Traditional Ecological Practices Of Mount Merapi Towards Panarchy-Based Resilience

Case Study: The Pelemsari Court-Village, Sleman, Yogyakarta

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Abstract

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This book is built in an attempt to understand the capacity of humans to recover from and better adapt to unexpected changes, especially by those who choose to maintain proximity to the source of threats regardless of the devastations they once suffered. It is in this phenomenon of living with risks in Mount Merapi that I invested my fieldwork, observations, cognitive mapping, archival study, and semi-structured and narrative interviews with my respondents in the Pelemsari sub-village. Driven by my four research questions, I approached my study with hermeneutic phenomenology to primarily articulate the reflective characters of human experience as manifested through my respondents' language and texts.

The local knowledge, place attachment, and the sense of community are found in this study as three emergent themes that serve as the Pelemsari villagers' adaptive capacities to confront

multiple disturbances after the eruption in 2010. Eruptions are clearly not the only threats faced by this close-knit community. In fact, other disturbances namely, the relocation policy and the forest controls exacerbated their adversity and anxiety in their everyday life. The unexpected ecological imbalance and the decreased forest biodiversity are among the impacts of the rigid controls following the eruption in 2010 that would endanger the sustainability of their farming traditions.

The sense of community, local knowledge, and place attachment of the Pelemsari villagers are not built in a day but formed, shaped, accumulated, and tested from time to time. The *panarchy* framework offers ways to understand and interpret how these three capacities interplay in hierarchical structures in which social-politico-ecological systems are interlinked in adaptive cycles across different scales in place and time, from the pre-colonial to the reformation period.

Dedication

To: Professor Robert Mugerauer (†) whose persistence, resilience, commitment, and humanness will inspire me as an individual and a researcher and without whom I may not be able to complete my dissertation. Professor, we finally did it.

My mother, Constantia Maria Susan Untari, whose endless love strengthens me all the way. My father, Ignatius Andrae Didi Depari, whose support allows me to reach this stage.

Acknowledgment

This project is evidence of a collaboration between me and those who have trust in the importance of understanding a lived world of a cultural group in Mount Merapi albeit its complexity that seems to have no ends. The context within which my dissertation is conducted, perhaps almost similar to that of other scholars, is marked by a lot of uncertainties: unexpected loss, global pandemics, eruptions, and unresponsive or slow systems that had long been trapped in procedures and bureaucracies. It is only due to my faith that a good outcome will eventually spring out from persistence, and most importantly people who directly and indirectly, consciously, and unconsciously strengthen this faith, I could finally complete this dissertation.

To the following, I am deeply indebted for their continuous guidance and support.

Having no experience in the US academic environment, I might still be wandering around without a definite academic goal if not because of Professor Daniel Benjamin Abramson who since my new journey here in the US continuously provides guidance and support to my study. I am fortunate to be able to learn about resilience from the Westport community in Gray Harbor, WA through his studio of planning and to be introduced specifically to the panarchy resilience theory.

It would be difficult to imagine how this project would be without the insights, consistent and detailed feedback, and encouragement of Professor Michael K. Lindell. It is through his expertise in risk perceptions and hazard risk management that I became more familiar with disaster mitigation and the Protective Action Decision Model (PADM) in different settings and contexts.

My interests in ethnography that at some extent shares similar characteristics with phenomenology grow since Professor Celia introduced me to Nancy Peluso's work: Rich Forest Poor People and to Professor Suraya Afiff, an anthropologist from the University of Indonesia. No less importantly,

Professor Celia's insights encouraged me to expand my knowledge of the socio-politico dimensions that provide contexts to the lived world of my areas of study.

My understanding of place attachment for further thinking about Pelemsari's adaptive capacity is inseparable from the expertise of Professor Lynne Manzo. I may not be able to reach this peak of my doctoral scholarship at the Department of Urban Design and Planning without her generosity and willingness to fill in the position of Professor Robert Mugerauer as my Supervisory Committee and reading committee member.

My source of learning from whom I feel humbled for their resilience after the tragedy of the eruption in 2010: my seven respondents in the Pelemsari sub-village, the Pelemsari community at large, the Pelemsari Sub-village Head, Ramijo, the gatekeeper, Asih, and the Village Head of Umbulharjo, Danang Sulistya Haryana. This book is about this close-knit community and I am proud to be the messenger of their narratives of living with Mount Merapi.

Professor Suraya A. Afiff , an anthropologist from the University of Indonesia whose insights and expertise in forest management and environmental politics had boosted my confidence about the significance of the sense of community and further research about its history towards self-governed forest management.

Dr. Tri Atmodjo, an expert on community development in the Mount Merapi National Agency, whose explanations about the community development programs during our discussion and book publication had become an important source of information for this dissertation.

This dissertation would be meaningless without the Mount Merapi National Park Agency maps and documents. Accessing these materials during this unprecedented time was possible due to the

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Finally, this dissertation would not be possible to be completed without my family's prayers and support, My grandmother, Koesningsih (†) whose prayers I believed had accompanied me since her return to heaven during my fieldwork in February 2022. My brother, Leonardus Novianto Depari along with his son and wife, Raphael and Nera, in Singapore as well as my large family members in Yogyakarta and Japan (Soekarto), Jakarta, Surabaya, Pematang Siantar, Sweden, and Germany (Depari).

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CHAPTER 1

INTRODUCTION

1.1. Problem Background

Tuesday evening of October 26, 2010, seemed very ordinary to the close-knit villagers of Pelemsari on the island of Java, who had long lived near Mount Merapi's crater. Never did they expect that a VEI 4 eruption would be released from the volcano that day, testing the limit of their adaptive capacities and transforming their livelihoods for years later. The event had caused them to lose 37 fellow members, families, homes, and the spiritual gatekeeper, Maridjan, whose intuitions of eruptions were heard and defiance against the Sultan's evacuation order inspired their future resistance. As of today, people still register the violent eruption in their minds, developing a feeling of a yesterday-like event while facing the ongoing impacts of the eruption on their farming tradition.

Eruptions, however, are not the only threats faced by these villagers. When dealing with man-made disturbances, namely the relocation policy in 2011 and the national park's annex in 2004, they mobilized to force the issuance of the certificates of their damaged homes, relocate voluntarily, and organize their living in a new site. Indeed, living around and relying on the forest of Mount Merapi which serves as the main water source for nearly 3.7 million people in Yogyakarta (Republika, 2017) means living at the intersection of conflicting interests: traditional knowledge and science, forest control and customary rights, indigenous people and state. With the stipulation of the forest's status as a national park, the state's controls became stricter, albeit collecting grass in particular areas in the forest is still permitted. The current forest controls inherited from the colonial forestry management, however, do not only further the people's misfortune but also slow down the forest rehabilitation. Indeed, rehabilitation had been exercised by the national park agency by engaging

the highly impacted communities and environmental activists (Hapsari, 2017; Medcom, 2015; Purnama, 2016; Syaifullah, 2011b). However, of 450 hectares of damaged land targeted by the government since 2010, only about 90 hectares were already reforested in 2017 (Hapsari, 2017). Because the national park agency lacked funding, they were forced to divide reforestation efforts into phases and they hoped for the exotic *Acacia* to expedite the forest succession (Hapsari, 2017) thus reducing the financial burdens. The reforestation program, however, continues to be overshadowed by unexpected wildfires during the dry season caused either by nature or villagers who wanted to increase soil fertility (Natalia, 2015). To further complicate matters, letting the invasive *Acacia* grow may lead to a decrease in biodiversity, water shortages (FAO, 2022, p. 17), and undesirable changes in behaviors of local wildlife species such as long-tailed monkeys. This animal, since the eruption, has invaded farmlands and grass plots, making them a serious threat to the local farmers.

These complex politico-economic-environmental issues after the unprecedentedly violent eruption show the impact of the eruption on Merapi's ecosystem (i.e., ecological system and social system) exacerbated by the top-down government's policies. In terms of resilience, how people deal with the multiple disturbances and impacts could be revealed through their interpretations of those events embedded with their narratives or texts. To support this argument, I use the definition of disaster by Oliver-Smith (2002) as follows.

> Disasters are also both socially constructed and experienced differently by different groups and individuals, generating multiple interpretations of an event or process. A single disaster can fragment into different and conflicting sets of circumstances and interpretations according to the experience and identity of those affected (Oliver-Smith, 2002, p. 25).

Accordingly, disasters can be interpreted by the community based on their shared values. Moreover, these interpretations of the events are complex and rich as they are experienced differently across groups and individuals. For example, the conflicting views of an eruption that are present between the government and the local community. An eruption is generally viewed by the government as a source of disaster while the event is not simply associated with disasters but also the source of life by the locals. No less importantly, the interpretations of disasters could inherently unfold people's capacity to deal with the impacts. Oliver-Smith and Hoffman (2002) provided a foundation for this argument.

> Disasters unmask the nature of a society's social structure, including the ties and resilience of kinship and other alliances. They instigate unity and the cohesion of social units as well as conflicts along the lines of segmentary opposition (Oliver-Smith & Hoffman, 2002, p. 9).

There are four sequential research questions that I pose in this study: 1) what is the meaning of living with risks according to the villagers after the 2010 eruption?; 2) how are those meaning-related insights applied to their traditional ecological practices?; 3) how do these practices affect and are affected by other systems outside those of the sub-village?; and 4) what strategies do the villagers develop to maintain the sustainability of these practices in the face of uncertainty? The goal of this study is to reveal the characteristics and resilience of the Pelemsari villagers' complex, dynamic, and transforming systems through their traditional ecological practices. To address the first and second questions, I adopted the approach of hermeneutic phenomenology because of the power of this methodology to unfold the meanings of one's experience, meanings that would enable people to organize themselves after turbulence. In terms of the third and fourth questions, I utilized a framework of panarchy resilience to assess villagers' capacities to deal with socio-politico-environmental turbulences: eruptions, relocations, and forest controls.

1.2. Literature Reviews

There are three concepts that underpin this study and have been central to providing insights to address those questions: people-place relationship, traditional ecological knowledge, and panarchy resilience.

1.2.1. People-Place Relationship

According to Westley et al. (2002), social systems, in contrast to ecological systems, are constructed by the human ability to construct and manipulate symbols (Westley et al., 2002, p. 107). This ability is inseparable from the fact that human beings are sense-making animals that have consequences for the environment as they take particular actions for something meaningful (Westley et al., 2002, p. 108). In the conception of Yogyakarta communities, for example, Mount Merapi, besides the South Sea of Java, is the symbol of the god's world to which human beings must safeguard the harmonious relationship by performing the annual rite *Labuhan Merapi* (Dove, 2010, p. 122; Troll et al., 2015, p. 148). The meaning assigned to the volcano is an impulse for the local community to collaboratively clean the road for preparting the *Labuhan* procession and protect the sacred harbor in the forest from any destructive activities.

A human's ability to construct meaning contributes to resilience at least in three ways. *First,* it enables the human system to self-organize by letting itself shape and be shaped by meaning structures which then allows the human system to divorce itself to some degree from space and time (Westley et al., 2002, pp. 108–109). disengage. Time, for instance, is rationalized by linking it to a particular phenomenon (e.g., the 2010 eruption) and the place is defined based on particular ideas (e.g., source of disaster) or particular meaning (Tuan, 1979, p. 387) rather than physical territory. *Second,* meaning allows people to self-organize in which they can easily and quickly move beyond their limits or skillfully move from one system to another when dealing with

changes. *Third,* meaning motivates self-organization in which people could have the flexibility to flip from one organization to another, return to the previous state in a short time, and switch essential properties of their organizations to adapt to changes or shift the system configuration (Westley et al., 2002, pp. 108–110

The meaning assigned to a place exhibits one's attachment to a place (i.e., place attachment) which is not merely shaped by the place characteristics (Scannell & Gifford, 2010, p. 2) but more importantly, by one's experiences-in-place (Manzo, 2005, p. 74). Place attachment, a phenomenon in which people are emotionally and culturally based bond to a place (Altman & Low, 1992, p. 5; Tuan, 1974, p. 93), varies in terms of spatial level, degree of specificity, and social and physical features. It is manifested through affective, cognitive, and behavioral psychological processes (Scannell & Gifford, 2010, p. 5) and can evoke an array of emotions in varying degrees of intensity (Manzo & Devine-Wright, 2019).

As a part of the social-ecological systems, a community interacts to effectively respond to environmental changes and stressors (K. Brown & Westaway, 2011, p. 322). They collectively develop capacities to function in, respond to, and affect a changing and uncertain environment is termed community resilience (Maclean et al., 2014, p. 145; Norris et al., 2008, p. 131). These adaptive capacities include place attachment, leadership, community networks, community cohesion and efficacy, knowledge, and learning (Faulkner et al., 2018, pp. 1–2). Place attachment can come into consciousness, particularly during stressful circumstances or when such attachments are disrupted. For example, in 1964, Fried studied the psychological effects of the forced relocation of residents in Boston's West End. He found that despite the new housing having high property values and better quality of living, the residents still suffered from grief for the loss of their social connections (Fried, 1964, p. 361). In relation to place attachment, there are two dimensions of this

phenomenon that I stress in this study: place dependence and place identity. Place dependence is defined by Raymond, Brown, and Weber (2010) as a functional connection based specifically on the individual physical connection to a setting. Prohansky et al, (1983) defined place identity as a sub-structure of the self-identity of a person that consists of cognitions about the place in which the person lives. The cognitions reflect memories, ideas, feelings, attitudes, values, meanings, and conceptions of behaviors and experiences that relate to the complexity of physical settings that define the existence of every human being (Proshansky et al., 1983, p. 59). In other words, place identity is a cognitive mechanism, a component of self-concept and/ or personal identity in relation to the place one belongs to (Hernández Bernardo et al., 2010, p. 281).

To reduce the psychological impacts of disasters and enhance community resilience to hazards, understanding the people-place relationships is critical (B. Brown & Perkins, 1992, p. 285; Zheng et al., 2019, p. 2). However, its implication for risk coping behaviors is inconsistent. Some cases show that place attachment can promote disaster awareness, planning, information sharing, purchasing insurance, and other mitigation, preparedness, stewardship, or activism behaviors (Scannell et al., 2016, p. 161). For example, due to their inherited local knowledge, a strong sense of community, and place attachment, the residents in the eastern and southern Katla volcano's hazard zones in Iceland survived glacial floods triggered by an eruption in 1918, They relocated to a building on higher ground based on their inherited knowledge (Bird et al., 2011, p. 1219). However, other cases show that place attachment can discourage people from voluntarily relocating from the place and community in which they are deeply rooted, i.e., place attachment can be a barrier to risk perceptions, thus, to coping behaviors (Bonaiuto et al., 2016, p. 45; K. Brown & Westaway, 2011, p. 2; Jansen, 2020, p. 421; Norris et al., 2008, p. 139). For instance, Gaillard (2008) found the loss of cultural heritage that shaped the Bacolor people's identity and

perception of risk related to poverty weighed heavier than the perception of risk related to volcanic hazards of Mount Pinatubo. Indeed, this community had a strong cultural attachment to their town which historically was the capital of Pampanga province under the Spanish government's reign. The town was filled with urban elements that evoke the history of the community through artworks, monuments, and churches at which people routinely gathered and maintained their cohesion. As the result of the people's strong perceptions of threats to their cultural heritage, people chose to face the lahars risk despite the volcanic materials that buried their settlements from 1991 to 1997 (Gaillard, 2008).

Mihaylov and Perkins (2014) developed a model of community place attachment in regard to collective action in response to disruptions (fig.1.1). Their framework is helpful to identify place-related individual and community mental responses in the face of disruptions. People's responses consist of the stages of disruption, interpretation, and responses. A disruption is interpreted and evaluated which, depending on the community capacities and social capital, leads to particular responses (Mihaylov & Perkins, 2014, pp. 64–70). Among the factors of place attachment in this model are place identity, place dependence, and a sense of community. A sense of community is a feeling of physical rootedness in the community that relates to place identity and place dependence, and a sense of social bondedness with one's neighborhood. The core elements of this spirit are emotional connection based on shared history, interests, or concerns, the neighbor's trust, and social bonding. A sense of community could motivate community members to mobilize and participate in collective action and cooperation (Mihaylov & Perkins, 2014, pp. 68–69).

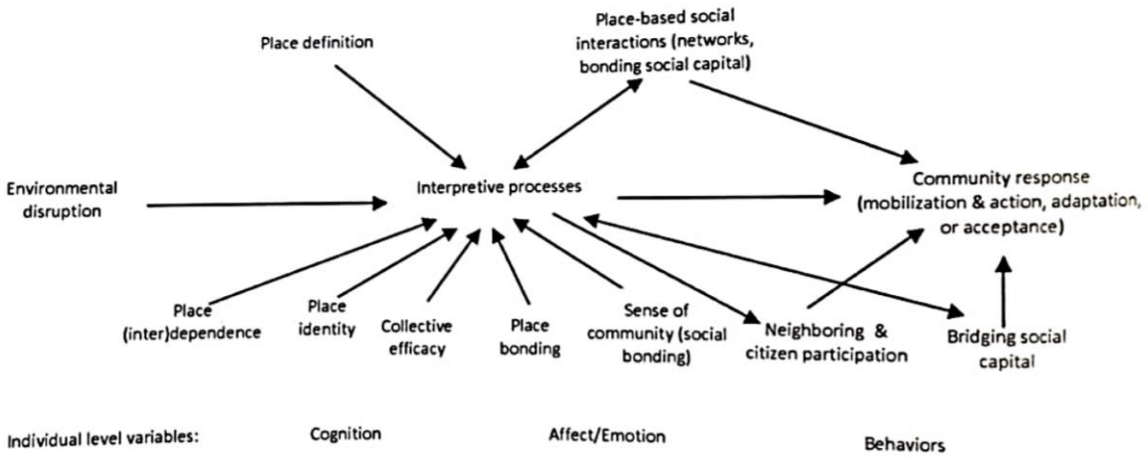

Fig.1.1. The relationship between place attachment, knowledge, and resilience of Mihaylov and Perkins (Mihaylov & Perkins, 2014, p. 68).

1.2.2. Traditional Ecological Knowledge

Traditional ecological knowledge refers to the cumulative body of local knowledge and beliefs evolved by adaptive processes and passed down through generations by cultural transmission about the relationship of living beings with one another and with their environment (Berkes & Folke, 2002, pp. 122–123). Traditional ecological knowledge is critical not only in reducing disaster impacts but also in managing and sustaining the use of sources, biological diversity, and ecosystems. Given its ability to anticipate large, infrequent disturbances, such knowledge could enrich recent scientific understandings of complex adaptive systems and management (Berkes & Folke, 2002, p. 146). Traditional ecological knowledge and practices could complement the conventional resource management at least in three ways: 1) it provides qualitative monitoring and management of the conventional resource management science that stresses the use of quantitative data; 2) it builds resilience to cope with disturbances and self-organization, and 3) it provides long time series of local observations and institutional memory for understanding ecosystem change (Berkes & Folke, 2002, p. 145).

Practicing traditional ecological knowledge, according to Berkes, Colding, and Folke (2000), relies on four categories of social mechanisms: 1) knowledge generation, accumulation, and transmission; 2) the structure and dynamics of institutions for implementing the knowledge such as taboos and regulations; 3) the mechanisms for cultural internalization that entail rituals, ceremonies, and other traditions, and 4) world views and cultural values. Also, there are at least five unique characteristics of traditional practices: 1) its management is carried out by using rules that are locally crafted and socially enforced by the users; 2) the resource use tends to be flexible through rotations and species-switching; 3) users accumulated an ecological knowledge to respond to environmental feedback; 4) the diversity of resources is used for securing a livelihood, keeping options open, minimizing risks; 5) an ecological practice is carried out by using qualitative management (Berkes et al., 2000, pp. 1256–1259). According to Ford et al. (2020), indigenous peoples typically had different types of environmental knowledge to help them detect, understand, and even predict environmental change and strategies to deal with natural disruptions (Ford et al., 2020, p. 533; Oliver-Smith & Hoffman, 2002, p. 8) By combining observations, familiarity with local conditions, social-ecological memory embodied in indigenous knowledge, indigenous people can detect unusual changes in the environment detect unusual changes in the environment (Ford et al., 2020, pp. 532–533).

Indigenous knowledge, from the risk perception lens, could raise a problem when it comes to the decision-making process for protective actions. In 2012, Lindell and Perry introduced the Protective Action Decision Model (PADM), which shows the general decision-making process that occurs when one receives a hazard warning. According to this model, decision-making is a sequential and multistage process that involves pre-decisional processes, core perceptions of threats, and protective actions. The primary factors that affect decision-making include environmental cues (e.g.,

smells), social cues (e.g., others' behaviors), information sources, channel access and preferences (e.g. radio, newspapers, face to face), warning messages, and receiver characteristics (cognitive, abilities, economic resources). Those factors then initiate pre-decision processes which then affect the perceptions of threats and determine decision-making around protective actions. The outcomes of the decision making, combined with situational facilitators (e.g., community cohesion) and situational impediments (e.g., physical disabilities) then determine behavioral responses vis-à-vis information search, protective response, and emotion-focused coping. The individual's responses, in turn, affect the cues and socially transmitted warning (Lindell & Perry, 2012, p. 617). Among these factors, "receiver characteristics" may create the difficulty to generalize the PADM's operationalization across different settings. Local knowledge embedded with beliefs may lead an individual to ignore the model sequence and make an unanalytical judgment, leading to failures of evacuation. Despite this, in some cases, local knowledge could contribute to the high perceived risk of the residents. For example, high-risk residents in the eastern and southern parts of Katla volcano's hazard zones evacuated altogether to higher ground to avoid glacial floods (Bird et al., 2011, p. 1219).

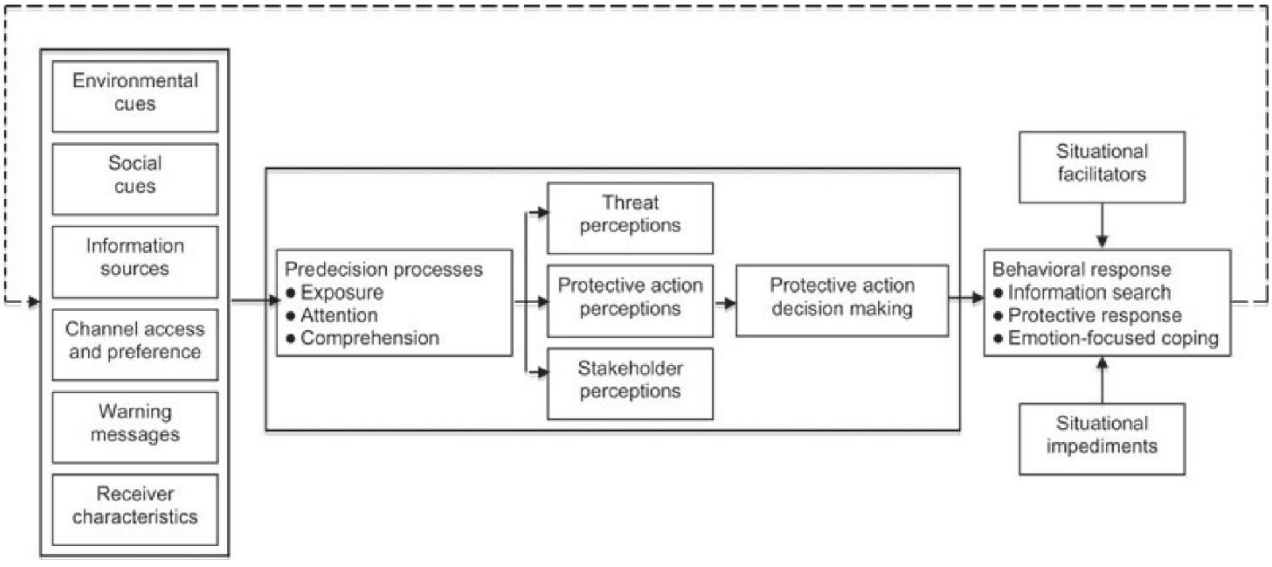

Fig.1.2. The flow of information in the PADM by Lindell and Perry (2012)

1.2.3. *Panarchy* Resilience

This study employs *panarchy* as a framework to analyze the resilience of the Pelemsari social system as a part of the Mount Merapi ecosystem and government system. *Panarchy* originated from the name of a Greek God named Pan and is first coined by Holling and Gunderson (2002) to illustrate the destabilizing nature that caused panic. *Panarchy* is a framework of nature's rules whose essential focus is to make sense of the interplay between change and persistence, between the predictable and unpredictable. Pan-archies are aimed to draw on the notion of hierarchies of influences between scales and to represent systems' structures that sustain experiments, test the results, and allow adaptive evolution. The framework connects adaptive cycles in a nested hierarchy containing multiple connections between phases of the adaptive cycle at one level and phases at another level (Resilience, 2015). *Panarchy* is important as it facilitates understanding of the complex interaction between the government system, social system, and ecological system.

To assist researchers in analyzing the complex interactions of different systems at different scales, Ostrom (2009) introduced a general framework of social-ecological systems (SES). The general framework consists of the first-level core subsystems—resource systems (e.g., a protected park that encompasses specific territories of forest and wildlife), resource units (e.g., trees), governance systems (e.g., park organization), resource users (e.g., park visitors)—which are linked one to another. Each of those systems comprises second-level variables that consist of lower-level variables. It is worth mentioning that the framework focuses only on a single focal SES (e.g., forest system) that incorporates diverse sub-systems and aims to identify factors that affect a particular phenomenon in the complex SES (Ostrom, 2009, pp. 420–421).

In terms of an adaptive cycle, it has two stages, each of which operates across four functions: *exploitation* (*r-phase*), *conservation* (*k-phase*), *release* (Ω-phase), and *reorganization* (α-phase)[1]. The *front loop* stage, the shift from *exploitation* (r-phase) to *conservation* (K-phase), is marked by slow, incremental growth and accumulation. While the *back loop* stage, the shift from *release* (Ω-phase) to *reorganization* (*α*-phase), is marked by a rapid reorganization towards a renewal. The *front loop* is predictable with a high degree of certainty but the outcome following destruction and reorganization is unpredictable and uncertain (Holling & Gunderson, 2002a, p. 47). The adaptive cycles can be categorized into three types (fig.1.2.). The *first* model is a two-dimensional adaptive cycle that concerns only two properties: potential and connectedness while the *second* model involves resilience alongside those two properties (Holling & Gunderson, 2002a, pp. 33–49). The third model is the *panarchical* adaptive cycle that represents the complex social-ecological systems across scales. Different from the first two models, this cycle induces space-time hierarchy into each of its systems (Holling et al., 2002, pp. 72–75).

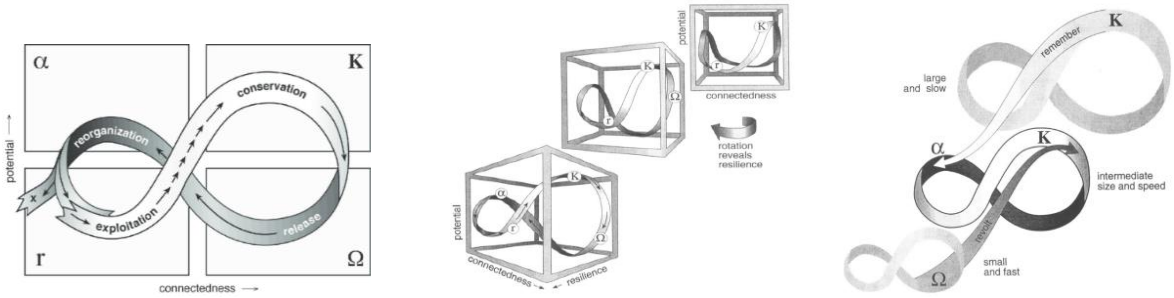

Fig. 1.3. Different models of adaptive cycles

[1] The *exploitation* (*r-phase*) is marked by the system's rapid colonization in disturbed areas. It demonstrates the system's dispersal ability and rapid growth that occurs in a competitive setting. The *conservation* (*K-phase*) is marked by a slow accumulation and storage of energy and materials. It represents the sustained level of the system which undergoes a slower growth rate and thrives in competition with other systems. The *release (Ω-phase)* is the tightly bound accumulation of resources (e.g., nutrients) that become fragile until suddenly released by agents like wildfire. The *reorganization (α-phase)* is a new beginning as the system minimizes the loss of resources after a disruption and reorganizes the remaining resources for future exploitation (Holling & Gunderson, 2002a, pp. 33–38).

The *panarchical* adaptive cycle illustrates the sequence from small and fast, through larger and slower, to the largest and slowest ecosystems. There are two features of this model. The *first* is 'hierarchy' in the *reorganization* (*α-phase*) that serves as the engine of variety and the generator of new experiments at each level. The hierarchy feature is a product of interactions among diverse variables that share similar speeds while the hierarchical level is the transitory structure maintained by the asymmetrical interactions of changing processes where the slower levels emerge from the experience of the faster. For instance, the forest system moderates climate (larger, slower levels) constraints and controls the behavior of temperature variation (small, faster levels). The *second* feature is connections between levels through 'revolt' and 'remember.' These are critical to creating and sustaining the system's capability at the time of change. 'Revolt' refers to what causes a critical change on one cycle to escalate to a vulnerable stage in a larger, slower cycle. 'Remember' refers to the facilitator of renewal by exploiting the accumulated and stored potentials in a larger, slower cycle (Holling et al., 2002, p. 75). The adaptive cycle begins from a level that enters its Ω-phase and undergoes a collapse. The collapse then escalates to the larger and slower level by triggering a crisis at the *k-phase* or the larger level where the resilience is low. The effects displayed by the 'revolt' arrow could cascade to higher, slower levels if these levels had accumulated vulnerabilities and rigidities at their *k-phases*. The downward 'remember' arrow indicates the second type of cross-scale interaction that is critical at times of change and renewal. The remember feature is organized at the *k-phases* of the next slower, larger levels to provide opportunities and constraints for the renewal (*α-phase*) in the level below them. The fast levels invent, experiment, and test while the slower levels stabilize and conserve the accumulated memories and the surviving experiences of the past (Holling & Gunderson, 2002a, pp. 72–76).

It is important to note that the adaptive cycle is "a metaphor thus it is not a rigid, predetermined path and trajectory." The adaptive cycle suggests periods of increases and decreases, systole and diastole, with various degrees of predictability at different stages. There are actors and species involved and termed pioneers, consolidators, mavericks, revolutionaries, or leaders who drive the cycle's mechanisms. The downfall of the adaptive cycle, however, is the model is too general and perhaps, could create a sense of being superficial (Holling & Gunderson, 2002b, pp. 51–52).

The feature of hierarchies across scales refers to the interactions between the *very small and fast* system (e.g., the Pelemsari villagers), the intermediate speed and size system (e.g., Mount Merapi), and the *very large and slow system* (e.g., the National government). Among these systems, there is a broad range of hierarchical systems across spatial and temporal scales that interact with one another. The cycle's basic structure encompasses three properties: *potential*, *connectedness*, and *resilience*[2] that dictate how ecosystems, agencies, and people respond to a disturbance.

1.2.4. Design Principles of Managing Common Pool Resources (CPR)

Ostrom (1990) introduced eight design principles to characterize robust institutions for managing common-pool resources in the face of uncertain changes. In relation to the third research question of this thesis about villagers' traditional practices, these principles are important to assess the extent to which the local institutions of the Pelemsari system influence and are influenced by other systems over time. These principles include: 1) clearly defined boundaries where the individuals who have withdrawal rights of resource units from the Common Pool Resources (CPR)[3] the CPR

[2] Potential refers to the available capacities for change that determines the number of options possible for the system. Connectedness refers to the degree of bondedness among internal controlling variables and processes that reflect the level of flexibility or rigidity of controls of the system. Resilience refers to the extent to which the system is vulnerable to unpredictable shocks (Holling & Gunderson, 2002a, pp. 32–33).

[3] Common Pool Resource refers to a natural or man-made resource system that is sufficiently large as to make it costly to exclude potential beneficiaries from obtaining benefits from its use (Ostrom, 1990, p. 30).

must be clearly defined; 2) congruence between appropriation[4] and provision rules and local conditions where the appropriation rules restrict time, place, technology, and quantity of resource units are related to local conditions and provision rules requiring labor, material, and/or money; 3) collective-choice arrangements where most individuals affected by the operational rules can participate in modifying the operational rules; 4) monitoring, where the monitors who actively audit CPR conditions and appropriator behaviors are accountable to the appropriators or are the appropriators; 5) graduated sanctions, where the appropriators who violate operational rules are likely to be assessed, graduated sanctions by other appropriators, by official accountable to these appropriators, or by both; 6) conflict-resolution mechanism, where appropriators and their officials have rapid access to low cost local arenas to resolve conflicts among appropriators or between appropriators and officials; 7) minimal recognitions of rights to organize where the rights of appropriators to devise their own institutions are not challenges by external governmental authorities; 8) nested enterprises where the appropriation, provision, monitoring, enforcement, conflict resolution, governance activities are organized in multiple layers of nested enterprises (Ostrom, 1990, p. 90).

1.3. Methodology and Methods

1.3.1. Methodology

The research design (fig.1.4) shows how the research goal drives the choices of the research methodology, epistemology, theories, and methods. The *panarchy* resilience, place attachment, and traditional ecological knowledge influence the epistemology, that is the worldview that each individual seeks an understanding of the world within which he/she lives and assigns meaning to

[4] Appropriation is the processs of withdrawing resource units from a resource system (Ostrom, 1990, p. 30).

their experience (Creswell & Creswell, 2018, p. 46). The epistemology of interpretivism influences the choice of hermeneutic phenomenology as the research methodology. Hermeneutic phenomenology is the study of lived experience that refers to an "immediate, direct, or pure description of the lifeworld" and of meaning that refers to an "intermediate" description of the lifeworld expressed in a text of symbolic forms (Van Manen, 1990, pp. 9–10). Hermeneutic phenomenology is founded on the belief that an individual's conscious experience of a phenomenon is inseparable from the world and his or her personal history. No humans, according to Neubauer et al (2019), can experience a phenomenon without referring back to their background understandings (Neubauer et al., 2019, p. 94).

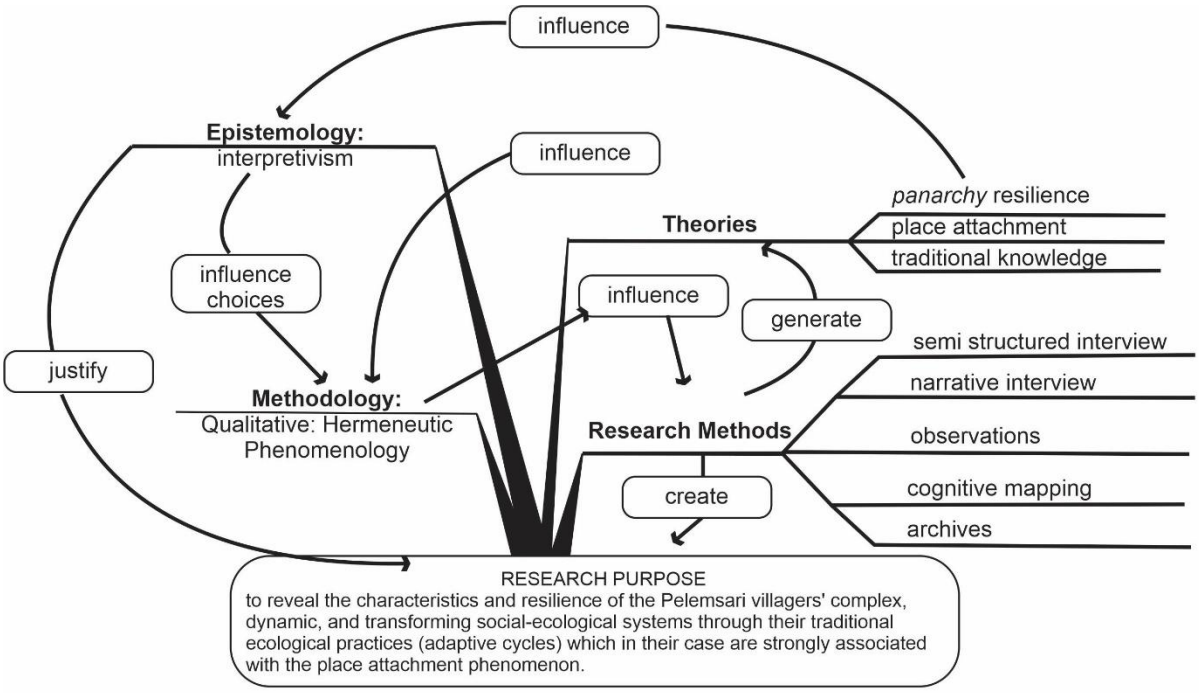

Figure 1.4. Research design framework. The diagram was adapted from Vision2Lead, Inc. (Salmons, 2015, p. 10)

1.3.2. Research Stance

In this study, having emic (insiders) and etic (outsiders) perspectives are equally important for my study. Being an outsider literally means that I do not belong to the group I study with, in other

words, I am not a resident of the Pelemsari sub-village, and my respondents' perceptions of my existence as an outsider are always unavoidable throughout my interactions with them. As a researcher who is not a part of the Pelemsari community, I would need to compromise with my research respondents by letting them influence my preconceptions and interpretations and, as Salmons (2015) stated, being involved in the actions and experiences of my respondents through observations (Salmons, 2015, p. 64). It is worth re-emphasizing that it is also almost impossible for me to become completely an insider given my identity as a non-resident of the Pelemsari community. However, being completely submerged in the insiders' views as conteded by Li (2020) would not lead to a comprehensive way to understand the target culture (Li, 2020, p. 33) which in the case of this study, the meaning of living with risk and resilience that I try to address. Therefore, combining the emic and etic perspectives is important as long as the etic is frequently developed from emic accounts.

In order to develop the emic accounts, I performed "deliberate naivete," that is, being open to new and unexpected phenomena (Brinkmann & Kvale, 2015, pp. 33–34); bracketing my personal presuppositions (Brinkmann & Kvale, 2015, pp. 33–34) or practicing "*epoche*," that is withholding my judgment and listening without prejudgment to each response (Salmons, 2015, p. 65). In other words, I avoid polluting what my respondents said by primarily expressing my personal views (Salmons, 2015, pp. 66–67). When interpreting the data, I used two approaches: the bottom up and the top-down approaches. The bottom-up approach represents the emic stance in which I attempt to understand the respondents' phenomenon of living with risks from their own perspectives as the insiders. The top-down approach represents my etic stance as a researcher in which I interpret the respondents' texts by using the theory of resilience.

In general, the research process (fig.1.5.) begins with the identification of the research problem and questions followed by the development of a study plan and proposal for research authorization in Indonesia and the development of a body of theories. All these three phases are attributed to the literature reviews during my academic study at UW. After the literature reviews, I conducted interviews, field observations, archives, and cognitive mapping in my two last fieldworks in Indonesia: October-November 2021, and January-March 2022. The final phase was the thematic analysis of the people's lived world and analysis using the *panarchy* approach.

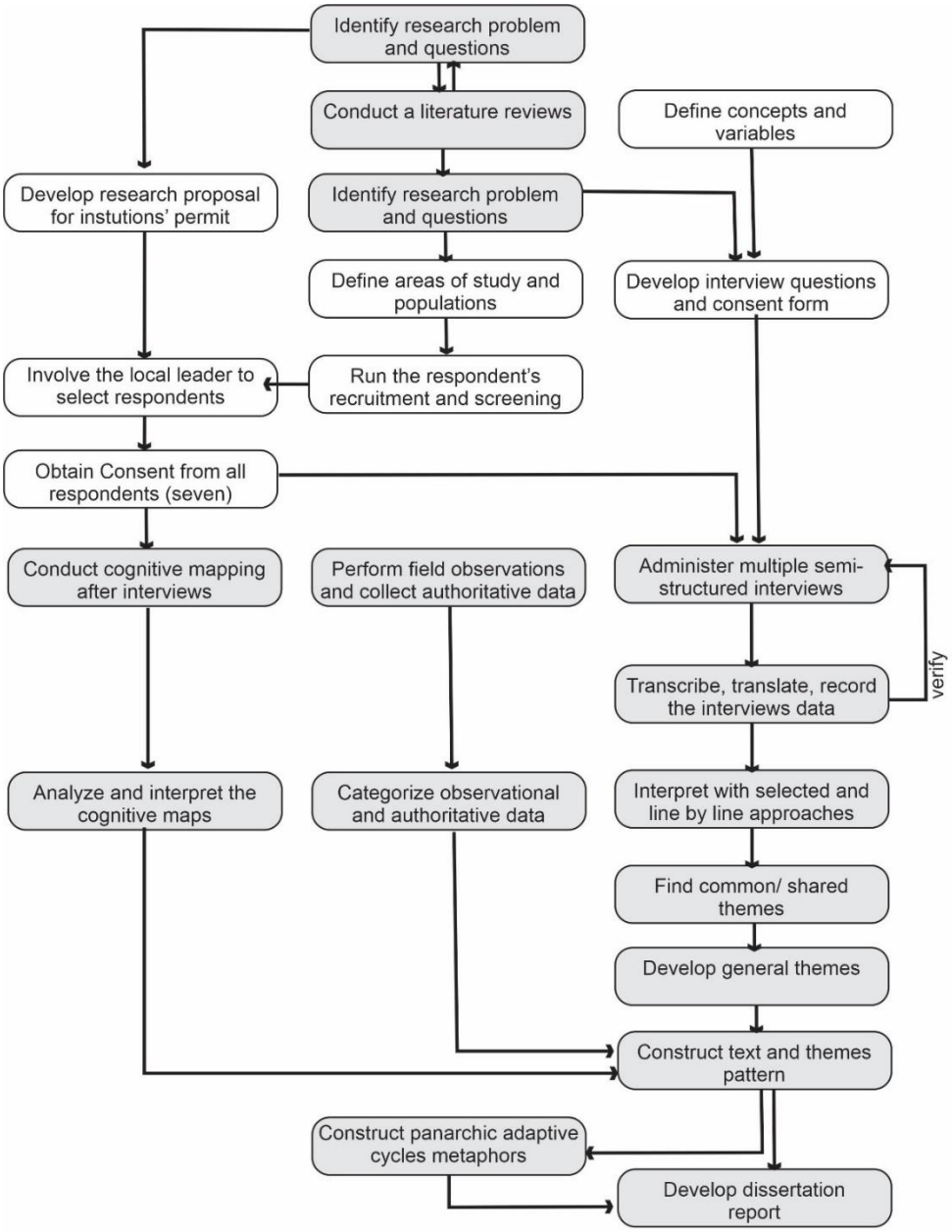

Fig.1.5. The research process

1.3.3. Methods of Data Collection

A. Sampling and Respondents Selection

There are two reasons why I selected the Pelemsari sub-village as the area of study. *First*, this close-knit community is an exemplar of a resilient community. After the eruption in 2010, they mobilized to voluntarily relocate until they finally resided in the Karang Kendal relocation site. *Second*, the sub-village holds a special cultural relationship with the Sultanate as the task to lead

the sacred rite *Labuhan* is bestowed upon one of its members throughout generations. Moreover, the deceased gatekeeper, Mbah Maridjan, refused the current Sultan's evacuation order during the eruptions in 1994, 2006, and 2010. His stubborn attitudes and resistance made this figure popular and an example for his community members. The total number of respondents in this study is seven, which is relatively small. Using a small size of sampling allowed me to obtain rigorous, detailed, and in-depth insights from my respondents, particularly, after we conducted interviews several times.

To locate trustworthy respondents, I used 'purposive sampling' and 'snowball sampling'. When planning to recruit them, I involved the head of the sub-village, Bapak Ramijo (triangulation approach). I considered demographic attributes (*heterogeneous sampling)* to select the potential respondents. The variant demographic profiles of my respondents can be seen in table 1.1. Here, I used pseudonyms to protect their identities.

Table 1.1. The respondents' characteristics

Respondent (pseudonyms)	Age	Educational attainment	Gender	Indigeneity
Rejo	50	Senior high school	Male	Native-born
Puteri	50	Elementary school	Female	Native-born
Moga	70	Elementary school	Male	Native-born
Krasan	70	Elementary school	Female	Native-born
Wisnu	30	Senior high school	Male	Non-native born
Samar	50	Elementary school	Male	Native-born
Aman	50	Bachelor degree	Male	Native-born

During the respondents' recruitment process, I depended on the head of the Pelemsari sub-village, for his knowledge and familiarity with the community members. Here, I first explained the criteria of respondents to the head of the sub-village and asked for his recommendations to locate credible and accountable respondents. After having the list of respondents' names, I contacted or visited my respondents' homes to obtain their approval. Before the interview began, I primarily introduced

myself to my respondents whom I met for the first time. To each of them, I also explained the research details based on the interview guide (Appendix).

B. Qualitative Interviews

For the qualitative interviews, I adopted open-ended questions, a narrative interview form, and a semi-structured interview style. Open-ended questions are aimed at empowering my respondents to give meaning to their testimonies and to build rapport with them (Appendix). The narrative interview form is important to enable me and my respondent to work and share stories collaboratively towards a co-constructed narrative and meaning (Salmons, 2015, p. 81). A narrative interview has roots in everyday conversations thus fluid flows of turn-taking are the consequence of this form. Despite there are benefits of this, there is a limitation. Being dragged into wandering around conversations could make the interviews meaningless. To solve this, I carefully changed the flow of my interview questions. Some other principles of narrative interviews that I did during my fieldwork are listening tentatively to their statements, giving up power control to the respondents, developing follow-up questions using 'why' and 'how', and following their unexpected trails (Riessman, 2008, p. 25). For instance, when my respondent talked about his hobby in art performance *jathilan*[5] and experience of expelling spirits from a possessed man, I found that Pelemsari villagers maintained a possessed tree in the Karang Kendal relocation site.

The interview style that I used to generate rich accounts from my respondent is the semi-structured interview. Here, I balanced the structured pre-determined questions with the unstructured, spontaneous, and flexible questions depending on their responses (Salmons, 2015, p. 36;

[5] *Jathilan* is a Javanese traditional dance that combines magic and art depicting a group of horsemen.

Brinkmann & Kvale, 2014, p. 31). A funnel-shaped interview in the semi-structured interview means that I primarily pose a broad question followed by specific questions throughout the rest of the interview. The application of this can be seen in my interview questions list in the Appendix (Brinkmann & Kvale, 2014, p. 19).

Running a qualitative research interview in the respondents' natural setting allows me to grasp the contexts within which my respondents lived, therefore, enriching my interpretations (Riessman, 2008, p. 25).. All interviews were conducted in the respondent's homes either in the Karang Kendal relocation site or former settlement, grass plots, guarding post, the entrance gate of the Kaliurang tourist site, or the collective cowshed. However, performing interviews in the respondent's natural setting also has consequences. There is one moment when my respondent, Wisnu, reflected on his experience of being mourned for his deceased mother in Magelang, his wife entered our interview and clarified his responses about *kesripahan* in their sub-village. What I would like to stress here is the potential for a researcher to meet a situation beyond his or her expectations where someone's answers could be influenced by others who suddenly present. It was not only in the context of a household as in the case of Wisnu. In a close-knit community like Pelemsari, neighbors could also come and enter the conversations.

The interview guides that I developed for this study are asking the respondent if they have any questions related to my explanation about the research before the interview, recognizing the respondent's anxiety and needs, clarifying particular statements when necessary, considering the respondent's request if he/she wants the recorder to be switched off, explicitly reporting the contexts so readers can fully grasp the respondent's statements which I implemented for Chapter 3, and ensuring that the data required to develop the adaptive cycles metaphors are described by

the respondents. Next to my interview questions list, I specifically described the adaptive cycle's key elements (e.g., potentials, connectedness) so they can give me a hint during the interview.

C. Cognitive Mapping

Cognitive mapping is a method in which a person generates a mental image of an environment, that can be evoked as what he or she wishes (Downs & Stea, 1977, pp. 6–7). The cognitive map is a means to record human experience (Yuan, 2020, p. 260) and the result of a two-way process between the observer and his/her environment (Topcu & Topuc, 2012, p. 576). Through cognitive mapping, one can assess the respondent's emotional attachment to a place and interpret how he/she interacts with and then become attached to a place (Smith & Aranha, 2020, p. 2). The limitation of performing this, generally, came from the context within which my fieldwork was conducted. The eruptive activities of Mount Merapi in 2021 and the eruptions from March 9 to 10, 2022, caused the former settlement of Pelemsari including Kinahrejo to be closed to the public for about two weeks. The impact of this on this method was my limitation to meet my respondents, Krasan and Aman. It should be noted that the government only allowed local villagers to access the upper land including the forest during this emergency time.

D. Field Observations

To conduct field observations, I adopted a 'marginal participant' position, that is familiarizing myself with the daily situations at the Karang Kendal relocation site. I usually spent my time on the site for interviews and field observations about 4-6 hours per day from Sunday to Monday. The goal is to be seen by the community and therefore allows me to obtain valid data (Zeisel, 2006, pp. 191–199). There are three types of recording devices that were used to conduct this observation: *verbal and diagrammatic notes*, sketches, or maps are used to record sequences of

behavior in settings where the respondents choose paths from home to the workplace, photographs/ images with a 20MPixel digital camera and a semipro camera by Canon (Zeisel, 2006, pp. 200–203).

E. Archives

To collect data about the history of Mount Merapi, Yogyakarta, the National Park, and the Pelemsari or Kinahrejo as well as PDF maps, I used archives from various data sources: the Mount Merapi National Park Agency's library, the Umbulharjo Village office, the Provincial Agency of Housing and Public Work's office, the Ministry of Public Works, the Sarono Makmur Dairy Cooperative in Wukirsari, the Sleman Regional Government's Board of Planning and Development, and the National Disaster Mitigation Agency. The documentation of the Pelemsari history is, however, very limited and can only be obtained from a book authored by an anthropologist, Lukas Sasongko. To address this, I relied on the interviews with the local elder, Moga, and a historian, Professor Suraya Affif.

1.3.4. Methods of Analysis

In order to reveal the "meaning of living with risks", I used the deductive approach, "an approach that is driven by the researcher's theoretical or analytic interest and may provide a more detailed analysis of some aspect of the data but tends to produce a less rich description of the overall data" (Anderson et al., 2014, p. 83; Nowell et al., 2017, p. 8). This means that my interpretations drive which themes are salient, the naming of the themes, and the interactions of themes in the diagrams. The bases used for this analysis came from my interviews, observations, and theories. Indeed, phenomenological themes could be simplicities as it is quite impossible for any researchers to be able to capture the rich world of the respondent in a notion (Van Manen, 1990, p. 79). To be clear, a "theme is always reductionistic but may present the best simplification" (Van Manen, 1990, pp.

87–88). In the first section of Chapter 3, I selected the richest narratives of my respondents' testimonies. My objective in providing the conversation is to let readers develop their own interpretations of the respondents' lived world in Mount Merapi. The respondents' themes are highlighted in the diagrams of the themes constellation. The second section of this chapter is dedicated to discussing the themes relevant to resilience. The objective of this section is to answer the research questions and show how they reflect respondents' perceptions as shown in the excerpts.

The second research question would need me to attend a cognitive model to explain how the meaning of living with risks affects people's behaviors. For this regard, I used the place attachment model of Milhaylov and Perkins (2014) which shows the one direct effect of environmental disturbances on community responses.

