal blocks took place four times, namely between 2013 and 2014, 2015 and 2016, 2017 and 2018, and 2018 – 2020.

The first two blocks were constructed in 2013 (MPG, 2020). The story of their construction goes back to 2009 when a biologist from a local university lived in the village and worked voluntarily with three villagers on peatland reforestation. To get funding from the local forest department, the three villagers on their own initiative informally established the PCC and worked on planting and caring for the natural peatland trees in their five hectares field (Interview 10). However, between 2011 and 2012, the mega-fire burned their trees, and only one of the villagers continued by replanting. An

international university from Japan and the Centre for International Forestry Research (CIFOR), with the assistance of the biologist, conducted research in the 2.5-hectare natural peatland forest that remained and belong to that single villager (Interview 3a).

After having a long informal discussion relating to vulnerability of the peatland and with the help of a shared budget from the international university, the villager decided to construct two canal blocks around his forest field. The villager who built the canal blocks for the first time said:

“Since my peatland field was dry and burnt several times, I asked them [the international university researchers] for help to build canal block. But they just helped me with gunny sacks to fill with sand and a budget for the logs. I bought other materials and worked using these together with my son and another villager. Then we could see the water table in my field was increasing. ... We [the villager and researchers] discussed at my home many times about the [canal] block model.”

Between 2015 and 2016, the PCC constructed eight other canal blocks under bilateral intervention funded by Norway’s bilateral funding undertaken under the Reducing Emissions from Deforestation and Forest Degradation (REDD+) programme (MPG, 2020). In this stage, there were also nine new people who joined the PCC (MPG, 2020). With the help of the REDD+ facilitators, the PCC members were involved in benchmarking activities to learn from the other community groups in the province (Interview 16). The REDD+ project hired several experts to help the local community in project planning to decide the distribution of the canal blocks and design its model. During the interview, the REDD+ coordinator said they chose the village due to its vulnerability to fires (Interview 16). The REDD+ provided all materials for the canal blocks as well as incentives for PCC members working in the construction (Interview 3c). The village office also opened road access for the REDD+ facilitators to transport the materials to the forest and welcomed all parties to use their multipurpose building for meetings and coordination (Interview 1a).

A year after the REDD+ project, WWF Indonesia, in collaboration with three local ENGOs and funding from WWF Singapore, came to the village and worked with the FCC. The interview data had shown that all actors in the village welcomed new actors coming to collaborate because they felt that constructing canal blocks was beyond their capability. For example, the village office had no budget allocation while the villagers had no financial ability to construct canal blocks (Interview 1a). They also expected to learn about the model of the blocks from outsider actors (Interview 1c). For example, one of the informants in the village said:

“I can say that most of them [outsider actors] are knowledgeable. If I am not mistaken, some of them are professors, aren’t they? You may know about this. They are educated [at higher education] while we are not [did not go to university]. Most people here do not understand

those things [canal blocks and water characteristics]. So, we are happy if they come because we want to learn from them, such as how canal blocks should be constructed taking into consideration the condition of water flow like in our village.”

With the help of hydrological experts hired by WWF, FCC worked collaboratively with the ENGOs to create nine canal blocks (MPG, 2020). WWF provided the construction materials and daily incentives for the FCC members who carried out the construction (Interview 13b). At the same time, the village office strongly supported the activities, for example, to tackle the issue of some trans-local oil palm owners who had objected to canal block construction (Interview 1a).

By December 2017, the international university from Japan, in collaboration with the local university and with the support of the Indonesian Peatland Restoration Agency (IRPA), launched the Tropical Peatland Society Project (TPSP) under the sponsorship of the Japan International Corporation Agency (JICA) to conduct a rewetting programme in the village (Mizuno, 2018). In March 2018, three facilitators of TPSP started living in the village and facilitating meetings relating to the canal block programme between villagers, village officers, and researchers from the universities (Interview 15c). Under their initiative, the PCC members also elected a new leader of the organization (Interview 3b). Since the immediate problem of drought around the village was due to water retention by the timber company, TPSP researchers also worked on conflict resolution by facilitating meetings between the villagers and timber company (Interview 15a). After a lobby process by TPSP researchers, the timber company finally agreed to share the water and work together with the villagers to construct the canal blocks and normalize non-functional canals (Interview 11a). With the financial support of TPSP and the help of the excavators from the timber company, 17 members of FCC and 20 members (including eight new members) of PCC worked together to rewet the degraded peatland in the village area (Interview 3b).