The third and fourth research questions that relate to systems' interactions and adaptive cycles metaphors are approached by using *the panarchy* framework which is holistic in nature and Ostrom's set of self-governed principles. The *Panarchy* framework is useful to understand the Pelemsari and Mount Merapi ecosystem dynamics across spatial and temporal scales" (Allen et al., 2014, p. 578). Ostrom's set of self-governed principles is used to assess the dynamic adaptive capacity of the Pelemsari villagers by examining their institutions (e.g., customary rights, local knowledge) in managing the forest over time. Two approaches employed in the analysis are synchronic and diachronic. The former helps examine the interactions of social-ecological systems in Mount Merapi and their patterns in each period while the latter helps examine the changes in the complex SES interaction dynamics over time (Chrisomalis, 2006, p. 397).

In terms of thinking framework, the themes found from the phenomenological analysis of living with risk after the eruption in 2010 by using the deductive approach serve as the adaptive capacities

of the Pelemsari villagers (fig.1.6). These adaptive capacities allowed the community to withstand and recover from the eruption in 2010 and the undesirable policies, namely the national park stipulation in 2004 and the relocation program in 2011. The sense of community, in particular, according to Ostrom (1990) could address the Common Pool Resources' problems of supplying new institutions in self-governance (Ostrom, 1990, p. 43). How the adaptive capacities are interplayed and how the CPR problems occur in the forest management of Mount Merapi will be identified through the panarchical analysis.

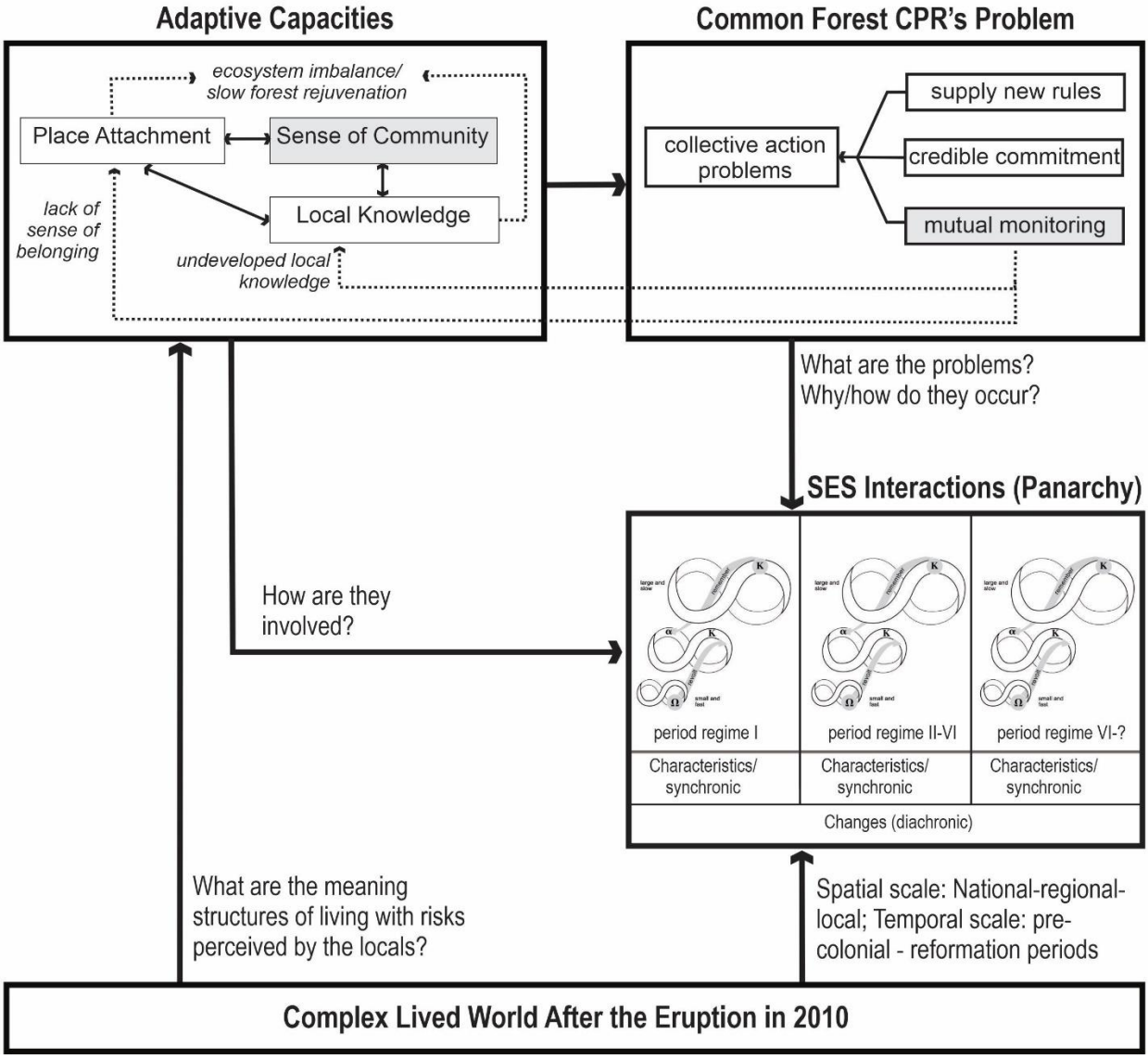

Fig.1.6. The thinking framework of the study

1.4. Dissertation Structure

The term "living with risk" seems to suggest the "choice" made by those who live around a source of threat which consequently requires this community to acquire capacities to deal with unexpected disturbances. These adaptive capacities, according to Oliver-Smith and Hoffman, could be unfolded through interpretations of disasters that could be caused either by nature (i.e., volcanic eruptions) or humans (i.e., undesirable policies). In this study, the adaptive capacities of the Pelemsari villagers cover place attachment, sense of community, and local knowledge.

In Chapter Two, I discuss the history of Mount Merapi's eruption and its main characteristic, pyroclastic flows, whose directions since 1994 changed from westward-northwestward to southwestward-southward. The direction change of pyroclastic flows in the eruption in 2010 had collapsed the longstanding belief that the spirits would continue protecting the villages on the southern flank. In this chapter, I also emphasized three major eruptions in the 20th century as they were repetitively mentioned by my respondents. People's interpretations of each eruption played important roles in this discussion as they imply the cultural uniqueness of the Merapi community in which the Javanese belief system influenced the meaning constructions of their lived world. Along with the volcano, I described the history of the national government and the Yogyakarta Sultanate in this chapter throughout periods, from pre-colonial to reformation. The history and the characteristics of the area of study, the Pelemsari sub-village, are discussed at the end of this chapter. It is worth mentioning that the written document about the history of this sub-village is very limited and the main data source of its history that I used for this study is the book published by Lucas Sasongko Triyoga in 1991.

I discuss the phenomenology of living wth risk in Chapter Three specifically through the sections of the respondents' narratives of living with risk and themes of community resilience. Three narratives belonging to Aman, Moga, and Puteri are selected because of their power to represent the unique lived world of the Pelemsari villagers. From Aman, we could learn how a farmer's childhood in the past was bounded responsibilities for continuing the uncompromisable *ngarit* (i.e., cutting grass) tradition. Moga's testimony informs us about the power relations between the forestry agency and the local farmers over generations. The testimony of Puteri, on the other hand, allows us to recognize the spiritual meanings that are assigned to an eruption by connecting this event to the state's forest controls. The themes of community resilience, identified with the deductive approach, are the adaptive capacities of the Pelemsari villagers to deal with multiple disturbances after the eruption in 2010. Here, I included the excerpts and my analysis for each theme of community resilience.

Chapter four contains the dynamic interactions of the Pelemsari community with other systems by using the panarchy framework and Ostrom's self-governed design principles of managing the collective pool resources of the forest. The panarchical connection in this study is illustrated through the interactions among three systems and levels: the Pelemsari villagers as the small and fast adaptive cycle, the Merapi's forest system as the intermediate speed and size adaptive cycle, and the national government as the large and slow adaptive cycle. The state's forest controls, I assumed, had become serious barriers to the development of local potential to manage the forest resources and monitor the environmental changes in the region. Spatially, the area that was accessible for villagers was limited to that determined by the government through a reforestation program where the types of species being planted were controlled by their foresters.

CHAPTER 2

THE HISTORY OF SOCIAL-ECOLOGICAL SYSTEMS OF MOUNT MERAPI

2.1. Introduction

The sustainability of Pelemsari villagers is influenced by at least three major forces: Mount Merapi, the state, and Yogyakarta Sultanate. Both positive and negative experiences of interacting with these entities shaped people's perceptions of living with risks. In this chapter, I will discuss the history of Mount Merapi in terms of eruptions and its major events in the 20th century that because of its different pyroclastic flow directions, had shattered the longstanding belief about villages' safety on the southern flank. Besides the volcano, the histories of the state's forestry services, the Yogyakarta Sultanate, and the Pelemsari villagers were also described to establish a comprehensive understanding of their characteristics and relations with one another.

2.2. Mount Merapi

The name "Merapi" originated from two words: *Meru*, a term in Hindu mythology for a mountain, and *api*, an Indonesian term for fire. From this terminology, the mountain of fire, it is conceivable why Merapi holds the status of the most active volcano in Java. On average, its small eruptions occur every two or three years, larger ones every 10-15 years, and very large ones every 50-60 years (Reuters, 2006). When compared to the global active volcanos, Merapi emits a densely pyroclastic flow[6] (ESDM, 2010). The Merapi's fame is, however, not merely shaped by its life-threatening eruptions but also by myths. It is no wonder why many Javanese links the eruptions to

[6] Pyroclastic flow in the Javanese term is *wedhus gembel* that refers to the white and wavy wool-shaped hot clouds spewed by Mount Merapi during an eruption.

spiritual meanings or upcoming landmark events. To comprehend the social and ecological dynamics of Mount Merapi, I dedicate this chapter to discussing its history of eruptions and socio-politico-cultural landscape. In the end, I describe the characteristics of the Pelemsari sub-village that due to the resilience of its society during the 2010 eruption, is selected as my area of research.

Mount Merapi stratovolcano is located about 30 km north of metropolitan Yogyakarta and is the most active volcano in Indonesia (Donovan, 2010a, p. 118; D. Hidayat et al., 2003; Mei et al., 2016a, p. 368). The volcano had claimed over 130,000 casualties since 1800 (Thouret et al., 2000) yet is still home to about 1.6 million people (Surono et al., 2012, p. 122). Only within two decades, the population at Mount Merapi quadrupled, from only around 206,600 in 1976 to 1,083,400 in 1995 (Thouret et al., 2000, p. 480).

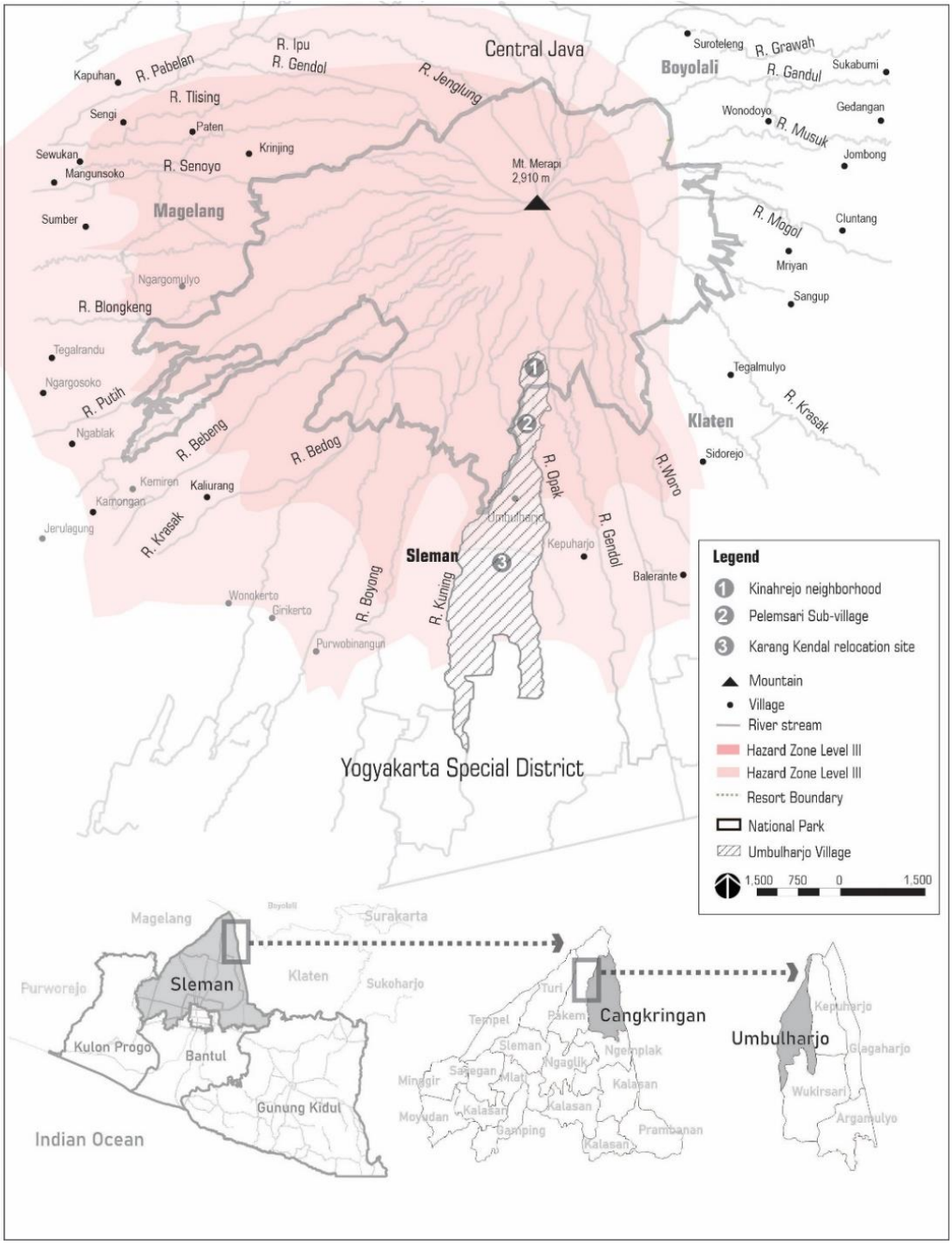

Fig.2.1. Mount Merapi shows its major river streams and tributaries. The map is adapted from BTNGM (BTNGM, 2021; KESDM, 2014; RXerself, 2020)

Geologically, Merapi's soil contains regosol, andosol, alluvial, and lithosol. These materials provided its inhabitants with fertile soil for planting various crops. Farmers in the Turgo Village,

for instance, with a multiple cropping technique, could yield agricultural products like peanuts, spinach, papaya, and corn throughout the years. Ngargomulyo villagers cultivated not only fruit or vegetable but also rice and obtained herbs in the forest (Muhammad, 2010, p. 96). The regosol soil containing tephra (Muhammad, 2010, p. 91) is mainly found in Yogyakarta which consequently gives this region an optimum capacity to store carbon (Fiantis et al., 2019, p. 1). Such a condition allows the residents to collect high-quality and abundant grass along the rivers (Umami et al., 2015, pp. 97–100). There are three mainstreams stretched out from this volcano: River Progo in the west, River Opak in the South, and River Bengawan Solo in the east with a total of 27 tributaries linked to these rivers (Gunawan et al., 2013, p. 7; Muhammad, 2010, pp. 91–92). Climatologically, Merapi is grouped in the C-type category, meaning that the rain is relatively wet and relatively frequent with the annual rainfall ranging from 875 to 2,527 mm per year.

2.2.1. History of Eruptions

Berthommier (1990), Berthommier et al. (1992), and Camus et al. (2000) divided the eruptive history of Mount Merapi into four periods: Ancient Merapi (40,000-14,000 year-BP), Middle Merapi (14,000-2,200 year-BP), Recent Merapi (2200 year-BP-1786 AD), and Modern Merapi (after the 1786 AD) (Thouret et al., 2000, p. 483). According to R.W. van Bammelen, the first major eruption of Merapi occurred in 1006 (Lucas Sasongko Triyoga, 1991, p. 13). Its quiescent phase ranges from one to eighteen years and since the 1600s, the volcano reportedly had erupted more than 80 times. Among those events, the eruptions of 1768, 1822, 1849, 1872, 1930, and 1931 had magnitudes of more than 3 VEI. Besides being frequent and destructive, Merapi's eruptions are also volatile. During the eruptions from 1872 to 1931, the ash plumes consistently drifted westward -northwestward but this trend changed after the eruptions of 1930 and 1931. For

instance, in the event 1994, the pyroclastic flows went southward towards River Boyong which stretched across Bukit Turgo and Plawangan. Likewise, the ash plumes emitted in the 2006 eruption also drifted southeastward towards River Gendol (KESDM, 2014) but at this time, the lava dome *Geger Boyo* (i.e., crocodile back) collapsed into the Woro Valley. Since 1930, this crocodile spine-shaped feature on the Merapi's upper southwest ridge had protected the villages on the southeastern flanks by diverting the threatening pyroclastic flows toward the west and southwest. With the loss of *Geger Boyo*, the flanks became exposed to an unstable and growing lava dome, thus, risking the villages nearby (Wilson et al., 2007, p. 11). Despite this, many of the inhabitants refused to relocate. Ancestral beliefs are often accused as the main factor that complicates evacuation and relocation plans. On the other hand, those beliefs enrich multiple interpretations of the Javanese to socio-political realities and predictions of the future. Table 2.1 provides the summary of Mount Merapi's eruptions adapted from the studies of Thouret et al (2000), T. Atmojo et al. (2018), and Darmawan et al. (2018).

Table 2.1. The summarized eruptions of Merapi according to Thouret et al (2000), T. Atmojo et al (2018), and Darmawan et al (2018)

Eruptive events*	VEI **	Type of eruption*	Ash flow direction*	death tolls*
1672		Ex, PF, DF		3,000
1822-1823	3	Ex, PF, DF, D		100
1832-1835		Ex, PF, LF, D		32
1846-1847		Ex, PF, LF, D		
1849	3	Ex, PF, LF		Hundreds
1862-1864		Ex, PF, LF, D		
1871-1872	3	Ex, PF, LF	Westward-northwestward	200
1887-1889		Ex, PF, LF, D		
1902-1904	2	Ex, PF, LF, D	Westward-northwestward	16
1908-1913		Ex, PF, D		
1920-1921	2	Ex, PF, LF, D	Westward-northwestward	35

1922		Ex, D, LF		
1930-1931	3	Ex, PF, DF, PS, DG	Westward-northwestward	1,369
1932		Ex, SDF		
1933-1935		Ex, PF, LF, D		
1939-1940		Ex, PF, LF, D		
1942-1943		Ex, PF, LF, D		
1948		Ex, LF, PF		
1953-1954	2	Ex, PF, PA, LF, D	Southwestward	64
1955-1958		Ex, PF, LF, D		
1961	3	Ex, PF, DF, PS, LF	Southwestward	6
1967-1968		Ex, PF, D		
1969	2	Ex, PF, PS, SDF, D	Southwestward	3
1970		Ex, PF		
1972-1975	2	Ex, PF, LF, SDF, D	Southwestward	9
1976	2	PF, LF, SDF	Southwestward	29
1977-1979		PF, SDF, LF, D		
1980-1983		Ex, D, LF		
1984		Ex, PF, Ph, SDF		
1986-1991		Ex, D, LF		
1992		Ex, PF, D, DF		
1994	2	Ex, PF, PS, DF	Southward towards River Boyong	66
1997	2	Ex, PF, D	Southwestward	6 missing
2006**	2	Ex, PF, LF, D	Southeastward towards Rivers Gendol, Krasak, Boyong, Sat	2
2010***	4	Ex, PF, DF, PS, LF	Southwestward towards Rivers Gendol and Kuning	379

Ex= Explosion, PF= Pyroclastic Flow; PS= Pyroclastic surge; D= Dome growth; DF= Debris flow; SDF= Secondary debris flow; LF= Lava flow; Phreatomagmatic activity= PA; Phreatomagmatic activity
Source of data: *) Thouret et al. (2000); **) T. Atmojo, et al. (2018); ***) Darmawan et al. (2018)

2.2.2. Major Eruptions in the 20th Century

Among the eruptions in the 20th century listed in Table 2, those that occurred in 1994, 2006, and 2010 have the most shattering impacts on the victims, thus, often spurring public interpretations of social realities or predictions of the future of the nation or even the world. The eruptions that

occur, albeit their lower magnitudes, are still able to generate such interpretations to rise. Based on my fieldwork in Pelemsari sub-village in 2021and 2022, I found that those three events were raised by my interviewees during our conversations. In general, they associated the events with the hot cloud directions and fatalities.

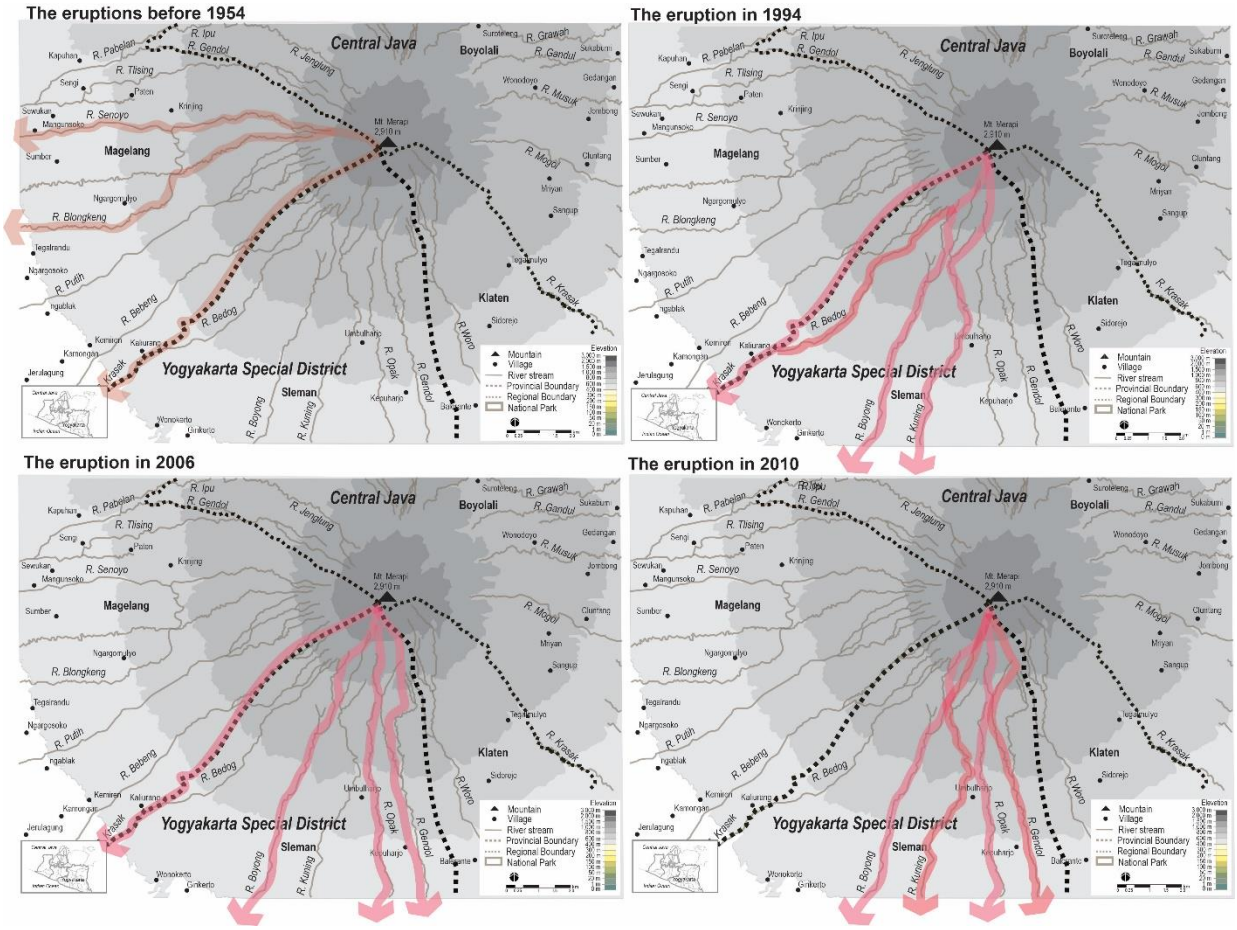

Fig.2.2. Illustration of the changing direction of pyroclastic flows from those before 1976 to those after the eruption in 1994 toward southward, shattering the longstanding beliefs about the village's safety

A. The 1994 Eruption

The eruption on November 22, 1994, resulted from dome collapses after a series of dome growth episodes. The ash flows and clouds of the eruption damaged the south-southwest flanks, sweeping over Rivers Krasak, Bedok, Boyong, and Kuning including villages in Kaliurang and Turgo (Kelfoun et al., 2000, p. 379). The event claimed about 66 death tolls and damaged around 500

hectares of forests and settlements. About 55,478 people fled to shelters in Sleman and Magelang and around 2,608 people became homeless (Schlehe, 1996, p. 392).

In the Javanese worldview, man's world and the god's world are two interconnected cosmos that should exist in equilibrium. Thus, natural events and human life are always interconnected. Merapi in the local perception is a sacred *Kraton* (i.e., court) of spirits who, like human beings, perform activities such as farming, planting, and riding horses. People in two of Merapi's hamlets, Turgo and Kinahrejo, specifically believed that whenever the volcano needs a workforce, the living disappears and joins spirits to work in the court. Further, the spirits of the dead maintain a connection to the living through dreams Here, they may send warnings of a possible disaster (Schlehe, 1996, p. 395). Besides the beliefs, there was also a taboo of holding ceremonies during two sacred days in the Javanese calendar, *Jumat Kiwon* (Friday Kliwon) and *Selasa Kliwon* (Tuesday Kliwon) (Donovan et al., 2012, p. 311). Accordingly, on these sacred days, every 35 days, spirits will go out and demand offerings from the people (Schlehe, 1996, p. 405). Thus, when Merapi erupted in 1994 and emitted pyroclastic flow that killed about 60 guests of a wedding ceremony on *Selasa Kliwon* in the Turgo Village, people soon associated the incident with the taboo (Wilson et al. 2007:6). Others perceived the eruption as a warning from the Turgo's spiritual ancestor, *Syech Jumadil Qubra*, whose tomb was situated on the top of Mount Turgo. People's moral degradation and the pilgrim's materialistic requests in his grave seemed to have raised Syech's anger. Besides this, the lack of the current Sultan's spiritual power, modernization dictating the royal's lifestyle, insufficient ceremonies, and improper developments interrupting the volcano's ecology (e.g., a golf course adjacent to River Opak and Gadjah Mada University's gigantic hall) and Yogyakarta's sacred axis also rose (Schlehe, 1996, pp. 106–107).

The eruption in 1994 was connected by the dream of the phenomenal gatekeeper, Mbah Maridjan, by the author of *Merapi Omahku*, Elizabeth D. Inandiak (2010). Mbah Maridjan shared his dream of meeting his late grandfather who was accompanied by tall, yellow, and handsome soldiers of Merapi court, and told him in Javanese, "*aku duwe dhuwit dum na*" (i.e., I have money, please share them). For Maridjan, *dhuwit* means treasures or valuable news (i.e., eruption) that should be spread out to his people. When he cleaned the road for the *Labuhan* rite, hot clouds flew toward him. Instead of running away, he greeted the cloud by saying *assalamualaikum*, and the wind suddenly diverted the clouds away from Maridjan. To the Sultan, Maridjan then sent a letter to protest against resettlement plans.

> *Saya mohon kebijaksanaannya supaya Kinahrejo aman tentram, tidak diusik oleh pemerintah untuk pindah. Juga mohon pada Tuhan di Kinahrejo diberi keselamatan* (Inandiak & Dono, 2010, p. 71).
>
> *I beg for your wisdom so Kinahrejo becomes safe and peaceful, uninterrupted by the government who orders to move. Also, I beg God so Kinahrejo is blessed with safety* (Inandiak & Dono, 2010, p. 71).

B. The 2006 Eruption

Volcanic tremors since April 25, 2006, and an M6.4 tectonic earthquake on May 27, 2006, in Bantul Regency (Wilson et al., 2007, p. 8) finally made the volcano's lava dome, *Geger Boyo*, collapse on June 4. With the loss of this protective wall, pyroclastic flows traveled 4 km southeastward to the Gendol Valley, damaging the nearby villages, Kaliadem and Bebeng, and burying two men who hid in a bunker (Wilson et al., 2007; Wunderman, 2007). The flows severely damaged the agricultural farms and water pipes and dried up the major water source, *Umbul Lanang*, creating a significant water shortage that caused a significant weight loss in the livestock. The sudden increase in eruptive activity following this collapse urged *Balai Penyelidikan dan Pengembangan Teknologi Kebencanaan Geologi* (i.e., the Research and Development Center for

Geological Disaster Technology) to return the warning level from alert to caution only within one day. In a confusion, people who already returned to their villages were then immediately re-evacuated. About 15,000 villagers in Kaliadem were indeed successfully evacuated but the process was run not without obstacles. Many villagers were reluctant to leave their farms and livestock behind (Donovan et al., 2012, p. 310; Wilson et al., 2007, p. 54). Some hypothesized that the refusal was triggered by people's distrust of the government's capacity in providing compensation for their losses after learning from the failing response to the Bantul earthquake. Others stressed the local's superstitious belief as to the cause (Wilson et al., 2007, pp. 53–54). In Pelemsari, people chose to rely on the intuition of their informal leader, Mbah Maridjan, who during the 1994 eruption spurned the Sultan's evacuation order. When an eruption re-occurred in May 2006, emergency agencies including the Vice President Jusuf Khala and Sultan Hamengku Buwono X persuaded the gatekeeper to evacuate. Instead of obeying the order, Maridjan meditated in *Srimanganti*, a site for harboring the *Labuhan* tributes nearby the crater. Maridjan argued that he tried to keep his promises to the former Sultan, Sultan HB IX, who once appointed him as *abdi dalem* or a royal servant. Thereby, he felt being bound only to the orders of this sultan, not of the current sultan who according to Maridjan behaved more like a governor rather than a king. Further, Maridjan believed that leaving the volcano would only raise his people's anxiety and doubts about the volcano (Syamsul et al., 2012, pp. 4–5). One of my respondents, Samar, recalled Mbah Maridjan's perplexing yet reflective phrase to respond to the evacuation appeals.

> *Itu kan sudah yang memberi tugas dari Pak Sri Sultan yang ke-9 jadi kalau ditinggal turun nggak nanti ditertawakan 'ayam' (Samar, March 25, 2022, 00:33:00)*
>
> *The task came from the Sultan XI so if I leave (the volcano), I will be laughed at by a chicken (Samar, March 25, 2022, 00:33:00)*

"Being laughed at by a chicken" was perceived by Samar as humor that reflects Maridjan's consciousness over his responsibility for remaining in the volcano regardless of its condition. He then assumed that Maridjan must have received *wisik*, an Indonesian term for 'revelation'. Only people with a supernatural ability such as the gatekeeper could receive it, mainly through dreams and meditations. When dealing with hazards, ordinary people who do not possess this ability mainly rely on two kinds of sources: the environmental cues such as the volcano's precursory activities and the authority's warning messages or science-based predictions. Whenever my respondent takes risks by going to his grass parcels in the deep forest despite the volcano's alert status, he used an ancestral message to become his *patokan* or action guide.

> *Itu orang tua sini bilang to nanti kalau Merapi mengeluarkan ada petirnya dulu. Kalau nggak ada petirnya, ya, nggak terlalu besar. Kalau sudah ada petirnya itu, besar, harus larilah, mbok di hutan, di mana saja. Kalau ada petirnya, harus lari. Kata orang-orang tua di sini (Interviewee-6, March 25, 2022, 00:35:39).*
>
> *People here said if Merapi erupts, there will be a thunderlight preceding it. If there is no thunderlight, that would mean the eruption is not big. If there is a thunderlight, the eruption will be big so we must run, either in the forest or everywhere. If there is a thunderlight, just run. That is what old people said here (Interviewee-6, March 25, 2022, 00:35:39).*

Then, he continued:

> *Kalau saya di hutan, patokannya ya itu. Nanti keluar ada petir, ya cepat-cepat larilah, tapi kalau nggak ada petir ya, lihat-lihat, awan panasnya kemana (Interviewee-6, March 25, 2022, 00:37:09).*
>
> *If I am in the forest, the guide action is only that. If there is a thunderlight, I will just immediately run, but if there is no thunderlight, I will just watch where the hot clouds flow (Interviewee-6, March 25, 2022, 00:37:09).*

Mbah Maridjan's attitudes had aspired many, if not all, Pelemsari residents to remain in their sub-village during eruptions. Thus, newspapers and regrettably, scholarly publications blamed him for people's refusal to evacuate. During my interviews, however, never did my respondents mention that Maridjan attempted to discourage the people from evacuating. In contrast, he advised people

to obey the evacuation order and at the same time, to pray to God for their own safety. In my interview with the current gatekeeper in 2022, I remembered the admiration that he keeps for his late father whose charism is hardly replaceable in the eye of his people. Dating back to our interview in 2019, Asih admitted that becoming his father's successor created a moral burden. He realized that it was almost impossible to match his father's legacy. When many negative comments were addressed to his father for refusing the Sultan's evacuation order, Asih chose to be calm. People who know nothing, he argued, have the right of speaking freely.

> *Ada itu ya orang-orang komentar lha Mbah Maridjan tidak mau diajak turun. Diajak turun itu tidak mau, ah jelas itu, Mbah Maridjan konyol itu. Tidak mau turun itu. Itu sudah kentara sudah tahu tentang marabahaya koq itu. Itu di waktu itu di surat kabar. Di surat kabar itu kan komentar orang-orang kan ada. Saya sendiri menemui di depan mata saya sendiri. Ya istilahnya tapi saya tapi mereka kalau saya puteranya Mbah Maridjan. Ah ha di pasar. Ada orang yang ngomong begitu ya saya diam saja, daripada.. Akhirnya saya cuek saja karena tidak tahu. Gitu Mbak. Orang yang tidak tahu itu bebas. Kalau sdah tahu tentunya tidak seperti itu (Interview with Asih, February 28, 2022, 00:16:25).*
>
> *People made negative comments about Maridjan because he refused to evacuate. They said that he was ridiculous for not evacuating despite the obvious danger present at that time. I noticed these comments in newspapers. I also encountered them in front of my eyes. They, who made the comments, did not know if I was the son of Maridjan. It was in the public market and I was calm and ignored the comments because they did not know. Those who did not know are free. If they knew, they would not behave that way (Interviewee with Asih, February 28, 2022, 00:16:25).*

C. The 2010 Eruption

The eruptive activities of Merapi in 2010 began on September 20 and caused the increase of the volcano's alert status from normal to *waspada* (i.e., advisory). One month later, on October 21, 2010, the status was raised to *siaga* (i.e., watch). The status was increased to the highest level, *awas* (i.e., warning) on October 26, 2010, at 6 AM. Respectfully, the areas within 10 km of the crater were specified as a high-risk zone. The volcano erupted on October 28, 2010, at 5:02 PM by releasing massive hot clouds that flew about 7.5-kilometers from the crater. The eruptive

activity increased on November 3, 2010, causing hot clouds to flow 1.5 kilometers further from the previous state between 11 AM to 3 PM. To mitigate the impacts, the high-risk zone was expanded to 15 kilometers from the crater. The volcano continued erupting on November 4, 2010, between 12 AM and 12 PM, and emitting hot clouds that traveled about 14 km toward the adjacent river streams. On November 5, 2010, at 1 AM, the high-risk zone was increased again to about 20 km as the eruption continued. It was on November 14, 2010, that the eruptive activities began to decrease, leading to the reduction of the high-risk zone in the Magelang regency to 15 km and that in Boyolali and Klaten regencies to 10 km from the summit. On November 19, 2010, this zone was further decreased to only 10 km for Magelang and 5 km for Boyolali. The status of Mount Merapi was returned to *siaga* (i.e., watch) level on December 3, 2010. However, all activities within 2.5 kilometers from the crater and 300 meters from the affected river streams were prohibited (BNPB, 2011, pp. 24–26).

The series of violent eruptions in 2010 released volcanic materials with a volume ten times greater than that in the 2006 eruption (Muhammad, 2010, p. 63) and was followed by over 240 rain-triggered lahars. The lahars then formed avulsions[7] on the distal slopes that could threaten the inhabitants in the densely populated areas (Bakkour et al., 2015, p. 174). The volcanic ash covered about 435,000 ha of Merapi's land where 20% of it comprises agricultural farms, forests, horticultural farms, plantations, shrubbery, and settlements. The event caused about 367 fatalities and 277 injuries (Bakkour et al., 2015, p. 167), killed about 1,961 cattle comprising 1,780 dairy cows, 147 beef cows, and 180 goats and sheep (Muhammad, 2010, p. 43), and forced 15,366 people to evacuate (BNPB, 2011, p. 22).

[7] Avulsion is the process by which a new channel is initiated by drawing discharge away from a former route that may later become abandoned. Avulsions cause redistribution of floodwater and sediment over the delta plain (van Asselen et al., 2017, p. 1694).

About three months before the 2010 eruption, *Labuhan Gunung Merapi*, the annual sacred ceremony aimed to express reverence to the spirits, was held without the gatekeeper, Mbah Maridjan. It was reported that Maridjan must have a rest after undergoing hernia surgery. This time, Maridjan only led one of the rituals at his home while those in the sacred harbors in the forest would be led by his son, Asih (Inandiak, 2016, pp. 155–156; Radja, 2010). Days before the volcano erupted on October 26, 2010, the government had appealed to Mbah Maridjan to evacuate. Similar to the previous incidents, Maridjan maintained his principles of remaining in Mt. Merapi. On the same day at night, the evacuation team found Mbah Maridjan's dead body at his house in a kneeling position while praying (Lang, 2010).

Shortly before the eruption, Maridjan shared his premonition with Mak Keti who, to this date, remains living at her house near the crater. In a low yet clear voice, the almost 70-year-old woman recalled that moment and stressed that Maridjan already had a hunch about the upcoming eruption.

> *Kalau Mbah Maridjan itu kan ramah sama warga. Sama saudara-saudara kan bebas gitu lho. Kalau sama saya kan gini, Yu, mau erupsi itu to. Itu kan sebelum erupsi sudah tahu Mbah Maridjan (Interviewee-4, Mak Keti, February 28, 2022, 00:28:38).*
>
> *Mbah Maridjan is very friendly to everyone. To sisters or brothers, he was so free. To me, he always called Yu, just before the eruption. Before the eruption, Mbah Maridjan had already known (Interviewee-4, Mak Keti, February 28, 2022, 00:28:38).*

Trying to convince myself, I asked, before the eruption? She replied:

> *Iya. Sudah tahu. Terus saya diberitahu, "Yu, jarenya yu, iki arep eneng gawe, mau mantu sesuk geden. Mbak Yu kudu lungo." (Responden bertanya) "Lha, jenengan?" (Maridjan membalas) "Ora lungo, aku, perjuanganku neng kene, tak entek ke neng kene." Bilang gitu Mbah Maridjan itu. Mbak Yu gitu sama saya. Saya dibilangin gitu pokoknya Mbak Yu kudu lungo. Ndoke buang sampah. Namanya buang sampah gitu. Sebelumnya, Mbah Maridjan itu sudah tahu. Saya kan sudah dibilangin gini gini. Saya turutin saja (Interviewee-4, Mak Keti, February 28, 2022, 00:29:00).*
>
> *Yes. He had. Then, I was told, "Yu, (they) said, there would be an occasion, a wedding, a major one tomorrow. Mbak Yu must go. (She asked) "But, how about you?" (Maridjan replied)" I will not go, my struggles are here, I want to finish them here." That was what Mbah Maridjan told me. Mbak Yu to me. I was told, Mbak Yu must go. It wants to expel waste. It is called expelling waste. Before the event, Mbah Maridjan*

> *had already known. I had been told this and this. I just obeyed (Interviewee-4, Mak Keti, February 28, 2022, 00:29:00).*

'*Mbak Yu'* is a title in Javanese tradition typically addressed to a woman relative or sister whom we are very close with. In her intimate conversation with Maridjan, one could soon conclude that he was not only trustworthy but also humorous and friendly. Despite his status as *abdi dalem* or royal court, Maridjan never considered himself higher than his fellow villagers. Also, Maridjan and most villagers called Merapi *Eyang*, a respectful title typically addressed to a grandparent in a Javanese household. Rather than saying Merapi erupts, they would prefer to say Merapi is developing itself, *Eyang* is coughing, or the spirits are expelling excrements. It is worth noting that using terms denoting negative attitudes such as 'erupt', *wedhus gembel* (i.e., pyroclastic flows), or alike will be considered impolite.

D. Relocation Program in 2011

To deal with eruptions, the national government ensured coordination across its agencies and levels by issuing the Law of the Republic of Indonesia No. 24/2007. Accordingly, the disaster management is run under the direct supervision of the President who then delegates the tasks to *Badan Nasional Penanggulangan* Bencana (i.e., the National Board for Disaster Management). At the provincial and district levels, the board is represented by a unit called *Badan Penanggulangan Bencana Daerah* (i.e., the Local Disaster Management Agency). Altogether with the National Board, this unit is responsible for the aid coming from donators or sponsors. In terms of warning messages, the government relied on five observatory posts that monitor volcanic activity. The information received is then transmitted to the Center for Volcanology and Geological Hazard Mitigation (CVGHM) which is supported by a unit called *Balai Penyelidikan dan Pengembangan Teknologi Kebencanaan Geologi* (i.e., the Research and Development Center for Geological

Disaster Technology). The tasks of this unit are to mitigate disasters, develop methods and technology, and manage the geological laboratories. All information related to the volcanic activities must go through the CVGHM's approval before being released to the public through the press or media (Bakkour et al., 2015, pp. 172–174).

During the rehabilitation phase in 2011, the Sleman regional government enacted a relocation program. This program was an integral part of Merapi's Action Plan of Rehabilitation and Reconstruction which was developed based on the updated hazard map. It is worth mentioning that prior to the 2010 eruption, the hazard map was made to only respond to less than VEI-3 eruptions (Jenkins et al., 2016, p. 82). The larger magnitude of the 2010 eruption urged CVGHM to extend the exclusion zone to 10 km and issued an immediate evacuation of tens of thousands of people in 35 villages on October 25, 2010 (Mei et al., 2016b, p. 362). The relocation plan, however, raised a dispute between the regional government and villagers living in the riskiest areas. Of 3,612 households, 1,059 refused to relocate. These dissenters mainly lived in three sub-villages in Cangkringan District, Kalitengah Lor, Kalitengah Kidul, and Srunen, located less than 5 kilometers from the summit (Suryandari et al., 2013, p. 147).

The renewed hazard map regulates the land uses and the kinds of development permitted in the designated zones. Accordingly, the Merapi's hazard zone is classified into three: *Kawasan Rawan Bencana III* (i.e., the third level hazard zone) covering areas close to the crater which are prone to pyroclastic flows, lava flows, tephra, and ash rainfalls; *Kawasan Rawan Bencana II* (i.e., the second level hazard zone) comprising areas that are prone to volcanic clouds, pyroclastic flows, lava flows, and lahars, and *Kawasan Rawan Bencana I* (i.e., the first hazard zone) covering areas that are prone to lahars, lava flows, and pyroclastic flows. People living in the first hazard zone must evacuate once a large-scale lahar flows through the rivers (BNPB, 2011, pp. 66–67). The

third level hazard zone or KRB III which is prone to the eruption's direct impacts was then ratified as a protected forest. The ministry of forestry was given the mandate to manage the land-use conversion and to ensure the resettlement of people living in this zone. Thus, there were thirty sub-villages adjacent to the crater that became the subjects of the relocation (BNPB, 2011, pp. 72–73).

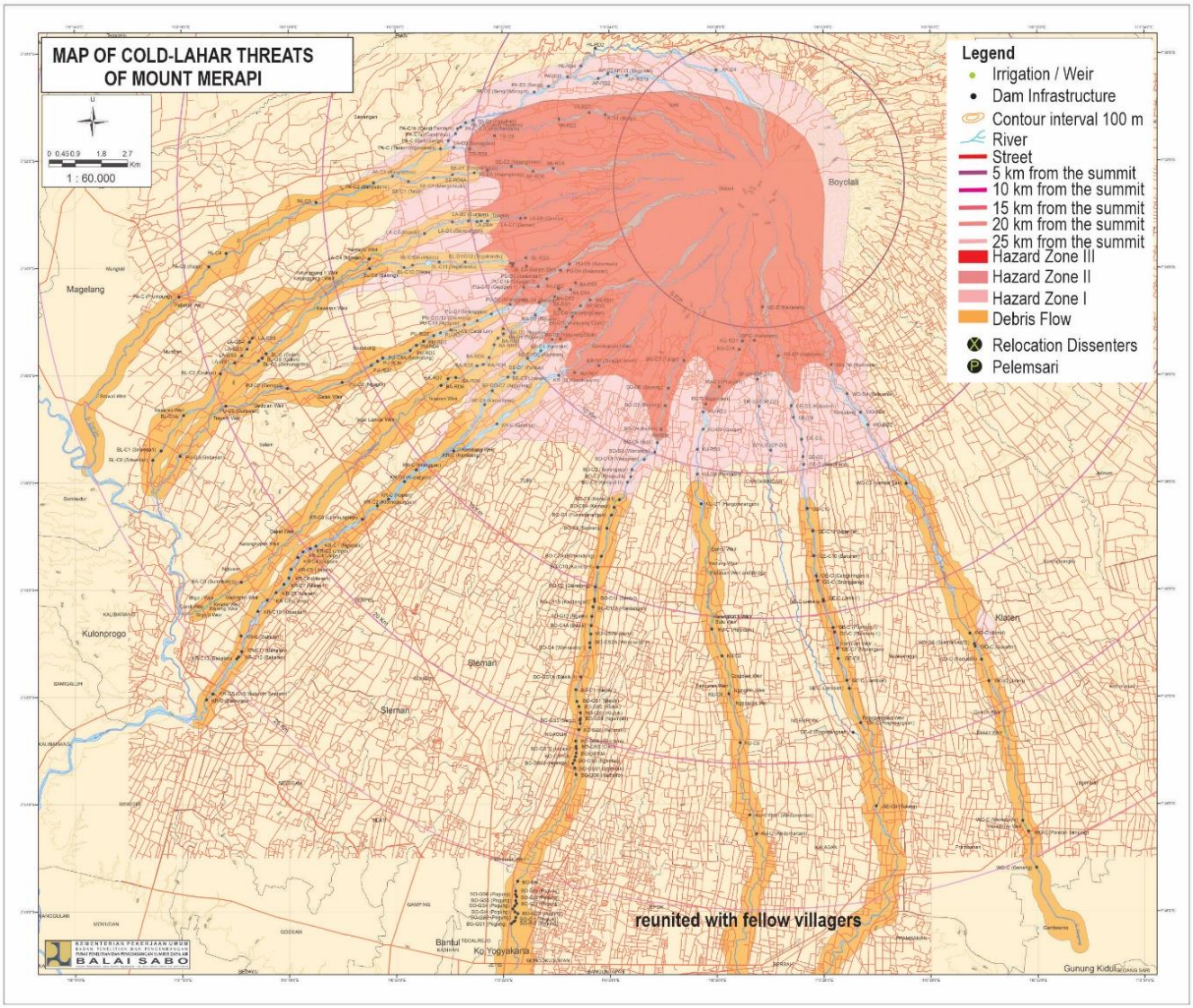

Fig. 2.3. The designated hazard zone map after the 2010 eruption. The riskiest area to eruption is indicated in the red zone (Hazard Zone III), the risky area is indicated in pink color (Hazard Zone II), the less risky area is indicated in pale pink color (Hazard zone I), while areas prone to lahars are indicated in orange color. The image was obtained from the Ministry of Public Works and Housing for the Technical Division of River dams Infrastructure in 2022.

During the rehabilitation process, the government launched a stimulus for each housing reconstruction. The stimulus took the forms of a 30 million Rupiah cash for one house unit, the allowance for the community to determine the house type as long as its dimension is not less than 36 square meters, a 100-square meter land with an additional 50 square meter per home unit for social and public facilities, and the development of earthquake-resistant houses (BNPB, 2011, p. 79). The reconstruction process was run under the national program *Rekonstruksi Masyarakat dan Permukiman Berbasis Komunitas* (REKOMPAK) (i.e., Community-based Reconstruction of People and Settlement) with a sponsorship either from the Java Reconstruction Fund (JRP) or the government's PNPM Support Facility. The Karang Kendal *hunian tetap* or permanent housing in which the Pelemsari community currently resides was developed with the JRF's sponsorship. Accordingly, the housing would be constructed within18 months from January 2011 to June 2012 (BNPB, 2011, pp. 79–80). When the government launched the relocation program, NGOs and grass-root organizations emerged to voluntarily assist the victims. One of them was *Wahana Lingkungan Hidup Indonesia (WALHI)* which encouraged people to develop their own schemes of settlement and monitored the government's disaster relief. Another organization called *Forum Rakyat Korban Merapi* recommended compensation for the victim's loss of cows to promote the relocation program. Accommodating this input, the government (i.e., the Ministry of Agriculture) then planned to buy about 3,881 surviving cows and financially assist about 2,097 dairy farmers. Depending on the health and productivity of the cow, the government compensated for the loss with the price regulation as seen in table 2.2.

Table 2.2. Compensation for each loss of a cow according to WALHI (2010)

Cow's condition	*Worths (Rupiahs)*
Healthy male cow	22,000 (per kg)
Unproductive female cow	20,000 (per kg)
Pedet or a young cow	2.5-5 million
Dara or a female cow	7 million
A pregnant cow	9 million
Productive cow	10 million Rupiah

The story of Pelemsari villagers evacuating across different shelters after the eruption is not less compelling than the myths or the gatekeeper himself. There is no doubt that the eruption in 2010 had become a test of their social capital, namely friendship, mutual respect, and trust among its members. They had lost their most respected figure, families, livestock, valuable homes, and perhaps, faith. The post-disaster trauma hampered their longstanding confidence in such a way that it required a considerable amount of time to heal, re-organize, and re-establish their living hood. Yet, as the sub-village head, Rejo, explained, his community chose to stay close together in the face of uncertainty. Community meetings were regularly performed despite they had to move to different shelters for five times from October 26 to November 4, 2010. At these shelters, the Pelemsari villagers regularly conducted community meetings to discuss their future that included the new setting to which they would voluntarily relocate from their former lands. Negotiations schemes were prepared to be proposed to the Sleman regional government in order to maintain their ownership of their irreplacable ancestral land. Table 2.3 shows the evacuation chronology of this community as narrated by the sub-village head in an interview in November 2021.

Table 2.3. Evacuation chronology after the eruption in 2010 according to the sub-village head (interview, 2021)

Start Date of Evacuation	*Estimated duration in the shelter*	*Location of the shelter*
October 26, 2010/ Tuesday	3	Umbulharjo Village Center
October 29, 2010/ Friday night	3	Wukirsari Elementary School
November 1, 2010/ Monday	3	Al-Qodir's boarding school
November 4, 2010/ Thursday	60	Agus Kholik's private house

Rejo, admiring the solidity shown by his community during the hardships, defined social ties as the phenomenon where the members will quickly reassemble after being dispersed for a while.

> *Di sini itu sudah sejak ngungsi pertama saja sudah mengumpul koq, sudah solid koq. Pindah sana, walaupun seketika bubar, akhirnya sekian jam, sekian hari ngumpul lagi (Interview with Rejo, March 18, 2022, 00:16:35).*
>
> *Here, since the first evacuation, we gathered, we were solid. Moving there, despite we became dispersed for a while, only in hours or days, we would gather again (Interview with Rejo, March 18, 2022, 00:16:35)*

Figure 2.4 illustrates the community's evacuation from one shelter to another and the event when one of its members evacuated to Kalasan and reunited with his fellow villagers in the house of the local representative member, Agus Kholiq.

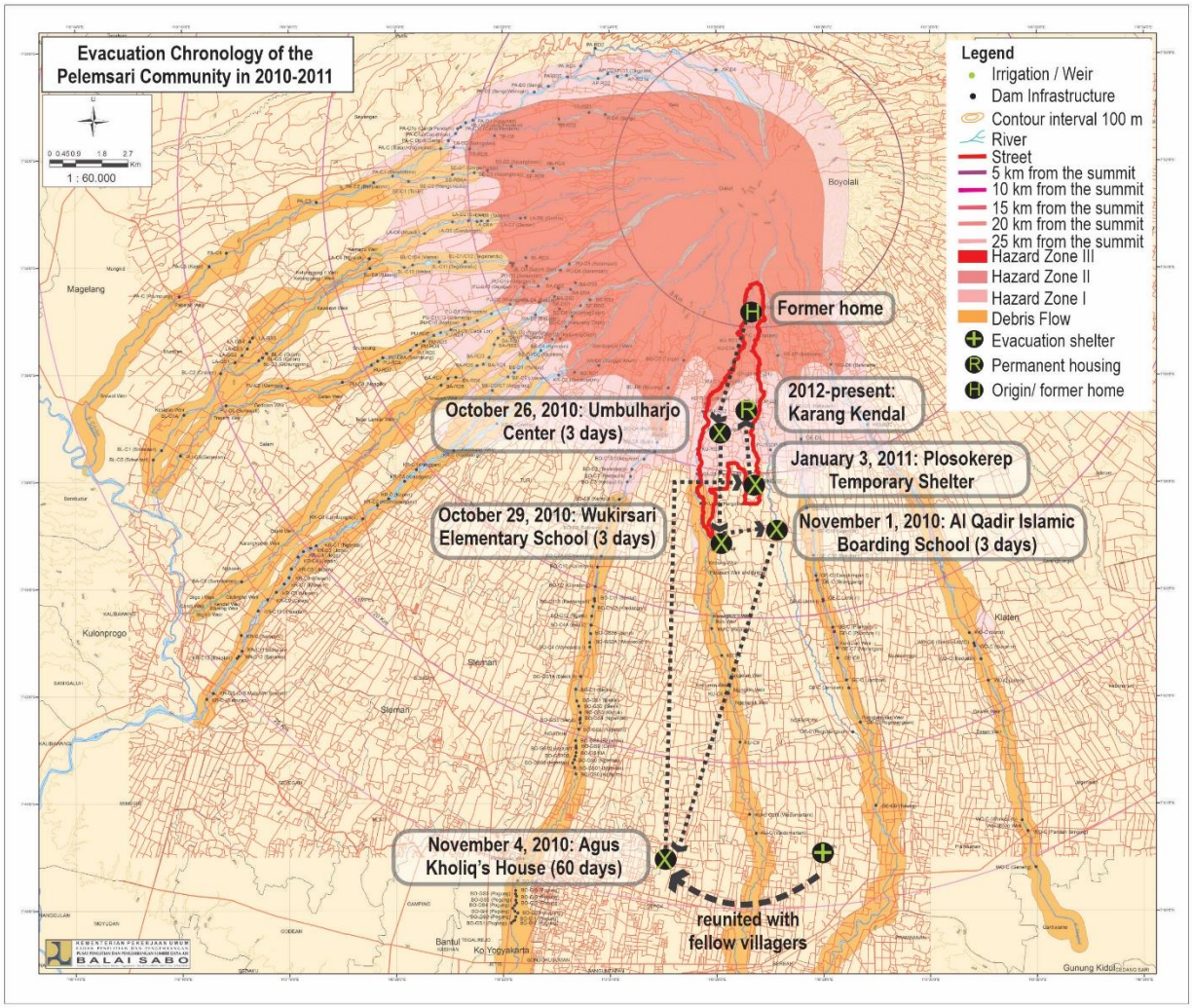

Fig. 2.4. The map shows the evacuation chronology of the Pelemsari villagers after the eruption in 2010.

2.3. The National Government

Disasters unfold the social grammar of people's lived experiences and formal-informal relationships with other structures (Hoffman, 2002, pp. 10–11). To assess the resilience of Pelemsari when dealing with uncertainty, it would be critical to first understand the dynamics of their interactions with the government (i.e., the Ministry of Forestry) and the Sultanate throughout periods. While the written records of the Pelemsari-level history were very limited, the work of Peluso (1992) in Java may provide significant insight into this understanding.

2.3.1 Pre-colonial Period (1600-1800)

In the 15th century AD, Merapi was a paradise for the people of the Majapahit kingdom who tried to escape from the Islam spread in Java's lowlands (Inandiak & Dono, 2010, p. 58). Peluso (2010) depicted this period as the time when forest villagers gained a great deal of freedom. Accordingly, Sultan loosely controlled the forest and let villagers clear the land, create grasslands and determine where, when, and how to cut and use woods. In cultivating the land, most villagers employed swidden-oriented practices while the rest combined this practice with settled-wet-rice. The social structure of villages was generally comprised of people whose origins remain unknown and *Kalangs* who possessed skills in carpentry and wood-cutting. To *Kalangs*, Sultan obliged them to pay taxes, work in the forest for his interests, and perform labor services. In exchange, *Kalangs* were permitted to cut wood anywhere they wished except on forest lands that had significant value to Sultan. In these lands, Sultan then invoked myths about supernatural repercussions of trespassing in order to control villagers' access. Echoing Peluso (2010), forest land thereby becomes a means for the Sultan to control the *Kalangs* through mandatory labor services (e.g., building infrastructures, cultivating crops) that act as taxes for the right of access to that land. The *Kalangs*, however, retained the rights to access the forest, control the trade, and hire their forces out to entrepreneurs. When Mataram Islam was split into Yogyakarta and Surakarta in 1755, about 6,000 households of *Kalangs* were divided between the two new monarchies.

Since the reign of the Majapahit kingdom (13th - 16th centuries CE), Sultan regularly traveled throughout the monarchy for displaying power, collecting tributes, and developing relationships with villagers. Sultan sometimes ordered villagers to create grassland or assist him in a hunt. As a reward, Sultan would permit them to access those lands for their own needs such as grazing their cattle. By granting access to the forest or at least not restricting it, Sultan secured the inhabitants'

loyalty. On the other hand, villagers took benefit from the Sultan's sovereignty pronouncement. They could recall his name for the Sultan's protection if strangers attempted to lay claim to their lands.

The faith of the forest villagers in Java began to shift as the Dutch laid eye on their dense teak forests. Indeed, teak was durable and considered the best wood for shipbuilding. Since 1622, the Dutch through its chartered company of trade, VOC (*Vereenigde Oost Indische Compagnie)* had regularly shipped teaks from Jepara to Batavia. For the shipment purpose, the Dutch primarily approached Sultan and appeased the royal with luxurious tributes. After signing a treaty with the VOC in 1677, Sultan permitted not only the establishment of a shipbuilding center, but also the control of villagers to log, hew, and haul forest timber. For this business, Sultan appointed an official called *tumenggung* whose task was to manage the contract between the VOC and the *Kalangs*. Pressures were often made by the *tumenggung* on *Kalangs*. Those consequently led to an incident in which the *Kalangs* refused to work, burned the Dutch storehouses, and killed one of the officers. In 1705, under the reign of Herman de Wilde, the Dutch conquered districts that had not yet been ceded by the Sultan and monopolized trade to deal with teaks depletion. A quota-based logging system was applied. This means the required number of logs subjected to each district may vary, depending on their capacities to supply and transport the woods from the forest to the coast. In the exchange, villagers could retain the right to cut woods for their subsistence.

In 1743, the Sultan relinquished the direct control of Java's northeast coast and transferred the authority to regional rulers. Akin to the Sultan, these rulers gave the Dutch access to local *Kalangs*. Here, the Dutch also imposed *blandongdiensten*[8] or forest labor service mandatory with exemption

[8] *Blandongdiesnten* system is a labor system imposed by the Dutch in which rents were subjected to forest lands being cultivated and the exemption of some villages from the rents if they collectively provided free laborers and groups of buffaloes for hauling and transporting timber from the forests.

from taxes and non-forest labor services. To support the VOC, the regents congregated the teak-hauling buffalo from local peasants to transport beams from the forest to the coast. It is worth noting that Java's forests during the VOC period were marked by environmental destruction. The excessive logging damaged the soil conditions and the selective cutting system imposed in 1777 hampered trees' rejuvenation. In 1796, VOC entered its dark ages as bankruptcy arose. Many private shipbuilders took over the trade by hiring laborers including those unleased by the VOC with higher wages.

2.3.2. Colonial Period (1800-1942)

To secure the Dutch trade monopoly, Holland sent Daendels in 1808 to Java. As the new governor-general, Daendels introduced scientific forest management with more controls on land, species, and laborers. He re-organized the teak forests exploitation, passed edicts for controlling the forest use, and secured the government's monopoly on teak, forest labor, and shipbuilding. The Daendels' system further laid down some philosophical importance of forest management in present-day Java. Accordingly, the state is an enterprise that has absolute domains over all forests, therefore, the forest must be managed for the state's benefit and the management must be seen as a civil service. Each forest is divided into tracks of logs and plantations by using a rotating system. Villagers were restricted from logging teaks for commercial purposes except for collecting deadwood and nontimber products. Daendels established sanctions for forest misuse. Villagers who were caught red-handed would be sent to imprisonment. To ensure its enforcement in the field, Daendels hired ex-soldiers who in Dutch were termed *bosgangers*. Daendels also imposed rules in which each laborer must divide the work into two seasons: eight to fourteen days of laboring in the forest and another eight to fourteen days of resting.

In 1812, Sultan signed a treaty with the British. Under the rules of Sir Stamford Raffles, the Daendels regulations were reformed. Raffles reserved the largest and best forests for the state, gave access to entrepreneurs to lease and log the rest, and parceled out the forest for local elites. Disapproving the laborers' exemption from land taxes, Raffles stipulated that laborers must work 8 to 12 months a year and guard the forests for the next 4 months in exchange for the exemption from land rent. All villagers were also responsible for providing labor and buffalos. Half the working men of a village were expected to work the rice fields at any time during the work season. As the result, villagers voluntarily lend their buffalos to drag heavy timber for the state.

In 1816, the Dutch reoccupied Java. Raffles' ideas were retained and the Forest Board was re-established before it was abolished in 1826. To decentralize the control over forests, the board's tasks were then transferred to residents in each district. Forest villagers, under the Cultivation System (*cultuurstelsel*) in 1832, were forced to work in the forest for the government's crop exports and each village must subsidize the state's forest activities with their agricultural products. Teaks were excessively logged to build factories, warehouses sheds, housing compounds, and luxurious homes, and to fuel plantation industries. At worst, these industries were assigned forests in which they could cut trees without reforestation mandatories. *Blandongs* (i.e., forest laborers) remained liable for land rents and were paid in the early years of the Dutch's reoccupation. From 1822 to 1850, villagers were permitted to cut fuelwood and timber for their daily needs but beginning from 1851, they must obtain a permit for wood cutting from the local authority. In 1865, the rules became more restrictive. They were only allowed to collect deadwood, stem, and woods from the forest thinning[9] but were banned from collecting firewood, cutting wood, and grazing

[9] Forest thinning is partial removal of trees used for a variety of commercial and non-commercial purposes, including reducing competition among closely spaced stems in young stands to accelerate growth of remaining trees and reduce flammable vegetation (fuels) (ScienceDirect, 2018).

cattle in the forest. Landowners could cut teak trees on their private lands without the government's permission but they must pay a 10 percent tax if the trees were sold. In 1865, the Dutch began measuring the forests and adopting specific management for each designated land. For instance, areas around the summit were subjected to conservation and labeled as 'non-teak forests'. The goal of the conservation was to appropriate the acquisition of watershed areas and the right for controlling species. In the same year, the *blandongdiensten* was abolished in favor of a free labor system. Accordingly, laborers must work in the forest and pay for the woods if they want to use them for building houses. Anyone taking wood from the forest without the state's permission would be considered a thief. The Dutch, however, turned a blind eye to those who cut and deliver wood for private companies but prosecuted those who cut trees for building houses. There were various forms of villagers' resistance in Java that demonstrate long-term disagreement with the forest controls imposed by the rulers. Some of them include migration, action against plantations, increased crime rate, messianic movements, explosions of rebellion, and the rise of specific sects with different social and religious views (Onghokham, 1975, pp. 214–215). Besides this, the resistance form commonly found was the collusion among villagers to avoid reporting new forest clearances. Performing this would prevent villagers from paying taxes to the Sultan.

In 1870, the Dutch issued an Agrarian Law that stipulated all land without ownership evidence would be claimed as state property. To promote teak harvest, the Dutch persuaded villagers in each district to plant teak trees on the state land. Each district, however, must develop its own reforestation strategies. Indeed, unlike cutting trees that generated profits, reforestation required the Dutch to pay laborers on daily basis for clearing, planting, and weeding the land. Buurman van Vreede introduced *tumpang sari* system in 1873. The system not only allowed reforestation to be effectively made but also provided a basis for a new form of farm-forest relationship. Technically

speaking, villagers cleaned the already-clear-cut forest areas and planted them with teak seeds. The clearing and planting phases were performed between August and September. Here, the Dutch permitted villagers to cultivate agricultural crops of their own for one or two years. Besides this right, they were paid with cash and until sometime later, were allowed to collect deadwood. The *tumpang sari* system attracted laborers especially the landless ones from other areas. It benefitted villagers as they could use the land for household production and the state as it could help them reduce labor wages for the reforestation.

In 1927, the Dutch specified the categories of the state forest land. More studies and applications of forestry for growing teak were intensified after this year. Aspects such as hydrological, climatological, and conservation began to be considered. Peluso (1992) argued that the conservation ideology was only used by the Forest Services to justify the state's control of the uplands while their main catalyst was a surplus gain. Using conservation as their means, the agency enforced teak plantations in the forests regardless of their potential for agriculture. The teak/monocultural plantation would create at least two disadvantages: the villagers' loss of the right to use the forest land and the decline of water storage/supplies on adjacent lands[10] .

Through the 1920s and the 1930s, the Dutch continued to buy up critical land around the slopes or eroded land and transform the non-teak land into teak land. It was estimated that by 1940, the Dutch had already possessed about 3,057,200 hectares of Java's land.

[10] Planting multiple species as evidenced by numerous studies would generate economic, environmental, and social benefits. Agroforestry system with mixed species provides a wide variety of goods, reduce poverty, increase carbon storage, enhance soil fertility, and improve water and air quality. Monocultures, on the other hand, would lead to the loss of soul productivity and fertility, disruption of hydrological cycles, risks associated with plantation forestry practices like the exotic species introduction, risks of promoting pests and diseases, risks of storms and fire and negative impacts on biodiversity (Liu et al., 2018, pp. 4–6).

2.3.3. Japan's Invasion Period (1942-1965)

Before Japan entered Java in 1942, the Dutch destroyed their legacies which include forest offices, bridges, railways, and teak logs. Villagers took the chance by looting the remaining log yards and openly claiming territory in the forest. In June 1942, Japan established the Japanese Forest Service (RTZ), kept some Dutch forest district officers, and appointed some Indonesians to managerial positions in forestry. The Dutch's forestry routines (e.g., planting, thinning, maintaining forests) were neglected, pushing many district managers to organize the reforestation on their own. In the forest, the Japanese created villages to change the lands into agricultural farms and exercise reforestation for the war's needs. Although the Japanese occupation was relatively short, it caused a deleterious effect on forests in Java and numerous deaths of laborers who worked under the *romusha* system. Regardless of their ages, the Japanese cut off teak near railways and roads for their warship-related industries. It was reported that only within one year (1943-1944), its forest production has doubled the production during the Dutch. A former head of Forest Service even estimated that it would need a reduction by 30 percent of teak production over the next 30 years to return the forest to its prewar condition.

2.3.4. Independent Period (1945-1965)

Japan's RTZ was changed by Soekarno Hatta into *Jawatan Kahutanan* (forest service) after the Indonesia's independence in 1945. The Dutch, however, with support from its British ally, attempted to re-occupy the newly independent country. The British attacks in Bogor forced Indonesia's forest service to move to Yogyakarta. Being independent of the central government, the agency developed new forestry policies that include the discontinuation of the Dutch-German management system and the establishment of a commission that could translate the Dutch laws

into the Indonesian language. Internal dispute rose as conservative nationalists wanted to return to the Dutch forestry routines and advocated the watersheds' preservations for the state's revenue.

The Dutch left the country in 1949 but unfortunately, the forestry had not yet successfully reformed. The *Jawatan Kehutanan* remained part of the Ministry of Agriculture until 1957 and the management was centralized. The provincial managers handled the marketing, management, exploitation, and protection of the forest products but the policies must be made at the central level. Internal conflicts arose as the members of the forestry service were ideologically divided, enforced by four political parties: 1) the Darul Islam and the Islamic Army of Indonesia (*Darul Islam/ Tentara Islam Indonesia*)[11]; 2) the military or the government's armed forces; 3) the Indonesian Communist Party (*Partai Komunis Indonesia*); 4) the Indonesian Nationalist Party (*Partai Nasional Indonesia)*. PKI, in particular, saw the Forest Service as an extension of a colonial bureaucracy that had not changed its social relations with peasants. Squatters, landless peasants, and forest laborers who had no legal rights to the forest land joined communist organizations. Having left ideology, Forestry Workers Union was affiliated with a communist organization and expanded its recruitment from only foresters in 1945 to laborers by the end of the revolutions. They influenced many forestry policies to advocate peasants' rights to the forest land and the welfare of the lower-level officials.

[11] DI/TII used guerilla warfare as its rebellious strategy and the wooded hills as their covert place, therefore, a high dense forest was highly preferable. Villagers who cut down trees were shot and only grazing cattle was allowed. Oftentimes, their cattle were consumed by the rebels. The villagers' experiences of meeting the DI/TII varied across regions. Some villagers could be corporative with this group while others chose to flee and abandon their lands. Foresters tried to get sympathy from villagers by involving them in a reforestation program using the "tumpang sari" system. In exchange for replanting with the given seeds, villagers were granted access to the forest land for a year or two with expectations that one day, they would leave the land, seek another job, and help fight against DI/TII. the program however was far from successful as most villagers were too afraid to plant the seeds nearby the DI/TII bases. Large tracts of the forest land, as the result, remained untended and were covered with *Imperata cylindrica* grass or thick secondary growth. During the rebellion of DI/TII, one could be easily suspicious of another's loyalty to the republic.

In 1957, the military chief of East Java pronounced that squatters who claimed forest land before August 1 would be provided with lands outside the state forest land. However, the PKI and BTI seemed unsatisfied with the concession. By 1964, they encouraged peasants to engage in unilateral actions by occupying private estates and cutting down trees. The strength of the PKI grew significantly and their efforts became more daring. In the forest, their resistance materialized in the form of open confrontations with foresters. Non-communist political groups in the Forest Service strengthened ties with other governmental agencies. They expanded membership to foresters who were already civil servants and worked together with regional legal authorities to expedite the forest crimes trials. Mass trials occurred in villages where hundreds of PKI followers were prosecuted. Illegal teak houses were torn down, convicted offenders were sentenced to jail, and the members of SARBUKSI were fired from their jobs in the agency.

Rather than engaging forest villagers in their programs, foresters had indeed labeled them squatters. Further, many of its conservative members continued the Dutch forestry by inviting Europeans to assist Indonesia's future forestry and restoring the Dutch's infrastructures. Further, of all wood products sold by the agency, only a small fraction was dedicated to villagers. Most of them, especially the best ones, were sold through large auctions to manufacturers or large consumers. In 1960, a law was passed, and accordingly, squatters could be evicted from state land without a court order and the military could be used for this purpose. Another law was passed in 1961asserting the establishment of a State Forest Enterprise or Perhutani. The goal of this enterprise was to manage a commercial business and ensure the forest products could supply industries (Nancy Lee Peluso, 1992, p. 116).

2.3.5. New Order Period (1965-1998)

The forestry management in Java during the reign of Soeharto was almost indifferent to that under the presidency of Soekarno. In 1967, the General Directorate of Forestry held a meeting in Kaliurang, Yogyakarta, and issued Law No.5/1967 about Principles of Forestry. The law provided opportunities for timber companies outside Java and foreign investment for forest products extraction on the island. Forest concession or the so-called *Hak Pengusahaan Hutan (HPH)* was granted. As the result, timber exports exponentially increased in 1978, followed by major deforestation (Isnaeni, 2021). In the meantime, the structures, laws, ideologies, and policies of the forest service still adopted the colonial style of the Dutch. The Forest Service which later became the State Forest Cooperation (SFC), however, applied a not less strict control over the forest use. The military was used to enforce their forest management while at the same time, they integrated the national principles, Pancasila, with scientific forestry and initiated community-based programs. This agency disregarded local ecological knowledge and saw villagers as backward and ignorant of the meaning and functions of the forest.

The Ministry of Agriculture was established in 1969. Under the ministry was the Directorate General of Forestry. The SFC was responsible for the ministry until it became a separate entity in 1983. The lowest management unit of the forestry service is the forest police resort also called the Resort Police or in a local term, *Mantri.* To run the tasks, *Mantri* was assisted by at least four mandors who specifically supervised the planting and logging activities in the forest. Unlike *Mantri* who were periodically moved across offices and locations, mandors work and stay in their home villages. They were familiar with local conflicts and enjoyed their status as government officials despite their low-rank status in the agency's structure. Due to their low salary, mandors often sold access to forest lands to villagers. It is worth noting that there was an unwritten rule

where a forester could only get a job promotion if he/she was affiliated with GOLKAR, the party of the ruler, Soeharto. Similarly, reforestation laborers who were GOLKAR members would easily gain access to the reforestation land.

Since scientific forestry spread in the 19th century, forestry bureaucracies saw the traditional forest as an industry's potential for profit gains rather than for household consumption. The villagers' forest activities such as swidden cultivation were seen as destructive or at worst, as threats to the state's rational use of forests. Traditional (colonial) scientific forestry is legitimized in forest law and justified by two universal notions: the management for the greatest good and the supremacy of science over other forms of resource management (Nancy Lee Peluso, 1992, pp. 130–131).

The SFC continued the Dutch legacy of exercising three types of controls: controls of land, species, and labor. In terms of forest land control, all activities such as mining, rock collecting, firewood, or even research must acquire SFC permission. All traffic of people and goods must be monitored by forest officers. Preventive measures were run to control territory and protect the state's properties by patrolling the forests, familiarizing the self with the territory, and acknowledging people living nearby the forest. Institutions involved in this control were forest police (*Polisi Hutan)*, mandor, the Special Forestry Police (*Polisi Khusus Kehutanan*), and long distant patrols (*Patroli Jarak Jauh*), and BRIMOB who served as a SWAT team. PH, in particular, must watch for illegal collection of firewood from living trees, collection of teak leaves, destruction of new seedlings, illegal grazing, illegal charcoal manufacture, or tree theft. In conducting their tasks, the police and Mantri worked with village informants to identify any plans, times, and places of the illegal activities, or the hiding places of the stolen teak.

The species control had two aims: to secure claims on forest lands and ensure the monopoly on forest products. Species controls imposed by SFC include the classification systems, tree tenure, and marketings. Forest species designated by the SFC include teak, pine, and rasamala and were intended for large-scale production. The SFC was responsible for the seeds but planting them required laborers. Under the *tumpang sari*, SFC involved villagers in planting the seeds. In exchange, they could gain access to the reforestation lands and plant agricultural crops. Typically, the agency paid farmers for carrying the seeds to the forest plots either from the mandor's house or a nearby drop-off point. The SFC possessed all living parts of the species while villagers were only allowed to collect leaves from teak trees over ten years old. SFC also had the right to determine when trees could be cut and the intervals between trees for new seeding and land markers[12]. On top of that, SFC controlled the kinds of agricultural species that farmers could plant. Planting tree crops were not allowed due to their long period of growth, shades over the major crops, and because this activity may rise a sense of ownership of the state's land. Agricultural species like papaya, banana, or cassava were also prohibited because of their negative effects on the growth of the main species. Only dry field rice, corn, peanuts, vegetables, or alike were permitted as they would not harm the primary species and were relatively easy to be removed. Not only the types and plantation techniques of the forest species, but the SFC also imposed controls on the marketing of the forest product. Farmers could indeed plant the state's forest species on their private lands but once they were about to be sold or transported from the owner's land, he/she must pay some fee to the SFC.

[12] In Java, planters have rights in the trees they planted and sometimes to the lands under or around the trees (Nancy Lee Peluso, 1992, p. 136)

As the total population of Java increased, temporary labor experienced a surplus. However, the low wages and scarce forest employment caused people to have more interest in engaging in illegal forest activities. Forest laborers were free laborers who were paid on a piecework basis. In terms of reforestation, laborers were paid based on a contract for the length of two or three years of tenure. The other forms of compensation received by these laborers were access to plots of forest land for a certain period of time, the right to dispose of stumps in a logged-over forest, and the right to the small stem on trees being cut. The control run by the SFC expanded to the informal forest labor. For those who wanted to collect firewood, fodder, wild game, leaves, rocks, limestone, and charcoal, the SFC would issue informal permission. Some activities were prohibited such as grazing in a young forest. The allowed activities were limited only to collecting dead wood for fuel and old leaves of teak trees. Nevertheless, fuelwood collectors often cut the live stem as the deadwood was not abundantly found. Grazing in the young forest was also preferable because of its abundant grass and the leaves of young teaks were cut as they were more supple for wrapping.

In the 1970s, the SFC initiated community forest programs, however, almost none of them were successful in alleviating poverty or stopping forest encroachment. Peluso (1992) argued that these programs did not change the forest access control of the SFC. Further, the underlying goal of the SFC programs was to control forest access by lessening the local's dependence on forests. (Nancy Lee Peluso, 1992, p. 155).

2.3.6. Reformation Period (1998-present)

Soeharto, for many, portrays a success story of a president who could ensure political stability in one of the most ethnically diverse societies. Under his reign, Indonesia could gain a significant annual economic growth that led it to be near Newly Industrializing Country (Crouch, 2010, p. 1). The Asian Monetary Crisis in the mid-1997, however, put this stability to a test. The regime's

failure in grappling with the crisis spurred public unrest throughout the country. Soeharto finally resigned in 1998 but the transitional era following his fall was beclouded by uncertainties. New leaders with short lived governance were present: Habibie, Abdurrahman Wahid, Megawati Soekarnoputeri, (Crouch, 2010, p. 4), Susilo Bambang Yudhoyono, and Joko Widodo (Adam, 2021). From the first phase of the transition to this date, negotiations between the survivors of the old regime and new political forces continue influencing Indonesia's politics (Crouch, 2010, p. 4). Conspiracies among politico-business blocks also flourish with orientation to market-based policies through natural resources exploitation (Ulum, 2020, p. 31).

A. Forestry Management in Java

Among the natural resources extensively exploited during this political period is forest. The sector is tremendously critical for people's well-being and survival. Forests are key to climate, water, health, and livelihoods (WorldBank, 2016) as they provide clean water and air, timber, wildlife habitats, stable soil, and biodiversity including employment, wood raw materials, fuelwood, supplementary food, and non-timber products (e.g., medicine plants, resin) (Bravo-Oviedo et al., 2014, p. 519). The national government passed Laws No. 41 in 1999 about Forestry. Accordingly, all forests in Indonesia and all materials contained are managed by the state and subjected to the prosperity of the whole population (Fredaur et al., 2014, pp. 32–33).

Globally, the total forest areas in 2020 reach nearly 4.06 billion hectares where Indonesia contributes about 2% (FAO, 2020, p. 10). Despite this small fraction, the wide-ranged endemic species of Indonesia's forests could put the country the third-highest after Brasilia and Colombia in terms of biodiversity (FAO, 2020, p. 37). Based on their utilization, forests in Indonesia are classified into Nature Reserve Area (KSA), Nature Conservation Area (KPA), Forest Nature Reserve, Forest National Park, Nature Recreation Forest, Protected Forest, Limited Production

Forest, Production Forest, Convertible Production Forest, and Industrial Plantation Forest (BPS, 2015, pp. 4–9). Tree species subjected for industrial and trade purposes are planted in the last four types. The tree species are extracted mainly in the forms of log or roundwood either for export needs or domestic consumption. The Central Bureau of Statistics recorded that Indonesia's log productions relatively fluctuated from 2010 to 2016 but began to consistently increase from 2016 to 2018 with a slight decrease in 2019 (fig 2.5). In fact, the 2018 high yield of log production allowed the forestry sector to break a record by generating about $12.7 billion after 10 years of low productivity. Similar to the 2018 trend, that of 2020 caused Indonesia's export value of forest products to increase accumulatively by 70.33 percent in 2021 (KLKH, 2021).

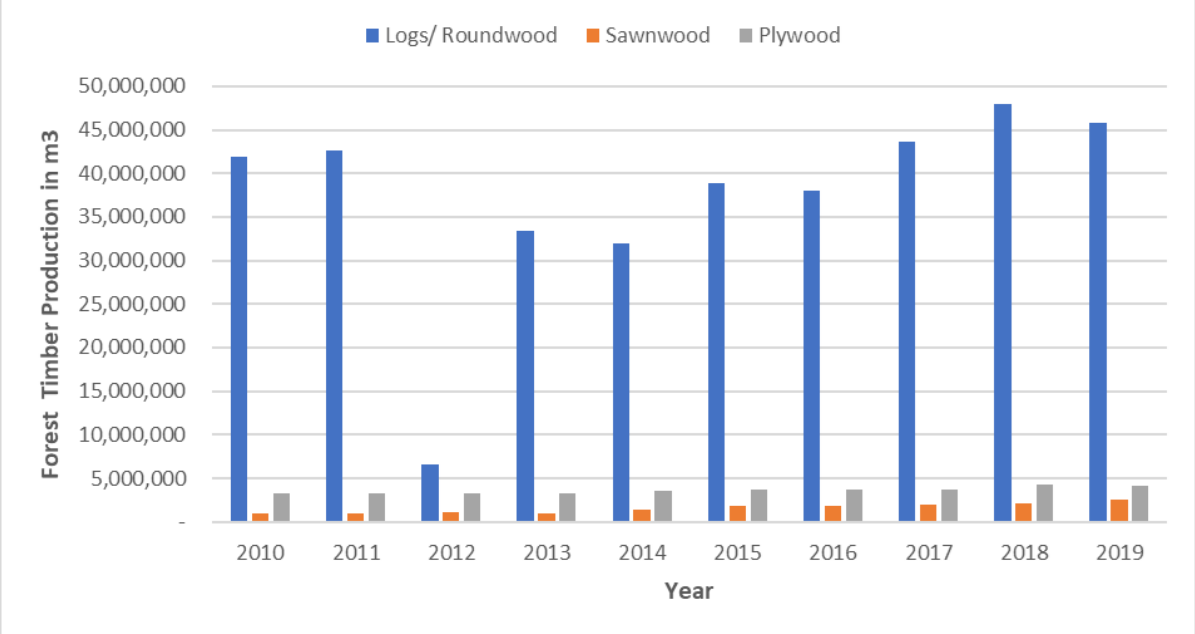

Fig. 2.5. Forest production by type in Indonesia adapted from the Central Bureau of Statistics (2022)

Java island is the third-largest producer of logs after Sumatera and Kalimantan. Based on the annual report of the Central Bureau of Statistics, throughout the years from 2012 to 2020 (fig.2.6), the trend of its production fluctuates but, overall, shows an increase. In fact, the log production in Sumatra could reach about 42 million m3 in 2020, far surpassing the production of other islands.

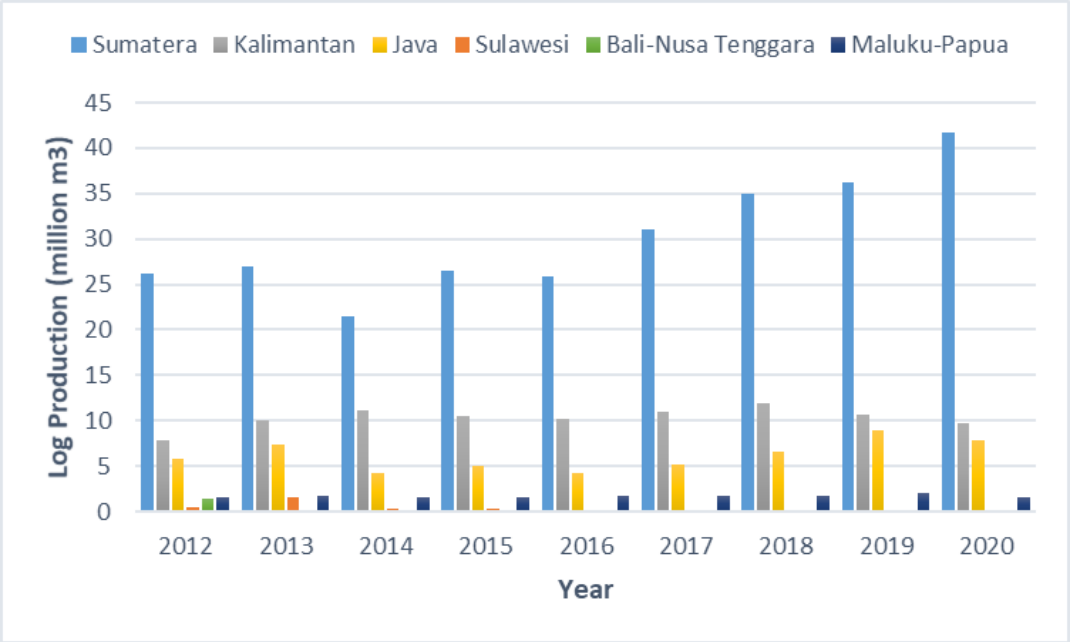

Fig. 2.6. Log production by islands in Indonesia adapted from the Central Bureau of Statistics (2022)

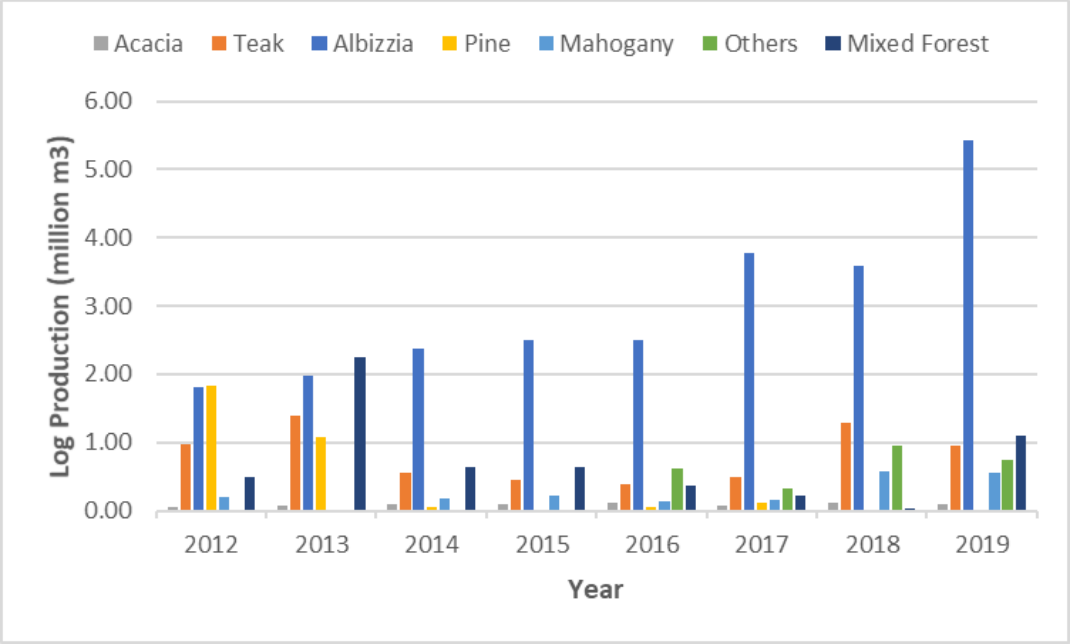

Fig.2.7. Forest Area by Type in Java's Provinces adapted from Central Bureau of Statistics (2022)

Tree species planted for logs include *acacia, eucalyptus, albizzia falcataria, shorea spp., mixed forest, teak, mirabow, dipterocarpus borneesnsis, mahogany, and shorea laevis*. In Java, the log production from 2012 to 2019 mainly came from *Albizzia Falcataria*, locally known as *sengon*. In 2019 logs extracted from this particular species reached about 5.50 million m3 (BPS, 2019, p. 14).

Besides *Albizzia*, other tree species that contributed to log production in Java are mixed forest[13], teak, mahogany, and pine (fig.2.8). *Acacia* in the Java case is the least contributor to log production.

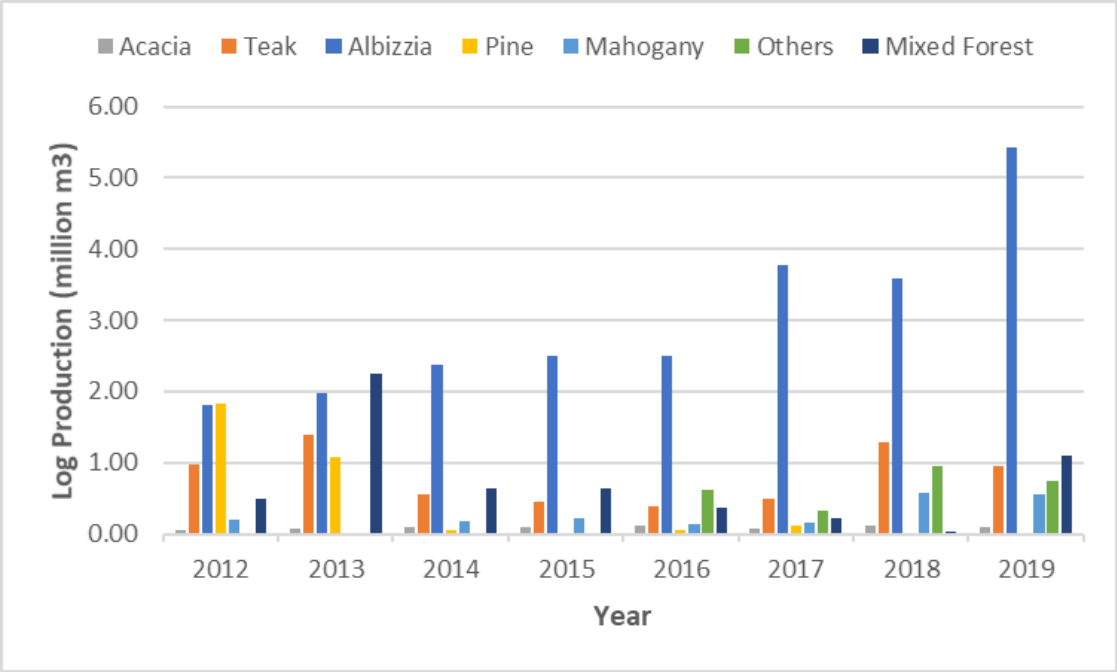

Fig.2.8 Forest Area by Type in Java's Provinces adapted from Central Bureau of Statistics (2022)

About one-fifth of the global population relies on forests for employment, forest products, and contributions to livelihoods and incomes (WorldBank, 2016). Nearly 48.8 million people in Indonesia lived in forests and about 10.2 million of this population live under the poverty line (Jati, 2016). Java is the most populous island in Indonesia and serves as the hub of the national-level administration, business, and economy. Ironically, the poor population is the highest on this island, mainly concentrated in three provinces: West Java, Central Java, and East Java (BPS, 2016). In the meantime, large parts of the forests in Java are classified as protected forests, limited

[13] A mixed forest is a forest unit, excluding linear formations, where at least two tree species coexist at any developmental stage, sharing common resources (light, water, and/or soil nutrients) (Bravo-Oviedo et al., 2014, p. 525).

production forests, and production forests. The data compiled from the Central Bureau of Statistics from 2017 to 2020 indicate that of 120.50 million hectares of Indonesia's forests, only about 2.10% (± 2.54 million hectares) are located in Java. Forests in Java comprise about 735,000 hectares of protected forests, 423,521 hectares of limited production forests, and 1.39 million hectares of production forests.

Unlike those in Sumatra, Kalimantan, Sulawesi, Nusa Tenggara, Maluku and Papua, forests products in Java and Bali, are directly managed by the state's owned enterprise, *Perum Perhutani*. In other words, forest concessions for the non-governmental companies are not applied in Java. Forest management in Yogyakarta, specifically, is shared between two governmental agencies: Dinas Kehutanan dan Perkebunan Provinsi DIY (i.e., the Yogyakarta provincial agency of forestry and plantation) for supervising the production of forests (+ 13,851 Ha) and the Ministry of Forestry's General Directorate of Forest Protection and Conservation for supervising the protected forest (+ 2,057.90 Ha). With this being said, forest management in Java entails law enforcement limiting people's access to forests. With the loss of the autonomy to access the forest, poverty continues to bedim the villagers' livelihood. Poverty, besides, natural disasters, and wildfires, could trigger people to illegally cut trees.

The forestry laws passed including Law No.41/1999 could not stop deforestation that was once practiced devilishly in the New Order period. It was recorded that the deforestation rate in this period (1985-1998) was 1.6-1.8 million hectares per year. This rate, ironically, increased during the reformation (2000), reaching nearly 2 million hectares per year (Isnaeni, 2021). The data compiled from the Central Bureau of Statistics (table 2.4.) show the deforestation fluctuation in the last decade. Interestingly, the deforestation trend from 2017 to 2019 in Java's three provinces, where the highest poor populations are concentrated, increase almost doubled. Further studies are

indeed required to investigate the relationship between poverty and deforestation in these areas, but it is almost indisputable that the distressing deforestation in Java is associated with the state's poor forest management. Some environmentalists even claimed the reformation period in 1998 was a chaotic period largely marked by a massive forest robbery. Most villagers illegally took woods from the forests to revenge the environmental justice in the past. Some laws were then enacted in 1999 to stop such crimes to expand in Java's forests (Fredaur et al., 2014, p. 30).

Table 2.4. The Net Deforestation in Forest Areas in Java's Provinces in Ha (2013-2020)

Year	Jakarta	West Java	Central Java	Yogyakarta	East Java	Banten
2013-2014	0	-10,979.5	-79.2	0.9	5,452.2	-237.3
2014-2015	0	1,750.5	1,589.5	51.8	3,621.0	1,282.2
2015-2016	0	0	0	0	0	0
2016-2017	0	-160.6	0	-163.8	0	-2,534.4
2017-2018	0	2,598.9	2,004.7	2.4	3,298.6	-523.6
2018-2019	0	3,782.4	1,859.6	141.4	5,066.4	67.3
2019-2020	0	0	0	0	0	0

Source: (BPS, 2022) adapted from the Central Bureau of Statistics (BPS) with a concentration on Java's provinces. Minus indicates the reforestation coverage (hectares) instead of deforestation in the province.

B. Forestry Management in Yogyakarta

In Yogyakarta, the reformation period under the reign of SBY is marked by state-people tensions following the enactment of the ministry of forestry's law No. 134/Menhut-II/2004 on May 4, 2004. The law stipulated the forest of Mount Merapi as a national park and the change of uses of the Protected Forest, the Nature Reserve, and the Nature Park. The ecological degradations in the Nature Reserve Plawangan Turgo, the sedimentation of two river streams, volcanic eruption activities, and illegal sand mining that intensively occurred within the forest were assumed to stimulate the enactment of the law. The law's enactment, however, raised protests from activists and environmental alliances like WALHI. They accused the government of being ignorant of engaging villagers in Mount Merapi in their policymaking. The term national park, they argued, would only marginalize the locals from accessing the forest.

The land conversion from a forest into a national park was initiated by the provincial forestry agency in order to register Mount Merapi as the world's heritage. This agency believed that the plan would allow the regional government to collect sponsorships and generate revenue. The enactment of the Ministry Forestry's law had been shaded by protest waves of activists, environmentalists, and disquieted villagers since 2001. A forum called *Masyarakat Peduli Merapi* comprising Merapi villagers along with civic society groups openly rejected the law and demanded the government for returning the forest to the people. It was also reported that during the negotiation process from 2001 to 2003, the provincial government only held one meeting with three out of ten districts. The government also formed a forum called *Tucangkem*, an acronym for Turi, Cangkringan, and Pakem districts that advocated the law. It is worth mentioning that the law was passed before the feasibility study run by Gadjah Mada University was completed. The law passed in 2004 incited protests from villagers living on Merapi slopes, activists, and civil society organizations. They demanded for the law be repealed. Even more strikingly, many villagers whom WALHI and its allies interviewed did not know about the law. To inspire people to find out more about this plan and question the government's lack of transparency, WALHI regularly held community meetings. This organization even filed a lawsuit against the government in 2004 but it was finally turned down by the Supreme Court in 2008 (A. W. Hidayat, 2009, pp. 81–91).

The forest management of Mount Merapi changed over the political reign, beginning from the issuance of the *Staatsblad* 497 in October 1909 followed by the *Staatsblad* 594 in December 1909. These two laws provided the foundation for the stipulation of the *Ordonantie tot Bescherming wan Sommige in Het Levende Zoogdieren en Vogels* or the Law for Protection of Wild Mammals and Birds on July 1, 1910. In 1912, the Dutch specified some moorlands belonged to the local villagers on the southern flank as parts of the protected forest. The purpose was to reduce floods and

landslide threats in Yogyakarta, Surakarta, and Magelang which were mainly triggered by farmers' land clearance activities through the slash and burn technique. The result was the issuance of the Dutch policy that prohibited all farmers to open or clear the forest land. On May 4, 1931, the Dutch issued *Gouvernements Besluit* Number 4197/B that stipulated the protected forest status to about 6,472.1 Ha of Merapi's land in Yogyakarta and Central Java. In Yogyakarta, the Dutch specified the forest functions not only for hydrology but also for botany and aesthetics. Here, the Dutch made an agreement with Sultan about land concessions, water management, plantation, agriculture, and forestry. The forest regulations of the Dutch were clearly aimed at protecting water sources, rivers, and the life support systems of Sleman Regency, Yogyakarta, Klaten, Boyolali, and Magelang (T. Atmojo et al., 2018, p. 32).

On August 20, 1975, Indonesia's Department of Agriculture issued SK No. 347/KPTS/ UM/8/1975 that specified a 198.5 Ha protected forest as the Nature Reserve and a 30 Ha land as the Nature Tourism Park of *Plawangan Turgo*. In 1984, based on the SK Ministry of Forestry No.155/Kpts-II/1984 the coverage area of the *Plawangan Turgo* expanded to 131 Ha. On December 16, 1989, the ministry issued the SK No 758/Kpt-II/1989 that re-expanded the total areas of the Nature Reserve and the Nature Tourism Park of *Plawangan Turgo* to 282.25 Ha. These areas were managed by Yogyakarta's Provincial Agency of Forestry and Plantation while the protected forest in Central Java was managed by the Perhutani Unit (i.e., Agriculture Enterprise Unit). After the 1960 eruption, villagers of Dukun and Srumbung relocated from their settlements near the crater, mostly to areas in Sumatra under transmigration programs. The settlements and yards abandoned by the refugees were then transformed into pine forests by Perhutani. This agency also required the villagers who remained in Mount Merapi to tap the standing pine trees for sap and to hand over the product to the agency. From 1988 to 1993, Perhutani rehabilitated the forest

by primarily running deforestation and replantation. In the first three years, local villagers were allowed to plant mixed crops and vegetables between the standing tapped pines including collecting grass in the forest but they had to tap the pine sap for the state. Perhutani also introduced *kalanjana* (*brachiaria muticathat*) to the farmers who previously relied on *alang-alang, blabakan*, and *iser* as fodder. The *kalanjana* was seen by farmers as more productive and preferred by cows. During this period, villagers began to shift the type of livestock from goats and cattle to cows. In the Resort Cangkringan, Perhutani also introduced pine (*Pinus merkusii)* and *acacia decurrens* species by adopting the *tumpang sari* system. Lands for this purpose were clearly defined and well-recognized by *Mantri.* These forest lands where farmers cultivated the trees with the *tumpang sari* system are locally termed *sanggeman*. The use of these lands could be passed down by the farmers although the lands are possessed by the state (T. Atmojo et al., 2018, p. 48).

The stipulation of the national park of Mount Merapi initiated by the Yogyakarta's Forestry Agency or *Kakanwil Kehutanan DIY* was approved by the Sultan or the Governor in 2001. Sultan then shared this idea with the Minister who once visited Yogyakarta. To prepare for the conversion, *Balai Konservasi Sumber Daya Alam* (i.e., the Conservation of Natural Resources Agency) worked together with Gadjah Mada University to run a feasibility study of the national park. Prior to the law's enactment, villagers who heard about this plan through a forum called *Forum Rembug Merapi Merbabu* raised a protest. They criticized the government's poor socialization of the forest use change. In Cangkringan, the rumor that the national park would be fenced and villagers would no longer be able to access the forest spread out. However, not all villagers, except their leaders, heard and understood the issue. Despite this polemic, the ministry of forestry still passed the Law No. 134/Menhut-II/2004 on May 4, 2004, which specified the change of the utilization of the protected forest, nature conservation, and nature tourism park in four Regencies: Magelang,

Boyolali, Klaten, and Sleman. A well-reputed environmental NGO, WALHI sued the ministry but the case was won by the government.

For years onward, people in Mount Merapi accept the change over the forest status as long as their rights of collecting grass (i.e., *mugut*) and fuelwood (i.e., *ngrencek*) continued to be accommodated. In 2012, these two activities were accommodated in the Traditional Zone of Mount Merapi. In the law, it is described that 'the protected forests on the slopes of Mount Merapi in the Province of Central Java and Yogyakarta are aimed for water sources for the livelihoods of the adjacent communities and protecting plants and animals species. To manage the water sources, the Mount Merapi National Agency survey and monitor the use of the available water sources and fulfill the legality of the use of water sources by all stakeholders. In 2017, there were 23 water sources in the national park, and in 2018, the number increased to 43. The water flow to Yogyakarta comes from the volcano's river streams: Rivers Boyong, Krasak, Opak, Gendol, and Kuning. Two water sources stemmed from River Kuning called *Umbul Lanang* and *Umbul Wadon* or also called *Umbul Temanten*[14]. After the 2010 eruption, about 55 vegetation species dominated the forest. These species mainly are exotic (e.g., *acacia decurrens, Cupressus sp)* and had beaten out native species like *Lithocarpus sp, erythrina llithosperma, schima wallichii, and ficus variegate*. The animal species that today become extinct are *nisaetus bartelsi* (i.e., Javanese eagle) and *Panthera pardus melas* (i.e., Javanese leopard).