At this stage, we also discovered how the collaborative actors had conducted knowledge sharing and social learning. For example, TPSP researchers trained two young members of the PCC to calculate the water volume in the canals and measure the water table in the peatland areas (Interview 15c). Although the canal blocks infrastructure model had been designed by the hydrologist from the local university, through dialogue the TPSP always paid attention to the knowledge of the PCC and FCC members since both PCC and FCC's members had long experience of working with the REDD+ and WWF project (Interview 15d). At the same time, the timber company engineers helped the TPSP researchers to plan how the canal blocks should be distributed around the village based on the Geographical Information System (GIS) basic layer which enabled the contours and topography of the area to be followed (Interview 11b). The engineers also shared the 15-year rainfall record data with TPSP researchers to assist water volume measurement in the canals (Interview 11b). In return

TPSP researchers shared the village water table data with the timber company as part of an evaluation of whether water sharing had influenced rewetting of degraded peatland in the village (Interview 15b).

Preparedness: peatland fire monitoring as collaborative effort

With regard to preparedness, the 17 FCC members conducted fire patrols around the village area. Every day, between two and three PCC members visited all village areas by motorbike and reported the fire situation at the sites observed via the FCC WhatsApp group (Observation 6). They monitored the availability of water in canals and human-made ponds in order to anticipate whether fires may appear in that area (Observation 7). Since 2016, the village office decree had mandated that large-scale oil palm owners must build ponds of 25 square meters each in their plantation, and up to February 2020 there were 20 man-made ponds scattered around the village areas (Interview 1a). Since most of the fire accidents recorded in the village were due to human carelessness, the FCC members always reminded farmers working in the fields not to use fire (Interview 4b). They also monitored and controlled the activities of hunters and anglers from outside the village on use of fire around the village area. For example, the head of FCC said:

“We [the FCC] always pay attention to strangers coming in from other villages. We communicate with them, and we talk to them not to use fire. They also must answer our questions about the purpose of their activities in the forest around our village. If they said to do fishing or hunting, usually they said so; I take a picture of their face and motorcycle number plate. I also tell them that if something happens here relating to fires, I will report you.”

Since the village area was contiguous with the timber concession, the FCC members also worked with the firefighter squad of the company. It was observed how both units shared information relating to the fire situation while they shared their packed meals for lunch (Observation 8). They had had a close relationship since 2009 because the establishment of FCC in the beginning was under the timber company's initiative for three years (Interview 12). After the mega-fire of 2015, all villagers realized the importance of the patrol, and the village office officially reactivated the FCC (Interview 1a). With the motivation of protecting their village from fire risks, the 17 former firefighters voluntarily re-joined the organization and deliberately chose a new leader (Interview 4b).

According to the FCC leader, they learned to conduct the patrol and identify the emergence of fires during the training under the firefighter squad of the timber company (Interview 4b). For example, it was observed how a member of FCC identified the smell of the smoke from the woody dry peatland after a little rain at night (Observation 6). They also informally learned about the dry and woody peatland characteristics from the TPSP researchers while TPSP facilitators helped them to map fire-

prone areas in the village (Interview 15c). When WWF in collaboration with three local ENGOs worked on the canal block programme in the village, the activists introduced the patrol schedule system to the FCC members (Interview 13c). Based on a deliberative discussion, they decided that every FCC member would be on fire patrol duty four times per month for eight hours a day on each occasion. For example, one of the FCC members said:

“We formed the patrol schedule based on a discussion once we worked on canal blocking development with WWF. It was not easy to decide how many times each person should have because some want to do more. Finally, we found the agreement that every person will be on duty once a week, which means four times per month. We do the patrol eight hours a day, morning until afternoon, but we are always on standby if something is happening relating to the fire at night.”

After the reactivation of the FCC was under the village office decree, the village office budgeted about 80 million IDR (5,526 USD) per year to be paid in the three instalments (Interview 1a). The allocation was mainly for the FCC member incentives and patrols operational such as motorcycle maintenance and gasoline. The interview data showed that the district's instruction did not allow the village office to pay the salary for the FCC members, and the involvement of villagers in FCC should be voluntary (Interview 1a). Hence, every member of FCC received only about 250,000 IDR per month (17.26 USD) and an additional reward of about 320,000 IDR (22.08 USD) from the timber company (Interview 4b).