Mount Merapi National Park Agency was established in November 2006 to replace *Balai Konservasi Sumber Daya Alam Yogyakarta* (i.e., Natural Resources Conservation Agency). The

[14] The Umbul Temanten supplies clean water for all people in Yogyakarta and most part of Sleman Regency. Umbul Wadon is used specifically as the water source and the Umbul Lanang is aimed for irrigation. According to the Village Head, Danang, Umbul Wadon was shutdown due to lahars flood in 2021 (Interview, 2022; Radar, 2021). It urged him to hold an urgent meeting with all the village heads to allocate money for repairing the damaged water pipes with the so-called *bronjong*. This feature was developed to protect the water source from future cold lahars.

principal tasks of the agency are protecting the ecosystem, preserving biodiversity, and utilizing natural resources without risking the natural ecosystem of the volcano. Under the head of the agency, there were four resort heads called *Mantri.* On-site officers of this agency include *polisi hutan* (i.e., forest police), *pengendali ekosistem hutan* (i.e., forest ecosystem controller), and *penyuluh hutan* (i.e., forest consultants).

The national park is surrounded by 30 villages which in total cover an area of about 19.817 Ha. Seven of these villages are within the authority of the Sleman Regency. About 107,488 people living in these villages mostly work as farmers and dairy farmers. They heavily rely on the forest for grass (*mugut*), fuelwood (*rencek*), freshwater, tourism, land, animals, honey, and cultural purposes. According to the Mount Merapi National Park Agency (2018), the total number of sub-villages accessing the forest for collecting grass and clean water is 71, which is the highest on the agency's survey list. The other two major activities are collecting fuelwood (60 sub-villages) and sand mining (41 sub-villages). The Mount Merapi National Park Agency had developed a community-based program called *Masyarakat Mitra Polhut* (i.e., Communities Partnership with Forest Police), *Masyarakat Peduli Api* (i.e., Community Concerning Fire), and *Kader Konservasi* (i.e., Conservation Caderisation). The agency developed a partnership both with individuals and community groups. These individuals are usually the community members of villages in Mount Merapi who had good ties with the agency officials. They assist the agency in plantation programs and become the channel of communication with villagers.

Fig. 2.9 The agency's personnel helps the Pelemsari farmers in taking the grass out of the automobile after being transported from Bebeng Street. Photo by the author.

In the Pelemsari sub-village, some of its community members work in the Mount Merapi National Park Agency. In fact, according to my respondents, many of them had parents who also once worked for this agency. There is a likelihood that employing the descendants of their former staff

could maintain loyalty and ties with their home villages. For the community, these personnel could become reliable sources of information and aids, especially, when dealing with risks. During the recent eruptive activities of Mount Merapi (2020-2022), these individuals assisted the Pelemsari farmers in transporting the grass from the designated polls along the Bebeng Street to the collective cowshed in Karang Kendal. Each farmer is expected to primarily inform the sub-village head about the time for picking up the grass and the preferred poll. He will then report to the agency's personnel. In some cases, villagers who had a close relationship with the personnel would directly ask for their assistance.

There are two models of partnership introduced by the agency. The first model is aimed to optimize the use of natural resources outside the national park which is performed by providing assistance and facilitating the infrastructures. The model had once been applied in 2011 in villages that were later called *desa binaan* (i.e., mentored villages). The second model is aimed to legitimize the local access to the forest to use the natural resources of the national park. The regulation gave a foundation for this model is KSDAE No.P.6/KSDAE/ SET/Kum.1/6/2- about Technical Guidelines about Conservation Partnership in the Nature Conserve and the Nature Reserve that regulates people's access for collecting grass, community development, and ecosystem restoration. It is expected that the grass collection activity of the locals could be legalized through the so-called *Perjanjian Kerja Sama* (i.e., collaborative agreement) in the traditional zone. Despite its status is not as strong as a law, the legalization in the agency's belief would yield people's trust and sense of belonging to the forest as their activities and existence are formally acknowledged. As the result, they would voluntarily participate in ensuring the security of the forest. Through this contract, the agency also planned to restore the ecology through silviculture intervention that is based on local knowledge to determine, for instance, the cultivation pattern and types of plants. According to this

agency's survey, the main activities engaged by the community of Umbulharjo Village include water use, grass and *rencek* gathering, culture, and tourism, excluding sand-mining (T. Atmojo et al., 2018, pp. 86–87).

Table. 2.5. The extraction and value of Merapi's main natural sources are based on the estimations of the Mount Merapi National Agency from 2017 to 2018 (BTNGM, 2018b, pp. 86–87)

The Extracted Natural Source	The Involved Villages	Number of the Involved Sub-Villages	Households (in thousands)	Quantity	Value (Rp.)
Water (m3/year)	32	71	62.77	1,106,717	2,932,798,725
Grass (kg/year)	32	71	46.41	77,618,630	19,404,657,502
Rencek (ties/year)	26	60	16.35	183,553,175	3,671,063,500
Sand	22	41	9.37	-	-

2.4. Yogyakarta Sultanate

Mount Merapi in the eye of most Yogyakarta society is the kingdom of spiritual beings. This conception of the volcano is highly influenced by the Javanese ideology, *kejawen,* that amalgamated different values: Hindus-Buddha, Islam, and animism. This chapter describes the history of the Yogyakarta monarchy that had shaped the cultural landscape of Mount Merapi based on the publication of the Ministry of Education of the Republic of Indonesia (1997).

2.4.1. Pre-colonial Period (1600-1800)

The Neolithic peoples were found in Mount Merapi, the South Sea of Java, River Progo, River Opak, and River Oyo. Migrations were often carried out as a response to natural disasters, forcing pre-historic communities to change their life habits. Eruptions and earthquakes were two events that commonly triggered the people's migrations. When migrating in groups or also known as *mbedol deso*, these refugees often carried the cattle with them.

The smallest organizational unit was a family comprising husband, wife, and children among which different tasks were shared. The family head was responsible for leading sacred ceremonies to ensure the stability of the household function and economy. It is believed parents passed their skills like craftsmanship to their children (Depdikbud, 1997, pp. 15–21). In a larger structure, the prehistoric Javanese appointed the most respected individual to become their leader. This leader was assisted by other members in managing the community's livelihood. Meetings were held at the selected time to collect people's aspirations. Regarding the cemetery, how the structure was built was determined based on the social rank of the dead. For a leader, for instance, the tomb was built in a menhir form to manifest the community's appreciation for his services. Later, the memory and appreciation toward the deceased leader became worship as the people continued searching for a sense of security. Spirits, according to primitive belief, reside in one place, attempt to enter human bodies or live around human settlements. It is also believed that people could connect with the mystical world by inviting spirits through a shaman or a statue and by directly entering the spirits' world. For the latter, this required them to pray, deliver sacrifices, and hold rites (Depdikbud, 1997, pp. 25–30).

In 1000 AD, the ancient Hindu values from India began to influence Yogyakarta's culture. The most prosperous Hindu kingdom during this era was Majapahit which reigned until 1500 AD. There were two dynasties that emerged before Majapahit: a Hindu dynasty named Sanyawangsa (732-929 AD) and a Buddha dynasty named Sailendrawangsa (752-856 AD). These two dynasties coexisted for a relatively short period of time as each attempted to expand its territory. The remains of the two dynasties were found in today's Papringan village nearby River Gajah Wong in Yogyakarta. During this period, the main food source in the villages came from agriculture and was managed by *Hulu air*, a village official who managed the water distribution for farmlands,

and by *Wanga*, an official whose task was to determine the good day for cropping and harvesting. The products were sold in markets managed by *mapekan* who also helped collect taxes from the commoners. The village official who had the expertise in managing dwellings and public buildings was *kalang*. In managing a village, a leader called *rama desa* was appointed. He was supported by five assistants called *pamong desa* and *wineka* whose tasks were to foster the village's affairs with other entities. All matters pertinent to the village affairs must be discussed in a community forum and the implementation of the decisions was worked on by the whole members. This tradition is today known as *gotong royong*. How the village was governed was determined by the villagers themselves. In other words, the village was autonomous in its own right. Affairs directly managed by the monarchy were limited only to tax, sacred buildings, and religion. Temples were erected in Yogyakarta from 800 to 1000 AD in two architectural styles: Buddhas and Hindus. Typically, those structures were built around river streams, mountains, or water sources that were considered sacred by commoners. The Hindu belief during the Sanjayawangsa dynasty was merged with animism and dynamism. Accordingly, man's life was destined to reach *triwarga*: religious activities that must be conducted (i.e., *dharma*), wealth that must be used for helping others (i.e., *artha*), and joy that should be let for others to feel (i.e., *kama*). The Buddha's values also influenced Yogyakarta through the teaching of *Trantrayana* and the five foundations of Buddha.

During the reigns of the two dynasties, cultures from India and China influenced Indonesia. Mataram from which the Yogyakarta monarchy originated, referred to land given by Sultan Pajang to Kyai Ageng Pemanahan. Mataram rapidly advanced through trade and gradually, began to replace the significance of Pajang. It became a new monarchy after a war with Pajang that was led by the rebellious son of Pemanahan, Senopati. After his death, Mataram was ruled by his son, followed by Sultan Agung in 1813. Similar to his predecessor, Sultan Agung had ambitions to

expand his territory and control the trade in Southeast Asia. However, it was never succeeded as the Dutch had already occupied Batavia. In terms of religions, the king initiated the integration of the former values, Hindus-Buddhas, with Islam and adopted the syncretized values as the kingdom's official religion called *kejawen.* Under his authority, Mataram Islam could possess a large territory and enjoy the peak of prosperity. The capital of Mataram Islam was moved several times but Sultan consistently replicated the elements that distinctively characterized his monarchy. Those elements include the palace itself (*Kraton*), a public park (*Alun-Alun*), Great Mosque (*Masjid Agung*), civic market (*pasar rakyat*), noble houses (*rumah para bangsawan*), royal servants' houses (*rumah para abdi dalem*) that were ordered based on the cosmology *axis mundi* (Junianto, 2017, pp. 234–236). The royal servants or *abdi dalem* had tasks to manage the royal household and ceremonies, serve Sultan, and connect the king to *wong cilik* or commoners.

Sultan had absolute power of controlling land and thus retained rights of distributing lands to princes, *abdi dalem*, or *priyayi* as compensation for their loyalty. The land is locally termed as *lungguh* which should be returned to the king once the owner was deceased or dismissed from their duties. This land bestowed was not calculated based on size (e.g., hectares) but rather on the population size named *cacah*. When someone was given a land 500 *cacah*, this means the land must be worked on by 500 peasant households. In villages, farmers who possessed lands are called *sikep* upon whom landless farmers or *numpang* rely for their livelihoods. Different from *sikep*, *numpang* was not obliged to pay taxes to the king. The land possessed by each *sikep* could come directly from Sultan or *priyayi* and could be transferred to their heir. This inherited land was called *tanah-pusaka* (i.e., heirloom lands). The *sikep*'s land could also be expanded with support from *numpang* and is locally termed *tanah-yasa*. Between *sikep* and *numpang* classes, there was the economically moderate group who was granted some parts of the village lands or *tanah-lanyah* for

their loyalty to *sikep* or for the need of raising families. The ownership of a part of this land was not permanent and was transferrable to their coequals. The land distribution in Java could trigger land conflicts if the land of *sikep* came from *priyayi* who in some cases must relinquish their right to another (Onghokham, 1983, pp. 6–11).

After Sultan Agung passed away in 1645, his son stepped in as a new ruler. The new sultan, hoping that Mataram could gain absolute rights over trade, signed a treaty with the Dutch. Pressures from other kingdoms were often directed at this unpopular king. After his death, Adipati Anon became a new king and bared the title King Mangkurat II. To combat his rival, Trunojoyo, the king signed a treaty with the Dutch in 1678 that allowed the VOC to take over all harbors on the northern side of Java. Since then, Mataram became a vessel of the Dutch. It was under the reign of his successor, Sunan Mas, that Mataram bravely fought against the Dutch. Being fearful of his reigning nephew, Prince Puger made an agreement with the Dutch in which he would let the VOC monopolize trade in Java if the Dutch let him replace the king. The Dutch were successful in taking over the power from Sunan Mas and made the prince become a new king with the title Paku Buwono I. During the reign of his son, Paku Buwono II (1727-1749), Chinese residents attacked the Dutch in Batavia and Central Java. The Dutch forts throughout the region including those in Mataram were attacked and their soldiers were killed. In 1755, the Dutch initiated the Giyanti Treaty that divided the Mataram kingdom into two small monarchies: Yogyakarta and Surakarta. Accordingly, Mangkubumi, who rebelled against the reigning king, Paku Buwono II, would earn some parts of Mataram and become a king under the title Sultan Hamengku Buwono I (Depdikbud, 1997, pp. 83–93).

2.4.2. Colonial Period (1800-1942)

In 1808, Daendels appointed some officials to become ministers in the monarchy. Different from Surakarta, Yogyakarta[15] refused to accept them. As a result, in 1810, a military directly commanded by Daendels attacked the palace, and the ruling king, Sultan Hamengkubowono II, was dethroned. When Java was seized by the British in the same decade, Yogyakarta and Surakarta united their powers to combat imperialism. The Yogyakarta monarchy was defeated by the British in 1812, and the king was then replaced by his son, Sultan Hamengku Buwono III. Not only did

[15] Sultan is the highest authority in the Yogyakarta monarchy and is patrimonial in nature. Sultan is assisted by princes whose tasks are to manage the palace's court trials and family affairs, *penghulu* who looks after the religions, *patih* who manages the court's administration, a prince who takes care of the monarchy, and a captain of soldiers. During the reigns of Sultan HB I to Sultan HB VII, the court's officers were paid with lands and paddy fields as well as *tetempuh* granted by the Dutch government (Depdikbud, 1997, p. 174). *Abdi dalem* is a term used for the royal servants, male and female, and typically consists of about 1,140 people. Anyone who wants to be *abdi dalem* must register to the so-called *Kawedanan Ageng Punakawan Purakarsa*. The *abdi dalem* was distributed throughout different departments and akin to the Sultan, the job is inheritable. Retirement is not recognized in *abdi dalem*, nevertheless, one could request a resignation, for instance, due to age. The salary is very little and barely able to satisfy the daily needs. Thus, having a side job is permitted. Many of them, despite this, confessed that serving the monarchy is aimed at proofing their loyalty to the sultan rather than seeking wealth or profits. During the reign of Sultan HB VIII, the royal finance was in the hand of the king and the monarchy's saving. Every month, *patih* would take the salaries of *abdi dalem* from the saving. As of today, the monarchy's finance was sourced from the ministry of home affairs. The monarchy's wealth such as sacred tools was heritage inherited by the Demak Sultanate to Sultan HB IX. Sultans were prohibited from either selling or transferring the ownership of the objects to their heirs, particularly, if those objects are symbols of authority. Besides those objects, the land is also owned by the monarchy thus Sultan is not allowed to either lend or grant the land to other parties. Those lands could be utilized by the Yogyakarta municipal but changes on them must first be reported to the king. In managing lands, the Sultan was assisted by the so-called *tepas wanakriya*. All objects that belonged to the Sultan could be inherited. If he did not have any children, the heritage must be passed down to his siblings from the same parents, otherwise, it must be given to his father. Land could be passed down to a particular person only if the king already made a notarized statement. Sultan in Yogyakarta had the authority to arbitrate the problems of his own families along with their descendants. In terms of the monarchy's religion, Islam-Java whose essence is mysticism is reflected through ancestral traditions *Labuhan Merapi* and *Labuhan Laut*. It is believed that these rites will safeguard the standing of the Sultan with the spirits of the mountain and sea (Dove, 2010, p. 122). Islam is the religion that dominated the royal court and the lives of the majority of Yogyakarta society since the reign of the Sultan HB I. Unlike the common Islam, Islam in Yogyakarta had been assimilated with ancestral values, namely animism, and dynamism. Such an undesirable condition compelled an Islamic teacher called Akhmad Dahlan to reform Islam by motivating the followers to return to the original teachings of Islam. In terms of education, only families with wealth or privilege such as those of village heads could obtain sufficient education. Children of peasants, unfortunately, could not afford education during this period

the two kings face the death penalty, but they also must surrender their territories, build police posts, admit Europe's supremacy in Java, surrender teak forests, and obey the British' rules. In 1816, the British returned the lands to the Dutch. At first, kings were very grateful as the shift would mean the opportunity to regain their power. The Dutch, unexpectedly, decided to continue the British legacy.

Public insurgents arose throughout Yogyakarta, among them were set off by Prince Diponegoro. In 1830, the prince was finally arrested, and the Dutch then became stronger. Fertile lands in Java that were once ruled by the kings were taken over and the kings' hegemony was devalued. The reigning king, unlike his predecessors, was granted limited authority in order to reduce any potential insurgence. To guarantee the livelihoods of a large number of princes in the monarchy, the Dutch occupied some regions and formed some new agreements. Accordingly, Yogyakarta's king and officials would gain permanent salaries but in exchange, the Dutch must possess the king's domains, rights to control the local courts and police, and produce laws needed to secure the monarchy. After the princes Mangkudiningrat and Prabuningrat were captured, no insurgence or rebels occurred in Yogyakarta. In 1830, the Dutch created an agreement with the kings of Yogyakarta and Surakarta. To compensate, a large amount of money and forest lands would be granted to the kings. The agreement resulted in the decreased territory of Surakarta as it could only possess Pajang and Sukawati. In Yogyakarta, after the death of Sultnan Hamengku Buwono, his successor named Sultan Hamengku Buwono V became a new king. When being coronated, the new king was only 2 years old. Only after he reached the age of 16 years that the king could officially reign over Yogyakarta. He made a promise that he would not interrupt the already-established agreement between his predecessor and the Dutch. During his reign, some princes were paid by the Dutch. They also lived away from the royal palace and thus would not threaten the

reigning king (Depdikbud, 1997, pp. 128–130). After a series of wars from 1825 to 1830, Yogyakarta's domains, wealth, and hegemony significantly decreased. Since 1930, the kingdom only possessed two regions: Mataram and Gunung Kidul. Some series of revolts spurred by local leaders took place between 1839 and 1848. It began from a fight of a commoner called Sarip Prawirosentono who gained support from about 1,600 commoners in 1840. By and large, the captured rebels were exiled to areas outside Yogyakarta. Until 1848, the Dutch relatively could cease local revolts. The success of the Dutch was also supported by the fact that many traditional rulers in Java and princes during this time often complied with the Dutch's terms. To sustain their allegiance and increase the political ties with the ruling kings, the Dutch provided rewards and privileges such as the General of Nederland Lion title.

The Dutch had a large autonomy in the monarchy's affairs. For instance, they once dismissed a royal adviser called *patih*. In the meantime, issues revolved around the land tenure in which many of the Dutch residents eagerly wanted to possess lands in Yogyakarta. The Dutch authority did not want any insurgences to re-occur due to the possible land misuses of the European residents. The Dutch then passed some land regulations to manage the tenure and rent system. The Dutch had absolute control of lands in Yogyakarta, thus, the royal kings were renters to whom lands were granted by the Dutch. In 1845, the Dutch limited the expansion of land rental around the monarchy. Only companies who already had contracts were able to renew and extend the rent duration. During the 1800s, farmers in Yogyakarta were able to satisfy their basic needs. A farmer, when needed, could gain helps from their fellow villagers. Yogyakarta, similar to most regions in Java, had long held a tradition of *gotong royong*[16], the mutual assistance or cooperation in a

[16] Gotong royong is a tradition that shows a collective spirit among neighbors aimed to strengthen economic and social resilience (Suwignyo, 2019, p. 407). It was argued by Suwignyo (2019) that this tradition has transformed in its meaning throughout time, depending on the motifs of the ruling elites or users. Accordingly, from around the 1940s

community that obliged everyone in the village to help one another. The land renting system was rarely found in villages except for sharing the agricultural products between the landowners and laborers. Two major networks existed in the villages: the feudal network and the village network. The former reflects the relationship between villagers and the government, the king and the Dutch government, which was mainly based on economic purposes while the latter reflects the relationship among the villagers that was founded on *gotong royong*.

During the reign of Daendels, Java was divided into nine prefectures each of which was led by a prefecture head. Daendels also intensified the operationalization of *contingenten* system that required commoners to pay taxes in the form of products from natural resources. In 1810, political tension sprung in the royal court between the anti-Dutch group led by Sultan Hamengku Buwono II and the pro-Dutch group led by Patih Danurejo. The conflict was won by the former thus forcing the Dutch to send about 1,500 military personnel to besiege the royal court. In 1811, when the British occupied Java, General Thomas Stamford Raffles enacted a land tax system. Yogyakarta during this year was reigned by Sultan Hamengku Buwono II who was previously dismissed by Daendeles but then took back the throne. In the following year, however, the British attacked Yogyakarta, and the reigning king was then exiled to Pinang and Ambon. To replace, Sutan Rojo became the new ruler with the title Sultan Hamengku Buwono III.

Being disrespectful to the Yogyakarta monarchy, Daendels attempted to change its long-standing traditions, thus, confrontations with Sultan HB II were unavoidable. As Sultan HB II refused the

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to the 1990s, the proclamation of gotong royong conformed with the government's large-scale economic development plans and targets. It was often used as a signifier of collective identity to support government propaganda and programs: compensate for failures in and complement the state's role in public welfare creation. It thus serves as a social engineering ad ingenious linguistic strategy by which elites orchestrated control over citizenship-making. The power was manifested in the structure of upward obligations imposed upon citizens and for the elites, it was an interment to gain people's loyalty and to extract taxes or to mobilize labor and capital.

Daendels's rules, he was discharged from his position and replaced by his son. Besides imposing changes on the monarchy's traditions, the Dutch also limited the territories and the hegemony of the Sultan. Land, for instance, was sold to European and Chinese residents. The Dutch invasion in Yogyakarta, not less importantly, had caused starvation in some areas. This crisis led some villages to lose plenty of residents due to the spread of cholera or dysentery (Depdikbud, 1997, pp. 182–185). In 1940, the Governor-general reformed the political contracts with kings in Java. Despite this, the Dutch continued to hold unlimited authority over the monarchy. People's resistance in Yogyakarta emerged in the early twentieth century, mostly, in education. The movements envisioning the betterment of education[17] for all Indonesian youths regardless of their social status were pioneered by many nationalist and Islamic figures in Yogyakarta. Among these figures are Budi Utomo who set down a youth congress in 1908, Ahmad Dahlan who established an Islamic organization, Muhammadiyah, in 1912, and Ki Hajar Dewantara who built a private school Taman Siswa in 1922 (Depdikbud, 1997, pp. 187–200).

The Dutch government granted access to free trade and foreign investment in Indonesia. In other words, a monopoly no longer existed in Yogyakarta or other regions in Indonesia. Such a political will incited mass investments from other countries which marked the beginning of capitalism in Indonesia. Exploitations of its natural resources including those in mountainous areas increased

[17] It is worth noting that education in Yogyakarta was centered on a family and traditionally, parents have responsibilities for the earlier lives of their children. They should become role models for their children thus disputes between husband and wife were barely recognizable. Wives should be loyal and respectful to their husbands and are responsible to manage the household. A young female typically is taught about a wife's obligations also called *bekti-laki* meaning being loyal to her husband as only through it, she could gain happiness. A young male on the other hand is taught to become a teacher for his wife also called *guru laki*. The main source of income of a male mainly comes from being a servant of the royal monarchy. This explains why etiquette or *tata krama* of Java is granted to males. Young females are obliged to help their mothers in taking care of the household or the economic sources of their mothers. Both girls and boys, when they were old enough, were sometimes obliged to take care of their young siblings. Similar to girls, boys were taught to manage the household matters like sweeping the floors and making tea for their fathers.

significantly. Numerous plantations were erected which in the case of Yogyakarta included coffee, tea, coconut, sugarcane, tobacco, and cotton. Some private companies required Dutchmen or employees to control the operations in small villages or towns. Irrigations, street networks, and health care providers were built to serve the Dutch employees. Some strategies used by the private companies of the Dutch to reduce competition with the local's agricultural farms by imposing taxes or controlling rents and markets. During this period, land rent business was arranged by private enterprises with Sultans and the region heads. Through them, these enterprises could possess fertile soils and farmlands.

The Javanese commoners had no courage to refuse the king's or the region heads' orders. In their perspective, it was the king who had the supreme power over lands and they only had the right to use and work on the lands. As the result, the farmlands were converted into plantations aimed for trade purposes. Farmers who lost their farmlands and occupations then shifted their profession into plantation laborers. Commoners lived in fear either of the Dutch or their own leaders. The Dutch, however, recognized the deep loyalty of Yogyakarta commoners to their king and their belief in their ancestral values. Numerous attempts were made to weaken the ties between the people and king, and reduce the Sultan's hegemony in the eye of his people. For instance, the Dutch built a railway line intersecting the north-south axis that philosophically means sacred to Yogyakarta's people. Historically, the imaginary axis was built by the first king, Sultan Hamengku Buwana I, in Yogyakarta after its split from Surakarta in 1755. Respectively, he situated the palace on a direct line between Merapi to the north and the Java Sea to the south. This spatial order along the axis represents the Hindus-Buddhas' cosmology *axis mundi* that symbolically links the humans' world (micro-cosmos) to the gods' world (macro-cosmos) with the palace as the custodian of the men-God relationship (Troll et al., 2015, p. 148). To safeguard its harmony, the palace performs ritual

offerings every year based on the Islamic calendar, facilitated by a ritual expert (Dove, 2010, p. 122) or spiritual gatekeeper.

2.4.3. Japan's Invasion Period (1942-1945)

After being defeated by Japan, the Dutch surrendered their power to the newcomer on March 9, 1942. In August 1942, the war general of Japan enacted laws regarding the changes in regional governance. Java was divided into *syun* which comprises districts. The supervision of all the autonomous districts was run under the authority of *gunseikan*. Respectively, each district carried special military goals and was expected to be self-dependent, particularly in terms of food supplies.

In April 1945, the Japanese reorganized the government structures of Yogyakarta by dividing it into two regions: the municipality of Yogyakarta and Sleman. Each regency was led by *shi-co* or a regency head. In terms of the Yogyakarta municipality, there were two regency heads: the heads of Kasultanan and Pakualaman. The lowest government units were *topari gumi* or neighborhood and *aza* or kampong. The municipal police or *pamong praja* had tasks to handle administrative and war-related issues and to enforce people to participate in wars. *Kampong* was strengthened during the Japanese since this lowest government structure had the greatest potential to assist war-related efforts. The managers of *kampong* were elected by the people and did not receive any official recognition. Indonesia, therefore, serves as a means for Japan to achieve its military goals by engaging Indonesian youths in its wars against the US and its allies.

At the end of 1944, the Japanese government carried out *romusha*. A *romusha* committee was established in every region in order to provide Japan with labor forces. Women aged from 16 to 25 were urged to participate in this labor system including laborers who worked in other sectors such as mining. Besides *romusha*, farmers were also obliged to give up rice to Japan. Rice was

collected from villages through cooperatives that served as tax collectors. Different from the Dutch, the Japanese directly confronted the commoners thus the implications of their invasion were directly felt by the commoners. Japanese influenced the belief system in Indonesia through Islamic teachers or *kyai*. In July 1943, military drills programs were introduced to these Islamic teachers. The goal was to nurture some spirits of war that would benefit their war-related interests. It was emphasized to these teachers about the sacred motifs of wars and that the drill program was not aimed at pressing Islam. With the support of these teachers, the Japanese could gather military forces from Islamic followers. The Japanese government also established coordination between the teachers and *pamong praja* in each district (Depdikbud, 1997, pp. 287–327).

2.4.4. Independent Period (1945-1975)

The news about the fall of Japan was relatively unnoticed by Indonesians since all radio stations were operated by the Japanese. It was through President Truman who announced the US and its allies' success in defeating Japan on August 14, 1945, that the news was finally spread out. Soekarno and his colleagues immediately returned to Indonesia to fill in the vacancy in Indonesia's governance and proclaim its independence. Indonesia's independence was finally declared on August 17, 1945. In Yogyakarta, the Japanese were disarmed by local fighters. Nineteen days after the proclamation, Sultan HB IX announced that the Yogyakarta monarchy was a special district under the authority of the newly independent country (Depdikbud, 1997; Lukas Sasongko Triyoga, 1991, p. 23). On August 19, 1945, the President of the Republic of Indonesia, Soekarno, issued charters that officially specified the positions of the Sultan HB IX as the head of the Yogyakarta monarchy (Depdikbud, 1997, pp. 304–305; Djunaedi & Sudaryono, 2015, p. 238). In September 1945, the Yogyakarta people took over fifteen factories possessed by Japan. The money received

from this seizure was then given by Sultan to the national government of Indonesia. One day later, on September 27, 29145, the Indonesian national committee was established.

The Dutch tried to re-invade Indonesia by terrorizing Indonesian leaders. During this political crisis in Jakarta, the capital city of Indonesia was then moved to Yogyakarta. Negotiations with the Dutch were continuously promoted by President Soekarno who elected Sutan Syahrir as Indonesia's delegation. Many disapproved of this approach and preferred to have open confrontations with the Dutch. The Dutch released its second aggression by attacking Maguwoharjo airport in Yogyakarta. They then moved toward the city center to occupy Yogyakarta. Under the command of General Sudirman and Lieutenant Colonel Suharto, the Dutch were successfully defeated. The combats of the Indonesian army were entirely supported by people's armies and political organizations. All regions in Yogyakarta during the Dutch aggression became the covert places for *Tentara Nasional Indonesia* or the Indonesian national army. After the agreement of Roem Royen was signed, the Dutch retracted its troops from Yogyakarta. All leaders returned to Yogyakarta including General Sudirman. In August 1950, the capital city was no longer in Yogyakarta and the city held the status of a special district.

The principal differences between Sukarno's guided democracy and liberal democracy are the roles of the regency head both as executive and legislative bodies and the election of the members of the senate which was not through a general election but the national government's ordination. During this period, six top army generals were kidnaped and killed by the so-called September 30th Movement. Soeharto and the military accused the Indonesian Communist Party as the actor behind the coup while the party perceived it as a plot designed by the military (Hanna, Willard, 2022). Movements initiated by students alliances that wanted to stop the PKI's actions rose in Yogyakarta. Demonstrations also led to open confrontations between the students who supported

the new and the old order regimes. The screening process to "clean" all governmental agencies from the communist party and old order regime was conducted beginning from 1966. Those who were found the partisans of PKI were dismissed from their jobs (Depdikbud, 1997, pp. 336–363).

The feudal system in Yogyakarta made it hold special district status which means that this region had a political privilege. Accordingly, an electoral democracy could be applied when selecting regents and city mayors but when it comes to the provincial leaders or governors, they must come from the royal family. The goal was to preserve the monarchy's longstanding traditions (Effendi, 2012, p. 19). In Yogyakarta, Sultan had roles in managing and protecting religions. There were five religions officially admitted by the government: Islam, Christianity, Catholicism, Hinduism, and Buddha. Each individual depending on his/her religion has the freedom to follow and spread their religious doctrines (Depdikbud, 1997, p. 373).

2.4.5. New Order Period (1965-1998)

The authoritarianism in Indonesia was marked by the political reign of President Soeharto which took place for almost 32 years. When dealing with resistant movements against his leadership, Soeharto was known for his military and repressive approaches. Among these movements are those led by an Islamic group *Komando Jihad* whose aim was to diminish the political ideology and the foundation of Indonesia, Pancasila. rip off the ideology of Pancasila. The development, especially of the economy, under his regime, was run aggressively and showed fundamental progress until 1996 but followed by a great gap between the rich and poor, corruption, and unequal wealth distribution between Java and regions outside this island. As a monetary crisis hit Southeast Asia from 1997 to 1998, Indonesia could not escape from the impacts. In order to re-stabilize the economy, Soeharto sought financial aid from IMF by signing a letter of intent (Saidi, 2007, p. 163). Soeharto's leadership style, monetary crises, and equity issues caused political unrest

throughout the country and met its peak in May 1998 when he finally resigned from the presidency (Saidi, 2007, p. 161). In the context of Mount Merapi, Indonesia's monetary crises and Soeharto's fall which also greatly influenced their life experience were highly associated with the eruption in 1997 (VOI, 2021). An eruption is typically perceived by the locals as an expression of deities' anger or disappointment in humans' moral degradation and disrespectful behaviors.

2.4.6. Reformation Period (1998-present)

The fall of the New Order regime led Indonesia to the transition phase. According to Effendi (2012), this phase demanded the national leaders decide whether the democratic system should be sustained or not in Indonesia's governing system. Such a wandering attitude exhibited by the government created anxiety among the civil society as any change in Indonesia's former governance system would mean threats to Yogyakarta's status as a special region and the hegemony of the Sultan its traditional leader (Effendi, 2012, pp. 13–14). Many argued that the existence of the Yogyakarta privilege must be respected as a part of Indonesia's cultural diversity which had long been preserved by the constitution. Further, the protestors forced the national government and the parliament to approve a bill admitting Yogyakarta's special status. The dispute became worsened when President Susilo Bambang Yudhoyono controversially stated that the monarchy was not fit with democratic principles (Effendi, 2012, pp. 13–14).

Merapi villagers are well-reputed for their persistence in holding their life principles that integrate mysticism with *tasawuf* (i.e., Islamic teachings based on Sufism) as the consequence of Islam-Java, the religion of the monarchy (Rachman, 2012, pp. 178–179). However, not all Islamic groups could accept their distinct religious values. They argued that the God to whom people in Merapi devote their lives is not the God of authentic Moslems. These ideological differences potentially mobilize an undesirable movement that may disrupt the harmony in Merapi's villages. For

example, a vow was made by a volunteer group during the 2006 eruption that they would disrupt the rite *Labuhan Merapi* as it does not reflect the Islam doctrines (Deegan et al., 2010).

2.5. Pelemsari

Publications that describe how and when the villages in Mount Merapi were first founded are very limited. Some of them, however, associate the founders with rebels who refuge from undesired influences of the reigning power, such as the Hindus-Buddhas' followers during the Majapahit kingdom (1500s AD), the absconding peasants during the Dutch *cultuurstelsel* (1900s AD), and the escaping partisans of PKI (1960s) (Inandiak & Dono, 2010, p. 58). The discussion about Pelemsari and Kinahrejo below is based mainly on my fieldwork in 2021 and 2022 and the work of Lucas Sasongko Triyoga (1991).

2.5.1. History of Kinahrejo and Pelemsari

Kinahrejo[18] is one of the neighborhoods of the Pelemsari sub-village whose history is traceable enough through the work of Indonesian anthropologist, Lukas Sasongko (1991). This neighborhood is widely known for its cultural role in preparing for the monarchy's rite *Labuhan Merapi* led by its resident who throughout generations was assigned by the Sultan to become the volcano's gatekeeper. The Kinahrejo neighborhood[19] was once a forest dominated by cinchona trees (Ghafur, 2012, pp. 47–48). A hermit, presumably, a refugee from the Dutch *Cultuurstelsel,* named Kyai[20] Wonodriyo, cleared the forest land to establish new dwellings. By his followers, the

[18] The name Kinahrejo is originated from cinchona tree or *kina* in the local term. At least 200 trees of this genus grew in Kinahrejo before the 2010 eruption, spreading both in villagers' home yards and the forest. People traditionally made use of the tree by taking its bark for curing malaria while others may sell a mature tree (15 years old tree) for some profits (Ghafur, 2012, p. 48).
[19] Lucas Sasongko Triyoga (1991) used a pseudonym Korijaya torefer to Kinahrejo in his book *Manusia Jawa dan Gunung Merapi*.
[20] Kyai refers to an expert on Islamic teachings.

Kyai was then appointed to become their *bekel*, a local term for a village head. Since *abdi dalem* (i.e., the royal servants) annually passed through his territory to carry out the *Labuhan Merapi*, they recommended the reigning sultan, Sultan Hamengku Buwono VII, to delegate the task to Kyai Wonodriyo. Sultan then mandated the tasks of leading the rite and overseeing their ancestors' cemeteries around the volcano to him and bestowed upon him the title *Mas Ngabehi Amongrogo* (Lucas Sasongko Triyoga, 1991, pp. 22–23). When the Yogyakarta monarchy was integrated with the newly independent country of Indonesia in 1945, under the reign of Sultan Hamengku Buwana IX, the *bekel* (i.e., sub-village head) was detached from the gatekeeper position. Despite this change, the roles of the informal leader were still considered culturally important. People typically perceive the gatekeeper as a gifted mystic from whom they could ask advice on their life matters and who understands the volcano's behaviors (Lucas Sasongko Triyoga, 1991, p. 23).

The sub-village head, the formal leader of the Pelemsari, must help the gatekeeper prepare for the rite (i.e., distributing tasks to the villagers) and organize an election event for a new gatekeeper. According to Triyoga (1991), once a new candidate is selected through community meetings, the result must be reported to the higher authority (i.e., village and district levels). The previous gatekeeper then propose the candidate to a unit in the monarchy called *tepas kawedanan pangulon*. If the proposal is approved, Sultan will issue a certificate called *serat kekancingan*[21] for the new gatekeeper who foremostly must pass the required qualifications: courageous, strong, able to protect Mount Merapi without expecting something in return, loyal to Sultan, and having *kawaskitan* (i.e., supernatural power) to communicate with the spirits or deities (Lukas Sasongko Triyoga, 1991, p. 24). In 1945, the gatekeeper position was held by Sastrodimejo entitled Mas

[21] *Serat kekancingan* refers to a court's certificate confirming the coronation of a person as 'abdi dalem' which should be returned to Sultan once he passes away. The status cannot be transmitted to his descendent (Lucas Sasongko Triyoga, 1991, p. 24).

Ngabehi[22] *Amongrejo*. He was then replaced by his *jajar*[23], *Mas Ngabehi Suragsohargo* who throughout his career was helped by his son, Maridjan until he died in 1983. The successor, Maridjan, became a new gatekeeper with the title *Mas Ngabehi Suragsohargo* (Lucas Sasongko Triyoga, 1991, pp. 23–24). Since the death of Maridjan on October 26, 2010, the post was assigned to his son, Asih Lurah Surakso Sihono, who was given the title *Mas Bekel Anom Suraksosihono* by the monarchy. It is worth noting that Asih was elected in 2011 after competing with other 18 candidates and passing a series of tests developed by the monarchy. The terms set in this process cover the aspects of religion, culture, and public communication including the knowledge of volcanology that required the elected gatekeeper to be able to cooperate with the volcanology agency (Rurit, 2011).

2.5.2. Pelemsari Sub-Village

It was estimated that about 1 million people live on Mount Merapi and the population density reached up to 500 people per km2 on its most fertile slopes. Merapi's volcanic ash enabled the soil to produce three harvests per year, which is very productive when compared with elsewhere in Indonesia. Such a condition compels people living in less productive lands to further move up the volcano's flanks for a better living (Troll et al., 2015, p. 138). The Pelemsari sub-village is situated about five kilometers from Mount Merapi's summit and had long been designated as one of the high-risk areas (BNPB, 2011, p. 72). The sub-village lies within the jurisdiction of Umbulharjo Village[24], Cangkringan District, Sleman Regency, and is bordered by two river streams, River Kuning in the west and River Adem in the east. Figure x shows the location of Pelemsari before

[22] *Mas Ngabehi* is a nobility title bestowed by the royal court or Sultan (Kemenristek, 2022)
[23] *Jajar* refers to a gatekeeper's representative or candidate who is assigned by the monarchy to assist the gatekeeper to look after the volcano (Lucas Sasongko Triyoga, 1991, p. 24).
[24] Umbulharjo is an acronym of *umbul* which means water source and *raharjo* which means prosper and peace (Umbulharjo, 2022).

and after the eruption in 2010. The former land indicates the setting of the Pelemsari where the villagers resided before the 2010 eruption. Such a setting allowed them to access the forest for conducting *ngarit-mugut* (i.e., cutting-collecting grass) or taking dead woods more efficiently than the Karang Kendal relocation site which is located around three kilometers from the former land.

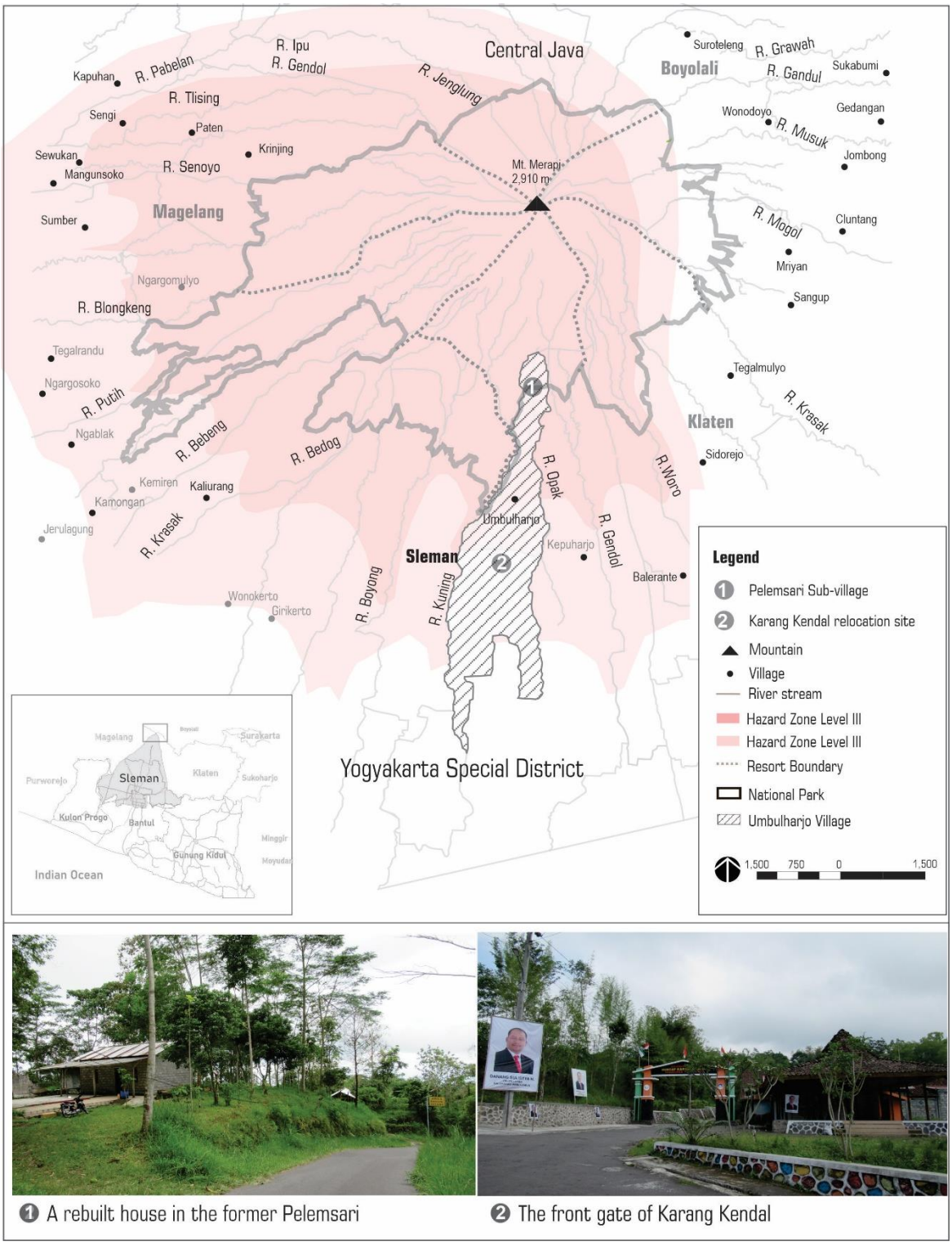

Fig. 2.10. The map shows the location of the Pelemsari sub-village before and after the eruption in 2010. The map is adapted from the Umbulharjo Village's map in 2010.

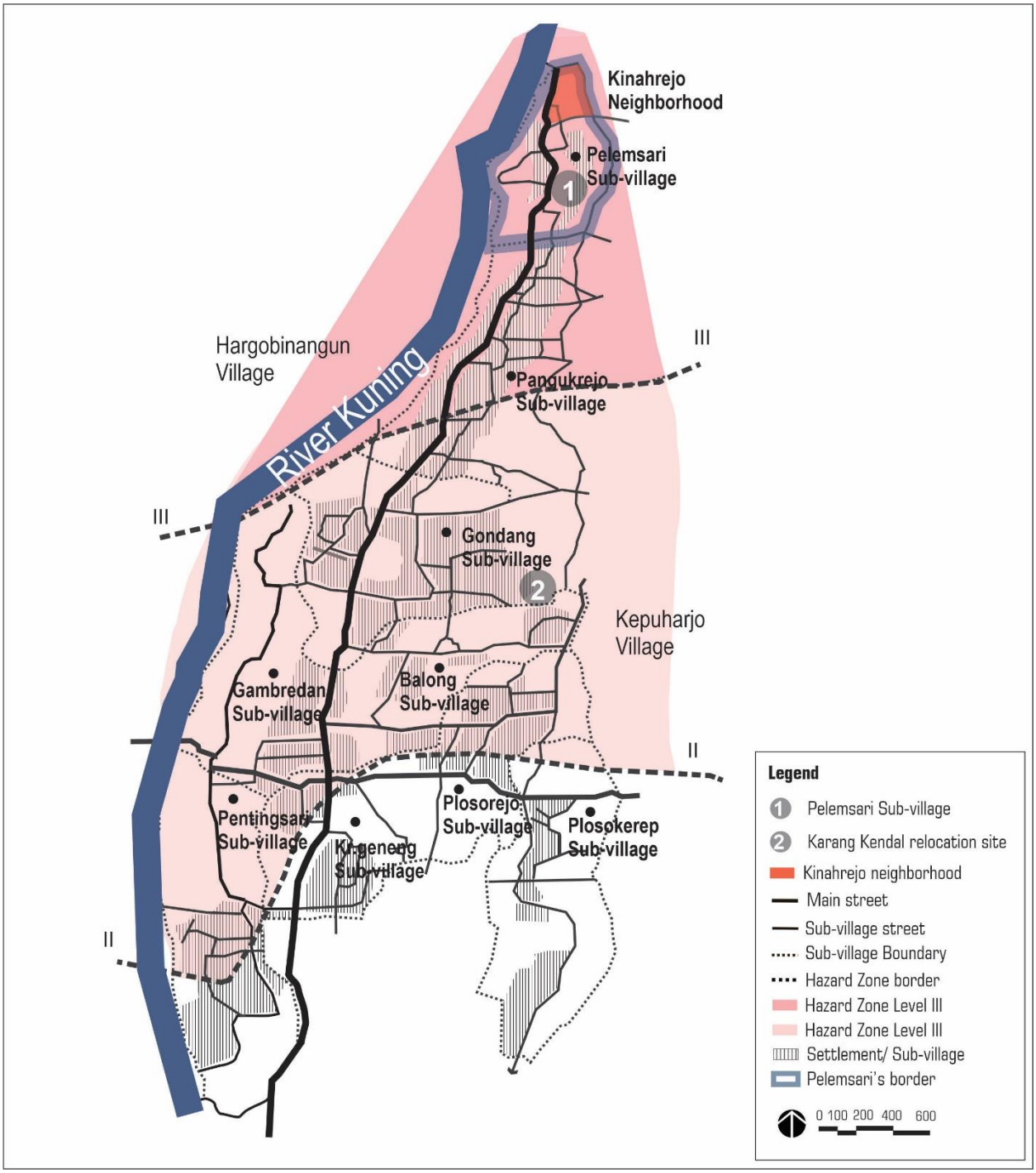

Fig. 2.11. The map shows the locations of the Pelemsari sub-village (1) , Karang Kendal relocations site (2) and Kinahrejo neighborhood (3)) where Maridjan once lived. The map was adapted from the Umbulharjo Village's map in 2010.

A. Government and Social Structure

Administratively, the Pelemsari sub-village is a part of Umbulharjo Village, Cangkringan District, Sleman Regency. It comprises four *Rukun Tetangga*[25] or neighborhoods—Kinahrejo, Pelemsari, Ngrangkah Lor, Ngrangkah Kidul (Cangkringan, 2021). The presence of a gatekeeper in the sub-village gives a distinct power structure to Pelemsari. The formal government structure of the sub-village can be seen in fig. 2.12.

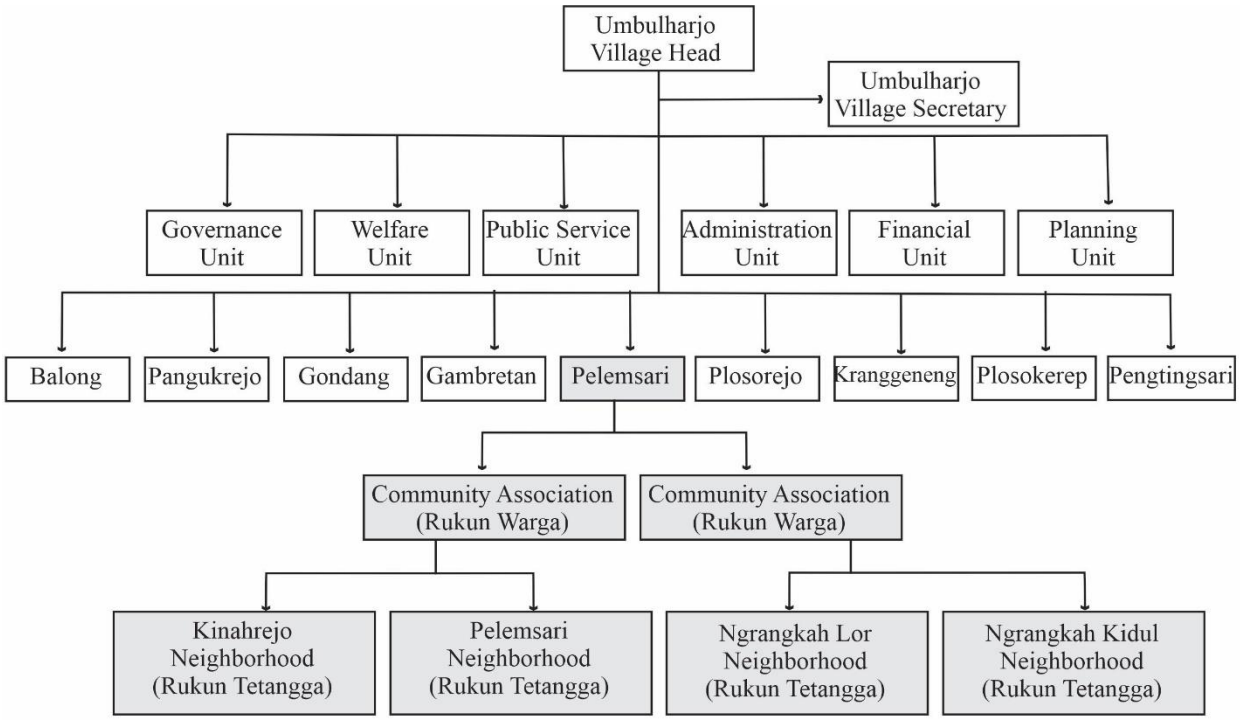

Fig. 2.12. At the top of the structure is the head of Umbulharjo Village who is supported by a secretary and six units. As the highest authority, the village head directly leads the nine sub-villages among them is Pelemsari. This sub-village's formal governance manages two community associations and four neighborhoods. The diagram was adapted from the village's organization retrieved in 2021.

The neighborhood Kinahrejo[26] is widely-known for its cultural role in preparing for the monarchy's rite *Labuhan Merapi* led by its resident who throughout generations was assigned by the Sultan to

[25] *Rukun Tetangga* is a name for the lowest government rank that directly governs a group of some households in a sub-village or a kampoeng in Indonesia.

[26] The name Kinahrejo is originated from cinchona tree or *kina* in the local term. At least 200 trees of this genus grew in Kinahrejo before the 2010 eruption, spreading both in villagers' home yards and the forest.

become the volcano's gatekeeper. The Kinahrejo neighborhood[27] was once a forest dominated by cinchona trees (Ghafur, 2012, pp. 47–48). A hermit, presumably, a refugee from the Dutch *Cultuurstelsel,* named Kyai[28] Wonodriyo, cleared the forest land to establish new dwellings. By his followers, the Kyai was then appointed to become their *bekel,* a local term for a village head. Since *abdi dalem* (i.e., the royal servants) annually passed through his territory to carry out the *Labuhan Merapi*, they recommended the reigning sultan, Sultan Hamengku Buwono VII, to delegate the task to Kyai Wonodriyo. Sultan then mandated the tasks of leading the rite and overseeing their ancestors' cemeteries around the volcano to him and bestowed upon him the title *Mas Ngabehi Amongrogo* (Lucas Sasongko Triyoga, 1991, pp. 22–23). When the Yogyakarta monarchy was integrated with the newly independent country of Indonesia in 1945, under the reign of Sultan Hamengku Buwana IX, the *bekel* (i.e., sub-village head) was detached from the gatekeeper position. Despite this change, the roles of the informal leader were still considered culturally important. People typically perceive the gatekeeper as a gifted mystic from whom they could ask advice on their life matters and who understands the volcano's behaviors (Lucas Sasongko Triyoga, 1991, p. 23).

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[27] Lucas Sasongko Triyoga (1991) used a pseudonym Korijaya torefer to Kinahrejo in his book *Manusia Jawa dan Gunung Merapi*.

[28] Kyai refers to an expert on Islamic teachings.

If the proposal is approved, Sultan will issue a certificate called *serat kekancingan*[29] for the new gatekeeper who foremostly must pass the required qualifications: courageous, strong, able to protect Mount Merapi without expecting something in return, loyal to Sultan, and having *kawaskitan* (i.e., supernatural power) to communicate with the spirits or deities (Lukas Sasongko Triyoga, 1991, p. 24). In 1945, the gatekeeper position was held by Sastrodimejo entitled Mas *Ngabehi*[30] *Amongrejo*. He was then replaced by his *jajar*[31], *Mas Ngabehi Suragsohargo* who throughout his career was helped by his son, Maridjan until he died in 1983. The successor, Maridjan, became a new gatekeeper with the title *Mas Ngabehi Suragsohargo* (Lucas Sasongko Triyoga, 1991, pp. 23–24). Since the death of Maridjan on October 26, 2010, the post was assigned to his son, Asih Lurah Surakso Sihono, who was given the title *Mas Bekel Anom Suraksosihono* by the monarchy. It is worth noting that Asih was elected in 2011 after competing with other 18 candidates and passing a series of tests developed by the monarchy. The terms set in this process cover the aspects of religion, culture, and public communication including the knowledge of volcanology that required the elected gatekeeper to be able to cooperate with the volcanology agency (Rurit, 2011).

The population of the close-knit community, Pelemsari, from 2007 to 2010, according to the sub-village head is relatively stagnant, that is between 86 and 88 households. In 2022, the total population reaches 241 (87 households) comprising 144 females and 97 males. This number is slightly lower than that in 2010 which reached 261 people (Wasito et al., 2012). Thirty-one

[29] *Serat kekancingan* refers to a court's certificate confirming the coronation of a person as 'abdi dalem' which should be returned to Sultan once he passes away. The status cannot be transmitted to his descendent (Lucas Sasongko Triyoga, 1991, p. 24).
[30] *Mas Ngabehi* is a nobility title bestowed by the royal court or Sultan (Kemenristek, 2022)
[31] *Jajar* refers to a gatekeeper's representative or candidate who is assigned by the monarchy to assist the gatekeeper to look after the volcano (Lucas Sasongko Triyoga, 1991, p. 24).

households currently work in the dairy farming sector, fifteen households work in the tourism sector, and the rest mostly work as state officials. None of the Pelemsari villagers are involved in the sand mining sector although one of my respondents confessed that he was compelled to mine for about three months due to the pandemic pressures in 2020. As can be seen in fig. 2.14, the total number of villagers who work in the tourism sector (e.g., Lava Tour jeep operators) presents in 2022 and the number of dairy farmers decreases in 2022. This trend is partly caused by the economic shift from dairy farming to the tourism sector made by villagers after the 2010 eruption.

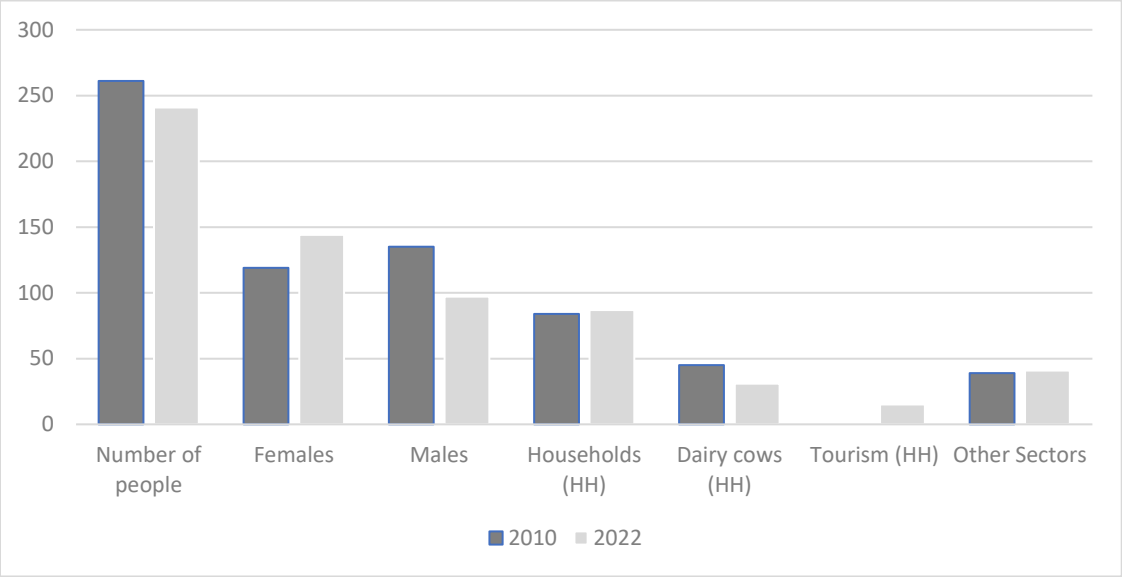

Fig. 2.14. The community profile of the Pelemsari in 2010 and 2022 according to interviews with the sub-village head and the publication of Wasito et al. (2012)

Fig. 2.15. Tourist jeeps operated by Merapi residents explore the volcano's slopes and the affected areas of the 2010 eruption. Photo by the author during her fieldwork in 2022.

B. Belief System: Islam-Java

Islam-Java was stipulated as Yogyakarta's official religion since the monarchy was established in 1755 (Djunaedi & Sudaryono, 2015, p. 238). Differ from the original Islam, Islam-Java is characterized by a mysticism integrated with *tasawuf* (i.e., Islamic teachings based on Sufism). The followers of this belief devote their lives to God and use meditation as a means to become closer to God (Rachman, 2012, pp. 175–177). They, however, pray not only to God and the Prophet as the Islamic followers originally do but also worship deities and ancestral spirits. The presence of those spirits could be recognized only by those who possess supernatural power or intuitions such as a shaman, or gatekeeper, or by those with whom the spirits want to communicate. Besides this power, people in Java also believed that gifted persons could predict an event before it occurs. Advice from them, thus, would boost people's confidence that their future actions would not violate the traditional rules and incite any harm to their lives, families, and the whole community.

Intuitions, according to the late Maridjan, are an inherent part of the Javanese identity that should be preserved.

> *Kula menika agamine Islam kados para abdi dalem Sinuwun, Islam menika agemanipun tiyang Jawi lan ingkang diagemi menika naluri nenek moyang. Kedah nglestarekaken naluri nenek moyang amargi panjenganipun sedaya ingkang ngawontenaken kita sadaya. Dhateng nenek moyang kita kedang ngaosi lan tansah ngawontenaken sugengan, kedah sedhekah lan among-among dhanyang dusun, Eyang Merapi sawadyabalanipun, awit piyambakipun ingkang njagi kita* (Lukas Sasongko Triyoga, 1991, p. 27).
>
> *I am an Islam follower similar to other royal servants of the Sultan. Islam is the religion of Javanese people who also use ancestors' intuition. We had to preserve the intuition given by our ancestors because they created us. To them, we had to deliver an honor and perform slametan, sedekahan, or among-among dhayang desa[32], Eyang Merapi and his army who look after us* (Lukas Sasongko Triyoga, 1991, p. 27).

Intuitions could be gained after someone refrains his/her self from worldly matters or conducts *laku*[33] *prihatin* in order to reach *sangkan paraning dumadi*[34]. (Lucas Sasongko Triyoga, 1991, p. 28).During my fieldwork, the local elder explained that some of their ancestors had the ability to predict eruptions and would advise their descendants to be aware.

> *Ya, kalau si mbah-mbah dulu itu memang ada yang tahu. Karena sering kata anak cucunya itu, 'dong hati-hati, gunung neng arep buang uwuh.'... Kalau si mbah-mbah dulu memang itu, titen, atau piye. Titen itu bisa tahu sebelumnya kalau mau erupsi atau nggak.... Kalau firasat atau piye ya, firasate koq kayak e ra penak, misalnya. Mungkin mau arep erupsi, apa gede apa cilik (*Moga, March 24, 2022, 00:09:08).
>
> *Well, some elders in the past knew. Because often, their children or grandchildren recalled them saying, 'be careful, the volcano would expel wastes.'.... Elders in the past had titen or something. Titen is the ability to know the future if an eruption will occur or not… Intuition or something, the sense of something that seems not right, for instance. Maybe, there will be an eruption, either big or small (*Moga, March 24, 2022, 00:09:08).

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[32] *Sedekahan* or *among among dhayang desa* is a tradition of delivering tributes to the ancestral spirits or deities (Lucas Sasongko Triyoga, 1991, p. 28).

[33] The varieties of *laku* include *pati geni*, the act of not seeing fire and sunlight and fasting from foods in a certain period, *ngrowot* or *ngidang*, the act of not eating except leaves and water in a certain period, *mutih*, the act of only eating white rice and water in a certain period, *mendhem*, the act of not eating and drinking and living in a enclosed hole in the ground in a certain period (Lucas Sasongko Triyoga, 1991, p. 28)

[34] *Sangkan paraning dumadi* refers to the beginning and the end of living in the world.

Do you mean all of them? I asked the elder to know whether there are conditions required for obtaining such a gift. Then, he replied:

> *Ya, nggak. Sebagian saja. Ya itu, yang saya bilang itu, keprihatinan…. Misalnya puasa, kerep puasa, kerep turu ya ora sore, misalnya itu namanya prihatin* (Interview with Moga, March 24, 2022, 00:10:01)

> *Of course, not. Only some of them. Just like what I mentioned, those living in keprihatinan…. For instance, fasting, often conducting fasting, or not sleeping in the afternoon. That is what we call prihatin* (Interview with Moga, March 24, 2022, 00:10:01)

The ancestral intuition in Javanese is commonly termed as *ilmu titen*, an intuitive knowledge formed by *petung*, that is the ancestors' accumulated records of good and bad events throughout the human life course. This local wisdom was then compiled in a book called *primbon* (Hartono, 2016, p. 267). Using Geertz's trichotomy[35], the Pelemsari villagers whose traditions are among others characterized by *slametan*[36] can be classified as *abangan* while the gatekeeper, akin to other *abdi dalem* who is concerned with the monarchy's traditions is classified as *priyayi*.

Since prehistoric times, ancestors in Java had believed that mountains, similar to trees, rocks, sea, rivers, or other objects around the living humans, were resided by the spirits of the dead. The mountain, in Javanese traditional arts like puppets or *wayang kulit*, was replicated through a form of *gunungan*. This art feature symbolizes life and manifests the heavenly world, the metaphysical realm where God rules all events in the universe. In the *gunungan*, one would see a painting of a giant creature sticking his long red tongue out, apes climbing trees and fighting with others, flying

[35] Based on their religious streams, Geertz (1960) divided Javanese into three types: *abangan*, people whose traditional religious system balances animistic, Hindu-Buddhis, and Islamic elements*; santri*, the devotees of Islam's pure doctrines, and *priyayi*, the group who are concerned with etiquette, art, and mysticism (Geertz, 1960).

[3636] The Javanese *slametan* is a communal feast that forms a social universal joint between a man with friends, neighbors, relatives, local spirits, dead ancestors, and gods by the virtue of their commonality. It unifies various aspects of social life and individual experience altogether to minimize uncertainty and conflict. Regarding experience, all people are the same and there is no individuality since the basic feeling, man, and God is eternal objects and the same in all people.

birds, trees, and flowers. In the middle of the *gunungan*, there is a painting of a Javanese house with two large doors being locked and guarded by a giant on each side. The locked doors symbolize the peaceful inner side hidden behind those doors. The worldly life manifested through animals, trees, and flowers must be defeated first before one enters these doors. It was believed that the mountain is the world where the spirits of the dead reside. During the ancient Javanese kingdoms, a mountain was associated with the residence of the gods (Lucas Sasongko Triyoga, 1991, pp. 35–36).

Fig.2.16. The majestic Mount Merapi (right), the gunungan symbolizes the heavenly world in *wayang* (i.e., shadow puppets) (middle), and rice cone tribute in the Grebeg Sekatenan in Yogyakarta palace (left). The image was retrieved from (Ananda, 2022) (left) and from the field observation (right).

Fig.2.17. The Pelemsari villagers pray in the local Mosque, Masjid Al-Amin (left), meditate (middle), and visit the cemeteries of their late families or ancestors before the sacred Ramadhan (left)

C. Myths

According to Javanese cosmology, the Yogyakarta palace represents the micro-cosmos (humans' world) while the cosmic kingdoms represent the macro-cosmos (deities' worlds) distributed in the earth's four cardinal points. Mount Merapi in the north is a kingdom reigned by *Kyai Sapu Jagad*, the South Sea of Java in the south is reigned by the *Queen of Southern Sea*, Mount Lawu in the east is reigned by *Kanjng Sunun Lawu*, while Wonogiri in the west is reigned by *Sang Hyang Pramoni* (Schlehe, 1996, p. 396). The scheme representing the constellation of this mystical power is provided in fig. 2.18.

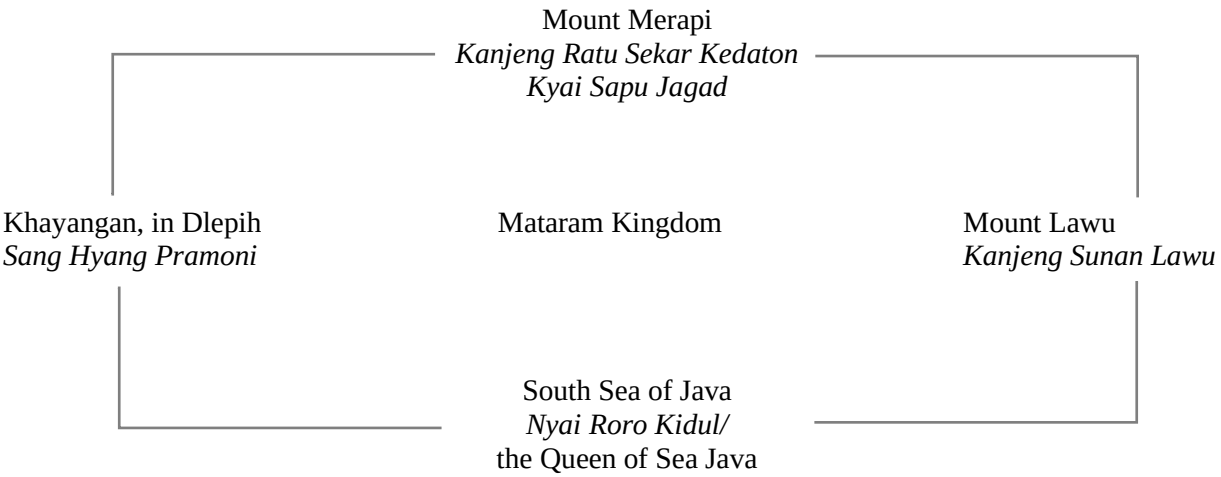

Fig. 2.18. The four sacred places of *Slametan Labuhan* are distributed throughout the earth's four cardinal points. The scheme is adapted from the work of Triyoga (1991).

The current gatekeeper, Asih, during my interview in 2022, described the myth surrounding the supreme deity of Merapi, Kyai Sapu Jagad. Accordingly, the Panembahan Senapati, the ruler of the Mataram kingdom meditated in Parangkusumo around the South Sea of Java. His prayers annoyed the spirits residing in the South Sea governed by a goddess, *Nyai Roro Kidul*. Seeing the anxiety of her people, the Queen asked Panembahan Senapati to leave her territory. Panembahan then stated that he prayed for peace in his monarchy which during his reign was in a war with the Pajang kingdom. The king agreed to leave only if the Queen promised to help him. In short, Panembahan and the goddess were involved in a romantic relationship. The Queen wanted the king to join her in her kingdom and secretly offered him to eat *endhog dunia* or an egg of the universe. Witnessing this, the king's guard advised him not to eat the egg but instead to bring it to the monarchy. In his palace, the king then asked his *juru taman* or gardener to eat it. The egg transformed the gardener into a giant who became very furious at the king. It raised a war between them but the king could defeat the giant. The king then expelled it to Mount Merapi and promised

that all his needs would be annually delivered to the giant. The king also granted him the title *Kyai Sapu Jagad* who later became the mystical ruler of Mount Merapi.

At least three features are regularly present in myths of Java: *mahkluk halus* (i.e., invisible creatures), *tempat angker* (i.e., haunted places), and sacred animals. In Javanese beliefs, the spirits could disturb human life as the human world is connected to the spirits' worlds: the upper world and the world below. The spirits and ancestors living in these two worlds have good or bad characters. In the real world, people should appease these spirits by delivering offerings through traditions like *slametan* or *kenduren*.

C.1. Mahluk Halus (Invisible Creatures)

Merapi is culturally rich with myths. Besides *Labuhan* and *Kyai Sapu Jagad*, another myth that surrounds Mount Merapi relates to two figures: *Empu Rama* and *Empu Permadi*. It was told that Batara Guru planned to move Mount Jamurdipo from the Java Sea to the center of Java Island to build a balance in his chaotic kingdom. Some gods were instructed for this mission but before this, Batara Guru already asked *Empu Rama* and *Empu Permadi* to create an heirloom dagger of Java where the mountain would be placed. Feeling that they already received the order, the two *empu*[37] refused to transfer the task to the gods. A fierce war occurred and was one by the two *empu*. Batara Guru then instructed Batara Bayu to punish them. Batara Bayu blew the volcano from the sea to the north and buried the two *empu* alive. Since then, people in Mount Merapi believed that the two spirits reside in Mt. Merapi (Lucas Sasongko Triyoga, 1991, pp. 42–43). Table 2.6 shows some names of deities in Javanese mythology which are still worshipped in ceremonies like Labuhan.

[37] Empu is an Indonesian term for a master whose expertise is in sword craftmanship (KKBBI, 2021)

Table 2.6. Deities and their roles adapted from Triyoga (1991) and (Meidinata & Sushmita, 2022)

Deity or God/Goddess	Roles
Eyang Merapi / Kyai Sapu Jagad	To determine whether an eruption occurs or not
Eyang Antaboga	To lead the invisible creatures that reside at the bottom of the volcano to keep the balance of the volcano's weight.
Eyang Megantara	To control the weather and climate around the volcano
Kyai Sapuangin	To control the directions and velocity of the wind
Empu Anjani	To create blades or weapons for wars.
Nyai Gadungmelati	To control villages and vegetation in Merapi and warn about an eruption through dreams.
Kyai Petruk	To give signs about the occurrence of eruptions

The universe according to local beliefs is occupied not only by human beings but also by *mahluk halus* or invisible creatures. Similar to human beings, they possess organizations that govern their daily activities. The spirits of the dead will live together with *Empu Rama* and *Empu Permadi* in Mt. Merapi and still communicate with their living relatives. The spirits of good human beings would be granted places inside the Merapi kingdom and become its royal servants. By contrast, the spirits of immoral human beings would be placed in *Gunung Wutoh*, a hill covered with a dense green tree that also serves as the kingdom's main gate. All these spirits do activities similar to what humans normally do. When *Eyang Merapi* or the supreme deity needs workforces with specific expertise, he would send his servants to seek the right human beings. It is believed that those who are selected would suddenly die (Lucas Sasongko Triyoga, 1991, p. 49). The invisible creatures living in the Merapi kingdom as can be seen in table x took at least three forms.

Table 2.7. Three forms of invisible creatures in Javanese belief based on Triyoga (1991) and Geertz (1960)

Type	Characters	Examples
Leluhur	The spirits of the dead wander around their houses until the next forty days after the death. The good spirits enter the Merapi and the South Sea before reaching heaven while the bad spirits or *lelembut* reside in places like rocks, trees, and rivers.	The spirit of an important figure (e.g, *abdi dalem)* enters one's dreams to send a warning message about disasters and how to cope with them.
Dhanhyang	An invisible spirit who resides in and controls particular places like valleys, rivers, water sources, villages, wind direction, and hills. The creature is benevolent, and charitable to human beings. The name assigned to it is determined by its place.	*Dhanyang* Wukirsari in the Wukirsari sub-village, *dhanyang* Pijen in the forest Pijen
Lelembut	The possessing spirit that enters and possesses one thus encountering it may end in sickness, insanity, or death. It has a dreadful appearance and horrifying voices to disrupt, destroy, or even kill human beings	Evils spirits in the forms of *banaspati, jin, wewe, gendruwo, peri, jrangkung, wedon, buta, thethekan, gundhul pringis*

C.2. Tempat Angker (Haunted and Sacred Places)

Places, where the invisible creatures lived, are considered haunted. People in Mount Merapi villagers must treat these places respectfully (L.S. Triyoga, 1991, p. 60) and are prohibited from cutting trees, collecting grass, moving things, talking dirty, or urinating there. These haunted places are the most hazardous areas of eruptions which according to the Sleman Regency's hazard zone map are prone to pyroclastic flows, lava flows, tephra, and ash rainfalls (BNPB, 2011, pp. 72–73). Table 2.8 shows the haunted places around the volcano and the functions of this place in a real and mythological sense. These sacred places include Merapi's crater, a rocky and sandy area around it called *Pasar Bubrah* (the kingdom's civic market), *Gunung Wutoh* (the kingdom's main gate whose area and biota are protected by a deity called *Nyai Gadung Melati*), the *Sjech Djumadil Qubro's* graveyard, *Patuk Alap-alap* (the deities' grazing land), *Bukit Turgo, Ringin Putih,* and *Watu Gajah* (the kingdom's horse ranch area) (Walsh, 2000, pp. 16–17).

Table 2.8. A summary of some haunted places and high-risk areas in Mount Merapi

Location	Beliefs	Source
Pasar Bubrah	The kingdom's civic market	Walsh, 2000, pp. 16–17
Gunung Wutoh	A lush, green, and flowery forest that is planted by Eyang Merapi to decorate his kingdom's gate. The hill is guarded by invisible creatures ruled by *Nyai Gadungmelati*	
The tomb of Sjech Djumadil Qubro	The graveyard of an ancestor of Merapi, the founder of Turgo village	
Patuk Alap-alap	The deities' grazing land	
Turgo Hill	The deities' horse ranch area	
Watu Gajah	The deities' horse ranch area	
Gunung Hijau and *Gunung Gebyok Gede*	Place for some people to pray for winning in gambling or conducting malevolent activities	Lukas Sasongko Triyoga, 1991, pp. 61–64
Gunung Bibi	The main gate of the kingdom is guarded by Kyai Petruk which serves as protection for the villages from an eruption.	
Tuk Bebeng, Tuk Opak River Kuning	The water sources and rivers at which pilgrims pray to ask for rains, prosperity, and fortune	
Tuk Pitu, River Kuning	The water sources at which villagers or pilgrims pray to ask for rains or blessings, prosperity, and fortune	Interview with the local elder, 2022
River Opak	The sacred river passed through by the Queen of the South Sea	

Fig. 2.19 Water runs out from the sacred *Tuk Pitu* located in the forest nearby River Kuning. Photos by Gilang Ramadhan in 2022.

Another place that is believed to be haunted is an area located on the northern side of Plawangan Turgo hill. This hill is located on the southern flank where the tomb of the *Sjech Djumadil Qubro* is also situated. According to one of my respondents in Pelemsari, whenever he collects grass with

his wife around this area, his wife sometimes hears people talking but without physical appearance. Besides the prohibitions of talking inappropriate, yelling, cutting grass or trees, and alike, villagers in Pelemsari typically would ask permission from those who are believed to reside around and in their grass plots. For instance, my respondent mentions that every time he crosses through *River Kuning* to collect grass deep in the forest, he would greet and ask permission from the invisible residents. Other respondents also often greet in Islamic *assalamualaikum* before cutting grass in the forest. Such actions would protect them from potential harm or injuries and boost their confidence in cutting the grass.

Fig. 2.20. Bamboo is still found in the Mount Merapi forest today. Bamboo could be used as a construction material such as a water pipe system. Photos by the author (top) and Gilang Ramadhan (bottom) in 2022.

Haunted places could take the form of a tree where *lelembut* or spirits reside such as bamboo. Despite this, bamboo has numerous functions for human living. Not only can it be used in the

building or infrastructure constructions, but bamboo could also serve as a natural early warning system for the locals before the occurrence of eruptions. The sub-village head whom I met in 2022, recalled when bamboo *petung* around his former house nearby the lahar streams, River Opak, helped some people divert their evacuation direction during the 2006 eruption. Bamboo *petung* cracked when the heat increased and emitted an explosive sound when the volcano was about to erupt. The people then shifted their evacuation direction to the east and south, avoiding the pyroclastic flows and lava that flew towards the river. Similar to the sub-village head, the current gatekeeper also mentioned how bamboo in his home yard in Kinahrejo emitted an explosive sound during an eruption in the 1970s. It is also worth mentioning that villagers link haunted and sacred places with areas where volcanic sand and rocks are accumulated and thereby no human activities are present. These places are preferred by spirits to reside. After the 2010 eruption damaged most of Mount Merapi forest, more areas are considered dangerous such as river streams where the volcanic sand was abundant. Many villagers saw the material as a blessing and chose to blind their eyes to their ancestral messages. The volcanic sand along the river streams such as River Gendol and River Kuning which served as the lahar's channels were extensively mined while the law enforcement against this illegal act was very low. One of the respondents believed that the deities migrate to quiet places in the south after feeling annoyed by the mining activities.

The ancestors' warning messages about haunted places around the crater are aligned to the government's hazard zone maps, indicating the people's attempts in the past to increase their resilience against eruptions. As can be seen in fig. 2.21, those places are located on the upper slopes, around the hills, forests, and water sources that protect the ecosystem and lands from erosion. Some haunted places are also found near the most hazardous areas such as the lahar channels or river streams and areas of poisonous gas (Lucas Sasongko Triyoga, 1991, p. 123).

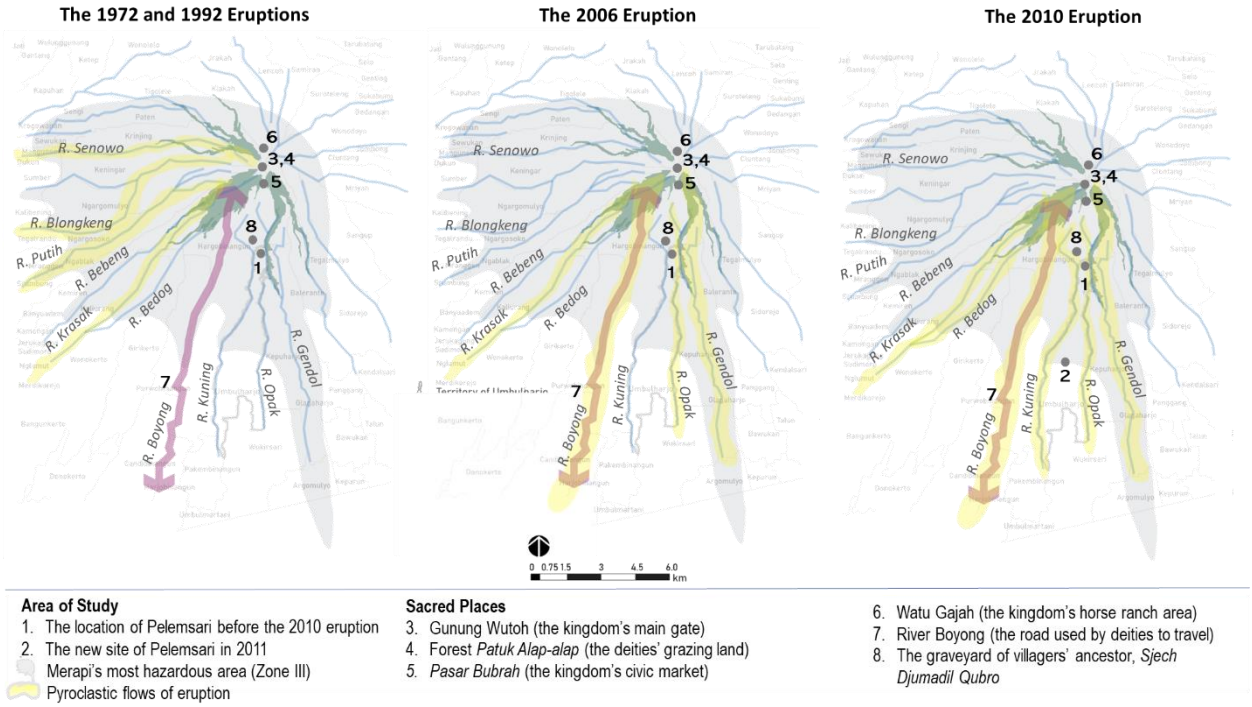

Fig. 2.21. The image shows the compatibility of the ancestral messages of haunted places with the hazard zone areas designated by the government[38].

Flat ground is preferable because it is more fertile than rocky and sandy ground and not less importantly, free from *lelembut*. If there is *lelembut* indicated in particular land, the landowner typically would ask a favor from a *shaman* for his advice to expel the spirits. Before the reconstruction of Karang Kendal began, a spiritual ceremony was held by the Pelemsari villagers. The aim was to acquire God's protection over the construction process from any disturbances including those from *lelembut*. However, long after the reconstruction, some villagers said that there is a palm tree inside their compound that is inhabited by *lelembut.* In addition to this, a local

[38] Since 1930, most people living in the southern flank believed that *Geger Boyo*, the local term for a crocodile back-shaped ridge of the volcano's upper southwest that appeared in 1930, would protect them from pyroclastic flows (Ghafur, 2012, p. 45). According to the Volcanology and Disaster Mitigation Center (2014), the pyroclastic flows of the 1872-1931 eruptions typically traveled westward northwestward. For example, the pyroclastic flows of the 1972 eruption traveled through Rivers Blongkeng, Putih, and Krasak, and that of the 1992 eruption traveled through River Senowo (Nurrachman, 2021). However, during the 1994 eruption, the deadly pyroclastic flows traveled southward through River Boyong between Turgo Hill and Plawangan (ESDM, 2014). The 2006 eruption was marked by the collapse of Geger Boyo which then caused the pyroclastic flows to travel southeastward through Rivers Gendol, Boyong, and Opak. Due to the collapse of the ridge in 2006, the pyroclastic flows of the 2010 eruption damaged villages in the south flanks including the Pelemsari sub-village, and caused about 367 fatalities (Bakkour et al., 2015, p. 167)

elder said that he expelled this *lelembut* from one's body during *jathilan* and returned it to the palm tree. It was not known why the tree finally died but the *lelembut* was moved by a local shaman to a fern tree. The tree grew around the new futsal field[39] located at the heart of the settlement or the north of the collective cowshed. It is believed that this spirit is benevolent and could be helpful for the locals to know about the conditions around the volcano's crater.

Fig. 2.22. The Pelemsari villagers believed the fern tree in the futsal field is inhabited by a benevolent *lelembut*. Photos by the author.

C.3. Sacred Animals

The ruler of the Merapi kingdom or *Eyang Merapi* is believed domesticating horses in some places: *Hutan Patuk Alap-alap*, an area around *Gunung Wutoh,* and *Selokopo Ngisor* and *Gunung Gajah*

[39] The futsal field is built with endorsement from the elected village head for the periods of 2022-2026, Danang. The land on which the field is built is *tanah bengkok,* the land that due to his administration services belongs to the village head. Since *tanah bengkok* is a Sultan's ground and traditionally bestowed to each village official in exchange for his duties, Danang must propose for Sultan's permit before building the facility on that land as wished by the Pelemsari villagers.

Mungkur. A white tiger is another sacred animal that is mainly found in *Hutan Blumbang* and preys on a human infant. People believed that before eruptions, *Eyang Merapi* command animals in the forest to go down the mountain. This changing behavior of these animals gives a signal for the nearby villagers to immediately evacuate.

D. Traditions

Religious teachings of Islam-Java are deeply rooted in Javanese traditions[40]. There were a great variety of traditions in Java but many of them unexpectedly changed or eroded. The effects of globalization and consumerism that came through social media, tourism business, and sand mining in Mount Merapi had degraded people's cultural awareness. One of the local elders raised his concerns about this undesirable change throughout our conversation. Young generations he said tended to refuse to live in *prihatin* and learn about *ngarit*.

D.1. Norms and Prohibitions

People in Mount Merapi develop norms to maintain a peaceful living with invisible creatures. For example, nobody in the village is allowed to cut grass and trees in the forest, move objects in haunted places, cultivate in sandy and rocky soils, orient the home façade towards the volcano, and wear green clothes in the forest. Green is Nyai Gadungmelati's favorite color thus wearing clothes with this color will be considered by the deity as an insult. Her anger could be materialized through disasters that could happen not only to the transgressor but also to the whole community.

[40] The kinds of traditions in Java include *slametan tandur (*start of cultivation), *grumbegan* (birth of a calf),; 2) *bersih desa* (i.e., clean the village), *ronda malam* (i.e., night-watch), rembuk desa (community meeting); 3) *bancakan brokohan* (birth of a new born baby), *bancakan pupak puser*; 4) *ngunduh pengantin* in marriage,; 5) *slametan* for the death commemoratino on three, sevem 40, 100, 1,000 days; 6) *nyadran, padusan, sekaten*; 7) isolating self in the silent place/ *petilasan* (the home of ancestors), hiking, *nyirik* (fasting), keeping sacred tools like *keris* (i.e., traditional blade) (T. Atmojo et al., 2018, p. 16) .

Further, once Merapi erupts, no one should say anything that will affront *Eyang Merapi*. At worst, the penalty for this could be the death of the offender (Lucas Sasongko Triyoga, 1991, pp. 81–82).

In daily conversation especially when passing through sacred and haunted places like those in the forest, it is expected that people do not cuss, complain, and make negative comments about Mount Merapi and its activities. Learning from Mbah Maridjan, the sub-village head explained that using words such as *wedhus gembel* commonly used to indicate hot clouds and 'erupt' or *jeblug* in local terms are forbidden. Instead of saying Merapi erupts or *jeblug,* people should say that Merapi is constructing to indicate the good behaviors of the volcano. When Merapi emits hot clouds, one should politely greet it by saying, for instance, *assalamualaikum* in Arabic.

D.2. Gotong Royong

Gotong royong, a tradition long practiced by people in Java, is defined as a mutual help system in neighborhoods aimed at strengthening economic and social resilience (Suwignyo, 2019, p. 388). So embedded this tradition with the identity of Indonesian society that oftentimes, the term *gotong royong* becomes a political means for elites to mobilize people's participation in development programs or invoke their sense of belonging and obedience. Koentjaraningrat (1961), a well-reputed anthropologist in Indonesia, categorized communal activities in Indonesia into two general groups: *tolong menolong* which refers to communal activities of helping relatives or immediate neighbors in a reciprocal manner, and *gotong royong*[41] which refers to public works for the benefits of all members of the community (Suwignyo, 2019, p. 391).

[41] *Tolong menolong* activities include *tulung layat* when someone dies or experiences disasters; *beceran* or *rewang* when someone holds a feast, *sambat-sambat* or *guyuban* when someone needs help to construct houses; and *grojogan* during intensive periods of an agricultural cycle. *Gotong royong* category includes *gugur gunung* when carrying out a public work project, *alur waris* when cleaning the ancestral graves; and *kerigan* or *kuduran* when carrying out the village head's command (Suwignyo, 2019, p. 391).

In Pelemsari, *gotong royong* is evidenced when people worked closely together to reconstruct their homes in Karang Kendal[42] and when they worked together with volunteers to clean the road to the Labuhan harbor, Sri Manganti. The current gatekeeper, Asih, described that the 2010 eruption severely damaged the *Labuhan* harbor, Post Rudal, forcing the rite to be conducted in *Alas Bedhengan* in 2011 and 2012. Knowing that the condition became more conducive, Asih initiated the move of the harbor further to the forest located up to three kilometers from the crater for the rite in 2013. For the latter, the monarchy approved his plan and hundreds of people helped him clean the road to the harbor Sri Manganti.

[42] On May 5, 2011, one year after the 2010 eruption, the regional government of Sleman issued Regulation Number 20 the Year 2011 about Hazard Risk Areas of Mount Merapi that stipulated the sub-villages of Pelemsari, Pangukrejo, Kaliadem, Petung, Jambu, Kopeng, Kalitengah Lor, Kalitengah Kidul, and Srunen as areas prohibited for residentials. The ownership status of the former lands, however, remained unclear. The regulation immediately incited disappointment for Pelemsari villagers who had already planned to establish a lava tour a few months after the eruption to economically recover. Ramijo, the sub-village head, argued that his village would not give up their ancestors' lands on which they had depended their lives over generations. Losing their former lands would mean a great loss of access to grass which is critical for their dairy farming (Arif et al., 2018).

Fig. 2.23. The second post of Alas Bebhengan (above) (left) and the first post, Sri Manganti (below) (right) for the Labuhan rite in 2022. Photos by the author.

When villager experiences *kesripahan* or grief for their family members who pass away, based on my interview with a local respondent, the neighbors would instantly help take care of the dairy

cows and fodder. The custom, however, does not apply to a non-native villager or someone whose family members die in areas outside Pelemsari. In contrast, when someone plans to hold a ceremony like marriage, he or she needs to *nembung* (i.e., ask for help) from neighbors. This tradition, she said, had been practiced long before the eruption devastated their sub-village in 2010.

Tolong-menolong and *gotong-royong* had been well-ingrained in Pelemsari's everyday life. These two traditions, as the result, enforce the emotional ties among the villagers that had already formed. To prove, it is quite often I found that people in Pelemsari call their fellow villagers by nicknames that seem irrelevant to their real names but are very well known among the villagers. To elders, the younger aged people would add the honorific *Mbah* that is usually used to call their grandparents in a family. Thereby, when the 2010 eruption damaged their settlement, instead of relocating to relatives' homes in safer areas, Pelemsari villagers chose to remain close one to another and together planned for their future in Karang Kendal. The sub-village head said that after the eruption in October 2010, some villagers fled to different locations but soon they all reunite in one relocation shelter. It is worth noting that the Pelemsari community together relocated to multiple shelters as a response to the fluctuating eruptions from October to November 2010.

D.3. Slametan or Kenduren

Slametan or *kenduren*, according to Geertz (1960), is a Javanese version of a communal feast that symbolizes the mystic and social unity of friends, neighbors, fellow workers, and relatives, including local spirits, dead ancestors, and the almost forgotten gods. All of the participants are bounded together by the goodness of their interdependency and form a social group pledged to mutual support. *Slametan* is typically held at the house of the sub-village head after *maghrib*[43]. The languages used on this occasion are Javanese and Arabic. If the event is aimed at acquiring

[43] Maghrib is the time for the Moslems to pray after sunset.

protection from *lelembut*, the Javanese language is used to deliver offerings with monotonous and fast song rhythms while the Arabic is used by the *modin* (i.e., Mosque official) to purify the tributes. After the prays, *ambengan* (i.e., food tributes) are distributed among the participants. If there are some food remains, they bring them home for their families (Geertz, 1960, p. 11).

There are various types of *slametan* held in most Merapi villages. Among them include *slametan* for cattle, *slametan* for seeking a disappeared person, *slametan* for Merapi eruption, and *slametan* for *Labuhan* (Lukas Sasongko Triyoga, 1991, pp. 86–93). Concerning dairy farming, the Pelemsari villagers also performed *slametan* when a cow gives birth to two calves at once. In the past, *Slametan* was carried out to appeal to two deities, *Mbok Sri* and *Sang Smarabumi*, for their blessings on the cultivated crops, followed by *slametan wiwit* to express gratitude to the deities for a successful harvest. When volcanic ash covered the farmlands, villagers stayed inside their houses until the ash rainfall ended. They would thank *Eyang Merapi* despite the devastation. In their beliefs, the crops were lent by *Eyang* for an occasion held inside his kingdom (Lucas Sasongko Triyoga, 1991, pp. 72–73). Further, villagers see lahars that burnt grass areas and *alang-alang* as *Eyang*'s blessing. The volcanic ash would naturally fertilize the soil and allow green grass to regrow abundantly. If lahars do not reach the grass areas, some villagers secretly expanded the fire by burning the matured grass. The burning is carried out at the end of a dry season to expedite the growth of young grass before the rain starts (Lukas Sasongko Triyoga, 1991, p. 77).

In the Pelemsari sub-village, three *slametan* occasions were carried out in March 2022. According to the villagers, this *slametan* was not held as a response to the volcanic events that occurred in the previous week, from March 9 to 10, 2022, but rather to sustain their ancestors' traditions. *Slametan* began on March 15, 2022, or date 12 Tuesday Kliwon based on the Javanese calendar, followed by another *slametan* on March 20, 2022, and ended with *nyadran* on March 25, 2022.

The first two *Slametan* events took place at the house of one of the neighbor heads at 07:30 PM WIB (Western Indonesian Time). On these two occasions, the participants were limited to only males while females helped prepare the food in the morning at the neighborhood head's house. The sub-village head informed the participants about their future agenda of participating in a climate change competition and disseminated warning messages to deal with the current eruptive activity of Mount Merapi. It is worth mentioning that the government decided to allow villagers to collect grass in the forest for their dairy cows. The local *modin* then led the prayers for the people's safety according to Islamic teachings and God's blessings on the foods placed in the middle of the room. At the end of the occasions, participants distributed the food to others. *Nyadran* was carried out at 9 AM in a public cemetery in the Ngrangkah neighborhood followed by *slametan* led by the local modin. The public cemetery was built by the regional government to bury all the victims of the 2010 eruption both from the Pelemsari and Pangukrejo sub-villages. Therefore, families from these two areas came into the cemetery and together participated in this *nyadran* event. Different from the first two slametans, each family in this event brought their own food to the cemetery.

Fig. 2.24. At the slametan occasion, the attendees, all The slametan (left) and *nyadran* (right) rite in 2022. Photos by the author.

D.4. Labuhan Merapi

At least once a year, that is in the month of *Bakda Mulud* of the Javanese calendar, Kinahrejo holds the monarchy's rite *Labuhan Merapi*. *Slametan* for the rite *Labuhan* had been performed since the reign of Panembahan Senapati and aimed at commemorating the king's coronation, marriage, and birthday. Delivering tributes to all deities living in all the four main cardinal points of the universe through *Labuhan* is believed to bring security, harmonious life, and protection to the king, the royal family, and the people in Yogyakarta (Lucas Sasongko Triyoga, 1991, pp. 86–94).

According to Triyoga (1991), preparation for the *Labuhan* phase typically begins a few months before the event. In this phase, the gatekeeper, *jajar*, and royal servants clean the roads towards the *labuhan* harbor. Days before the rite, Sultan would send his messengers to inform the gatekeeper about the time of the event. Then, the gatekeeper must report to the palace once the preparation was completed and receive financial aid from the palace. On the date 25 of *Bakda Mulud* at 08:00 WIB, the *uba rampe* or offerings were carried from *Bangsal Sri Manganti* inside the palace to different destinations including Mount Merapi. The tributes were kept inside a box with the dimension of 60 cm long, 40 cm wide, and 40 cm high and brought to two districts: Cangkringan and Depok (Lukas Sasongko Triyoga, 1991, pp. 95–97). Based on my fieldwork on March 4, 2022, the gatekeeper's parade, wearing Javanese traditional clothes and carrying the tributes and the sacred yellow umbrella, arrived at the district office of Cangkringan while local women prepared food in the gatekeeper's house. Around 01:00 PM, the parade with escorts from the district and regional officials arrived in Kinahrejo. At 00:00 AM, *slametan Labuhan* started and was usually attended by high-rank officials and guests.

On March 5, 2022, at 06:00 AM, the royal parade, led by the gatekeeper, began to walk to the forest by bringing tributes inside a wooden made box toward the *Labuhan* harbor. Some women

using Javanese traditional clothes walked behind the royal servants carrying food, flowers, and incense in large bamboo-made baskets. After walking for about two hours, the parade stopped at the first harbor, Alas Bebhengan, and continued to the last harbor, Sri Manganti. Here, the gatekeeper and his *jajar* prayed to deliver the tributes to the deities and threw flowers around the harbor. After the rite, the women helped by other royal servants prepared the snack and distributed them to all participants. It is believed that the snack would prevent the receivers from black magic and disasters and allow them to achieve success in their career and so forth.

Fig. 2.25. The officials in the Cangkringan District Center were waiting for the arrival of the gatekeeper carrying the tributes (left) and the last harbor of Labuhan Merapi at Srimanganti (middle), and women helped by others prepared snacks for the participants (right). Photo by the author.

D.5. Javanese Calendar and Eruption Predictions

Triyoga (1991) asserts that people in Mt. Merapi had tried to record and predict Mount Merapi's activities in accordance with the Javanese calendar. Accordingly, small-scale eruptions would occur at least once a year during the month of *Sura*[44]. People would thank *Eyang Merapi* for the eruption as the lahars and volcanic ash could burn *alang-alang* on the upper flank. Lahars in their belief are the invisible creatures that remove waste from their kingdom, the channel through which the deities travel to the South Sea of Java, or a wedding ceremony of the deities' family inside the

[44] The month of Suro is the first month of a new year that is celebrated by most people in Java. Javanese, in this month, would clean themselves, clean their environment, and visit sacred places.

volcano. People would be anxious if the volcano does not erupt during that month as this indicates that a major eruption would occur. Logically, frequent low-scale eruptions would mean that there is no blockage in the crater's throat and vein and therefore no materials accumulated in the magma chamber that may cause a major explosion. Lahars that burn *alang-alang* on the upper slopes accelerate the forest rejuvenation thus helping prevent landslides. *Alang-alang* (cogon grass) has strong and long roots which allow it to survive fire and grow again. Farmers imitate the natural succession by burning the moorlands at the end of the dry season from April to October. The goals of this burning are to expedite the growth of the young grass at the beginning of the rain season from October to April and to avoid the spread of the wildfire reaching other forests or areas (Lucas Sasongko Triyoga, 1991, p. 122). Once every eight years or during the Wawu year, the volcano periodically erupts and releases a great amount of ash. People perceived this event as the time when Eyang Merapi renovates his kingdom or visits the Queen of the South Sea. While a volcanic-tectonic earthquake, according to local belief, is triggered by a snake called *Kyai Antaboga* that moves its tail or head to release back pain.

Besides the Javanese calendar and deities' messages through the dreams of a gifted mystic, villagers also relied on environmental cues about the upcoming eruption such as thunder light, black smoke, the continuous black smoke that lifts above the crater, hot temperature, and animals in the forest that suddenly go down the slope (Lucas Sasongko Triyoga, 1991, pp. 68–69). Based on my interviews with Pelemsari respondents, there are two mechanisms used by the Pelemsari villagers (i.e., commoners) to develop their awareness of eruption threats. People rely on signs from nature, mainly thunderlight, roaring sounds, and earthquakes to predict eruptions, and on the government's warning messages disseminated through the local leaders (e.g., WhatsApp group,

speaker of the Mosque) and radio HT. These mechanisms are particularly critical for the 'risk takers' like villagers who collect grass into the forest during the volcano's eruptive activity.

Fig. 2.26. The sub-village head orients the motorcycle towards the path to prepare for an immediate evacuation (left). After praying, he shows a radio HT carried during his activity of collecting grass near River Opak (left). Photos by the author.

D.6. Settlement

The Islam-Java belief is reflected in how Sultan HB I laid down the spatial concept of the Yogyakarta monarchy in 1755. Following the legacy of his predecessors that were influenced by ancient Hindus, the sacred elements were ordered on a direct line that consists of Mt. Merapi to the north, the Java Sea to the south, and the royal palace between them. The line, also known as the imaginary axis of Yogyakarta, is a symbol of the transcendental relationship between macro-cosmos and micro-cosmos where the palace served as the guardian (Troll et al., 2015, p. 148).

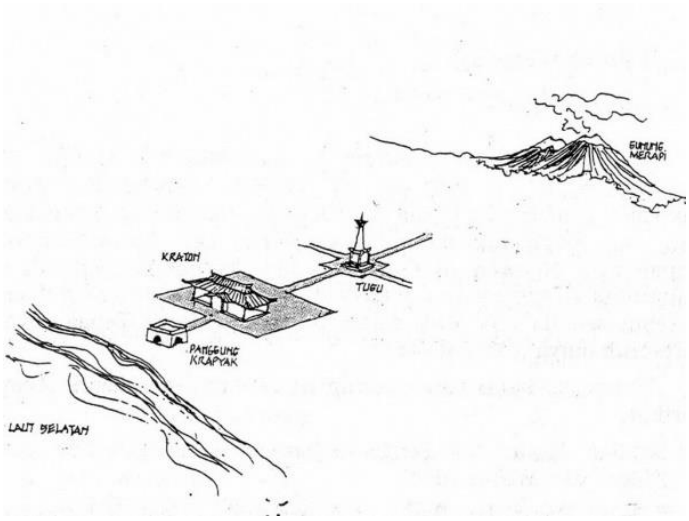

Fig. 2.27. The imaginary axis of Yogyakarta adapted from (Anshori, 2020)

Yogyakarta community strongly held a philosophy of *manunggaling kawula lan gusti*, which means that each individual should maintain harmony with God and deities. To safeguard harmony, the king must annually perform ritual offerings based on the Islamic calendar with the gatekeeper as the facilitator (Dove, 2010, p. 122). Thus, when a magnitude 6.4 earthquake occurred on May 26, 2002, along the Opak River, many people superstitiously linked the event with the 2006 eruption that destroyed Kaliadem village on the southern flank of Mt. Merapi. The earthquake was assumed to accelerate the ongoing eruptive activities of Merapi and the dome's growth and collapse. It was also believed that the two environmental disruptions were due to the monarchy's failure to keep the balance between the two elements (Troll et al., 2015, p. 151).