However, the timber company would still pay the incentive even if there was no fire in the village during the three months of the patrol (Interview 11a). Moreover, the two motorcycles used by FCC were a donation by the forest ranger of the Ministry of Environment and Forestry (MoEF), while the uniform, safety shoes, and mobile phone were aid from the donors (Interview 4b). The FCC also constructed a fire control point in the village with the help of funding from TPSP, which members could use when on patrol duty to discuss and plan their work activities for patrolling (Interview 4d). In addition, due to the resistance of the trans-local oil palm owners, the FCC got support from sub-district police and army station by conducting joint fire patrol every four months (Interview 4a and 8). For example, an informant said:

“If they [FCC members] do the fire patrol to the forest and meet with the oil palm owners, they [the oil palm owners] will not allow the FCC members to enter their area. So, if we [army] go with them [FCC] in the joint patrol, they [the oil palm owners] understand that the FCC patrol is legal and under the support of the army and police. So, they [oil palm owners] know who we are. Do you [the interviewer] understand what I mean?”

Response: jointly fighting against the fires?

Although efforts have been made in anticipatory and preparedness, the local community always got ready with the potential occurrence of fires. It was found how multi-lever actors of the government institutions relating to the fire response worked together to help the FCC members fighting against the fire (Observation 13). Under the top-down authority instruction, the sub-district army and police stations were responsible for leading all squads fighting against the fires (Interview 7). The current administrative regime of the Indonesian government has pointed out that the president would replace commanders of the army and police if peatland fires occurred in their territory (Cabinet_Secretary, 2018). For these reasons the sub-district police and military commanders took the initiative very seriously and shared the schedule of all squads for three shifts, namely morning, afternoon, and night (Observation 11). However, most firefighter squads worked during the day, and only the FCC members and timber company fire squad monitored the movement and direction of the fires at night. For example, the district firefighter leader said:

“Before getting dark, yes, all of us leave the fire field because, you know, fighting against fires in the peatland at night is very risky. We must pay attention to the safety of our members. But the firefighter squad of the timber company and FCC members always stay in the location during the night to monitor the fire movement because they are afraid that the fires will spread to the concession area.”

During participatory observation, the firefighters of the timber company taught the FCC members on how to spray water from the hose, block the underground fires, and make a fire free circle around the flame (Observation 13). The learning process was carried out in the informal setting when they rested for coffee while firefighting (Observation 13). Since FCC members were ordinary villagers, the REDD+ project also took the initiative to send the FCC members for training. Under REDD+ funding, the FCC members were involved in a week of training at the Sumatra Forest training centre under the supervision of MoEF. During the training, they learned leadership, line of march, and characteristics of peatland fires. REDD+ facilitators of the province also conducted a simulation in the village on fighting peatland fire and facilitated writing a fire management module. The REDD+ project leader said:

“I think that we may be the first donor who brought the FCC members of the village to joint fire management training in the Sumatra Forest training centre under the MoEF. This centre is for training for forest fire voluntary organizations of all provinces on Sumatra Island. We also helped them on strengthening their organization by writing a module. Lastly, together with them [FCC members], we simulated how to fight against the peatland fires, which are completely different from the crown fires in the mineral forests.”

The response of the peatland fires required resource sharing among the actors. Since the fire equipment of the timber company and the district firefighter station had much better quality, all actors in the fire fields usually used their water pumps and spray hoses (Interview 4a). The timber company also sent two excavators for digging ditch circles to break the flame chain (Observation 13). During the interview, the timber company representative said they were responsible for taking care of five kilometres outside its concession to be free from the fires (Interview 11a). With the legitimization of military support from the sub-district army stations, the firefighters of all squads could take any action, such as blocking the road access to the forest and block the water flow in the ditches to extinguish the fires. In addition, all fire squads received a reward in fighting against the fires (Interview 1a, 9, and 12) even though all the efforts they made in the field were voluntary for FCC members. For example, one of the FCC members said:

“Previously [2016], when WWF worked here [on canal blocking development], we got money from them if we were working to extinguish the fires. But now we did not get any money, no allocation from village office for this. We always stay in the field during the night with the timber company fire squad because we are afraid that the fires will spread the village settlement areas.”