Land on which villagers reside would influence the faith of the occupants. A bad land or *sangar* would decrease the health, economy, and social network of the occupants. In contrast, a good land that is free from *lelembut* would give positive effects on the livelihood of the occupants in terms of fortune, prosperity, and safety. A house built on the rocky and sandy ground is considered *sangar* as it is occupied by *lelembut*. Kinahrejo, in this case, would ask a favor from a shaman.

Based on the Javanese calendar, the shaman will come to the land and at noon, he would sit by crossing his legs in the middle of the land and heading towards the west. Then, the shaman starts to pray with words that could only be heard by him alone. After that, he will dig the ground for about a half-meter deep and then smell the soil. If the smell is stink, he will recommend the villagers to seek another land as it indicates that the land is owned by a bad *lelembut*. Otherwise, he could negotiate or expel the *lelembut* by delivering *sesajen* or offerings like incense, flowers, or chicken, depending on the requests of the *lelembut.*

Besides the location, the direction of the house façade will also influence the inhabitant's safety, fortune, and welfare. Houses on the southern slope are forbidden from heading towards the volcano except towards the south or roads while those on the northern flank should be directed westward or eastward. Directly the house façade towards the volcano would be perceived as disrespectful to the spirits residing in the volcano and thus would incite misfortune and sickness for the inhabitants (Lukas Sasongko Triyoga, 1991, pp. 78–79). In terms of the village architecture, the wavery topography of the former land situated about five kilometers from the summit forced people to either flatten the land or select the flat land to construct their houses. Close to these houses, a barn is usually built for the livestock (e.g., dairy cows, chickens, goats) and yards for mixed crops. The construction materials came from the local resources such as dry spear grass for the shed roof and bricks or natural stone for their houses. The architecture of villagers' houses typically adopted the so-called *sinom* or *kampong* style with facades heading towards the village's main roads and not to the volcano (Lucas Sasongko Triyoga, 1991, pp. 29–30). According to the local belief, orienting the houses toward the volcano would annoy the deities living in the volcano.

Fig. 2.28. The architectural style of houses in the villages in Mount Merapi. Photos by the author.

D.7. Ecological Practices: Ngarit-Mugut-Dairy Farming

Ngarit is a local term for the tradition of cutting grass, a skill that had long been practiced by people in Mount Merapi over generations. Some Pelemsari villagers even claimed doing *ngarit* is easy since it has been learned from their predecessors during their childhood. So easy *ngarit* is for the villagers that they had no interest in trying other economic sectors for the living. Doing unfamiliar activities is considered very difficult and full of speculation. Many considerations are involved in the decision of whether they want to shift their job or not. One of my respondents said that these considerations include knowledge, time, money, skill, and energy. This chapter is dedicated to discussing the *ngarit* tradition and dairy farming.

D.8. Ngarit

The Dutch stipulated the prohibition of land clearance in the forest and the conversion of areas on the Merapi's slopes into a protected forest. The law forced the local farmers to shift their

agricultural system from *peladangan* (i.e., shifting cultivation[45]) to *tegalan*[46] (farming) (Lucas Sasongko Triyoga, 1991, pp. 120–121). Each household typically worked on more than one land with a dimension of more than one hectare. The sandy and rocky lands which were too infertile for cultivation were abandoned for a considerable amount of time to let *alang-alang* grow. While the fertile lands were cultivated with *tumpang sari* (i.e., mixed-intercropping technique). The Dutch's protected forest stipulation restricted people not only from cultivating the forest land but also from grazing their cattle in the forest. This condition forced them to shift the grazing into domesticating system. Consequently, they must seek grass in the forest. To increase the cattle growth, they let the cattle move around the village once a day. A cattle shed was built nearby the house by using bamboo, wood, and dry *alang-alang*. The cattle manure was periodically removed and dried off in an open area to remove the water and smell. Then, the dried manure was brought to home yards to fertilize crops (Lucas Sasongko Triyoga, 1991, p. 76).

According to the Mount Merapi National Park Agency (2018), Mount Merapi's frequent and large eruptions formed open spaces, bushes, savanna, and secondary forest. The primary forests that remained undisturbed were situated on the southern and the eastern slope [47]. From the highest to

[45] Shifting cultivation system is a cultivation system in which a plot of land is cleared and cultivated for a short period of time then abandoned and allowed to revert to producing its normal vegetation while the cultivator moves on to another (OECD, 2001).

[46] Tegalan is a dry land cultivated with one-season crops, separated from the home yard, and attended for permanent uses.

[47] From the highest to the lowest elevation of the volcano, the agency describes the current vegetation and human activities n Mt. Merapi. The highest level (2,800-2,968 meters above sea level) covers the mystical area of *Pasar Bubrah* and the volcano's crater. This zone is restricted to research and observations performed by the government's national park and disaster agencies. The plant that could grow here is limited only to *selaginella feei.* The second level is volcanic sand and Pasar Bubrah (2,800 meters above the sea level) on the northern slope. The zone is barely covered by big trees except for grass and shrubs. The third level is the sub-alpine forest (>2,400 meters above the sea level) that covers areas of Selo, Sapuangin, the Kemalang hiking tracks, and is dominated by grass. Besides grass, one could find trees species such as *sengon* (i.e., *Albizia lophanta*) along the Selo hiking track. The fourth level is the upper forest (1,500-2,400 meters above the sea level) that includes areas of Tlogolele, Babadan, Klakah, Tunggul Arum where abundant grass *alang-alang* and the predominated *iser* could be found. On 2,000-2,400 meters

the lowest elevation of the volcano, the agency describes the current vegetation and human activities n Mt. Merapi. The highest level (2,800-2,968 meters above sea level) covers the mystical area of Pasar Bubrah and the volcano's crater. This zone is restricted to research and observations performed by the government's national park and disaster agencies. The plant that could grow here is limited only to selaginella feei. The second level is volcanic sand and Pasar Bubrah (2,800 meters above the sea level) on the northern slope. The zone is barely covered by big trees except for grass and shrubs. The third level is the sub-alpine forest (>2,400 meters above the sea level) that covers areas of Selo, Sapuangin, the Kemalang hiking tracks, and is dominated by grass. Besides grass, one could find trees species such as sengon (i.e., Albizia lophanta) along the Selo hiking track. The fourth level is the upper forest (1,500-2,400 meters above the sea level) that includes areas of Tlogolele, Babadan, Klakah, Tunggul Arum where abundant grass alang-alang and the predominated iser could be found. On 2,000-2,400 meters above sea level, one would find moss, for instance, usnea barbata that grows on short, bent, and crooked trees' stems stimulated by heavy wind and thick mist. As one goes down the slope to the level of 2,000 meters in areas of 1,500-2,400 meters above sea level, cantiga, a tree species that grew after the 2010 eruption on the

above sea level, one would find moss, for instance, *usnea barbata* that grows on short, bent, and crooked trees' stems stimulated by heavy wind and thick mist. As one goes down the slope to the level of 2,000 meters in areas of 1,500-2,400 meters above sea level, *cantiga,* a tree species that grew after the 2010 eruption on the upper slopes would disappear and be replaced with *Lithocarpus sp*. This tree grows abundantly throughout posts 2 and 1 of the Sapuangin hiking track. Between these posts, one would find *dadap* (*erythrina sp*.) and *sawo* (*engelhardtia spicata*). After passing the first post, *puspa* (schima wallichi) once introduced by Perhutani seemed to dominate this area. Besides the species standing, *kalanjana* grass also grows abundantly in a communal formation. In areas of 1,500-1,700 meters above sea level, *acacia decurrens* dominate, especially after the 2010 eruption, along with the grass beneath the tree. Here, one could expect to find the grass parcels belonged to villagers for generations. The sub-montane forest (1,000-1,500 meters above sea level) covers areas of Bukit Plawangan and Bukit Turgo. Vegetations that grow here are *sawo* (*engelhardtia spicata*), *pasang* (*Lithocarpus sp*.), *sarangan* (*Castanopsis argentea*), and *kendung* (*helicia attenuate*). Plawangan Turo is an area with minimum *mugut*, slightly different from Tritis and Tunggul Arum dominated by savanna, bushes, and secondary forest that serve as the sources of grass for many villagers. The low plain forest (<1,000 meters above sea level) on the western slope in the districts of Srumbung and Dukun. The forest was dominated by pine standing, *berasan* (*tarenna incerta*), and *puspa* (*schima wallichi*) (T. Atmojo et al., 2018).

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Sanggeman is similar to *kontrakan* (i.e., contract), the term that according to my respondent was commonly used by people in the land. The term *kontrakan* stresses the land concession made between villagers with the state's foresters in the past. The concession embedded in this term according to him is *babat alas terus ditanduri*, which means after the land is cleared, then it must be planted by the cultivator. In the exchange for planting the trees, the cultivator was allowed by the state to collect grass and plant vegetation and fruit crops (understory vegetation) within the land plot. The local elder whom I interviewed about this explained the history of the land plot in the forest of Mount Merapi.

> Kavling-kavling itu sejarahnya itu dulu waktu si mbah-mbah dulu ya, itu kan kehutanan. Kehutanan itu waktu itu hutan produksi. Hutan produksi itu ditanami kayu juga dulu boleh ditanami palawija dari warga, Makanya itu namanya kontrak itu di alas itu, lamanya dua tahun. Ah sesudahnya, itu terus dikavling-kavling kalau saya ambil. Itu kan tidak sama. Ada yang ¼ Ha, ada yang ½ Ha, ada juga yang mampu 1 Ha. Ha, itu ditanami jagung, ada bubung, dan lain-lain dan ada juga sayur-sayuran ditanami di hutan itu. Itu, namanya than produksi. Itu warga yang disuruh mengelola itu. Itu setelah ditanami kayu 2 tahun kan tutup. Sudah tidak dikelola lagi. Nah, terus itu dari warga, disuketi (Interview with Mbah Moga, February 15, 2022, 00:27:40)

> The land plot was historically by our ancestors and the forestry agency. The forest was a production forest at that time. The production forest was planted with trees and could be planted by the villagers with mixed crops. That is why it is called 'kontrak' on land for two years. After that, the land was parceled out. If I tool, for instance, it would not be the same. One may take a ¼ Ha land, someone could take ½ Ha, and others even could take 1 Ha land. Ha, the land was planted with corn, or *bubung*, or anything else, and some planted vegetables in the forest. That is a production forest. People were asked to manage the land. After being cultivated for two years, the land was closed. No longer being managed. Then, by the people, the grass was cut (Interview with Mbah Moga, February 15, 2022, 00:27:40)

Then I asked, who did order the people?

> Pemerintah Kota. Itu dengan syarat kalau sudah panen, panen jagung itu memberi ke kantor kehutanan itu kalau aturannya. Kalau aturannya misalnya dapat 5 kuintal itu, yang disetorkan 1 kuintal. tetapi yang hanya aturan saja. Kalau memberi ya paling 50 kilogram. Gitu, kalau panen gitu. Terus, nantinya tempatnya menanamin palawija itu, terus ditanamin kayu, yang nanam ya yang mengelola itu (Interview with Mbah Moga, February 15, 2022, 00:29:12)

> The city government. It was with terms that after being harvested, the corn was delivered to the forestry. That was the rule. If according to the rule, someone harvested

> 5 quintals, then 1 quintal must be given. But it was only a rule. Only 50 kilograms was all right, That was it, during the harvest time. Then, the place for the mixed crops must be planted with trees. Those who planted the trees were the cultivators themselves (Interview with Mbah Moga, February 15, 2022, 00:29:12)

Then, my respondent explained how the land plot was divided in the past.

> *Kemampuannya membukanya lahan hanya sekian. Kalau kira-kira mau sehektar tetapi tidak mampu menanamnya ya tidak boleh. Harus ditanami selesai (Interview with Mbah Moga, February 15, 2022, 00:36:04)*
>
> *The ability to clear land was only that. If someone wanted to have a one-Ha land but could not take care of the land, he/she would not be allowed. The land must be completely planted (Interview with Mbah Moga, February 15, 2022, 00:36:04)*

The land division in the forest was based on the capacity of the cultivator or the villager to manage the plant and was supervised by the state's forester. Each villager could remember the location and the border of his or her neighboring land plot or parcel. The border of the grass plot is termed by the villagers *kikis* which could take various forms such as bamboo, ditch, valley, or particular trees that only the cultivator and his/her neighboring cultivator could understand. Norms were established among the cultivators. For instance, when a farmer could no longer manage the plants, another villager could *nembung* or ask for the right to use the land.

The conditions of the ecosystem in each *mugut* area are typified into three categories. The first category is 'open space' in the form of savannah in certain spots in areas of 700-1,500 meters above sea level. It is assumed that the land is covered only by one or two trees as some people cut down the trees to allow sunlight to accelerate. The second category is areas beneath the 'young secondary forest' in which about 30-60% of this forest is covered with trees. Here, one could see the natural ecosystem of the forest combined with the grass that is routinely harvested. People usually take the branches of the trees for fuelwood and to let sunlight reach the grass. However, this practice stopped, allowing a secondary forest to grow. In this forest, the *kalanjana* grass grows

under the *acacia decurrens* stand or pines after the 2010 eruption. The last category is the *mugut* areas located beneath the old secondary forest with trees coverage of about 60%. The locations are in Gemer, Tunggul Arum, Tritis, and Sapuangin. The pines and *puspa* standings leave room for the grass including the high-quality grass *kalanjana* to grow (T. Atmojo et al., 2018, pp. 113–114). There were 30 villages adjacent to the national park (fig. x) and according to research run by the National Park Agency of Mount Merapi or BTNGM from 2017 to 2018, people mostly relied on the forest resources for water, grass, *rencek* (i.e., firewood), woods for charcoal, tourism, sand, animals, land, honey, orchid, and cultural interactions (T. Atmojo et al., 2018, pp. 72–87). Table 2.9 shows water and grass that dominated the villagers' use of the forest in accordance with the agency's survey from 2017 to 2018.

Table.2.9. The extraction and value of Merapi's main natural sources adapted from Mount Merapi National Agency's survey from 2017 to 2018

The Extracted Natural Source Types	The Involved Villages	Number of the Involved Sub-Villages	Households (in thousands)	Quantity	Value (Rp.)
Water (m3/year)	32	71	62.77	1,106,717	2,932,798,725
Grass (kg/year)	32	71	46.41	77,618,630	19,404,657,502
Rencek (ties/year)	26	60	16.35	183,553,175	3,671,063,500
Sand	22	41	9.37		-

The forest restoration efforts began in 2014 by planting crops such as *rasamla, salam,* and *puspa* under the pine standing. The types of grass collected by local villagers are quite diverse which include *alang-alang* (i.e., *Imperata cylindrica*), *kalanjana* (*brachiaria mutica*), *lulangan* (i.e., *eleusine indica gaertin*), odot (i.e., *Pennisetum purpureum*), PB, and iser bumi (*paspalum conjugatum*.

Alang-alang (Cogon Grass)

Alang-alang or cogon grass was the type of grass that villagers in Mount Merapi mostly sought for their cattle before the 1990s, especially during the dry season. Villagers typically collect the young grass for fodder while the old ones were burnt to generate the growth of the young ones. Each time eruption and wildfire occur, cogon grass grows faster. The grass survives in almost all types of lands, from the low to high grounds, and is spread out naturally. This species is highly responsive to abundant sunlight and will stop from growing when being shaded. Open areas and a damaged forest are therefore ideal places for the growth of the grass. So important its roles for the villagers in the past that this species inspired the local myths. It is believed that *alang-alang* belongs to *Kartadimeja*, the mountain deity that herds his horses on the upper slopes. The deity forbids humans from gathering the grass in his territory located about one kilometer from the crater. The forbidden places in this area include, but are not limited to, Forest *Patuk Alap-alap*, *Plawangan Turgo* Hill, Umbul Temanten, and *Watu Gajah* (Kriesdinar, 2021). The sanctions of the transgression would be taking over the grass, kidnapping, and even killing.

Kalanjana (i.e., Brachiaria Mutica)

Compared to *alang-alang*, *kalanjana* is more preferred by dairy cows. *Kalanjana* is characterized by its capacity to be easily grown, high production, high nutrients, and capacity to grow in areas of about 1,500 meters above sea level. Unlike *alang-alang, kalanjana* strives under the shades of trees or secondary forests. Cultivating *kalanjana* in the forest only requires a farmer to plant its stem into the soil and let it grow without further care. However, the grass cultivated in home yards, however, requires farmers to fertilize it. This grass was introduced to Mount Merapi in the 1990s both in people's home yards and grass plots in the forest. The grass is resistant to water pools but relatively difficult to adapt to the dry season. A regular cutting with a shifting system from one

plot to another allows the grass to be available sustainably. A rotation system then becomes a solution for keeping the grass abundance throughout the whole year. The first cutting during the first cultivation is done after the grass reaches about two months of age. After that, the rotation could be done according to the needs. For instance, one could harvest the grass only within 20 or 30 days. In Pelemsari, villagers typically collected grass two times a day, depending on the fodder needed to feed their cows. The more the grass needed, the more efforts should be made to collect fresh and young grass. Oftentimes, villagers are urged to collect grass in their grass plots in the deep forest. The time required for a round trip is typically 2-4 hours which begins at 6 AM or 7 AM in the morning. Old villagers preferred to plant grass within the Karang Kendal around the cowshed. While the younger farmers, aged between 25 and 50, typically collect grass in the forest by riding a motorcycle. Cutting grass or *ngarit* itself does not need much time. Only within 30 minutes, a farmer could collect about 35-45 kilograms of grass to feed one adult cow. Villagers usually collect grass with their spouses but when an eruption occurs, they would prefer to go to the forest in groups. According to a respondent, going to the forest together with other villagers is rarely arranged in advance. Rather they all will meet in a parking area to then walk into the grass. To carry the grass from the *mugut* areas to the parking site, there are two methods that the villagers do. The first method is *nginjing*, which is by carrying the grass over the head and the second method is *gendong*, which is by carrying the grass on the back. Whenever they feel exhausted, the farmer would take a rest for a few minutes.

During the watch status of Merapi from 2020 to 2022, the national park agency helped carry farmers' grass with their four-wheeled car to the collective cow shed in Karang Kendal. Those who want to get the agency's assistance are required to inform the sub-village head. After collecting the grass from the forest, the villager should place the grass in one of the designated

pools along Bebengan street. Three grass pools were situated along the Bebeng street around the intersections of Kinarejo *petilasan*, Pelemsari, and Ngrangkah (see fig. x). It is worth mentioning that during the watch status of Merapi, the government did not prohibit villagers from accessing the forest. They only advised people to collect grass as soon as possible. The prohibition from accessing the forest and the national park zone only applied to visitors or tourists.

D.9. Dairy Farming

Farmers in Pelemsari typically departed from their homes in Karang Kendal at 6 AM to collect grass either at their former home yards or grass plots in the forest. Depending on the number of the cattle and the condition of the cow—whether it is lactating or not—, a farmer, on average, could collect 30-50 kilograms of grass per trip each day. Famers whose grass plots are far enough from Karang Kendal preferred to collect grass only once a day while those who own grass plots relatively near the relocation site would collect grass twice a day, in the morning (06:00-07:00 AM) and afternoon (1:00-02:00 PM). Sometimes, especially during the dry season or hard times like eruptions, the amount of grass collected is not adequate to feed more than one cow. To solve this, people bought concentrates from a private dairy cooperative, Sarono Makmur. Before feeding the cows, the *gomboran* must be prepared. Here, the concentrates are mixed with water, minerals, and other substances by following the recommended ratio. The milking process was performed twice a day, at around 8 AM and 3 PM before the cooperative picks up the containers. Milking a lactating cow is seen by some villagers as an obligation. Missing this activity would mean a financial burden to the owners as it is the milk they sell to the cooperative (i.e., salary) that they could afford the relatively expensive concentrates. Further, missing the milking would increase the cow's discomfort, bruises, and udder injuries due to the built-up milk inside their glands. In Pelemsari, the price of one liter of dairy milk determined by the cooperative Sarono Makmur is

Rp. 4,000-Rp.7,500. Each household typically has at least two cows. In a normal condition, a healthy cow could produce at least 10-15 liters of dairy milk per day. The profit is then used to buy concentrates sold by the same cooperative which per kilogram, costs about Rp.5,000-Rp.6,500,00, depending on the quality of the concentrate. It should be noted that a farmer must buy the concentrate in at least one 50-kg sack.

D.10. Relocation and Land Ownership in 2011

People in Pelemsari had long relied on their ancestral messages that eruptions would not reach their villages. After the 2010 eruption severely hit their sub-village and caused many of them to lose their families, livestock, and homes, the only thing left for them is deep trauma. Even to this date, many villagers are still shocked every time they hear a load noise from the EWS sirens, ambulance sirens, or alike. The deep trauma caused by the eruption urged the whole community to decide to voluntarily relocate. Under the sub-village head's leadership along with the local elders, they prepared to purchase land for relocation.

The 2010 eruption caused about 350 fatalities and forced about 410,000 people to relocate (Pritanti & Ilham, 2011, p. 155). The event changed the volcano's morphology, putting villages on the southern flank at greater risk. As a response, governments from the national to regional levels revised the existing land use zone and expanded the national park zone to 10-kilometer from the crater. This means that villagers living in this zone must relocate. To ensure the effectiveness of the relocation[48], the regional government of Sleman planned to hand out a-30 million Rupiah cash and a-36 square-meter house on a-150 square-meter land in exchange for each piece of land in the upper areas (BNPB, 2011, p. 77). On May 5, 2011, one year after the 2010 eruption, the regional

[48] Relocation is a process which beyond housing, involves the reconstruction of socio-political relations (Gaillard, 2008, p. 31).

government of Sleman issued Regulation Number 20 the Year 2011 about Hazard Risk Areas of Mount Merapi that stipulated the sub-villages of Pelemsari, Pangukrejo, Kaliadem, Petung, Jambu, Kopeng, Kalitengah Lor, Kalitengah Kidul, and Srunen as areas prohibited for residentials. The ownership status of those lands in the upper areas, however, was left without clear plans (Arif et al., 2018).

The sub-village head recalled this polemic during my interview in March 2022. I asked him how he and his fellow villagers responded to the relocation policy of the regional Sleman.

> *Kalau dulu, kalau terlalu khwatir nggak. Jadi, waktu rencana relokasi itu, yang mempunya pendapat itu warga masyarakat. Warga masyarakat karena sudah kejadian, ada korban jiwa, rumah hancur. Terus punya ini, pendapat warga itu, relokasi. Nggak tahu nanti, relokasinya kemana, sistemnya seperti apa, ini nanti direlokasi. Terus ada, apa itu, jajag pendapat, atau apa ya. Pertemuan antara Pemprov dan warga. Ha, semua warga di huntap (Interview with Rejo, March 18, 2022, 00:06:40).*
>
> *In the past, in the past, I did not feel too much anxiety. So, the relocation was the idea of the community. Because there had been the event that took lives and destroyed our homes. then, people initiated to relocate. Although they did not know where to go, or what the system was like, we wanted to relocate. Then, there was a public hearing or something. A meeting with the provincial government and people. Ha, all the community members gathered in the temporary housing*
> *erti apa, ini nanti direlokasi (Interview with Rejo, March 18, 2022, 00:06:40).*

During a public hearing in Plosokerep shelter on May 7, 2011, with the governor or Sultan Hamengku Buwana X, their neighboring sub-village, Pangukrejo, stated that they completely refused the relocation. While Pelemsari accepted the relocation but with one condition: their former lands and homes still belonged to them and those areas should not be annexed with the protected forest and the national park. Sultan promised that he would raise their concern to the central government. After the meeting, the Pelemsari villagers held a community meeting on July 4, 2011, and decided that they would relocate if the government certified their former homes and

signed the treaty with the community (Kristyarini, 2011). Rejo, then continued describing how he and the community planned for the relocation.

> *Ya itu mau menjaring tapi terus sudah mengajukan untuk relokasi terus seterusnya. Tempat relokasi jelas, jelas kekuata hukumnya, jelas sertifikat. Tersu setelah pindah atau relokasi, tanah yang di atas yang kena erupsi itu juga untuk, untuk bisa dijelas apa, statusnya, adalah statusnya sertifikat atau disertifikat oleh Pemerintah atas kepemilikan masing-masing. Nah, itu Pemerintah sanggup untuk merelokasi warga tapi tanah yang ditinggali itu jelas nanti disertifikat. Terus yang kedua, tanah yang di atas itu belum ada kesanggupan. Belum ada jawaban untuk disertifikat itu. Belum itu. Terus, dulu permah mau ngadain diganti Pemerintah tapi berapa-berapany ajuga belum ada kejelasan. Nah, apa intinya. Warga kan tanah yang di atas tetap berpegang, tidak lepas gitu lho. Jadi waktu itu ya tetap belum ada jawaban. Belum ada jawaban, akhirnya permohonan dibawa, tetap dibawa. Tapi terus warga, warga ragu. Ragu, bahwa tanah yang di atas itu kan belum ada kejelasa. Nanti gek gek atau mungkin nanti gek sistemnya tukar guling atau apa. Itu juga belum jelas. Akhirnya warga terus mandiri, beli tanah dengan segera, itu dibiayai sendiri, warga terus nanti kalau sudah tetap segera kita laporin ke Pemerintah. Setelah dilaporin ke Pemerintah, bahwa kami sudah punya tanah,terus tegak, terus gerak cepat to. Pertemuan tegak, sukat, terus cari tanah. Tanah, ya akhirnya, dapat di sini itu (Interview with Rejo, March 18, 2022, 00:09:22).*
>
> *Yes, when the government wanted to gather people's inspiration, we already had the plan to voluntarily relocate. The place for the relocation must be clear, the legality must be clear, and the land must be certified. After we moved or relocated, the lands in the upper areas that were impacted by the eruption must be clear in terms of their status. The status must be certified by the government for each one of the villagers. Then, the government stated that they were able to relocate but we wanted that land to also be certified. Then, in terms of the lands in the upper area, the government had not yet responded. They had not yet stated that they were able to certify the land. Not yet. Then. there was a plan that the government wanted to buy our lands but the price was not clear either. So, what was the point? People wanted their lands to be owned by them, not surrendered. But, no responses yet. No responses, but the proposal continued to proceed. People felt doubt, doubt since there was no clarity on the land status yet. Worrying, if, and if or maybe the system would be like a barter system or something. It was also unclear. Finally, people decided to become self-reliant, purchasing land immediately funded by themselves. After being settled, people wanted to report to the government that we already had land. After reporting to the government that we had land, we stood and mobilize quickly (Interview with Rejo, March 18, 2022, 00:09:22)*

It took time longer than they expected for the government's response. Villagers decided to act immediately and purchase land three kilometers from their former homes by using *kas dusun* (i.e.,

sub-village saving). This saving was obtained from *ojeg* (i.e., taxi-motor business) mobilized by Badiman. All neighborhood heads worked together to collect donations coming to the village and save a portion of it for the land purchase in Karang Kendal hamlet, Balong sub-village in Umbulharjo Village. To construct their new homes, the villagers worked collaboratively under the sponsorship of the Ministry of Public Works. Using the design guidelines of the ministry's program, REKOMPAK, the villagers then adopted the housing prototype for the home construction (REKOMPAK, 2012, pp. 4–5). Regardless of the number of family members, each household occupied a 36-square-meter home on a 100-square-meter land. Here, the villagers must adapt to a radically different home layout and form—formally ordered, small homes, minimum home yards, attached houses.

2.6. Conclusion

From this chapter, it is found how conflicts had long marked the political landscape of Yogyakarta and the Pelemsari sub-village. The Dutch, in particular, with its *divide et impera* strategy tried to disintegrate Yogyakarta and weaken the hegemony of Sultan. In the meantime, the forest controls of the Dutch was expanded by the Indonesia's foresters, continuing the marginalization of the local villagers. The volcano, as we learned, is active ecologically and spiritually in the eye of the local villagers. For instance, the eruption in 2010 was interpreted by my respondent as a warning of the deities to the elites. These complex interactions of social-ecological systems marked by conflicts in the past influence people's perception of their lived world. The next chapter will explore the meaning assigned by my respondents to living with risk after the eruption in 2010 which are actually inescapable from the negative experiences far before it.

CHAPTER 3

THE PHENOMENOLOGY OF LIVING WITH RISK

3.1. Introduction

In the last decades, planners become more well-aware that improving disaster risk reduction is impossible to be made without understanding how people living in disastrous areas deal with the impacts and adapt to the unexpected changes. In many cases, such as Mount Merapi, people had long developed their knowledge of disasters intertwined with spiritual beliefs and myths. Hermeneutic phenomenology, in this regard, provides methodological means to this understanding because it recognizes that the existence of each human being is inseparable from his or her social context. It is in the respondent's interactions with others (i.e., *Das Man*) that a researcher could construct the meaning of the experience being studied (Heidegger, 1994, p. 119). Parallel to this is perhaps the term 'we' or 'us' instead of 'I' or 'me' used by my respondents to answer my questions about their personal views or experiences. It displays the embeddedness of my respondent's identity with his or her society that among many factors was enforced by their strong social ties after multiple natural and political disasters.

I used sampling techniques of the 'purposive sampling' and 'snowball sampling' to locate individuals who are resourceful and have a willingness to participate in this study. Regarding snowball sampling, I also considered triangulation by considering the recommendations of the head of the sub-village whom I met in my first fieldwork in 2019 and who is knowledgeable of my future respondents' credibility (Pritanti & Ilham, 2011, pp. 163–167). Different from snowball sampling, the purposive sampling type entails the criteria for selecting the respondents to ensure the credibility and the accountability of the research. In this study, I used the following criteria: 1)

the respondent should be the direct eyewitness of the 2010 eruption; 2) the respondent should be a person who remained with other community members before, during, and after the 2010 event; 3) the respondent should be a person who has long engaged in traditional ecological practices that are before the 2010 eruption. The rationale underlying these criteria is the more direct the respondent is in experiencing the 2010 eruption and exercising the ecological practices (dairy farming, agriculture), the greater the potential for this research to gain credible and accountable data or rich insights from them. The '*heterogeneous sampling'* type is applied by using demographic attributes as my basis for recruiting respondents. The demographic attributes used in this research are social roles (e.g., leaders, members), age, gender, and indigeneity (local and non-local born). Hypothetically, the more diverse the demographic attributes, the more varied their interpretations and the greater the commonalities or differences across themes that can be obtained.

During the interviews, I discovered that the interpretations of the respondents were sometimes obvious, but in some cases, they required affirmations and efforts to re-formulating my questions on spot. The technique I employed when encountering this issue was pausing the interview for a few moments so my respondent could find words to express their feelings and thoughts.

The procedure of hermeneutic phenomenology that I operated comprises five steps as can be seen in figure 3.1. It is worth mentioning that considering the uniqueness and representation of particular themes, despite they are not present across texts, I may loosely include them in the diagram. These individual themes are "spirits' warning of the state's controls" by Puteri, "lacking time to continue traditions" by Wisnu, and "inspired by other's evacuation" by Moga. In the case of Puteri, the theme represents the cultural characteristics of Pelemsari and may correspond to her status as one of the royal servants in the sub-village. Wisnu's unique theme represents the challenges faced by most villagers today as they lived at the relocation site, meaning going back

and forth with a longer distance to reach the forest for grass and having more than one job with the emergence of jeep tourism in the sub-village. Moga's theme corresponds to the fact that he is one of two returnees to the former settlement. He was inspired by the successful evacuation of his neighbor during eruptions and his notice of standby volunteers and rescuers.

Fig. 3.1. The hermeneutic phenomenology procedure of this study using inductive or bottom up analysis: 1) develop initial codes in the left margin and themes (after reading the initial codes and re-reading the text) in the right margin based on the interviews; 2) develop each respondent's themes list; 3) compare the list themes to find commonalities across texts of all respondents; 4) develop a general theme for each cluster of shared themes; 5) develop a diagram of themes pattern.

To conduct thematic analysis, I used the techniques introduced by Van Manen (1990). The *first* phase is isolating thematic statements by finding phrases that seem essential about the phenomenon

being described (selective or highlight approach) or finding every single sentence or sentence cluster that represents the phenomenon being described (the detailed or line-by-line approach) (Van Manen, 1990, pp. 92–93). For example, Aman describes the meaning of Mount Merapi as follows.

> *Merapi is a source of life for people in Yogyakarta and surrounding it. For instance, we live on Mount Merapi's slopes, and we can plant anything as the soil is fertile. Secondly, we can take the rocks, and the sand, including tourism. People can also live from trade due to the tourism (Interview with Aman, 2022)*

I highlighted "Mount Merapi as a source of life" to explicate the meaning representing the whole paragraph. It should be noted that there is no conceptual formulation that can capture the meaning of the life structure. The theme is always a reduction of a notion (Van Manen, 1990, p. 88).

Another transcript belongs to Wisnu who described the meaning of Mount Merapi this way:

> *The blessing is abundant, I do not mean to say taking benefits. I mean dairy farming is a blessing due to the grass, and tourism is a blessing due to tourists who before the pandemic came from abroad. They heard that Merapi is the most active volcano so they are curious to see Merapi (Interview with Wisnu, 2022).*

Similarly, I also highlighted essential aspects as the potential theme. For example, I highlighted the first sentence that "Merapi as a source of blessing." The *second* phase is discovering the shared or the common themes across narratives. I may notice that certain experiential themes re-emerge, indicating the salience of these themes for all my respondents (Van Manen, 1990, p. 93). It should be noted that these themes serve as knots that make up the meaning of a lived experience and foci that facilitate a phenomenological description (Van Manen 1990:92). Using the two testimonies of Aman and Wisnu, for example, I found the commonalities of their themes and categorize them under one notion best capture their themes: Merapi as a source of life. The *third* is conducting a collaborative analysis through discussions on the themes to generate deeper insights and understandings. Here, the themes will be tested, articulated, re-interpreted, omitted, added, or

reformulated (Van Manen, 1990, pp. 100–101). The *fourth* is determining the incidental and essential themes to establish reliable and clear phenomenological descriptions (Van Manen, 1990, pp. 92–108). Finally, I developed a diagram of themes-pattern based on the respondents' testimonies.

To reveal these themes, I used inductive or bottom-up analysis, "an approach in which the themes are strongly linked to the data themselves and a process of coding data without trying to fit it into my preconceptions of living with risks" (Anderson et al., 2014, p. 83; Nowell et al., 2017, p. 8). Practicing *deliberate naivete* by being open to new and unexpected phenomena (Brinkmann & Kvale, 2015, pp. 33–34) and bracketing personal presuppositions (Brinkmann & Kvale, 2015, pp. 33–34) or the so-called *epoche* (Salmons, 2015, p. 65) are required throughout the process. The salient themes that emerged from the testimonies of my seven respondents after the eruption in 2010 are "*nyedaki ngadohi* (get close to and go away from the volcano)", "let the leaders handle", "traditions save us all", "disturbing policies", and "living with trauma".

Each diagram of themes pattern consists of respondents' themes which are connected and separated from the outside world by a dashed line. The objective of the diagrams is to assist readers in thinking about how the respondents assign meanings to a living with risk. Events or entities outside the grey bubble (e.g., unjust city) are external factors that affect respondents' interpretations of living with risk (e.g., parents' negative experience). Similar to themes inside the bubble, the factors outside them also have their own dynamics. The North and South axis represents two poles of power: modern and traditional that influence the internal dynamics of the Pelemsari sub-village. The West-East axis indicates the period or condition before and after the 2010 eruption to which each theme is linked. Despite the diagram having a pattern, it should not be seen as rigid and deterministic.

This chapter is divided into two parts: narratives of living with risks in Mount Merapi after the eruption and themes of community resilience. For the first part, the three phenomenological narratives that I discuss here are selected due to the richness of their testimonies and deep reflections on living with risk in Mount Merapi. It is worth noting that the three narrators are native-born residents in their fifties and sixties. The first respondent, Aman[49], professes as the spiritual guardian of Mount Merapi and the administrative staff of a private university in Yogyakarta; the second respondent, Puteri, a well-reputed pioneer of dairy farming and the eruption victim of the greatest losses in Pelemsari, and finally, Moga, the local elder who had witnessed the periodical changes of Mount Merapi and decided to return to his former home on the upper land following the step of his sister. Each narrative has its own complexity in terms of views, memories, feelings, ideologies, and uniqueness when interpreting his or her lived world. The objective of presenting these narratives is to allow readers to encounter the complexity of meanings they assign to the experience of living with risk after the eruption in 2010. Besides the narratives, I also incorporated the cognitive maps of Puteri and Moga to examine respondents' emotional attachment to places and interpret how they interact with them. For clarity reasons, I included directly onto the maps alphabets to the rural elements meaningful to them.

The second part of this chapter consists of themes that I consider best capture resilience as the main topic of this study. I used the same diagram of themes pattern to identify the resilience-related themes. Here, in contrast to the inductive, I adopted the "deductive analysis" or top-down analysis which is dictated by theories and research interests. The benefit of this analysis is its capability to provide a more detailed analysis aspect of the data for further interpretation but it could produce a less rich description of the overall data (Nowell et al., 2017, p. 8). There are three themes that

[49] In this dissertation, I use pseudonyms in order to protect the confidentiality of my respondents.

emerged from the themes-pattern: place attachment, sense of community, and local knowledge. Based on the concepts and definitions of these three themes[50], I determined which themes found in the inductive process are relevant. The outcomes are the diagram of each emergent theme.

3.2. Narratives of Living with Risks After the Eruption in 2010

There are five general themes representing the meaning structures of living with risk after the 2010 eruption that I extracted after appropriating and clarifying: "living with trauma," "*nyedaki-ngadohi"* meaning get closer and go away, "let the leaders handle", "traditions save us all", and "disturbing policies" (fig. 3.1.).

[50] Place attachment is a phenomenon in which people are emotionally and culturally tied to a place (Altman & Low, 1992, p. 5; Tuan, 1974, p. 93) and comprises two constructs: place identity and place dependence. Local knowledge is a part of the cultural capital by which societies convert natural capital (resources and ecological services) into human-made capital. Local knowledge refers to knowledge generated through observations of the local environment held by a particular group (Berkes & Folke, 2002, pp. 122–123). A sense of community is s a feeling of physical rootedness in the community with core elements: emotional connection based on shared history, interests, or concerns, the neighbor's trust, and social bonding. A sense of community would motivate community members to mobilize and participate in collective action and cooperation (Mihaylov & Perkins, 2014, pp. 68–69).

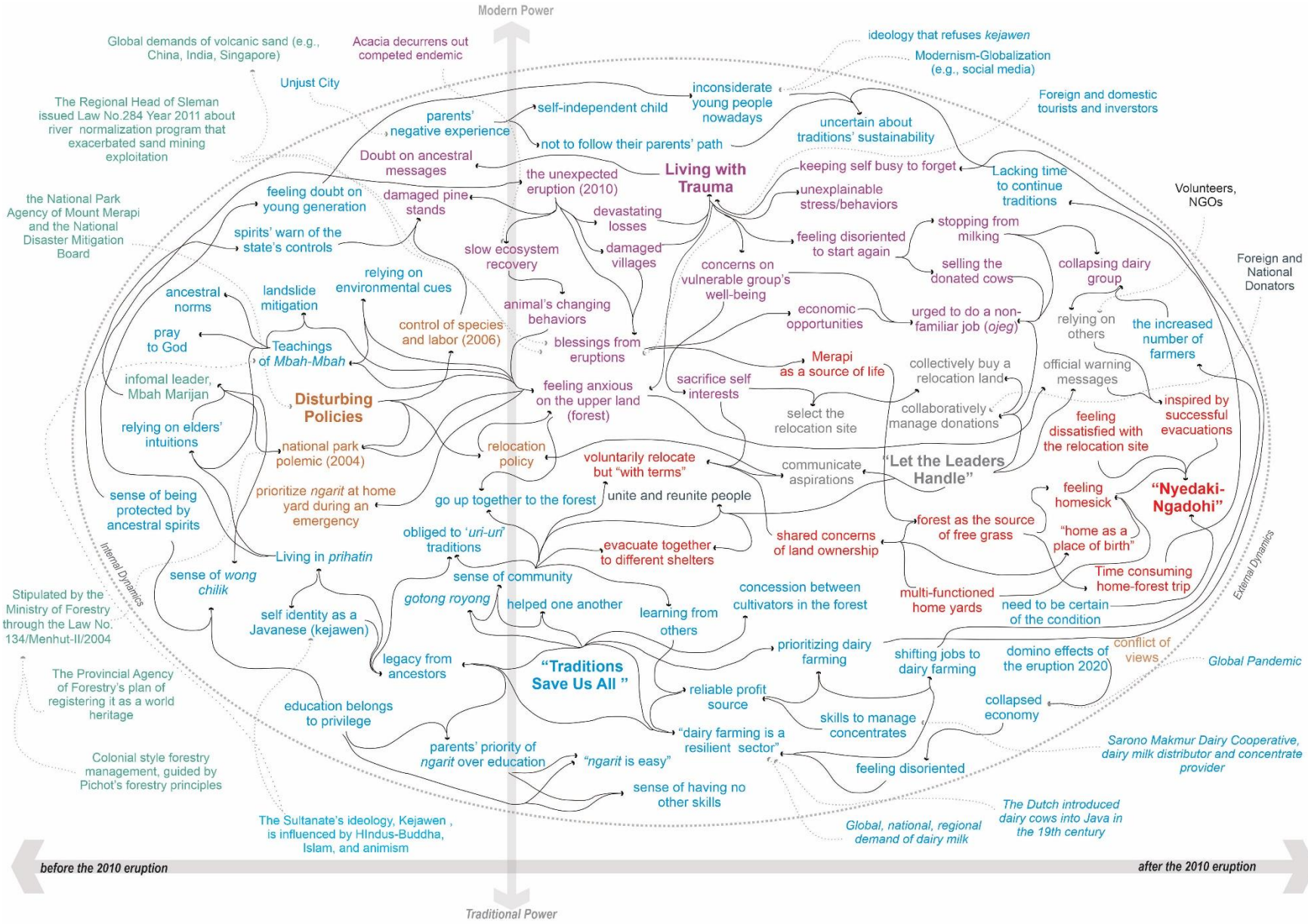

Fig. 3.1. Shared Themes of Living with Risk in Mount Merapi after the 2010 eruption across the respondents

3.1.1. Being Aman

I finally met *Bapak*[51] Aman only two days before the spiritual ceremony *Labuhan Gunung* was performed. It would be our first meeting after my interview with him in 2019 in Karang Kendal. The sky above the volcano, similar to previous ones, was bright that anyone who went northward could see with her naked eye the volcano's lush green hills and muscle-like contours. Nobody expected that Merapi, in the next few days, would force people on its slopes to evacuate. Indeed, since its first eruption in 2020, the authority had boosted the volcano's status from two to three-alert-level. Originally, I should meet Bapak Aman at Karang Kendal but then I went up to upper land after being told by his home assistant that he had not yet finished his activities. Passing through Kinahrejo, one could notice the quietness yet mysticism of the place where Bapak Aman along with his family and assistants cleaned the home yard of his late father. It has been a long tradition that the ceremony's *uborampe* (i.e., tributes) would be held inside the gatekeeper's house before being carried to the deep forest on the following day. Groups of tourists went in and out of the complex (i.e., Maridjan *petilasan*) but as a part of the community's tourist sites, Aman certainly must ignore the roaring noise including that from three to five WW-II-Willys jeeps that shifting parked at a large yard next to the compound. Anyone who had never met Aman perhaps would be misled by his appearance, a thin, quiet, and soft-spoken man, and did not notice him as the volcano's gatekeeper, the prestigious position given by the Sultanate for many decades. I remember Bapak Aman as a man who committed himself to carrying on his father's legacy despite the negative voices and doubts about his capacity back in 2019. Approaching Bapak Aman who

[51] *Bapak* is the Indonesian language for Mister.

was removing some old branches with his assistant, I reminded him about our meeting while also hoping that he would not be annoyed by my presence and remember me.

> *"Bapak Aman, do you remember me? I once interviewed you some years ago, in 2019." I asked after he apologized for his absentmindedness about the meeting.*

He stopped for a moment and tried to remember and then said," Wah, I am sorry. I did not remember, Mbak[52] Katrin." We laughed for a moment. Then, he asked me to wait for him to finish his activities.

I used that moment to observe the surrounding of the compound. There were not many changes in the Maridjan *petilasan* since my last visit in 2019 except for the layout of the museum objects (e.g., two motorcycles used by Aman to evacuate, and kitchen tools belonging to his father) which were currently placed closer to the yard. Going up to the watching tower built at the back of the home yard, I could barely hear the roaring sound of some jeeps convoying around a hill. We were separated by a large and quite deep slope but the noise could still be heard from where I stood.

Bapak Asih decided to start the interview in the *waroeng* (i.e., food stall) operated by his family. Next to the *waroeng* was his family's souvenir shop. He changed his mind to have the interview in the home yard after seeing me taking my audio recorder out of my bag. He seemed to realize that the site was not ideal with the seemingly increased number of tourists that noon. Bapak Aman then invited me to enter a 2.5 m x 2.5 m living room where we sat cross-legged on a woven mat as what people in Java traditionally do. No objects were inside the room which was quite understandable but the room undeniably allowed us to speak and listen very clearly.

[52] Mbak is the Indonesian language for Miss or Missus.

I started by asking him about his daily routines.

> *"The activities that we usually do are basically around the home or in the garden, and sometimes, we adjust our work to the incoming guests. "*

From my little observation that day, I noticed no plants were managed in such a way that suggests it was a garden. Feeling intrigued by this, I asked about it and he replied,

> *"The area below this place is our garden, only a small garden. The garden was once very large before most of it became a river due to the eruption. It had become a part of River Opak now, filled with rocks, sand so most of it could not be cultivated anymore."*
>
> *"Do you mean the area at the backside of the viewing tower?"*
>
> *"Hm. That area was once a flat ground, not as deep as what it looks like now."*

Then he explained that the ditch was only 2 or 3 meters wide but after the eruption, it became a valley towards a cliff to the west. It was hard to believe that the area separating me from the hill crossed through by the jeep convoys that morning was once a coffee garden. From what I read in newspapers, Bapak Aman also worked as an administrative staff at a private university in Yogyakarta besides being a gatekeeper. I then asked him about how he managed the two jobs.

> *"Do you feel handling the two jobs between being a gatekeeper and an administrative staff troubles you? How do you manage that?"*
>
> *"Well, actually I do not feel any problems. Indeed, after the eruption, I was appointed to become a gatekeeper. So, I gave a letter to the Rector of the university that as a gatekeeper, I was obliged to uri-uri (i.e., preserve) the traditions. Thus, whenever I have some occasions related to the palace since I was a royal servant, I would like to have a dispensation. But if there are no occasions from the palace, I will concentrate on my tasks at the University. "*
>
> *"How do you become a staff at the university?" I asked.*
>
> *"Well, I entered the university in 1996. At that time, I was not yet a permanent staff and was taking some tests. So, whenever my father went up, I could still follow him because I was only an apprentice at that time. I went up with my father every Friday. He would clean the road in the upper area. If the Labuhan was about to come, I followed him. At*

> *that time, I already raised a family but had no permanent job yet. I once taught at an elementary school in Wonosobo for three years."*
>
> *"What did you teach there?"*
>
> *"Well, I was a homeroom teacher and taught general subjects. I graduated in 1986 and then directly went to Wonosobo to become an apprentice. Three years. I was there for three years and took the CPNS[53] test. Then, I was asked to complete the required documents and they said that I passed the test. Since I passed, the only thing that I needed to do was only to complete the administrative documents. (They said), Ladies and gentlemen, the official result would be announced by the Ministry of Education and Culture at the regional level. The only thing needed was the issuance of a decision letter. The letter was supposed to be released within three months but until up to the fourth month, the decision letter for me was not yet issued. Oh God, why had it not been issued yet? I investigated it and asked them why I did not yet receive the letter. I was surprised because they told me that I was replaced by someone. I then asked them how it could happen. In other words, I protested it. They said that those who replaced me were from Jakarta. Then, I investigated it again in Semarang because I lived in Wonosobo. From them, I also acquired the same response. Then, I went home and taught at a kindergarten."*

It was through his cousin's support that Bapak Aman could work at the university. At the same time, Aman applied for a job, the university opened a new faculty. Bapak Aman then described his desire to leave the hamlet Kinahrejo before applying to the university.

> *"Because I failed in Wonosobo, I became very disappointed and wanted to know how I failed. When the announcement was released, I was with my wife. She said, let us go home. There was nothing that you should wait for right here."*

Reflecting on this experience, Bapak Aman then said that he should be grateful. The most important thing for him was getting a job and its alignment with his degree was not important.

> *"Despite the work was complex and the salary was good but when it comes to convenience, the meaning would become different. To me, if the job is enjoyable but only gives you a low salary and the person feels the so-called ngegangsan, —you know ngegangsan right, it means everything feels not enough—, then the job would not become a blessing. But, if the job gives a low salary but is enjoyable, peaceful, to me, it becomes a blessing."*

[53] CPNS is the abbreviation for Calon Pegawai Negeri Sipil or the candidate of the state officers

It had been widely known that the monthly salary received by a royal servant probably is not equitable to the tasks that he or she must carry out. Then, I asked Bapak Aman about what is the meaning of being a gatekeeper for him.

> *"I did not have the desire to become a gatekeeper, but I decided to register to serve the palace. My motive was only to devote myself to the palace. The term for this is nelah berkah. That is the first. Secondly, I wanted to preserve the cultures, so they sustain, not vanish. Cultures are varied. There are traditional cultures, and traditional arts, of all kinds that could be performed by the community. For example, here, is the nyadran culture. We should not let it vanish because nydran had become a tradition since our ancestral time. From that time to this date, it exists. It will be held during the Ruwah month. Perhaps, one month from now."*
>
> *"And as a gatekeeper, what is the meaning of Labuhan to you?*
>
> *"Because I am a messenger from the palace in other words I am the person in charge, I could not abandon the job. It is my task. My main task is that. I have to be able to carry out the task except there are matters that obstruct me. The meaning of it is we deliver our wishes to God so He would give us something, something like a fortune. In general, this means that Yogyakarta becomes safe, peaceful, and tranquil. We must be grateful and besides this, we also pray to God so we are given safety, especially during an eruption. Merapi is the creature of God so we must pray to God to manage His servant. That is from my point of view. If you want to interpret it in other ways, you can go ahead. From my perspective, we pray to God so we are always provided with safety and fortune as we already got from many directions. Merapi is the source of life for the people of Yogyakarta and the surrounding. For example, we live on the slopes and could plant in fertile soil. We cultivate everything that we want and then, can eat from them. Secondly, we can take the rocks, sand, and everything else. Also, it becomes a tourist object. Then, people could get food from tourism including trade, photography (business), jeep tours, et cetera. So, to me, God gives us fortune from it. Indeed, there are advantages and disadvantages. Of course, there are victims and hopefully, they become "surada" meaning that because they struggled, they become soldiers. Those who died, hopefully, are accepted by the Almighty God. Those who are alive must live and hopefully are given a fortune, ease in getting the fortune, and health. We pray for them so they who live in another world could become what we call holly."*
>
> *"An eruption indeed provides fortune," I concluded, wanting to know what further interpretations Bapak Aman had on the event.*
>
> *"Oh, yes. It provides blessings. To me, it is right. But go ahead. I feel that way but others might not which I think would be bizarre. Just like what I already mentioned, being grateful to God so the blessing becomes beautiful. And that is where our fortune comes from."*

Then I asked Bapak Aman what he thinks about the common perception that Merapi is the source of hazards.

"Because people live close to the volcano, so eruptions are just ordinary events for them. What does it mean? A common thing because Merapi's eruption did not only happen in 2010 but since the time of our ancestors, they already happened. During my childhood, it was when I was in elementary school around 1969 or 1970, there had been eruptions. The eruption was big but no fatalities fell. I think it was a big one. "

"It was during your childhood, am I correct, Bapak Aman?" I asked for his confirmation.

"During my childhood, around 1970s. There was an eruption but it was accompanied by rain. The rain was big so it was not hot but full of ash. Fortunately, the house did not fall off. Trees fell off, branches fell off. Fortunately, there was rain. If no rain existed, what happened would be hot clouds. At that time, nobody evacuated. Nobody. The government also did not order us to evacuate. Well, that period. Trees fell off and branches fell off because of the volcanic ash they burdened. Rain caused the trees unable to carry the weight. It was an amazing event. Because at that time, Mbak, we held nyadran. Yes, right. Nyadran. But the occasion was carried out at night. Usually, in the following morning, we went to cemeteries. There would be kenduri. Kenduri was held in one amben, in other words, in a room like this, people left the room and only six people stayed. They were our ancestors or elders like Mbah Modin, Mbah Reso, or Mbah Resodimego, whose house was close to that of Mbah Margo. He was also the ancestor of Bapak Purnomo, if you know Bapak Purnomo."

"Are any of them still alive now?" I was curious.

"They passed away. The ancestors at that time include my grandfather, Mbah Argo, my father, then Mbah Ngatmo, Mbah Parjo, and others. There were only seven people at that time. The modin left the room because he was afraid and not courageous enough to leave the house. It just likes moving to another room. The kenduri was then moved to that room because people became anxious and afraid. The situation gradually became calm but the sound from falling trees continued including the exploded bamboo."

I was surprised. I once read an article about a local young scholar who studied the potential of bamboo in Mount Merapi as a disaster warning system.

"It happened for a quite long time, I assumed," I invoked further Bapak Aman's memory.

"The duration was long. At least about two hours, More than one hour. I was worried. If the house was hit by trees, then what should we do. God, what should we do? There was rain, a heavy one. Well, that time we stayed at the house of Mbah Metyo up there. Yes, what happened next was larang pangan, Mbak."

"What does larang pangan mean?" Based on my understanding, larang in our everyday life in Java is used when we say something is expensive, and pangan means food. But in the context of Bapak Aman's account of the eruption, the term I believed is

not simply expensive food. I guessed it would mean a food crisis but I needed my respondent to first state what he thought.

"Expensive food, meaning no food existed. Because we relied on agriculture and the farms were damaged. Soon after the event, neither food assistance from the government nor volunteers came. Nothing. I remembered that the government only gave us corn, Mbak. Then we transformed the corn into rice. At that time, there was no rice, we were not given rice. It was very rare that I could eat rice during my childhood. The government only gave 3 kilograms or at most, 4 kilograms of corn to each household. That is why it is called larang pangan. Then, we just ate whatever existed. In the garden, there were leaves. Whenever we found them eatable, we cooked the leaves."

How amazing human memories were in recalling such details especially when triggered by suffering. Then, I asked about the cows, that is what happened to them and how they managed the fodder if any of them survived.

"We fed them with leaves, there were jackfruit leaves. We watered the leaves because the water source after that event was huge."

Then, I asked about the ancestral messages which guide people's behaviors in the face of disasters. Bapak Aman recalled his late father, the phenomenal gatekeeper, to answer the question.

"Elders who knew ways how to read the signs of eruption did exist. It depends on how they observe or respond as each person is different. I was told once that my father had a dream. He dreamt of meeting Mbah Retso, who was also Mbah Kaum and already passed away. So, he dreamt of meeting Mbah Retso who told him to be careful and that he wanted to expel waste to the west. Then, my father shared with me his dream and then I asked him about what we should do. Well, the most important thing is to be careful because Merapi wanted to expel waste or garbage. In 2004, the eruption hit Turgo"

"People in the past knew but I was only a small kid at that time so I was kind of stupid. I did not believe it. Well, it (the dream) became reality and I do not know how it happened. I am not sure whether it was just an accident or something happened to my father. So there were signs like that. There was Mbah Hadi who lived around the cowshed. Mbah Hadi, the male one. He also told the same story and it was fit, Mbak. It was just incidental or anything, I do not know. There were signs that not everyone possessed. It was not mystic but probably metaphysic. But the general signs could be in the form of earthquakes, and animals that run down the slope. It also happened. Or, maybe, the temperature increases and one might curiously ask why the weather is hot. So, people are like that. They are prepared for anything that might happen. I mean prepare their minds so they would not be afraid. At least, they are already prepared

mentally to respond. Well, if they are afraid of something, well, just take a rest, go away for a while. That is how people respond."

Among all the ancestral traditions, probably, the supernatural ability of the gifted mystics is the most remarkable one. *Ngarit*, in particular, has a very deep meaning for this society that many of them including Bapak Aman feel very concerned with its sustainability in the future.

"Well, after the eruption, the young men today do not want to learn about ngarit." His complaint obviously shows his concern, if not a disappointment.

"This must be a great challenge. Are you anxious if it no longer sustains?" I asked.

"Of course, and it has not sustained. So, this era is different. The young generation nowadays just wants to do whatever they pleased. Don't you think? In the past, we cleaned the road but at this time, they are given cows to ngingu (i.e., take care of) them. But they, unfortunately, sell the cows and say that they do not want to cut grass. Really, people's minds change as time advances.

"It is my hope for Kinahrejo that, first, the people, whether be young people or adults, understand about culture. But whom I stressed here is the young people. It seems that they want to leave behind our culture but it requires knowledge so they could understand the culture and that culture is not similar to beliefs. Culture is a tradition that is managed and performed by the community. To solve this, sometimes it could be through ceremonies, our traditional ceremonies. They are involved in these occasions and given responsibilities for simple tasks. For example, being a keeper of the parking area in the Labuhan rite and being a receptionist to welcome the incoming guests."

"Ngarit is the oldest tradition. Whenever I arrived from school, if I had not yet cut grass, my father or mother would be mad at me. Principally, ngarit was prioritized and education was not viewed as important during my childhood. So many failed because education was not important. Seng penting iki kuwe iki sek ngarit (i.e., what important is ngarit). Parents were like that so the encouragement for school was none. In other words, kids were let to do whatever they pleased. After graduating from elementary school, I wanted to continue my study. I have to go to school. My parents did not let me do this. My father and mother said, ora sah sekolah, sekolah nggo opo (i.e., do not go to school, what are the benefits of going to school?). No, I have to go to school."

"Why do you consider education as important?

"Well, there was a hiking post around this place. Many hikers wanted to go up. Then, why did these hikers, or wong kuto in another term, they carried bags like that, and had good shoes. Then, why did they carry things and had things like those? I feel serawung. I did not know them. One day, I hike and was taught mathematics during elementary school. I was also taught the Indonesian language."

"By who?" I asked.

"By those hikers, I was then motivated to continue my education. I must go to school. I must go to school. I finally went to school and ngarit became my second priority. At that time, I was given goats by my father. Probably one speculated that I would sell them but no child was brave at that time. "You must use this goat. This is your responsibility, and you must take care. Later when it gives birth, you will have many for your own good." It was like that at that time. I finally graduated from elementary school, otherwise, I would have had four goats. Then, "you do not have to go to school, to junior high school." No, I must continue my study. I must. Then. I continued my study at the Junior High School level. At the beginning of school, I still collected grass, Mbak. Even when I entered a senior high school, I still collected grass. But ngarit could not be abandoned. I finally went to school. went home, and ngarit. As I entered a senior high school, my school in Pakem, I could not manage my schedule to continue ngarit. Then finally, I would collect grass every Sunday. Then the frequency of doing this activity decreased. The ngarit time was only every Sunday. So, I was not given the main task of feeding the goats. I just need to help my parents."

"How do you think what Maridjan *felt once he knew that you did not do ngarit?"*

"Well, who mainly pushed me to ngarit was my mother. My father did not push me. My mother usually said, wis kuwe kudu ngarit. Ora ngarit iki, sesok ra entekke sangu nek sekolahan (i.e., if you do not ngarit, I would not give you money for your school). But it did not only happen to me. The culture is like that. The culture of people in the past for owning cows is they must ngarit. That is the culture and it still is a culture. That is what we call culture. I still did ngarit because I decided to do it. I stopped doing ngarit just recently. After the grass grew again following the 2010 eruption, I completely stopped doing ngarit. At that time, I did ngarit and when I already had a wife, I still ngarit because I had five cows. Then, my wife did ngarit and I also did ngarit."

"And, why did you also stop from continuing dairy farming?"

"I am busy and so is my wife. My wife was recruited back by her office or campus. In the past, while working in the academic institution around here, she could work and do ngarit. But, since she is now working at the office so she no longer cut grass. She still worked there to the date."

We had to stop our interview as we heard a praying sound from the Mosque nearby signaled the *Dhuhr* praying. While I was waiting for Bapak Aman from finishing his mandatory praying, a young woman entered the room and provided us with sweet and hot ginger drinks. The ginger drink was a homemade product of his family's business that was sold in their souvenir shop in Maridjan *petiliasan*. Once, as told by Bapak Aman, a student from the United States ordered forty sacks of ginger from his business so he must ship them to the country. I was still intrigued to know

his view on his late father's persistence to remain in the sub-village and defied the current Sultan's order during eruptions.

> *"How do you see Maridjan's persistence to evacuate during eruptions and his defiance against the Sultan's order?*
>
> *"Well, my father refused to evacuate because he saw his tasks as obligations, meaning that they were based on an agreement or a vow since he was appointed by the Sultan IX. Probably, my father did not want to evacuate because it had been his principle. It was his principle because he was given a mandate that needed to be fulfilled in whatever the condition is. He fulfilled his mandates and became a role model for his people. What does it mean? Mbah Maridjan was a determined person, who had strong principles no matter what the condition is. So, people viewed him as someone who fought for the interests of the monarchy and the people. Why? My father did not want to evacuate or go down the slope but he was not just silent. He prayed to the Almighty God as much as he could, But people could only ask from God and it is He who grants what they want. We ask from God, but it does not necessarily mean that it will be granted. But, we have tried."*
>
> *"But not everyone seems to understand his principle, am I right?"*
>
> *"Many people said that Maridjan was ridiculous. He was ridiculous. Many said that but just ignore them. There were comments that Mbah Maridjan did not want to evacuate so he was foolish. He was ignorant of the dangerous condition at that time. I found the comments from newspapers but I also encountered those who said that right in front of me, They did not recognize me as Mbah Maridjan's son. In the market, some people also said that. I chose to be silent. I ignored the rumor because they did not know. People who did not know anything are free. If they knew, they would not say anything like that."*

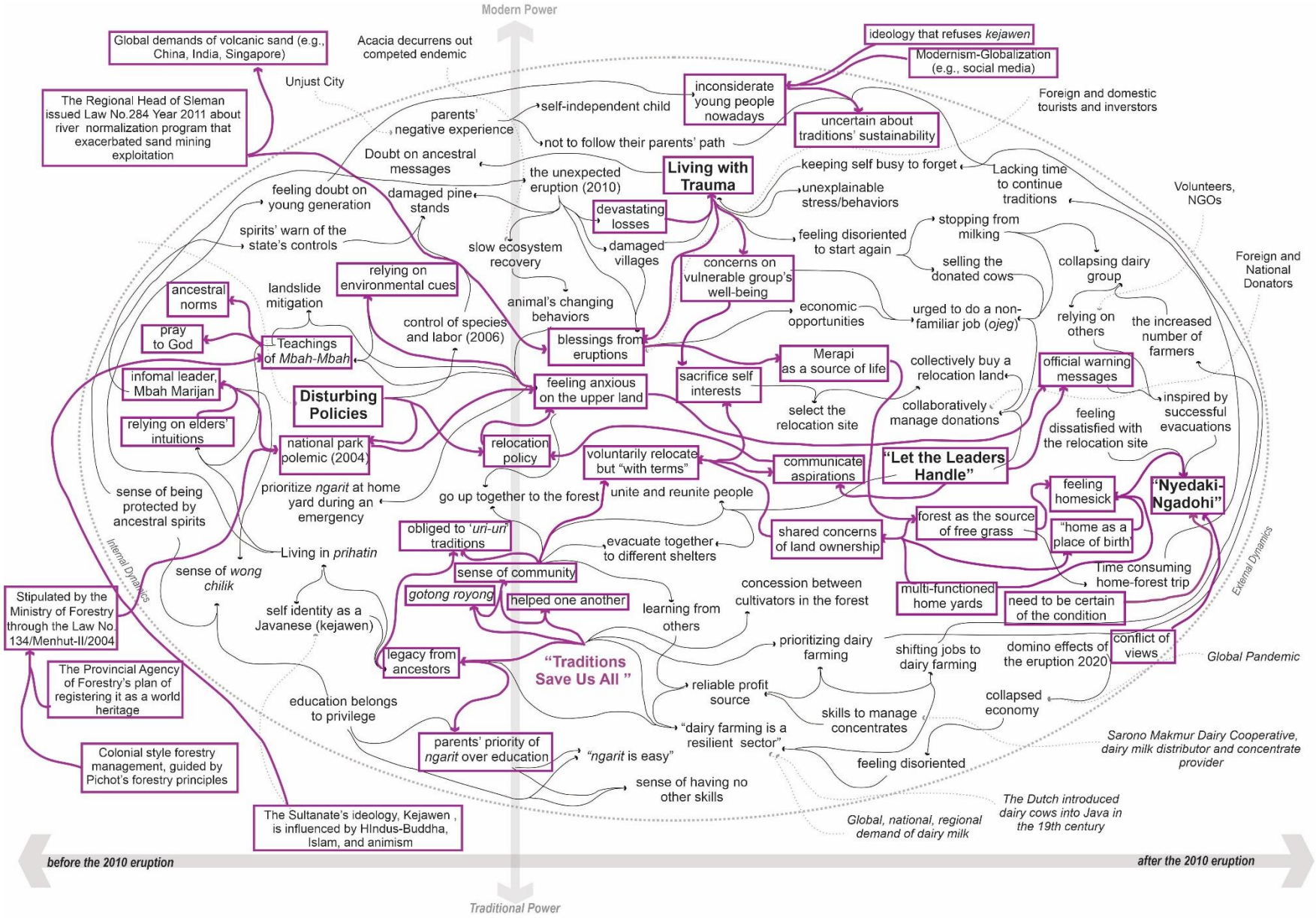

Fig. 3.2. The pattern of themes of Aman in purple-colored boxes and lines is based on his testimony in 202

3.1.2. Being Moga

I was very fortunate when I finally met *Mbah* Moga at his home on the upper land on February 15, 2022. It has been two weeks since our last meeting in his sister's house where I conducted my first interview in 2022. I must say that meeting my respondents on the upper land was not easy. Besides the government's dynamic restrictions following the global pandemic and the volcano's behaviors since 2020, both Mbah Moga and his sister chose to detach themselves from the disturbing communication devices, namely mobile phones.

To reach his house on the upper land, one could just directly drive their vehicles up to the north through the road Bebeng. But similar to the previous time, I chose to park my vehicle 100 meters from his sub-village's gate on a space owned by the Pengok sub-village's resident. It would be a great moment to delve into the respondents' everyday routes through walking. Considering the steepness of the road, walking to Mbah Moga's house would need about 45 minutes. The road was occasionally passed through by jeeps filled with 4-5 tourists or motorcycles that noon. On the eastern side, one could see the lush grass and rare trees while on the western part was the high ground where the former homes of the Pelemsari villagers were located. Along the asphalt road, there were concrete pegs belonging to the government. The road Bebeng divided the Pelemsari sub-village and was about 30 degrees steep. To reach Mbah Moga's house, one must then go through a ground path on the east, the only branch of the asphalt road. Following the path, I noticed a farm field, bordered with bamboo sticks on each corner and cloth hung over the bamboo, probably to scare out birds or long-tailed monkeys. I greeted the farmer, *nyuwun sewu* which literally means I am sorry in English. In this context, it was used to ask for one's permission for passing through his or her property. I heard the farmer, who was barely seen in his field on the ground 2 meters higher from the street, replying *monggo* (i.e., please) or go ahead. Then, there was

a wooden-made building filled with a bunch of grass on the corner of the path. On the right, one could see the ruin of a used-to-be large house, abandoned after the volcano's fury in 2010. Then, I further walked through a corridor of 10-meter-high bamboo-tree which signaled that I was about to arrive. The house itself was located on the ground 10 meters high from the street. To reach it, one would need to walk on a steep, narrow path. The first house that would be seen once arrived on the high ground was his sister's house before Mbah Moga's. Soon, two little puppies welcome me with their loud barks. I remembered that his sister once said they were given by her grandson as gifts. At the front of Mbah Moga's house was a large room made of bamboo. It was built by his sister's stepson who then installed a wooden plaque engraved with a title, University of Merapi. Indeed, since his sister's phenomenal return to her ruined and ash-covered house only five months after the eruption, soon reporters became her regular guests. People, from students to the national guard's trainees, then occasionally used her house as the so-called basecamp, of course, with the approval of the homeowner and the local authorities.

Around Mbah Moga's house, there were some pots of plants, two dairy cows, a 1-meter-tall water drum, and a toilet. In the corridor separating the bamboo chamber and Mbah Moga's house was a two-meter long table and seats. Mbah Moga was about to go to the guard post when I arrived. It was his turn to monitor the incoming vehicles that entered the Mbah Maridjan's petilasan from the road Bebeng. He must change the turn of his fellow villager who began his work at 8 AM. We then decided to conduct my interview at his post, located about 1 kilometer from his house. We chose his regular path which was certainly not the easiest but the shortest one. The long sharp *kalanjana* grass, *sengon* trees, and steep grounds accompanied our ways to the post. As we arrived, there were two buildings: a large open building and the post itself where his friend was waiting for him. We first talked for about 15 minutes in the large building. There, the seats and the table were

quite dusty and a large poster of the elected village head, for some reason, was still hung on the wall. According to the village head whom I talked with a few days before, about 98% of the Pelemsari villagers elected him. A big accomplishment that was well-remarked in the memory of the village head as the support came from a resilient and phenomenal sub-village.

Mbah Moga is a respected leader and elder in the sub-village who had experienced several eruptions and political changes in the last five decades. Following the path of his sister, he decided to re-inhabit his former home on the upper land while his wife and children chose to take care of their step-granddaughter at the Karang Kendal relocation site. I interviewed Mbah Moga four times and followed him to his grass plots in the forest, the public cemetery during the *nyadran* occasion by riding a motorcycle, and the parking posts at two different locations.

In my first interview with Mbah Moga, similar to my other respondents, I opened the interview with a general question related to his daily activities.

> *"I search for grass to support our living hood. Since a long time ago, the Pelemsari villagers had farmed cows, then, dairy cows. In the past, almost 90% of them farmed cows. Only if the cows were milked could they generate income. that could be supportive. I once farmed three dairy cows before the eruption. If I am not mistaken, I could store 10 liters of dairy milk but there was also a cow that could only produce 5 liters so the income was not the same. But for the operationalization, the grass was absolutely free. What I had to buy was komboran, I once could get a net income of about 1.5 million rupiahs. So it was relatively high compared to others who could only gain 300 or 500 thousand. If we buy grass, probably I could not get that amount of profit. But, because the grass was free, the profit could increase."*
>
> *"How is about the kombor?"*
>
> *"Well, the komboran was provided by the dairy group. So they prepared the komboran and we just need to take them from the dairy group. After taking the komboran, they calculated the expenses for one month. For instance, the cost of the concentrate was 1 million and the dairy milk worthed 2.5 million so we still gain a one million profit. If someone ngingu (i.e., fosters) cows like me, they could become fat and then be sold."*

> *"In the morning, sometimes at 6 AM, I will have departed from my home. Sometimes I depart at 7 AM if there are some occasions. Basically, if I do not have any occasions, I will collect grass. After I finish with the grass, then, I will start doing other activities. But, a farmer typically also seeks firewood or something, Here, I plant coffee because I was asked by my brother who participated in a coffee cultivation workshop. Before the eruption, there was a donation of Arabica seeds. I planted 500 coffee seeds.*
>
> *"Do you feel fit with the Arabica coffee?"*
>
> *"That time, Arabica could yield a satisfying result. But over time, as the result became so satisfying, the price decreased. First, the wet coffee per kilogram worthed three thousand rupiahs. It was considered good. But then the price was only less than one thousand rupiahs. Other farmers then sell the coffee without any profits and started to plant other crops. It is not the case with me. Because I planted them, I just let them if they did not die by themselves. Because I remember that planting a crop seed was for my life then I asked myself, why I removed them. I felt pity for them. After that, I just let them. If there were the fruit, although only a small number of them, I took care of them. I sold them no matter how much the price was. Over time, other farmers did not crop the seeds, the coffee price began to rise again. Not bad. I felt very relieved. The price increased because nobody had coffee seeds anymore while I still had them. The price rose. That is me."*

There was a limited resource that describe the history of coffee in Mount Merapi. It was told that the coffee plantation, also known as *meneer* coffee, was introduced by the Dutch in the 1930s. The Turgo Village was the primary center of this coffee. Robusta coffee began to be intensively planted in 1984 while the Arabica was introduced in the 1990s (Rosana, 2022).

> *"Besides farming cow and coffee, I noticed you also work in tourism?"*
>
> *"I am a coffee farmer. My work in tourism is only a side job. I work both in this area and at the tourism retribution post down the slope. My job there was taking retributions from the incoming visitors who will go up to this area. Here, the job is more and less the same except the street junction is narrow. My job is similar to that of Bapak Marso who stands right there."*

There are two posts where Mbah Moga works. The main retribution post was located on the Kaliurang street about 8 kilometers from the summit whereas the controlling post around the street junction of Maridjan's *petilasan* was about 3.5 kilometers away from the main post. My interview with Mbah Moga that day was conducted at the Maridjan's or Kinahrejo's post.

"How do you manage the time?"

"Here, I only work once every six days. So, I need to search for grass first then ngombor, and finally, come here. It is the same with the area down there. I work once every ten days there.

"How is about the location of your grass plots in the forest? Are they far from your home?"

"They are close from here. During the dry season, I could collect grass farther to about 2 kilometers from the crater. It could be a one-and-a-half-day job. A half-day then I go home. I depart from home at 6 AM and arrive at home at 12 PM."

"And, how do you learn about dairy farming?"

"Well, people around here had long farmed cows and goats. At that time, the cow type was the Javanese cow. We fed them and once they became fat, we sold them. They were breeding, then gave birth to calves. If there were urgent needs, we just sold them. That was all. But it was in the past. Then, over time, there was dairy farming in the Kaliurang village. Dairy farming spread not only to that village but also to areas down the slope. It seemed very good and then, we developed a dairy group. Then, we try and try. After some people farmed dairy cows, there was a consultation program of the animal husbandry agency that came and taught us about dairy farming. To get high-quality milk, we should give additional nutrients to the cows. Without komboran, the milk being extracted would not be much."

From my interview with the Pelemsari sub-village head back in 2019, I learned that the Pelemsari's dairy farmers relied on a dairy group belonging to a nearby sub-village, Karang Kendal[54] after the eruption. I wanted to know what Mbah Moga thought about the fall.

"Well, after the eruption, most people did not have cows and the government donated one dairy cow for each household. But everyone did not milk the cow. They became lazy or something. All of them."

"Does it automatically happen?"

"Yes, automatically, because they were confused about where to store the dairy milk. To restore the dairy group, people were still traumatized. Because they were close to the Karang Kendal so the milk began to be stored in that area. Then. since the number of dairy farmers increased to more than 15, they were advised by the Sarono Makmur dairy cooperative to make their own dairy group. We will take the milk, they said. About two months ago, perhaps."

[54] It is worth noting that the Karang Kendal relocation site refers to the area within which the Pelemsari villagers today live. The site was located adjacent to the Karang Kendal sub-village, the host of the Pelemsari's relocation.

Interviewing Mbah Moga on that post enabled me to see the traffic of jeep convoys that brought visitors to the nearby tourist objects. One and two jeeps went up to the north passing through the main road Bebeng. It seemed that the increased eruptive activity of the volcano did not quite affect tourism in the region. Mbah Moga clarified this and said,

> *"They must want to go to the bunker or the upper area for looking around."*
>
> *"Don't the government prohibit activities there?"*
>
> *"No, they don't. Only when the global pandemic began that the government closed the tourist objects. It occurred for about two years."*
>
> *"Mbah Moga, could you tell me about your grass plots in the forest?"*
>
> *"The plots historically, that is during the time of my ancestors, the forest was a production forest stipulated by the forestry agency. The production forest could be planted by people with trees including mixed crops. It was then called contract on alas for about two years. The land was then divided but each may have a different size. Some would get only ¼ Ha, others ½ Ha, but some may get 1 Ha. Then the land was cultivated with corn. The main food here was once corn. Besides corn, there were vegetable crops in the forest. It was called production forest. People were asked to plant."*
>
> *"Who did ask?"*
>
> *"The city government. It was with terms that once the crops had been harvested, the corn product was handed into the forestry office. The rule was that when one produced a 5 quintal corn, then the 1 quintal must be handed into the agency. But rules are only rules. The person could only give them 50 kilograms. If people harvested, that was what happened. Then, the place where people cultivated mixed crops must be planted with trees. People who planted them were those who managed the plants. The farmer planted the trees. Then, by the people, the land plot was disuketi."*
>
> *"What does it mean?"*
>
> *"Disuketi means the grass was managed. For instance, I had ¼ Ha of land so the grass that I had was only within the ¼ Ha of land. Next to my land belonged to someone else.*
>
> *"How did you get the plant seeds?"*
>
> *"The seeds were provided by the forestry agency. They must be carried from the Kaliurang by walking and sunggi*[55]*.*

[55] *Sunggi* is the term for weighting a load on top of the head.

His experience of carrying the state's plants seeds was similar to that of Ibu Puteri although, in the case of the latter, the seed centers were located relatively close to the forest.

> *"The trees were managed by the farmer, including the grass. Taking grass and trees at the same time. The trees after they became big, the ancestors would cut them off. Some used the trees for charcoal, or for building construction. It was the ministry agency that ordered it. As of today, after it was designated as a protected forest, the land opening was prohibited. In other words, a entuk nandur neng alas (not allowed to plant in the grass plots). When the woods are dead in the grass plots, it was the cultivator who must replant."*
>
> *"But the seeds came from the government."*
>
> *"Yes, from the government. For instance, if there were 30 trees dead in my grass plot, I must report and say 30 trees. Other cultivators may say 50 or 10."*
>
> *"Do the grass plot still exist?"*
>
> *"Yes, the plots exist, and it was inherited over generations. My grass plot belonged to my father and now I am the one who must manage the grass. My grass plot in total is about 1 Ha, located on the western and eastern part of the river."*

I once visited his grassplots in the forest on my next visit to his home. Wearing long boots and a large *caping* (i.e., straw-made hat) and carrying a *sabit* (i.e., sickle), he led the way to the forest. He offered me the easiest path but I chose to walk on Mbah Moga's everyday paths while being aware of the challenging and risky paths that it would mean. We went up to the higher ground and stopped for a while when he showed me his grass plots. There were two locations of the grass plots, on the eastern and western side of the River Kuning. Those two grass plots were divided into four different sized plots where the first three plots were located on the flat ground surrounded by a river valley on the west and a rocky terrace on the east. The other one was a grass plot lying on the steep contoured ground of the hill's foot in front of us, located just across the dry river valley that separated us from the hill. The forest floor of the vast ground was filled with rocks, sand, and wild plants including the dead pines. Sometimes, I saw two or three standing-still remnants of the trees which turned into hard rocks after being swept by the dense hot clouds in

2010. Walking down through the somewhat between 45 and 60 degrees steep and about 60-cm-pathway was no less dangerous than the path for going up to the high ground. Mbah Moga then offered me another tour to a water source named *Tuk Pitu* where Hindu pilgrims had just recently performed their rituals. To reach the site we must go through a narrow path surrounded by a deep valley on the right and a high soil ground on the right. It was a troublesome scene since the high soil around us could possibly fall off once an earthquake triggered by the volcano's activity shook the ground. Once we arrived at the sacred water source, I saw the Hindus' tributes around and here, Mbah Moga talked about the local legend of *Tuk Pitu*. During extreme dry seasons, the people of Pelemsari one by one used the water for their daily life. It was the only water source available at that time and one of those that survived after the eruption in 2010. It was believed that anyone who drink from and pray around the site would receive whatever he or she wishes.

In my interview that day, I asked how the people in past divided the grass plots in the forest.

> *"It depends on the capacity of the cultivator to open the land in a particular size. If he wanted one Hectare land but he could not plant it, he would not be able to possess it. He must plant the entire land."*
>
> *"Who would determine it?"*
>
> *"It was an officer from the forestry agency. The officer would ask during the land division, how much land do you want to take? For example, if he asked and then I answered, here is the boundary, while that one belongs to someone else. My land ends right here. But there must be someone whose boundary expands to that point. Then, the officer would ask again, are you able to plant it? I must be able to plant the plot. If I could not, the land would not be mine."*

Despite people stating that their grass plots in the forest are their ancestral legacy, the legal right associated with the plots was not similar to their homes and only limited to the right to use. In other words, the grass plots in the forest are the state's lands lent to the villagers to be managed.

Mbah Marso went home and it was the turn of Mbah Moga to control the tourists' circulation entering the Maridjan's petilasan in front of us. So we moved to the guard post from the large open structure. He took out a radio HT from his small carry-on bag and started to communicate with the people in charge at the main retribution post. It was his task to report back to them whenever a vehicle entered the Maridjan's petilasan. This means that the incoming tourists have paid the retribution at the main gate and he should let the tourists enter the petilasan.

"If every Saturday and Wednesday you controlled the tourists' circulation, when would you milk the cows? Do you have strategies to improve the dairy milk quality?"

"I do not milk them and to improve the quality, it depends on the fodder. If the komboran is not great, the milk extracted would not be much. Bad komboran will result in a low quantity of milk. The grass is also important. If the grass is dry, the dairy milk produced would not be much. But if the grass is a high-quality one, the milk will be much. For example, if the cow is fed with dry grass then the milk produced would only be 3.5 liters but if it is a good quality grass, the milk could be more than 4 liters. The greens also affected the dairy milk. The komboran could be standardized. At first, the cow is fed 1 or 2 kilograms of komboran and it produces 3-liter milk, for instance, Then, we try again by giving it 4 kilograms and it produces 3.5 liters of milk. The farmer gives the cow 5 kilograms of komboran and it produces 4 liters of milk. Then it is added to 6 kilograms and the cow produces only 4 liters of milk. This means that the farmer should only give the cow 5 liters of komboran, not more than that. Otherwise, the farmer would gain no profits. It also depends on the cow's condition. Because each cow may produce different milk. There is a cow that is when fed with 5 kilograms of fodder, the milk produced is only 10 liters. When the amount of komboran reaches an optimum level for that cow, then, we just give it at that level consistently. Because when I add the komboran but the milk produced does not increase, then, I should just give it 5 kilograms of komboran. Consistent so the product gained would be consistent too."

"So, you must be experimental in dairy farming. What assets do you think are critical?"

"The cowshed must be available then the containers for the fodder and the water. Have you seen the one in the Karang Kendal?

"Yes, I have." Months before I met Mbah Moga, I have observed the cowshed several times and found how farmers in that area wash, milk, and feed the cows with komboran and grass while maintaining the use of water and public tools. Sometimes, some farmers used the wheel charts to transport the cow manure to the open space next to the shed. At that time, they did not yet have their own dairy group thus they need to store the dairy milk in a center located outside the relocation site. I was intrigued to know Mbah Moga's opinion about the collective shed and whether this was also the reason motivating him to return to his former home.

"And, how do you feel about the collective cowshed in Karang Kendal?"

"The cowshed at the Karang Kendal is good. If we milk or not milk a cow, it is a great shed. But since I did not milk the cow, so I just build a cowshed here. I felt much better having a cowshed of my own. Over time, I felt that the cowshed there was dirty. I saw the cowshed and it seemed dirty. If I take care of cows there, I did it in rush. It is different from farming in my own shed. Because many people use the shed. Then, I clean up my own cow's room but not my neighboring cow's room."

"Is this the reason why you feel not comfortable there?"

"Not really. Not only that. If I farm my cow here, it will be close to the forest. Being close to the forest, that is all. There are no problems with the shed. No promblems because people live in relocation. the place must be like that and we have to accept it. It was built by the government. Alhamdullilah."

"Don't you have a family in Karang Kendal?"

"Mbah puteri[56] *lives there because we have a granddaughter. Her mother works in the Merapi Golf so nobody accompanies her. She takes care of her granddaughter. Yes, every day if my daughter works early in the morning, our granddaughter sleeps at my home. But my daughter lives in the Plosokerep relocation site. Then, if my wife comes here with Mbah Kasno, it would be too far for the trip from there to here, back and forth. So I asked Mbah Puteri to stay at the house to take care of her granddaughter while I am here to take care of the cows."*

"Don't you meet your wife sometimes?"

"(laugh) It has been for days. I went there last Saturday when I guarded the post on the downland. I went there. A long time ago, every 20 days, I went down. Sometimes, she went up to this home when her granddaughter had holidays. In the past week, she did not yet come here. She was picked up by her son, riding a motorcycle. Sometimes, her son had a vacation from his work in building construction. Then, she came here with her granddaughter."

"Mbah Moga, what is the meaning of Mount Merapi for your life?"

"Well, just like what I said. Mount Merapi just like in the past could fulfill everything because from the slopes, we could take the products. For the people, mainly the sand while for farmers, it is the grass. The grass, dry woods. By the national park agency, taking the dry wood is allowed. In the past, there were people who took home large dry woods. By the authority, it was not allowed. And, sometimes they took them where nobody was around. If somebody found out, it would not be allowed."

"So, do they take them silently?"

[56] Mbah puteri is a title given to a grandmother or a female elder.

"They must take them silently. Well, I also sometimes took the woods. Sometimes, I took the large ones for my farm. I have a farm at home. But, I do not take them every day, just occasionally."

Taking the wood silently. From the agency, the rule actually says that whether be the deadwood or falling trees, people should not take them. They just could not. What is the reason? So they will be decomposed and help fertilize the soil. That is what is said by the agency."

"Yes, that is the rule. How is the practice?"

"Yes, some of them still search for woods. In the past, almost everyone searched for woods. As of today, if any, there would be not many of them."

"How do you feel about the current forestry?"

"Today, the national park agency begins to collaborate with the community and develop some committees or something like that. Community groups also exist today to give support. They want the groups to help. I am also involved in the group. When the forestry agency managed the forest and we collected grass, sometimes we gathered. The foresters and the cultivators. Gathered on the upper land in the forest. There was the place of Mbah Retnyo who also worked in the agency. Every month, there was arisan[57]."

Before the national park agency was established in 2006 following the national park stipulation in 2004 by the Ministry of Forestry, Merapi's forest was ruled by the state's agricultural enterprise board called Perhutani. The board was established after the eruption in 1960. After this eruption, people living in the Dukun and Srumbung Villages were relocated whereas their lands were converted into pine stands by the board. People were then engaged to tap the pine sap and hand in the product to the government. Between 1988 and 1993, the board ran reforestation programs in which people were labored for planting pines (T. Atmojo et al., 2018, p. 45). As compensation, people were allowed to plant mixed crops and collect grass which, according to Mbah Moga, was limited to two years.

"When was it?"

"It was in the 1990s. Then, there was a competition for planting pines including bamboo. I once got first place in a competition. At that time, for planting pines. But, it was in a group. We got two goats (laugh). But I had to take them in the Baron. I was asked to go down to get them in the Baron but then, they were delivered to my home. I went there to symbolically receive the awards there. After the arisan, the forest was taken over by the national park agency."

"Do you still remember what happened in 2004?"

[57] Arisan is a social gathering aimed to develop cohesiveness of the members, develop networking, or gather money within the group based on the members' agreement.

"Yes, the forest would be taken by the national park agency. We conducted meetings in which people stated that they refused the national park. Then, we gathered in the house of the sub-village head. the last meeting was at Mbah Maridjan's house. I remembered that Mbah Maridjan said to the agency, "entuk digawe Taman Nasional neng wargaku kudu entuk ngarit neng alas. Kalau ra entuk ngarit neng alas, aku ra entuk" (i.e., the national park is allowed but my people must be allowed to cut grass in the forest. If unallowed in the forest, I will not allow). That was the late Mbah Maridjan. Then, it was allowed. It was considered thoughtfully by the agency that the ngarit was finally allowed. In the national park, there were zones where people could collect grass. It was once only 100 meters from the national park's border that was allowed for people to collect grass. But, only a small amount of grass was in that area while those who relied on the grass were so many. We could not accept. Then, the agency also refused. Mbah Maridjan then said like that. Right now, there was the red zone. During the dry season, we search for grass farther into the forest. If the allowed area was only 100 meters, then, only a few people could get grass plots."

"It was not in their actual grass plot, right?"

"It was not. Not everyone had grass plots in the forest. Then, if the grass was only permitted in that area, people would compete to collect grass first. Finally, they will conflict with their own friends. And, from the agency, it was said that the ministry's law must be issued. Must be done. Must be done? But, my people must be able to collect grass. So, the national park agency accepted it. The community meetings were held four times and there were debates several times. The last place was at Maridjan's house. Mbah Maridjan said that and if I thought about it, the agency somehow lets us collect grass. So far, it still runs that way. The officers in the national park right now also are close to us so they become our friends. There were group meetings with the agency over there, I was often invited. This one also comes from the national park."

He showed me the agency's vest that he was wearing that day. There was an orange-colored circle emblem of the national park on the right chest, contrasting the black color of the vest. I have noticed it and thought that he must work as a forest guard. I chose to save my questions about this until he himself revealed it."

"If you would not mind talking about the eruption in 2010, how was it according to your experience?"

"In 2010, the national disaster agency had disseminated the information about Merapi and boosted the alert status of Merapi to the third level. Two or there days after that, many elders, pregnant women, and infants were evacuated. A few people here had been evacuated but on the next day, the status was boosted again to watch-level. It erupted at night but people had no chance of evacuating. The last son of my sister, who also became a victim, visited his friend with my own son in the Mrican district before the eruption. They had the same hobbies in taking care of birds. My nephew arrived at home that afternoon and said to me, Pak[58], he also called me pak, from the east, the roaring sound in the upper areas was very loud. I immediately went to my child's house

[58] *Pak* is a short title of *Bapak* that is used to call someone's father or an adult male.

and told my daughter-in-law not to cook rice. After that, my son drove his motorcycle with his wife, child, and Mbah Puteri to go down the slope. It was only me and my sister's first son to walk until we reached the asphalt road in front of my house. I planned to stop anyone from the upper land to go down with us together on the road. But, nobody was around. Nobody came from the above. Then, there were two kids from below who came and asked me, do you want to go down? I want to go down then he reoriented his motorcycle and drove me to the downland. The sky here was very red. The hot clouds had flowed down. I was dropped in the Umbulharjo Village office. I then searched for my family and met them. The news that Mbah Maridjan was found dead was spread out in the afternoon including the other 37 people. If those kids were not there, I probably was also hit."

"I felt relieved that you and your family survived. And, how was about your cows?"

"My cows were survived. Out of five cows, two were injured. One of them was a calf. That one was evacuated on Wednesday. On Thursday, it was moved to the downland. I sold the cow that night for about 1 or 1.5 million rupiahs. I sold the surviving one. The large one was evacuated by the volunteers to a safe area down there. "

"How about the rest?"

"They were all dead."

"How do you feel that moment?"

"I was very confused. Then my brother who lived on the upper land did not evacuate. They were all hit by the eruption and died. My brother, children, and grandchild. They had not yet evacuated because they refused. While in fact, he had an infant grandchild who was only 35 days old. "

He continued.

"That time. I evacuated in the Kalasan district. There were four or five households. Then, I was called by my neighbor in the Sleman. He said, Mbah, do you want to come here? If you want to, I will pick you up. Yes, I do, but if you want to pick me up please bring a car because there are some other families too. Then we were picked up from Kalasan to Sleman. In Sleman, sak dusun jadi siji (i.e., the whole sub-village became one) at the place of Agus Kholiq. Someone told us that there were shelters for us in Plosokerep. I along with three or four other people was invited by the sub-village head to survey the shelters. We agreed to move there. I once helped build it there for a week but I could not stand it any longer. But I ten saw it as entertainment. Then the shelters were finished and we all moved to the shelters. Then, Pak Agus said to us, why don't you all find your own homes? Then, we were offered land in the Karang Kendal and he said it worthed 120,000 rupiahs per square meter but we could not afford it. Then, we visited the land directly and met the landowner from Yogyakarta. Once, the land was planned for a chicken farm but people around it did not agree. Then the owner mined the sand. We negotiated with him. He was a Yogyakarta citizen and I was surprised why

he let us and he was a kind person. He agreed and said, no matter how much the land would be bought, he would accept it. We went to him and said that we would buy it for 30,000 per square meter. The land size was 1 ha, more than 800 square-meter. We bought the land together. On the next day, we planned to build the houses slowly but surely and find ways how to afford the construction. There was REKOMPAK[59] that provided post-disaster houses. We met frequently with REKOMPAK. Finally, each of us received a 30-million-house donation per household but only to the roof. The finishing of the house was not included; only limited to the construction. Since we lived in the shelters (Posokerep), I collected all the donations coming to our sub-village and split the rest so each household received 13 million rupiahs. Then, along with Baduman who was also the head of the neighborhood IV—who was very experienced while I was not—saved the donations. I was told by him to save them. Then we saved them and not all of the gathered donations were distributed to the community as parts of them were saved. About 200 million rupiahs were saved at that time by the sub-village. To buy a house per household would cost about 4.5 million rupiahs. The 2 million came from the saving and the rest 2.5 million was paid by each household. That is what happened. It was such suffering."

Agus Kholiq mentioned by my respondent here was a former member of the house of Representatives in the Yogyakarta special district. Being a successful entrepreneur and owning a large land, he let the evacuees spend their time for almost two months on his land.

"How do you deal with the trauma?"

"Trauma is trauma. what important to me is being ikhlas as this is what the Almighty wants. Those who want to do their jobs, just do their jobs. When needing something, just do not think about it too deeply Those who had died would not come back. We must take care of ourselves and hopefully, live conveniently with friends and families. Sad, yes, we are sad. Trauma, yes, we are traumatized. But if we let ourselves continuously think about it, it will not good for our bodies. We live in endless suffering."

"And, it did not stop you from returning to your home. Why, Mbah Moga?"

"Well, because it was convenient. In the past, when I farmed my cows in the downland, I came here only to collect grass. Then, I wanted to spend my night here. Over time, I became more compelled to stay much longer. My sister had stayed here before me. I said to myself, I will stay here on dhuwur (i.e., the upper land) as my sister also still stayed on the upper land. Then, I stayed on the upper land. Well, it felt convenient. That is why my cows were then moved to this area. I repaired my cowshed (laugh), next to my house."

"Is there someone who advised you to come down?"

"If I was on the upper land, they said, Mbah, why don't you go down? Some of them asked me to do that. I said to them it was okay. As of today, if something happens, many

[59] REKOMPAK is the Ministry of Public Works and Housing's program of the community and housing rehabilitation and reconstruction.

will help. The national disaster agency. If something happens, people from the regency, the district, and the village could help. When there was gredeg-gredeg[60], quite big at that time, my sister was picked up by standby rescuers. Volunteers are ready. "

"Many volunteers would help."

"Yes, those volunteers. If something happens, there are volunteers who will immediately pick us up. They will come. When it is allowed to go up to the upper land, I will go again. Those volunteers are also the friends of my sister. "

"Why did you continue farming cows?"

"For my activities. It would be lonely if there is nothing that I can do here. What I want is that after buying a calf, I can sell it once it becomes big. If I buy, for instance, 11,000, it can be sold at 20,000. It was what I did. I bought a 12 million Rupiah cow and 1,5 years later, I sell it for 20 million Rupiahs. The price of a male cow, during the Idul Adha, will increase."

"And, after the eruption, how is your relationship with them?"

"I feel it is good. It becomes tighter because we live very close to one another. For me, I just try to relax. Other people might feel differently. At least, we help. I, my children, and siblings; all of them are close to me and I love them all. The bottom line is whatever we plant good will produce something good and those we plant badly will produce something bad."

"Mbah Moga, about the national park in 2004, the zoning had its limitations. How do they affect your activities?"

"To me, everything seems just the same. To the date, they are all the same. Before this, people were still allowed to collect grass in the forest. The main point is although it is not yet clear, our relationship should still be good. That is what the national park agency wanted. People could collect grass in the forest so everything is still the same as it is today. Those who manage the forest were once from the enterprise board and as of today, it is from the national park agency. In the past, the head was Mantri and today is the resort Head. Isn't it? Yes, I think they are just the same. Because those who work in the national park agency are also kind to people."

"Do you find the traditional knowledge has contributions to your life?"

"All people here in the past were farmers. They were farmers who became dairy farmers. Farmers and dairy farmers. In the past, when young people saw their friends do something, they would follow. If there were sambatan (i.e., occasions of working together), gotong royong, to build a house, we worked together without any fees. The sambatan for building a house happened when I was a kid, starting from cutting the wood to becoming a house. It certainly was what would happen."

[60] Gredeg-gredeg, mimicking the roaring sound of the eruption that happened in 2022.

"How did you get the construction materials?"

"From our home yards. In the home yards, there were trees for the building structures. For the structure bracing, we used bamboo. We could not afford to build a house. In general, during the agricultural time, the yards were planted with corn or other crops. If we started planting corn but could not catch up with our friends when digging the land. there could be gotong royong to help dig and fertilize the land ."

"How is it now?"

"Today, people do it by themselves, or they pay for it. We still work together but only for small parts. But in neighborhood II, I often asked my people to work together. We are advance in gotong royong. I asked people in neighborhood II to go up and clean the roads. We still do it. But since it is now a rainy season, I must stop it for a while. Gotong royong in my place is still good. "

The cognitive map of Moga shows his daily route from his home in the upper land (A) and grass plots in the forest adjacent to River Kuning (C). Rather than using the formal names River Kuning (D) and Bebeng Street (I), my respondent named these two places with his own words: *Sungai Kering* which means the dry river for River Kuning, and *Jalan Merapi* which means street Merapi for Street Bebeng. He recognized *Tuk Pitu* as an important and sacred site that also serves as an element to navigate his wayfinding in the forest. The other elements were the guard post where he worked as a traffic controller and the tourist object, Maridjan's house in Kinahrejo. The absence of his home at the Karang Kendal relocation site on the map indicates his lack of emotional attachment to that area. As he mentioned, he rarely returns to his home at the relocation site and preferred his wife and family to visit him in the upper land.