DISCUSSION

Based on Feenstra et al. (1998), we consider anticipatory, preparedness, and response measures that reflect the application of everyday adaptive activities before and during climate stimuli. The research evidence from our case study has shown how the local community has applied the collaborative endeavour through structural arrangements, knowledge and learning, and resource sharing in their everyday life to adapt to the peatland fire vulnerability. This strategic institution has enabled the local community to reduce potential damage and harm from the peatland fires. Although there are still potential peatland fires to occur, the collaborative approach to govern fires has helped the local community to minimise large-scale wildfires, reduce unnecessary deliberate factors of the fire occurrence, and save the society from the haze problem. We now continue by discussing the case study findings in three stages, 1) anticipatory, 2) preparedness and 3) response, and we connect our discussion using three out of four capacity dimensions introduced by Emerson and Gerlak (2014), namely 1) structural arrangements, 2) knowledge and learning, and 3) resources sharing (See figure 1).

Structural arrangements for decision-making dialogue while the top-down system still exists

With regard to the anticipatory stage, we find that the structural arrangement has facilitated various actors to engage in the collaborative endeavour. From the interview data, we understood that although the community was vulnerable to the fires, the local institutional capacity to adapt to the peatland fire vulnerability developed over time, and the community was welcoming for the new dialogue with various actors involved in collaborative governance. The local community represented by PCC, FCC, and village office welcomed new actors since they are interested in new knowledge to answer their problem relating to peatland fires. They also feel that financing the construction of the canal blocks is beyond their capability since the village office has no budget allocation and villagers have no financial capability. At the same time, the external actors are voluntarily engaging in collaboration because they feel that the village is vulnerable to fires and the villagers are at high risk of its impact. In addition, the decision-making process has proceeded in a deliberative way based on dialogue and knowledge sharing between the community and external actors. For example, the election of a new PCC leader was based on discussion between the members, and to decide the model and location of the canal blocks is based on knowledge sharing among the collaborative actors.

As for the preparedness stage, although the establishment of FCC is under the village office decree, the involvement of villagers in the organisation is voluntary based on their awareness of fires. The institutional structure allows them to elect the new leader and decide the fire patrol schedule in the deliberative manner, and expand their collaboration with ENGOs, district firefighters, timber company fire squad, and sub-district army. However, with regards to **the response**, since the engagement of sub-district police and army is mandated from the central authority, every decision-making process is taken in the top-down way, for example relating to leadership in organising the activities and the schedule of the fire squads in firefighting. Since the timber company fire squad is professional and well trained and has adequate fire equipment, they may in reality have greater capability to lead the response. The situation is a reflection of how, due to the central authority intervention, the structural arrangement returns to a traditional way of management that may not allow accommodation of the different perspectives and interests of the actors (Choi and Robertson, 2014).

Knowledge sharing and social learning: sharing and domination?

Concerning the anticipatory stage, the local community learned the infrastructure design for establishing canal blocks from the experts hired by WWF and REDD+ project. The timber company engineers shared the GIS basic layer and the 15-years rainfall record data, while the researchers shared the water volume data with the company. The evidence has shown that the inclusive and deliberative manner of the structural arrangements with regard to anticipatory measures and preparedness has

facilitated knowledge sharing and social learning. Tran (2020) has classified this type of learning process into formal and informal kinds, such as seminars and workshops as well as dialogue and interactions. Social learning occurs when the actors can formulate the input from knowledge sharing to improve their understanding of the system's behaviour (Emerson and Gerlak, 2014). In case of the case study in Indonesia, through the dialogue and interactions process with the outsiders who were mainly researchers from the local and international institutes, the local community was motivated to establish the PCC and initiate construction of canal blocks in the village.

With regard to preparedness, the local community learned to identify the occurrence of fires from the timber company squad and to pay attention to hotspot information shared by the district fire station. One of the villagers also said that their local knowledge could not predict when the rainy season would start or finish, and that from year to year the dry season was becoming longer and longer (Interview 2a). For these reasons, the local communities felt that they benefitted from collaborative learning and information sharing. For example, the FCC members obtained information support from the district fire station. The station forwarded the information relating to the current hotspot situation from its regional headquarters (Interview 9). The station fire squad also regularly monitored fire in the village using the binoculars from their 25-metre-tall fire watchtower (Observation 9).

In terms of response, since the military institution dominated the decision-making process, the structure was not able to facilitate knowledge sharing and learning, for example between government and non-government actors. The evidence has shown that the learning process in the field occurs only between the FCC members and the firefighters of the timber company on, for example, on how to stop underground fires and create a fire free circle around the flame. On the contrary, the powerful actors of the government institutions who take the lead in the response had little interest in listening to the knowledge of the professional firefighters of the timber company or sharing that knowledge with the FCC members. The government institutions also paid little attention to training the FCC members on how to fight peatland fires because the formal training of FCC members was facilitated by the REDD+.

As Emerson and Gerlak (2014) argue, inclusive and deliberative structural arrangements can generate diverse knowledge to help the institution understand the problem and promote learning processes. The local community has an interest to engage in formal knowledge sharing and social learning activities. For example, the FCC were involved in the training on water volume and water table measurement facilitated by TPSP and in the simulation of peatland fire response facilitated by REDD+. We find that such formal and informal knowledge-sharing and the changing live situation-in have brought the local community to learn and adapt to the vulnerability in their everyday lives.

For example, the negative experience during the 2015 mega-fires has awoken the community to importance of reactivating the FCC. The mega-fire of 2015 also caused the local community to pay attention to the water availability in the canals and human-made ponds while the very real possibility of fires has made them control visitor activities in the village. Hence, we argue that social learning not only formulates the knowledge input of the understanding of collaborative actors (Emerson and Gerlak, 2014), but also it can generate the future decision for the local community to adapt to the climate vulnerability in their everyday life.

Resources sharing: No single actor has adequate resources

Since the local community has no adequate resources to adapt to their fire vulnerability, resource sharing plays a critical role in the collaborative everyday adaptation. **In the anticipatory stage**, financial funding from donors and the help of the timber company for providing excavators enabled the local community to construct canal blocks to rewet degraded peatland vulnerable to fires. Without the facilitation of the lobbying process from TPSP researchers, the timber company would have retained the water inside its concession, and without proper support from the village office, the collaborative actors would not have been able to address the oil palm farmers' rejection of canal block construction. As Emerson and Gerlak (2014) argue, resource sharing is an essential element of joint action, as seen in our Indonesia case study.

With regard to preparedness, without the support of the motorcycle, safety shoes and uniform, smartphones and budget for the fire control station from the donors, the local community may not have been able to conduct fire patrols, monitor water availability and control the activities of visitors from outside the village. Due to the unique distribution of resources, every party needs to share resources such as the budget, tools and legitimacy (Emerson et al., 2012; Zachrisson and Lindahl, 2013). In Indonesia, regarding preparedness, the military backing of the sub-district police and army stations has enabled the FCC members to take preventive actions such as controlling the activities of hunters, monitoring the oil palm plantation areas of the trans-local owners, and regarding the response. FCC members have been able to block road access to the forest and increase water flow in the canals and ditches to reduce the frequency of the fires. No single actor has adequate resources to tackle a wicked problem unilaterally, but depend on each other to implementing their efforts (Raitio and Saarikoski, 2012), as our study also shows in case of Indonesia.

Looking at response, the timber company mobilized fire equipment, excavators, and fire squad while the government institutions did the same to help the local community. The case study confirms that collaboration is not only a way to share resources but also to mobilize such resources from different actors (Thomson and Perry, 2006). We find that resources sharing is not merely related to budget and

tools; but backing or legitimation provided by the formal authority is also considered critical (see also Zachrisson and Lindahl, 2013). For example, the legitimation provided by military support enabled the firefighters of all squads to block road access to the forest and block the water flow in the ditches during the actual peatland fires to extinguish the fires.

However, we find that in the preparedness and response stages, the local community was poorly positioned in terms of resources sharing. For example, due to instructions from higher level authority, each FCC member only received limited incentives from the village office (17.26 USD per month). The timber company also paid an additional reward (22.08 USD per month) if there was no fire after each three months period of fire patrols. Moreover, in the response stage, the FCC members did not receive any rewards if they made greater efforts to fight fires during both day and night. Therefore governance structures do not necessarily support the adaptive capacities of citizens but rather force responsibility on them (Mustalahti and Agrawal, 2020). Transferring or reassigning the responsibility to local communities occurs without giving them appropriate resources and operating conditions, as was also seen in other cases in Indonesia (Erbaugh, 2019; Ramdani and Lounela, 2020).

12. KESIMPULAN PENELITIAN

Our case study in Indonesia shows how the local community has used the collaborative approach as a strategic pathway in their everyday activities to adapt to climate change vulnerability. Their collaborative endeavour, through structural arrangements, knowledge and learning, and resources sharing, has enabled the local community to reduce the potential damage and harm of peatland fires (Figure 1).

The structural arrangement in the anticipatory and response stages has been carried out in an inclusive and deliberative manner that facilitates the multi-level actors to participate in the processes. However, in the response stage, due to the mandatory engagement of military institutions to take the lead, every decision-making process is still taken in a top-down way. As Nelson et al. (2007) argue, adaptation is a process of deliberate change in anticipation of or reaction to external stimuli, the case in Sumatra shows that a deliberative process of change occurs when some actors engage voluntarily while others engage due to a mandatory from the central authority.

The formal and informal knowledge-sharing has enabled the local community to learn and to adapt to their climate vulnerability. Social learning not only formulates the knowledge input of actor understanding (Emerson and Gerlak, 2014) but also generates the future decision to adapt to climate vulnerability in everyday life, as our Indonesian case shows. If allowed to, inclusive and deliberative

structural arrangements can generate the diverse knowledge that can help an institution understand the problem and promote learning processes (Emerson and Gerlak, 2014). In our case study community, the structural arrangements in the anticipatory and preparedness stages have facilitated knowledge sharing and social learning, yet due to the domination of military institutions in the decision-making process, the structure in the response stage was not fully able to facilitate a similar process.

The resources sharing relating to budgets, tools, and skills plays a critical role in enabling local institutional capacity. Yet we also need to pay attention to the legitimation support from formal authority. However, the local community is poorly positioned in the preparedness and response stages since they receive inadequate incentives and rewards for their efforts. Based on our understanding from Emerson and Gerlak (2014) and as confirmed by our case study, through resource sharing, deliberative and collaborative governance could provide a significant institutional capacity to adapt to climate vulnerability if the authoritarian society allows dialogue and collaborative forms of governance.

In our conclusion, we highlight two terms: capacity to act and capability to act. Adaptive capacity depends on the ability to act collectively, and this capacity to act is greatly influenced by social capital, trust and organization (Johansson and Vinthagen, 2016). The local community utilizes everyday collaborative activities in the anticipatory, preparedness, and response stages as a capability to act. As introduced by Sen (1999), the concept of capability means the enablement that make it possible for people to achieve goals, and the availability of opportunities to enhance outcomes that people value (Lehtonen, 2004; Mustalahti, 2018). Thus, based on Emerson and Gerlak (2014) and our case study in Indonesia, we argue that knowledge and learning through the collaborative approach is needed to build an everyday adaptive capability to act. To support everyday adaptation, collaborative governance should aim to support building capability and resources to act than just concentrating on capacities and activities required to act.

13. STATUS LUARAN WAJIB

Major revision in Ecology and Society (Q1) special feature of everyday adaptation to climate change led by prof. Arun Agrawal from Michigan University, USA.

14. DOKUMEN LUARAN WAJIB

Attached to this report, article manuscript.

15. LINK LUARAN WAJIB

- (forthcoming)

16. STATUS LUARAN TAMBAHAN

Published/ available online.

17. DOKUMEN LUARAN TAMBAHAN

Policy Brief/ Ringkasan Kebijakan.

18. LINK LUARAN TAMBAHAN

<https://sites.uef.fi/responsive-natural-resources-governance/wp-content/uploads/sites/78/2022/02/Globally-responsible-locally-responsive-2022-English-PDF.pdf>

<https://sites.uef.fi/responsive-natural-resources-governance/wp-content/uploads/sites/78/2022/03/RINGKASAN-KEBIJAKAN-2022.pdf>

19. PERAN MITRA (JIKA ADA)

UEF Finland – co-authorship.

MLH PP Muhammadiyah – Policy Brief Workshop participant and collaborator as it can be seen in the policy brief.

20. DAFTAR PUSTAKA

- Abram NJ, Henley BJ, Gupta AS, et al. (2021) Connections of climate change and variability to large and extreme forest fires in southeast Australia. *Communications Earth & Environment* 2: 1-17.
- Arneth A, Shin Y-J, Leadley P, et al. (2020) Post-2020 biodiversity targets need to embrace climate change. *Proceedings of the National Academy of Sciences* 117: 30882-30891.
- Artur L and Hilhorst D. (2012) Everyday realities of climate change adaptation in Mozambique. *Global Environmental Change* 22: 529-536.
- Baird J, Plummer R and Bodin Ö. (2016) Collaborative governance for climate change adaptation in Canada: experimenting with adaptive co-management. *Regional Environmental Change* 16: 747-758.
- Barton JR, Krellenberg K and Harris JM. (2015) Collaborative governance and the challenges of participatory climate change adaptation planning in Santiago de Chile. *Climate and Development* 7: 175-184.
- Bates LE, Green M, Leonard R, et al. (2013) The influence of forums and multilevel governance on the climate adaptation practices of Australian organizations. *Ecology and Society* 18.

- Bele MY, Sonwa DJ and Tiani AM. (2014) Local communities vulnerability to climate change and adaptation strategies in Bukavu in DR Congo. *The Journal of Environment & Development* 23: 331-357.
- BRG. (2016) *Pulihkan Gambut: Pulihkan Kemanusiaan*, Jakarta: Badan Restorasi Gambut.
- Brink E and Wamsler C. (2018) Collaborative governance for climate change adaptation: mapping citizen–municipality interactions. *Environmental Policy and Governance* 28: 82-97.
- Cabinet_Secretary. (2018) Arahan presiden Joko Widodo pada rapat koordinasi nasional pengendalian kebakaran hutan dan lahan tahun 2018. 2018. Febaurary 6, ed. Jakarta: Sekretariat Kabinet, 2.
- Choi T and Robertson PJ. (2014) Deliberation and decision in collaborative governance: A simulation of approaches to mitigate power imbalance. *Journal of Public Administration Research and Theory* 24: 495-518.
- Creswell JW. (2007) *Qualitative inquiry and research design: Choosing among five approaches*, London: Sage publications.
- Dupuy J-I, Fargeon H, Martin-StPaul N, et al. (2020) Climate change impact on future wildfire danger and activity in southern Europe: a review. *Annals of Forest Science* 77: 1-24.
- Edwards-Jones A. (2014) Qualitative data analysis with NVIVO. *Journal of Education for Teaching: International research and pedagogy*: 193-195.
- Edwards RB, Naylor RL, Higgins MM, et al. (2020) Causes of Indonesia’s forest fires. *World Development* 127: 104717.
- Egunyu F and Reed MG. (2015) Social learning by whom? Assessing gendered opportunities for participation and social learning in collaborative forest governance. *Ecology and Society* 20.
- Emerson K and Gerlak AK. (2014) Adaptation in collaborative governance regimes. *Environmental management* 54: 768-781.
- Emerson K, Nabatchi T and Balogh S. (2012) An integrative framework for collaborative governance. *Journal of Public Administration Research and Theory* 22: 1-29.
- Erbaugh JT. (2019) Responsibilization and social forestry in Indonesia. *Forest Policy and Economics* 109: 102019.
- Feenstra JF, Burton I, Smith JB, et al. (1998) *Handbook on methods for climate change impact assessment and adaptation strategies*, Amsterdam: United Nations Environment Program.
- Few R, Brown K and Tompkins EL. (2007) Public participation and climate change adaptation: avoiding the illusion of inclusion. *Climate policy* 7: 46-59.
- Firms. (2019) Fire Information for Resource Management System. <https://firms.modaps.eosdis.nasa.gov/>.
- Funder M and Mweemba CE. (2019) Interface bureaucrats and the everyday remaking of climate interventions: Evidence from climate change adaptation in Zambia. *Global Environmental Change* 55: 130-138.
- Hamilton M and Lubell M. (2018) Collaborative governance of climate change adaptation across spatial and institutional scales. *Policy Studies Journal* 46: 222-247.
- Herawati H and Santoso H. (2011) Tropical forest susceptibility to and risk of fire under changing climate: A review of fire nature, policy and institutions in Indonesia. *Forest Policy and Economics* 13: 227-233.
- Hornidge A-K and Scholtes F. (2011) Climate change and everyday life in Toineke Village, West Timor: uncertainties, knowledge and adaptation. *Sociologist*: 151-175.
- Huitema D, Adger WN, Berkhout F, et al. (2016) The governance of adaptation: choices, reasons, and effects. Introduction to the Special Feature. *Ecology and Society* 21.
- Johansson A and Vinthagen S. (2016) Dimensions of everyday resistance: An analytical framework. *Critical Sociology* 42: 417-435.
- Kalesnikaitė V. (2019) Keeping cities afloat: Climate change adaptation and collaborative governance at the local level. *Public Performance & Management Review* 42: 864-888.

- Kox T, Lüder C and Gerhold L. (2018) Anticipation and response: Emergency services in severe weather situations in Germany. *International Journal of Disaster Risk Science* 9: 116-128.
- Kvamsås H, Neby S, Haarstad H, et al. (2021) Using collaborative hackathons to coproduce knowledge on local climate adaptation governance. *Current Research in Environmental Sustainability* 3: 100023.
- Lehtonen M. (2004) The environmental–social interface of sustainable development: capabilities, social capital, institutions. *Ecological economics* 49: 199-214.
- Levesque VR, Calhoun AJ, Bell KP, et al. (2017) Turning contention into collaboration: engaging power, trust, and learning in collaborative networks. *Society & Natural Resources* 30: 245-260.
- McCarthy JF. (2002) Turning in circles: district governance, illegal logging, and environmental decline in Sumatra, Indonesia. *Society & Natural Resources* 15: 867-886.
- McCarthy JJ, Canziani OF, Leary NA, et al. (2001) *Climate change 2001: impacts, adaptation, and vulnerability: contribution of Working Group II to the third assessment report of the Intergovernmental Panel on Climate Change*, London: Cambridge University Press.
- Mizuno K. (2018) Toward the Regeneration of Tropical Peatland Societies. *Newsletter*. Tokyo: Research Institute for Humanity and Nature.
- Morris LL. (2020) Stakeholder collaboration as a pathway to climate adaptation at coastal ports. *Maritime Policy & Management* 47: 953-967.
- MPG. (2020) *Daftar Sekat Kanal di Desa Tanjung Leban dan Daftar Anggota MPG*
- Mustalahti I. (2018) The responsive bioeconomy: The need for inclusion of citizens and environmental capability in the forest based bioeconomy. *Journal of Cleaner Production* 172: 3781-3790.
- Mustalahti I and Agrawal A. (2020) Research trends: Responsibilization in natural resource governance. *Forest Policy and Economics* 121: 102308.
- Nelson DR, Adger WN and Brown K. (2007) Adaptation to environmental change: contributions of a resilience framework. *Annual review of Environment and Resources* 32: 395-419.
- Ostrom E. (2005) Doing institutional analysis digging deeper than markets and hierarchies. *Handbook of new institutional economics*. Springer, 819-848.
- Purnomo EP, Ramdani R, Agustiyara, et al. (2019) Land ownership transformation before and after forest fires in Indonesian palm oil plantation areas. *Journal of Land Use Science* 14: 37-51.
- Raitio K and Saarikoski H. (2012) Governing old-growth forests: the interdependence of actors in Great Bear Rainforest in British Columbia. *Society & Natural Resources* 25: 900-914.
- Ramdani R and Lounela AK. (2020) Palm oil expansion in tropical peatland: Distrust between advocacy and service environmental NGOs. *Forest Policy and Economics* 118: 102242.
- Ritzema H, Limin S, Kusin K, et al. (2014) Canal blocking strategies for hydrological restoration of degraded tropical peatlands in Central Kalimantan, Indonesia. *Catena* 114: 11-20.
- Sub-District. (2020) Hotspot di Bukit Batu dan Bandar Laksmana Bengkalis: Kecamatan Bukit Batu, 1-15.
- Susilo GE, Yamamoto K, Imai T, et al. (2013) The effect of ENSO on rainfall characteristics in the tropical peatland areas of Central Kalimantan, Indonesia. *Hydrological sciences journal* 58: 539-548.
- Thomson AM and Perry JL. (2006) Collaboration processes: Inside the black box. *Public administration review* 66: 20-32.
- Tran TA. (2020) Learning as an everyday adaptation practice in the rural Vietnamese Mekong Delta. *Climate and Development* 12: 610-613.
- Ulibarri N. (2019) Collaborative governance: a tool to manage scientific, administrative, and strategic uncertainties in environmental management? *Ecology and Society* 24.
- Village-Office. (2020) Profile Desa Tanjung Leban. Bengkalis: Desa Tanjung Leban, 1-25.

Wilson D, Farrell CA, Fallon D, et al. (2016) Multiyear greenhouse gas balances at a rewetted temperate peatland. *Global change biology* 22: 4080-4095.

WMO. (2021) *State of the Global Climate 2020*, Geneva, Switzerland World Meteorological Organization.

Yin RK. (2009) *Case study research: Design and methods*: London. Sage.

Zachrisson A and Lindahl KB. (2013) Conflict resolution through collaboration: Preconditions and limitations in forest and nature conservation controversies. *Forest Policy and Economics* 33: 39-46.