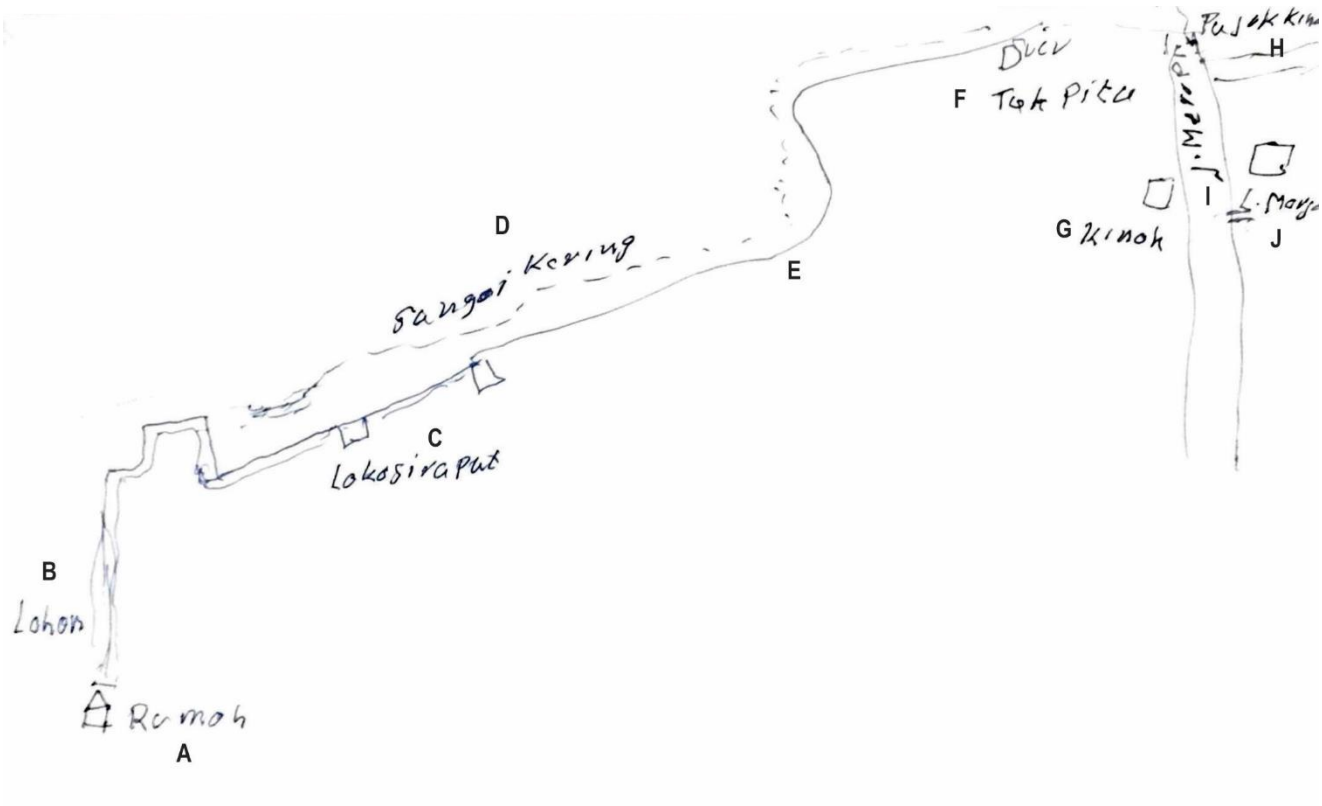

Fig.3.3. Moga's cognitive map of the daily route in Mount Mera

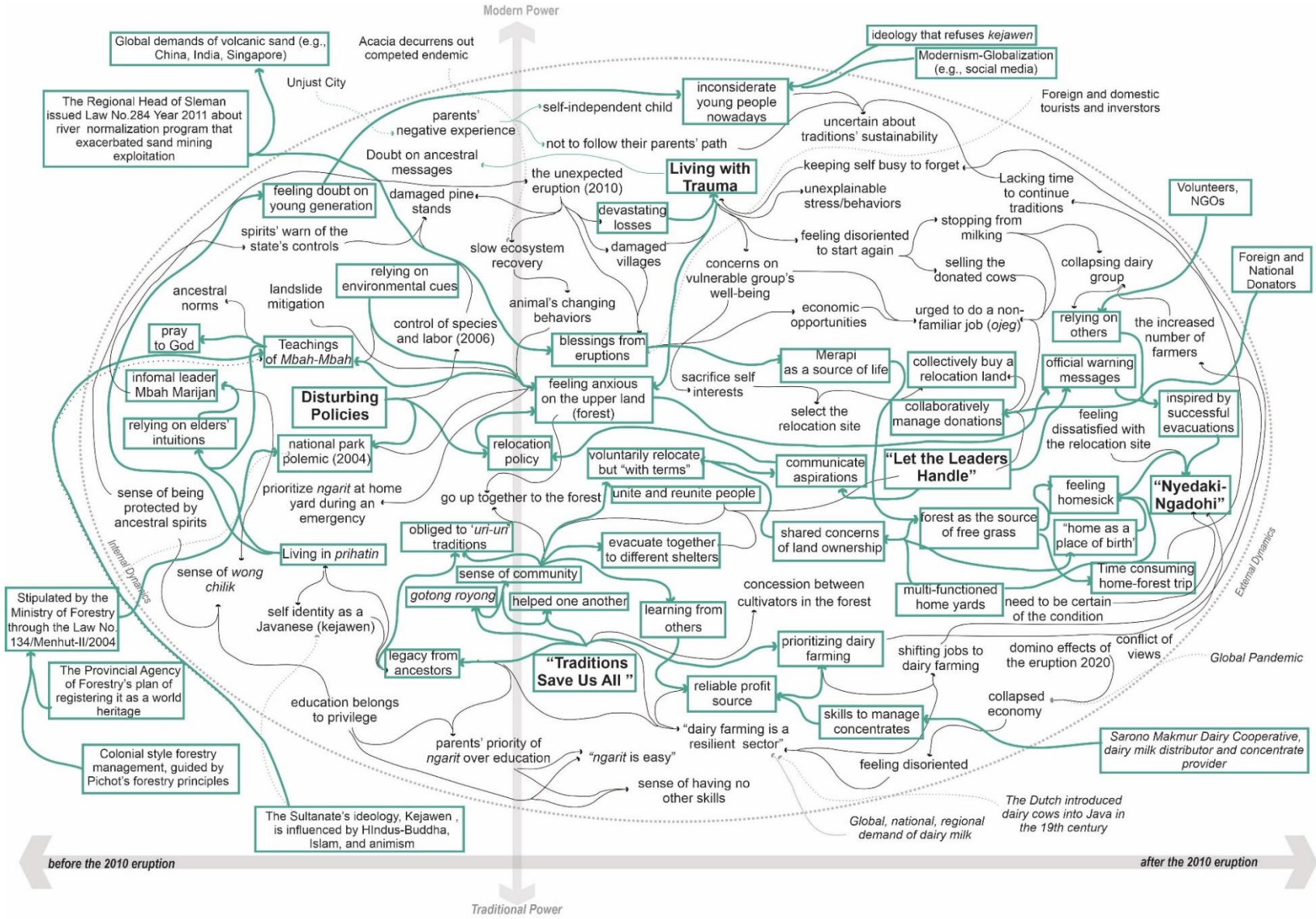

Fig. 3.4. The pattern of themes of Moga in green-colored boxes and lines is based on his testimony in 2022

3.1.3. Being Puteri

I met Ibu Puteri at the *Sringmanganti* post during the *Labuhan Merapi* ceremony on March 9, 2022. It was an unintentional meeting after our two engaging interviews in 2021. Only a day before the event, I noticed Ibu Puteri along with her husband riding a motorcycle, passing through my other respondent's home. Wearing *kebaya* [61], one could immediately assume that Ibu Puteri must be one of the *abdi dalem* (i.e., royal servants) who just attended the Labuhan's opening ceremony in the Cangkringan District office, the location where the tributes were officially transferred from the monarchy to the Kinahrejo hamlet.

Ibu Puteri in the eye of her neighbors is considered the most successful dairy farmer in Pelemsari due to her experience of farming twelve cows before the eruption[62]. She along with her late husband, who was the head of the local dairy group at that time, was routinely invited to dairy group meetings. The Pelemsari sub-village head recommended Ibu Puteri when I was in the process of recruiting respondents in 2021. Besides her expertise in dairy farming, she was also known for being a victim of the greatest loss in her sub-village—house, cows, trees, and biogas system, not to mention her grief for losing her husband and children. The trauma, she said one day in 2021, had caused an acute nerve-system breakdown around her right eye that she must take intensive medical care after the eruption. For this reason, I decided to become more cautious in posing questions that may remind her of the loss while ensuring her meaningful narrative arises.

[61] *Kebaya* is an upper garment traditionally worn by women in Java.

[62] It is worth bearing in mind that farming dairy cows is a very demanding job that required one's skills in managing time and knowledge of the cow's condition. To find fodder, people typically must walk into their inherited grass plots, most of which are situated only 3 kilometers from the crater. *Ngarit* requires only about 15-30 minutes to be able to collect 30-45 kilograms of grass but carrying them from the forest to home either by *gendong* (i.e, carrying on back) or *nyunggi* (i.e., carrying on the head), sometimes two times a day depending on the number of cows possessed, are undeniably exhaustive tasks.

I interviewed Ibu Puteri at her house in Karang Kendal *Huntap*[63] in 2021 at around 3 PM after we arranged an appointment through WhatsApp. Walking throughout the relocation site that noon, one could notice houses decorated in such manners by using light paint colors on the facades, gravity painting, plants, bamboo-made bird nests, or a large fish aquarium on the veranda. For an outsider like me, this would give cues when locating one's house on a site that was built in accordance with the government's housing standard. Ibu Puteri's house, however, was kept modest. To ensure that I was at the right address, I asked a young lady who was relaxing on her veranda. At first, she seemed confused when I mentioned Ibu Puteri's name. I explained some details about her and suddenly, she laughed and spelled out another name, "Oh, Mbah Manggar[64]." It has been a local habit of nicknaming one another in the Pelemsari, indicating such a close tie shared among them.

After waiting for some minutes on her house veranda with the guidance of her helpful neighbor, Ibu Puteri opened the front door and welcome me. She just arrived from the cowshed located about 50 feet from the house. We sat on chairs in the living room. From my position, I could clearly see framed photos of hers and her family hung on the wall. I then introduced myself and explained that I was advised by the sub-village head to meet her given my research topic that is relevant to her expertise in dairy farming.

> *"Could you describe what your daily routines are?" I opened the interview.*
>
> *"I plant trees and grass in the home yard so I do not need to search for grass in long distant locations. You can get them in your own home yard. In the morning, after taking care of the cow, I go to the former home yard on the upper land. If it is the time to feed the cow, I will go down (to the Karang Kendal). I can feel relaxed only after feeding them (laugh) and then, taking a rest. If I want to take care of plants in my home yard, I*

[63] Huntap is an abbreviation for hunian tetap that refers to a permanent housing of the community relocated from high-risk areas with assistance and sponsorship from the Ministry of Public Works in Indonesia and foreign donators.
[64] The nickname given by the neighbors to each respondent, similar to his or her actual, is psuedoym.

will usually take care of the cows early in the morning. If I want to milk the cow, I will do it before subuh[65] *but if I do not milk it, I will finish the subuh first before going to the cowshed. Then, I will start managing my garden and trees on the upper land."*

After her husband passed away, Ibu Puteri re-married to a resident in the Pelemsari. Her husband owns a home located next to the main road Bebeng. Because of its strategic location, his home yard became an ideal parking space for visitors before they go farther up to the tourist site, Maridjan's petilasan. She has two children who already raised their own families. One of them works as a dairy farmer while the other joins the jeep tour business. She lives alone while her husband spends most of his time on the upper land taking care of the parking business.

"What do you plant in your home yard?"

"There were once trees of nongko, mindi, sengon, waru. All these trees can be used to construct buildings. But, after the eruption, only sengon (i.e., Albizia Falcata) can grow while others are not yet recovered. In my home yard, I also plant and fertilize grass so I do not need to ngarit (cut grass) in a long distant area. I can do this in the home yard so I do not need to go to the forest. In the past, when I have a lot of cows to feed, I would find additional grass in the forest. As of today, the grass in the home yard is already enough (laugh)."

"How do you feel if you collect grass in your former home, do you feel anxious?" After the 2010 eruption, all damaged residentials in areas within five kilometers of the crater including the Pelemsari were designated as a high-risk zone. Early warning messages are something crucial for the people who run their activities within this zone.

"In the upper land? Yes, of course. I always bring my mobile phone in my bag (laugh). When cutting the grass, I usually tie them up each by each so when something happens, I could just run."

"Do you mean that you need the phone to check WhatsApp if something happens?" I assumed this would be the case. WhatsApp is a very popular medium in the sub-village (including in other parts of the country) in their everyday life to exchange information and to disseminate and receive warning messages from the sub-village head.

"In the upper land, I always carried a mobile phone so when there were some urgent events, I could know. I should not go home but because there will be some occasions as I received from the WhatsApp, I will go home. If I were in the upper land, I could relax because I have a big house. I built a new home on the remains of my former home which

[65] ***Subuh*** is one of the Islamic praying time that begins at around 5 AM in the Western Indonesian time.

is located next to the road. So, if I was tired, I could take a rest at my home close to the road."

The former home that Ibu Puteri mentioned here was different from the home of her husband who works in tourism. When I visited her home on the upper land, she recalled and pointed to some locations where her parents' house, cowshed, water reservoir, and kitchen once existed on her almost 1 Ha-land. The kitchen seemed to be the largest remains in that yard and was covered with large leaves of pumpkins and an endemic called *waloh*. I never heard about this plant before until that day but she said it had long been traditionally used as a meal and tasted delicious. Inside the kitchen, one could soon notice the surviving floor ceramics and some chambers through which the biogas pipes were linked to the stoves. Ibu Puteri always seemed enthusiastic and proud of the biogas. It was only her along with her late husband in the sub-village who had it before the 2010 eruption. Abundant manure that came from her twelve cows must contribute to the biogas to work well. Next to her house was a valley covered with green and lush grass, ready to be cut and picked up for her two lucky cows in Karang Kendal. The valley was bordered by a narrow deep slope and a river stream where wild plants and bamboo called *preng* lavishly grew. She flowed the wastes of the biogas toward the valley through the pipes built by her late husband.

"How do you feel when visiting your former home?"

"Convenient (laugh). If I am at my former home, I feel very convenient. It feels like living in my former home (laugh). But if the cattle were on the upper land, it means that I have to build a cowshed. Here, the cowshed has already been built by the government and could be immediately used. If the cows were fed on the upper land, a cowshed must be built on our own. The former cowshed was damaged so the cow shed here is more convenient and I could meet some friends too."

What do you do to reduce your anxiety?"

"I am the person with the greatest losses. I felt depressed and the depression caused a nerve system breakdown. My eyes became like this because of the depression (appointing her right eye). Yeah, sometimes I just forget it so I do not have to remember

it all the time. Just try to feel relaxed so I can take care of all things. I plant trees, do this, and that. So I become motivated to forget it."

"Do you find the people around you help you, your neighbors?" She connected my question with her and the sub-village's evacuation experience in 2010.

"Yes, in the past, the sub-village was the last place to be evacuated. So, a lot of victims there. At that time, people up there were those who were ready to run. Elderlies and infants were already evacuated. But before they run, the eruption has already reached them. People who were ready to run in the past said that they wanted to stay to give a chance to others. Some of them were volunteers. Kids were also there to help. We stayed here if anything happened they said but it turned out that they were hit."

"You said that you have three cows today. Do you have any targets you want to pursue in dairy farming?"

"I thrived the dairy farming at a very early time. I and my family had once fed 12 cows. Twelve cows so I had no time to take a rest for a very long time. I could only take a rest in the afternoon. Today, I feel that I do not want to be like that anymore. I want my thought to be relaxed and my energy to be saved by taking a rest. Not like I was in the past."

'As you said, work is only for entertainment now."

"Work is for entertainment. It is for earning money but I also look for something to do so I can be busy. What is important for me is I have some activities to do. I did this or did that. Whenever I take care of my home yard, I could become tired and have a good rest."

Then I asked her, why all farmers in the sub-village chose the Sarono Makmur dairy cooperative as their milk distributor agency. I wanted to know whether it was based on their own will or a directive order from their leader.

"It depends on each farmer. They can choose any cooperatives that they prefer. But, I no longer milk cows. In the past, when I still milked cows, I could feel sleepy and very tired. At this hour, I usually have to leave (laugh). Whenever the time comes, I milked the cows despite I was sleepy. Now, I am relaxed and I see that many people milk their cows. today. Those who did not milk their cows in the past begin to milk the cows."

According to my interviews with my other respondents, after the eruption in 2010, all dairy farmers in the sub-village stopped milking their dairy cows. They speculated that feeling disoriented contributes to this phenomenon.

"I assumed that it is because of your roles in giving your community training about dairy farming before. Do you also think so?" During the respondent selection process, the sub-village head told me about her role in giving consultations to the local farmers to enhance their dairy farming.

"Yes, I once succeeded in dairy farming. Managing dairy farming, I apologize, would not require a high level of educational attainment. One just needs to work in the field. As time goes by, he or she will be skillful, But, theories are also needed. If one has a high level of educational attainment, he/she must have theories."

My second interview with Puteri was held at her home at the relocation site. At this time, I begin my interview with traditions in the sub-village and how she viewed them.

"Do you think the Javanese traditions are important for your life?"

"Yes. For me, it is very important. Because all traditions have purposes and their purpose is to save all of us."

"What is the example?"

"For example, like yesterday, there was the kenduri ceremony where we used amben, banana, wajik to commemorate Maulid Nabi (laugh). So, those who had not yet been involved could join in; anyone who did not yet know about the tradition could learn. I have been involved in the tradition for a long time so I must have already known. I have been accustomed to acknowledging that this month is the time to use this or that. It becomes ordinary."

"Whom do you refer to, do you mean the youth?"

"Yes. Yesterday, we collected money from everyone to buy things for the tradition. Last year, each one of us brings something to make it appear like a tradition. Well, dairy farming has long been a business for each of us. It is a part of our routines but it does not necessarily mean that you need to leave anything else behind. You could join the kenduri after taking care of the cattle. For example, if we have the kenduri to attend at 9 AM, they can finish taking care of the cows at 5 AM, both for milking and collecting grass. They can finish doing both activities and arrive home at 9 AM so they can still join in. I was used to being actively involved in the family welfare development programs. Everything is simply like that: the cows are taken care of but other activities and families are also taken care of."

"Are you suggesting that dairy farming has become farmer's priority? How do you involve in this business?"

"I had a friend who was succeeded in dairy farming. When I just raised my own family, my friend told me, 'if you want to build a home, you must feed cows. If you have some money, buy a cow first so you could someday build a house.' It turned out to be true. I bought a house after I saved my money to buy cows. It turned out that the dairy cows

grew so fast. It turned out that after some time, I could finally build a house but still owe cows (laugh). I do not have to attain an educational degree. I worked in dairy farming and it turned out that I was able to fund my kids' education, build a house, and fund their needs."

"Do you think that Mount Merapi contributed to this?"

"Well, according to people's stories, Mount Merapi is the richest in the world. Because it often erupts and emits sand and rock. And, those sand and rocks can be used for buildings and are carried to every place. The sand and rocks are carried by river streams and people could take benefit by selling the materials."

"So I assumed, you must have been engaged in sand mining too?"

"Well, I never engaged in that activity, only those who are skillful. I am only a woman so I just cut grass. I built the house with my own money. The rocks were bought, and the sand was bought, although I live in the Merapi region. But, I bought the sand and rocks from my friends who worked in the sand-mining."

"In 2006, the Bantul (regency) experienced an earthquake. Then, I visited that area with my social group. People there told me that some houses still stood up and it was because the sand came from Merapi (laugh). I laughed, I was with my social groups that day. Other houses were built with sand that came from the seashores and they contain salt."

"And, how is your experience during the eruption? Would you mind sharing it with me?"

"In 2010, I was one of those who had the largest number of cows in the sub-village. But, when the status of Merapi was elevated, the government ordered that people and cows must evacuate. For those whose cows were only one or two, it would not be troublesome. I had more than ten cows so it was difficult. So my cows were not evacuated. So, in 2010, all my cows were hit by the eruption. I received aid for each cow that I lost. The baboon worthed eight million or something. The ndoro worthed five million while the pedet worthed three million. But, because the situation changed, then many people used the money from the loss compensation[66] to buy jeeps. At that time, tourism was booming as the volcano was still barren. About two years after the eruption, there was no vegetation so some people established tourism businesses. Almost four years later, grass grew and trees became green again then there was a cow donation from the government. Then, people began farming cows again. The government gave one cow for each household. People who were physically strong bought cows again. Some of them bought cows for their activity of collecting grass. Yes, indeed, most of them bought a jeep because if they wanted to cut grass again in the upper land, the land was still barren. But, others bought cows again depending on the situation."

[66] The regional government of Sleman donated about 23 billion rupiahs to compensate for the loss of each cow killed by the eruption in 2010 to about 1,352 dairy farmers. It was estimated that about 3,413 cows were killed because of the hot clouds and acute inhaling problems after being abundant by the owners (Syaifullah, 2011a).

"Do you think that the impacts still influence you today?"

"Yes, I still do. It is because the government compensated with the price that was not (discontinued). But, I think it is better to receive the compensation rather than not getting any. But the compensation was only enough for buying food, not for establishing the business again."

We stopped the interview for about 15 minutes as she wanted to boil some water for our drinks that afternoon. When she returned to the living room, I asked her,

"Then, what is it that motivated you to continue the business?"

"If did not do dairy farming again, I would have no jobs. Dairy farming is aimed at increasing my economy and allowing me to keep my home yard in the upper area to be undamaged and beneficial. If the number of cows increases or taking care of them is troublesome, some of them could be saved. If you save money, you could use them for emergencies."

"Where do you learn about this lesson?"

"Well, from myself (laugh). It is because I am a person who must fight. That is who I am. It is because as a little person, a suffering person, having no experience, I must command myself (laugh). I also learned from my friends and brothers. I was often invited by my friends from different groups or other businesses to exchange experiences."

"And, what knowledge from ancestors that you view is important for your dairy farming?"

"In the past, if people have an occasion, the cow can be sold to fund that event. In the past, during the time of my ancestors, if their children had an occasion such as marriage, the cows were used to fund it. If one wanted to purchase land, he also could sell the cows. When I was a little child, I remembered that my parents bought my brother land with a big cow. When it was dragged out of the shed, it collapsed because the cow was so enormously big. The land exists to this date. I remembered to this date that the cow could be sold again to buy land here and there. As the time goes by, I followed my parents' strategies (laughing)."

"What is it that you think one needs to do to sustain their dairy farming?"

"Collecting grass, when being done together with others, in my opinion, is the easiest job. You do not need to wear fancy clothes or to have a high education attainment level. The only thing you need is to work hard to be skillful since you were a kid. When you become an adult, you can then search for another experience. At that time, you can choose whatever job you want to do, and where to go. Going to school, for an instance, could be done at the same time as collecting grass. Then, once you graduate from

college, if you want to continue doing dairy farming, you already had the theory. For example, you go to school, but you already have a job. You go to school and at the same time, you also already have the asset to do whatever you want. To my knowledge, people my age who were mostly involved in dairy farming could fund their children's education. The kids went to school and their parents were still relaxed. They ngarit and at the same time taking care of their children to go to school."

My third interview with Ibu Puteri was conducted a week after our meeting at the *Labuhan* ceremony. When I arrived at her home in Karang Kendal, she was removing clothes hung on the cloth wire in her home garage. That day was bright, unlike the other days which were dominated by heavy rains. Karang Kendal is also quiet as most of its residents leave their homes for *ngarit* in the forest despite the increased eruptive activity of Merapi one night before. Ibu Puteri invited me to enter her living room. Nothing changed since my first interviews with her in November 2021. Ibu Puteri went to the kitchen and served me some snacks in a jar, bananas, and sweet tea. She told me that she received the news about the eruption from the WhatsApp group comprising the rescuer team members. As areas within five kilometers of the crater are close, she chose to limit her activities in her former home and let her husband collect grass in the yard for their three cows. My interview at that time was intended to learn about my respondents' narrative of human-made disasters namely the government's restrictions.

"Ibu Puteri, have you ever heard about the national park issue in 2004?"

"Well, I was once invited by my friends at an NGO to attend a meeting about the national park. People did not agree but it seems that the plan came from someone at the top and people became not strong. People basically did not agree. And there were many interests involved in the national park. Finally, the national park became a reality (laugh). I was once invited to a meeting at the office of the House of representatives. There were pros and cons to the national park. But over time, many people became employees of the national park and many people living on the slopes also worked for the national park."

"What positions did they fill? Forest police?"

"Forest police, or those who worked in the field."

In 2004, the Ministry of Forestry issued a law that stipulated areas within five kilometers of the crater become a national park. Activists, NGOs, and people forums in Mount Merapi went to the House of representatives in 2004 to urge the senates to refuse the ministry's law. They claimed that the law would exacerbate the burdens of the people as they relied on the natural resources in the forest for their living. The scope of risks in my research was not limited to the ecological but also socio-political dimensions.

> *"There were successful national parks, but they were also some that failed. When the national park issue in 2004 intensified, an eruption occurred in 2006 but the impacts only covered areas on the top; they did not reach areas below. Then, there were some opinions that people are not allowed to collect grass in the forest. Others said that people should be allowed to collect grass on the upper land because they could help maintain the trees. For the national park, what important is trees in the national park so removing the grass would be advantageous. Because many people farm cows, they were allowed to collect grass in the forest as long as they did not damage the trees. That was what happened. Then, when being in the forest, people could actually help protect the woods. When there is vacant land, people could help plant it with trees. Before the year 2010, perhaps around 20008, after 2006, Merapi emitted hot clouds that reached the woods below the crater, and all trees managed by the people who collected grass were burnt. After that, I was given some seeds by the national park. People were asked to plant on the upper land and carried the seed on their backs. I also once was asked to carry the seeds. On the upper land, they were planted, and then we took them again."*
>
> *"From where?"*
>
> *"From kampongs. In the past, the seeds aimed for the West sector were pooled in the Pelemsari Neighborhood II. After the west was cultivated, that is before the 2010 eruption, the seeds were planted in the northern part, from the Kinahrejo up to the forest. I remembered that I also carried the seeds and planted them. My husband divided the workloads into groups. So finally, it was my husband who was charged to plant the seeds."*
>
> *"Do you mean that he became the group leader?"*
>
> *"Yes, it can be said like that. My husband was asked by the national park to search for friends to plant and carry the seeds up to the forest."*
>
> *"How did you carry the seeds?"*
>
> *"The plants' seeds were placed in polybags. I carried them bit by bit. If I carried all of them at once, I was not strong. I took 10 polybagged seeds. If too heavy, I would take only 8 polybags. If they were still heavy, I took only 6 polybags. I traveled back and forth until they were finished. In one day, I could travel back and forth multiple times.*

But if it was the time to go to the cowshed, I went home. For instance, until 12 PM then we took a rest I was with other people, at least there were 10 people."

"Was it determined that there should be 10 people?"

"No, but yes. I mean they were selected because it required fitness to carry the polybagged seeds up to the forest. People who did not feel fit would not be able to carry them."

One seed polybag with the dimension of 30 cm x 30 cm could weigh at least 1 kilogram. It definitely would require a strong person to carry 6-10 polybagged seeds at once to higher ground.

"Since in the past, my work had been only that, ngarit, plant trees, and go up to the forest by gendong (i.e., carrying a thing on the back). My story is long. Since long ago, I had been a person who lived in prihatin (i.e., suffering) so I must fight."

Carrying the state's polybagged seeds for her was something that she was familiar with as it had been a part of her life since childhood. Her strength in carrying the seeds, she assumed, must have been attributed to her suffering since her childhood.

"Were people also participating in deciding the plant species?"

"Well, people once asked for particular species but even if they asked while the national park wanted the thing that was already available, nothing could be done. We accepted what was available. If planting trees like salam and dadap, they must be useful. If pine was planted, there would be full of leaves. When planted pines, the space between them should be rare. If we plant puspo, it would not dirt the grass. Pines killed suket (i.e., grass). Grass would become dry if pines grew. The pine stands in 2010 in the forest were already big. They were planted when my father was a child. During my childhood, the government officials from the forestry also cropped something for the reforestation program. Then, in 2010, all pine stands became big trees."

"So, they killed suket, right?" I highlighted this as it presents the conflicting interests between the people and the government in terms of the tree species in the forest.

"Since people do not like dense pine stands so the seeds that were planted after the eruption in 2010 were those besides pine. Puspo was favorable. The trees from puspo could be used for abahan (i.e., building constructions).

"How do you and people feel about the issue of the national park at that time?"

"Well, I was anxious, and people were afraid. If the national park agency governed, they thought that they were no longer able to collect grass or do this or that including passing through or walking on particular paths due to prohibitions. But over time, the access was actually allowed. Well, pros and cons always existed. They said that once the national park agency governed, there would be a fence, and accessing the forest would need tickets."

"How about the eruption that recently occurs, do you feel anxious too?"

"Well, I don't. Because people here were those who lived in the nearest place to the crater so when Merapi becomes active like that, we no longer feel anxious."

"How do you receive the news?"

I had the WhatsApp groups of the rescue teams who watched in the monitoring posts. This morning, I saw on my mobile phone that Merapi became active last night. It was from WhatsApp but I have not yet checked youtube because the signal was very poor. No signal here so I could not see it."

Most people whom I interviewed often, if not regularly, watched the live Merapi channel, Merapi Activity Live Streaming, on their mobile phones. The channel shows the raw data of the volcano's seismic, and visualization transmitted from the national disaster agency's monitoring stations around Merapi. Raw because the data had not yet been gathered, analyzed, and interpreted by the agency's volcanologists. Besides youtube, people could also access the updates on the volcano's activities through the agency's social media of Twitter, Instagram, and Facebook.

"I see myself as someone who, what should it be called. I mean my story is long. Before the eruption in 2010, I received meeting invitations every couple of days from many places to discuss Mount Merapi. But, the eruption in 2010 had made me the victim of the greatest loss. Doesn't it look like a test? Then, I was once thinking that before the eruption in 2010, the last meeting in Kali Adem, many people attended it but they did not find snacks anymore. It just felt not right. The meeting was held as usual but in the middle of it, one by one left the meeting. Within less than 5 days, the largest eruption occurred. The disaster agency once disseminated information that there would be this, this, and this. People became more anxious if something passed over their heads. Merapi's eruption could flow above and below through the river valleys. It would be scary if there are people on the upper land because it would be dark and they will run afterward."

"Did you also run after the meeting in Kali Adem?"

"Oh, yes. All of my friends went home and ran away so I also followed them. I felt very sorry for the host and she became all alone. Nobody gathered after that. It felt very uncomfortable as people just thought about their families. Some walked here and there and watched the sky above. If they sat in the meeting, it felt so uncomfortable. People just walked around here and there. The last meeting was in the Kali Adem because people thought that the eruption would not reach this area. And stories in the past about Merapi also said that. But it just felt very wrong so people became more anxious and more uncomfortable. And, the eruption finally did reach the area."

"So, it was not the same as what the ancestors said?"

"Yes. The disaster agency said that according to the activities of Merapi that had ever been recorded, an eruption like that one occurred every some decade. And small

eruptions occur every 4 and 5 years or every 5 and 6 years, not every 50 years. Sometimes it was like this, the eruption. For instance, it erupts this year with the direction towards that. The eruption in the following year went there, the future eruption would go there. I had notes from the agency when attending a meeting in the Village office. The notes were about the eruptions in the past that include the years and the number of victims."

"So, the eruption had its cycle. And, how about the Geger Boyo. What do you think?" Geger Boyo was the feature of the volcano's dome that grew after the 1930 eruption. It became a protective wall to the villages on the southern flank but it collapsed during the eruption in 2006. Many assumed that its presence had shaped the local's myth about the eruption.

"Geger Boyo was said as a strong fence. But it was in the past that people believed it was strong but it actually was not strong. So it was collapsed."

"The ancestors believed that it was strong. Why was it not strong then?"

"Merapi emitted a large eruption every hundred years. The eruption in 2010 happened every hundred years. Not all people could live until 100 years. If the eruption was just small ones, unlike the eruption in 2010, maybe geger boyo still existed. But if over time the volcanic materials emitted became larger, the geger boyo became weak. Over time, the geger boyo was hit by hot lahars so it became weak and then jeblug (i.e., collapse).

"And, about the national park, do people also feel angry about the national park?"

"They were not angry but there were only pros and cons, that's all. Pros and cons were ordinary things and finally, the national park became a reality. But some parts of the national park did not become like that because they were burnt."

"How could they be burnt?"

"It could be because Merapi had spirits that resided in it. So, when the national park agency had plans, those who waited in the Merapi did not allow them to happen. Then, there were fires or the lahars."

"Do you mean the eruption in 2006?" I was referring to geger boyo which we talked about earlier.

"The eruption of 2006 only damaged areas around the bunker[67] *and the complete burn that I referred to is the eruption in 2010. The national park issue intensified in 2008, after the eruption in 2006." She clarified the chronology of her narrative about the burning of the national park.*

"So, do you see it as a sort of warning?"

[67] Bunker is a tourist object in Kali Adem at the southern flank of the volcano, located about five kilometers from the Merapi's crater. People associated the bunker with the incident in 2006 where two men tried to escape from the hot clouds by hiding in the underground bunker but then were trapped by the volcanic debris (NEWS, 2006).

"Yes, it looked like those who resided in the Merapi volcano did not allow it thus it was burnt. It also seemed that those who resided in Merapi felt empathy if it became a national park. People who come to Merapi usually go through some streets to some areas. In areas at the front of Mount Merapi, people mostly wanted to isolate themselves for a while. If they desired something, they could stay on the upper land and do some activities there like searching for traditional medicines if their family members are sick. They said they could find Tambo there."

"What does Tambo mean?"

"Tambo is medicine, some kind of medicine. Most people who come to Merapi usually had some wishes for being successful in school and jobs. So, if they want or plan for something, they come to Merapi. People who want to pass an examination and the examination will be held on the following day, for instance, they will pray on the upper land. So in the future, they can graduate or the school runs smoothly. Many people will pray like that on the upper land."

"Do you mean places like Labuhan harbor?"

"Yes, it could also be on that place. On the lower land, there are also some posts or particular places where some people place tributes and spend their nights. In the past, they went up to the north in the afternoon and spent their nights there. They went down the following morning. It was what students usually do. Also, some young people who wanted to be rich, would go up to the volcano and pray."

"Do you also have the same experience like this?"

"I also did the same thing. Because, since I was a kid, I had lived in suffering (i.e., prihatin). Then, when I was a kid, I had been left by my father. Since then, I lived with my siblings and my mother. And I am a person who just accepts what happens. Then, one day, I was asked by Mbah Maridjan to register as an abdi dalem. The impressions about Mbah Maridjan as an Abdi dalem, well. Then I thought, sesok iki nek kuwe gelem iki, ono berkahe (i.e., in the future, if you accept the advice, there will be a lot of blessings). So, I thought what important was to get blessings."

"Do you feel the blessings then?"

"Yes. I think, there were blessings. Blessings do not come at once. The blessing could be in the form of health while souls belonged to the Almighty God. And from ngarit, I could build a house, and pay for my children's education. That is why they are called blessings."

"So, do you feel more anxious about the government's policies?" I challenged her to understand her perceived risk of the two disruptions: eruptions and government policies.

"I feel more concerned with Merapi. Government programs sometimes become reality and sometimes they do not (laugh). But Merapi belongs to God so if it becomes angry, it is just angry. We also belong to God, Merapi also belongs to God. Then, if all belong to God become angry, that means they are being active. Every place has its possessor."

"And, there is nothing we can do?"

"Hmm."

The cognitive map of Puteri shows her daily route from her current home at Karang Kendal (A) to her former home and home yards (J) from Sunday to Monday. Here, she rebuilt a house by utilizing the remaining foundation structure to take a rest whenever she comes by. The around one-hectare home yard was transformed into a land where she could practice the "*tumpang sari*" system by cultivating vegetable crops, grass, and a profitable tree stand. After the eruption in 2010 and her concern of not being as strong as she used to be, Puteri cultivated grass in her home yard and different from Moga chose not to collect grass in the forest. The home for her was convenient as it allowed her to feel like in the past again. It is worth noting that Puteri had lost her husband and children, including twelve cows, making her the eruption victim with the highest loss in the sub-village. The former home that she retained was the only channel that enabled her to re-visit her memory of the past, before the eruption in 2010. There are strong elements that serve as cues for her wayfinding. The symbols E, F, G, I are the jeep tour operators along the main street Bebeng and two tourist sites, Merapi Garden (H) and Maridjan's house in Kinahrejo (L). KDM stands for Kali Adem, the area where she attended a meeting in 2006, a few days before the eruption occurred.

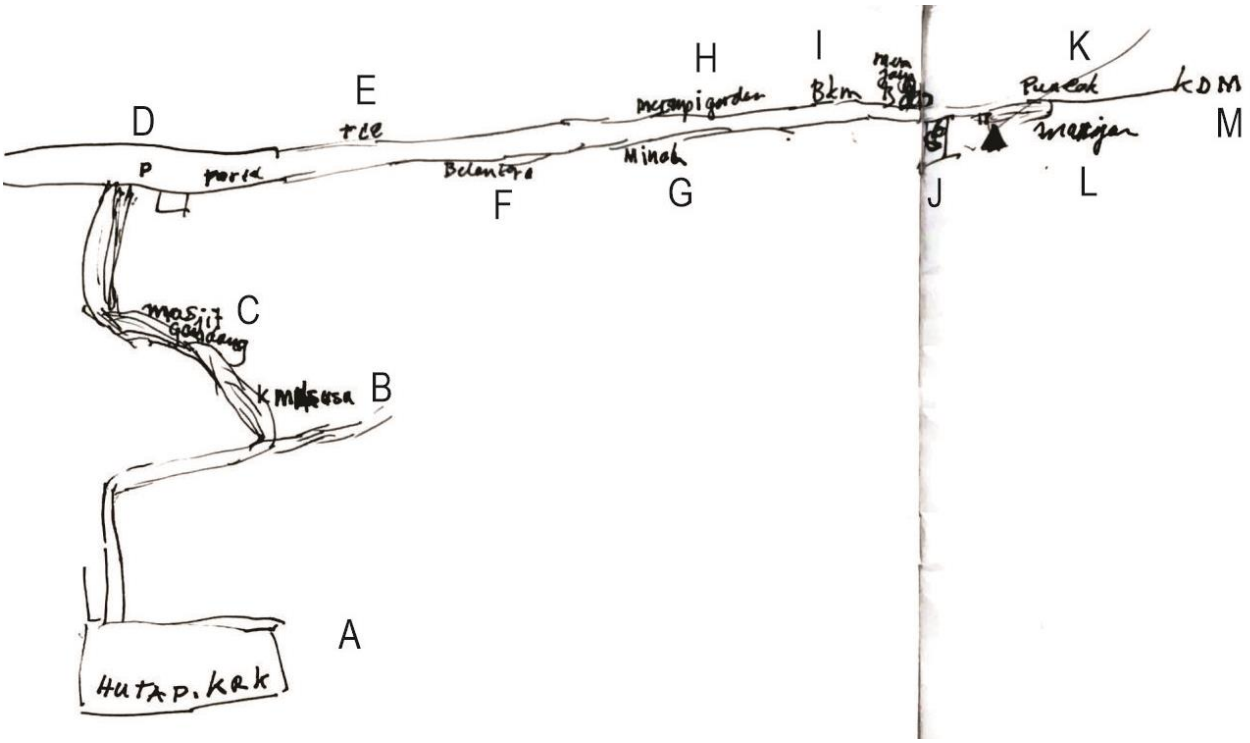

Fig.3.5. Puteri's cognitive map of the daily route in Mount Merapi

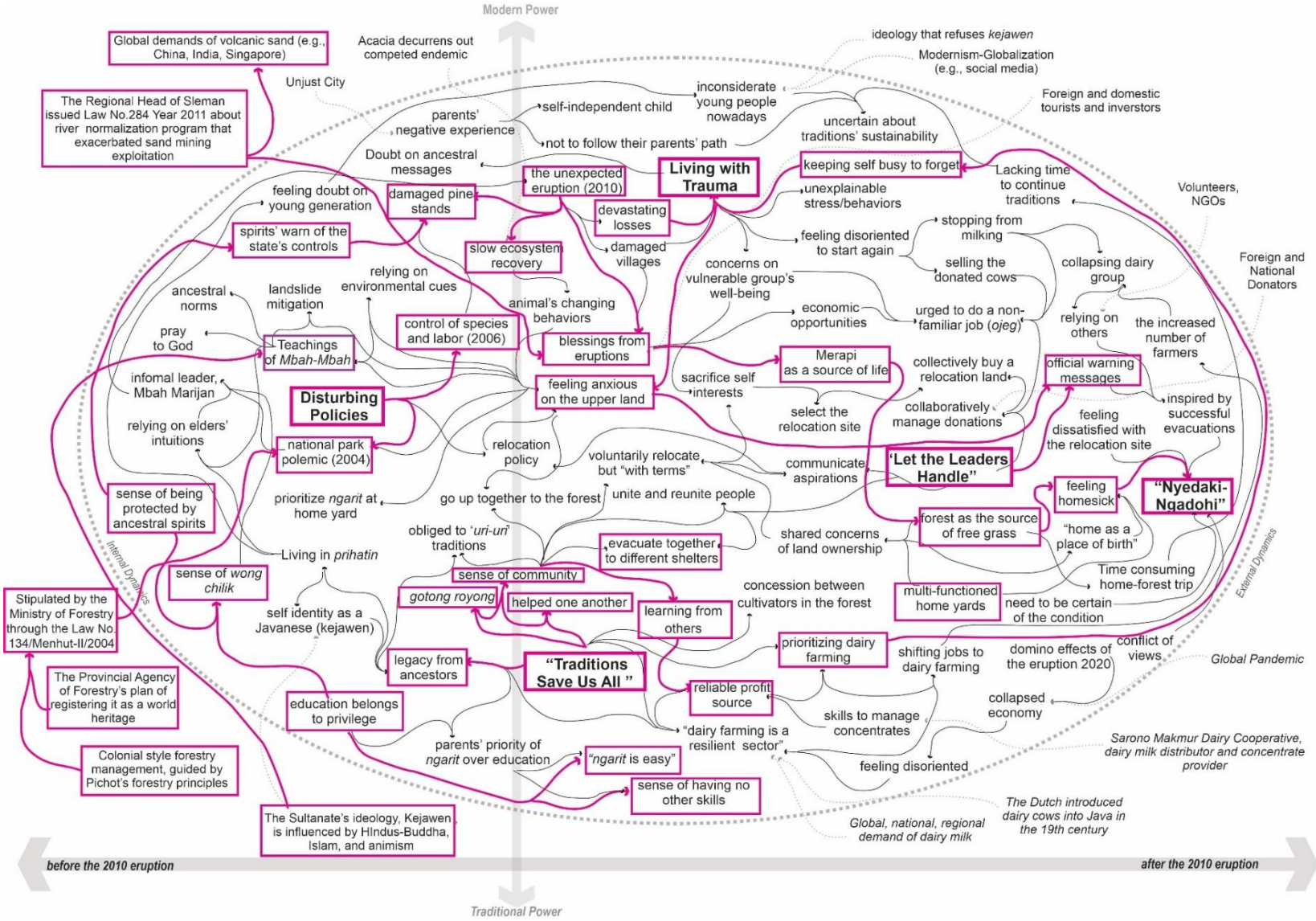

Fig. 3.6. The pattern of themes of Puteri in pink-colored boxes and lines is based on her testimony in 2022.

3.3. Themes of Community Resilience

Oliver-Smith and Hoffman (2002) argued that disasters can uncover the place attachment, people's traditions (e.g., laws, customs, practices, oral stories), and social grammar (Oliver-Smith & Hoffman, 2002, pp. 10–11). In order to reveal their adaptive capacities, I use the hermeneutic phenomenology to articulate the life experience and the relationships of the Pelemsari community and meanings they assigned to those experiences.

The Pelemsari community based on my research findings is the exemplar of a resilient society. Particularly since the devastating eruption in 2010, this close-knit community strives to adapt to the undesirable changes while at the same time, conserving what they believed should be unchanged: "the ownership of their ancestral lands." Throughout the phenomenological analysis, I was inescapably exposed to tremendous information and insights given by my respondents, not to mention the unprecedented contexts of my fieldwork (e.g., COVID-19, eruptions from 2020-2022) that complicate the interpretations of their lived world. While I enjoyed the comprehensiveness of their lived materials or responses, I must remind myself not to be drowned in them and use the aforementioned frameworks as tools to identify the themes most relevant to the resilience issue.

While I was deeply indebted to all my respondents for their enthusiasm and insights, I found the interpretation made by one of my respondents justifies the Pelemsari people's behaviors and my advocacy about living in a volcanic environment.

> "Well, for the Merapi community, disaster is an ordinary event. Ordinary as people have understood Merapi. But there is a source of life so when Merapi is threatening, we go away from the volcano. In other words, if Merapi is in that condition, we should not fight. But once Merapi becomes beautiful, becomes better, it can be our best friend again. Yes, indeed. For the government, the

> volcano is prone to risk. It is true but we do not have to act like the disaster occurs all the time, it does not. Merapi emits something but then it stops. It will then return to us, and get closer to us again. We need to really know the condition. If it is said that the volcano is dangerous, we can leave for a while or go away. Once it gets better, well, people do live there."

In my phenomenological diagram, I incorporated this excerpt under the theme *nyedaki ngadohi* or get close and go away from the volcano as it is also shared by my other respondents, either those who chose to return to their former homes or those who remain in the relocation site, Karang Kendal. With respect to resilience, the themes most salient and shared among my respondents include "place attachment", "sense of community", and "knowledge."

3.3.1. Theme 1: Place Attachment

A. Excerpts

The Pelemsari community strove to adapt to the undesirable changes while at the same time, maintaining what they believed should be unchanged: "the land ownership." The following excerpt shows Aman's view of relocation as what would disengage his community from their meaningful land. It is worth remembering the context of this interpretation was the government's relocation policy in 2011.

> "Because our origin is from Merapi. Our place of birth is in Merapi so we would not leave our land. It is difficult, you know. To forget our land is impossible, it is impossible. We cannot, although we now live in relocation, it does not necessarily mean that I do not want to go to my former home anymore, do not want to go to the place of birth. It is impossible. The main point here is if I do not go up for a week, it feels very long. Well, what am I doing here? Yes, sometimes I do not do anything but just look around. That is only it but I feel very satisfied. Hopefully, I could do something here like clean the yard, plant anything in the yard, or cultivate whatever the crops that I want to grow. At night, if I feel very bored, I will go up (from the Karang Kendal relocation site) and sit here. Just being silent and without anyone. When morning comes, I will go down. But I feel very pleased and satisfied. Satisfaction really depends on our hearts."

Aman criticizes the rigidity of relocation and offers a more flexible way of thinking about the policy. He did not disagree with relocation but people's ownership of their ancestral lands should not be sacrificed. The reasons underlying his argument include "home as the place of birth" and home as "the place to express self (i.e., cleaning the yard, cultivating crops, isolating self)", the two factors that belong to the place attachment construct. Aman then explains the "homesickness" that he suffers if he is not able to visit his former home for a considerable amount of time. The insecurity caused by the homesickness could only be compensated with his visits to the place despite he did not do anything there. The sense of satisfaction soon replaces the homesickness after his visits.

Aligned to Aman's interpretation of land, Wisnu emphasized the meaning of land as a response to the relocation policy following the eruption in 2010.

> "Because the land is the ancestral heritage that will sustain our descendants. Land nowadays is different from the past as it could be utilized for growing grass, trees, and crops like chilly, and other uses. But if the government takes control over our land for the forest, this would mean that we automatically cannot do anything except collect the grass, similar to what we do in the forest. To plant trees for being cut once it grows will not be allowed, similar to the forest."

Wisnu gave a complex interpretation of the meaning of land spatially and temporally. First, he defined ancestral land by linking it to the past (i.e, the heritage from the ancestors) and the future (i.e., descendants). Ancestral land is a critical asset for descendants. Second, land has multiple functions that tend to expand over time for grass, trees, and crops. And, not less importantly, the land is where he could express himself or gain freedom, a value that he could not gain in the forest.

Rejo interpreted the meaning of land by using a metaphor of cassava sticks to stress the significance of land to human lives and thereby is worthwhile to strive for.

> "Well, the land is like a heritage, in other words, a source of life. Metaphorically, if we stab cassava sticks into the soil, it will produce fruit that can make us alive. The value of land is like that. If we think about it, eating cassava can make us alive although it's modest. it's able to save lives. that is why unless you really have to, do not let it go away. Do not let it go away."

Krasan's narrative is a compelling case of one's deep emotional ties to place after a disturbance. Only five months after the devastating eruption, Krasan returned to her former home while her fellow villagers still lived in the shelter.

> "I lost my brother and my house. There was absolutely nothing left after the eruption. Back in my house, there were small wall ruins. I was already here. So, I covered them with tarpaulin. Many people came by and noticed me. They said, there is a person living here. Other people from Borneo were also curious. They just were curious and asked me what I was doing here. I just said, nothing. How was it possible? I said, why not. Afraid? No, I am not."

Krasan was resistant to all comments directed at her and did not feel that she would need to explain her action. Nevertheless, as seen in the following excerpt, the loss of her youngest son during the eruption might explain her attitude and action.

> "I was sad at that time. I only had two sons. The oldest one had his own house so I lived only with my youngest one. When he passed away, I felt sad. We lived here by ourselves. I could not explain how I feel (laugh)"

Grieving for her late son, she sometimes recalled the memory of him. One night, she wandered around the forest until she reached the main road. There, she sat alone by herself and went home. It gave Krasan a moment of relief although once she arrived home, she still could not sleep.

> "Yes, one night, I traveled around the forest. It was midnight Friday Kliwon. I walked until I reached the main road up there. I went up to the forest and down towards my home. I just sat there; nobody was around (laugh). Only playing, I felt convenient. Walking at night is pleasing. I did not feel tired. Really."

Krasan's narrative of her home is inseparable from her memory of her youngest son whose picture was hung over her living room's wall. Despite her negative experience of the eruption in 2010, her desire for being close to her home does not decrease.

Homesickness could result in a critical level of stress, leading to a serious threat to her well-being. The following excerpt still belonged o Krasan shows the phenomenon.

> "I once was very sick. The sickness was very burdensome. I did not recover until I went home. If I did not come here, I would have never recovered. Being here really makes me feel convenient."

Puteri, similar to Krasan, feels convenient whenever she goes up to her former home from the relocation site where she currently lives. I asked how she feels when being at the former home.

> "Convenient (laugh). If I am at my former home, I feel very convenient. It feels like living in the past (laugh). But, if the cowshed was on the upper land, I have to rebuild my own cowshed. Here, the cowshed was already built by the government and could be immediately used. I feel happier with this cowshed so I could meet my friends."

My respondent's narrative here shows how a home is interpreted as a convenient place in the sense that she is able to "feel living in the past". Home, therefore, is a "nostalgic place" that could remind her of events in the past, the happy and the sad ones. After losing twelve cows in 2010 which made her the victim with the greatest loss in her sub-village, it is understandable if she linked home with the availability of a cowshed. Here, she refers to the free and collective cowshed at the relocation site Karang Kendal.

Returning to the former home was obviously the only cure for the sickness that she suffered. Further, the stress was exacerbated by the limitation she encountered while staying at the relocation

site, Karang Kendal. I asked her why she did not stay at the relocation site and with a high-pitched voice, she said,

> "What could I do if I were there? If elderlies are silent, and not doing anything, they will be stressed. They must do something."
>
> "But, could you still do something in Karang Kendal?"
>
> "No, I could not. What could I do there? The house is very close to one another. I do not have land there. What I mean is a land like the one here. Here, I have land on which I can do anything or the forest access to search for something."

From this excerpt, we can find Mbak Krasan's dissatisfaction with the relocation site. In her view, the relocation site failed to facilitate her needs for performing her daily routines. Doing nothing, she pointed out, would cause stress, something that she definitely tried to avoid. Based on this excerpt, "the availability of home yard" and "the proximity to the forest" are two conditions that make her former home more satisfying than the relocation site.

Moga, similar to Krasan, decided to return to his former home after two years of spending his life at the relocation site with his family. Choosing to be separated from his family at Karang Kendal, Moga spent his days and nights at the former home. The home once only served as a transit place for his activity in the forest gradually became his permanent residence again. I asked how he feels about his former home.

> "Because it was convenient. In the past, when I farmed my cows in the downland, I came here only to collect grass. Then, I wanted to spend my night here. Over time, I became more compelled to stay much longer. My sister had stayed here before me. I said to myself, I will stay here because my sister still stayed here. Then, I lived on the upper land. Well, it felt convenient. That is why my cows were then moved to this area. I repaired my cowshed (laugh), next to my house."

From this account, Moga's decision to return to his home was also influenced by his desire to accompany his sister who had already lived there. As we went through the interview, it was revealed that the convenience is attributed to the former home's proximity to the forest

> "Is this the reason why you feel not comfortable there?"
>
> "Not really. Not only that. If I farm my cow here, it will be close to the forest. Being close to the forest, that is all. There are no problems with the shed. No problems because people live in relocation. the place must be like that and we have to accept it. It was built by the government. Alhamdullilah."

My other respondent, Rejo, examined the advantages of his former home after being asked about his views of the relocation site. I was intrigued by the terms "social burdens" in his narrative as this indicates an undesirable social consequence of living in an unfamiliar built environment.

> "When living in the upper area before the eruption, the grass plot was very close to my home and each house was large and there were no social issues. The social issues have not yet become burdens."
>
> "Could you please elaborate on social burdens?"
>
> "What I meant with no burden in the past is each one has a house that when they want to throw away the garbage in their territory, for example, would not be a problem. Only from the health perspective, it was not good. But after being here, throwing away garbage even in front of the house will cause a problem."

In his views, "a long distance to the forest", 'limited size of the house", and "social issues' are attributes that make the relocation site less desirable than his former home. Further, he sees social issues as inevitable social implications of a relocation that forces the Pelemsari villagers to better adapt to the new setting. "Burden" expressed by Relo in this context is inseparable from his being as a village official in Pelemsari or Karang Kendal relocation site.

B. Explications and Analysis

Ngarit in the Pelemsari villagers is embedded with dairy farming, a sector to which my respondents devoted most of their time to take care of their dairy cows. So important were *ngarit* and dairy farming that the skills were passed down to the next generation, promoting not only a "sense of belonging" but also a "sense of having no other skills" after the devastating eruption severely hit their assets. *Ngarit* and dairy farming had long influenced my seven respondents' lived world since their childhood and shaped their identity as Merapi's farmers (i.e., place identity). Forest is inevitably seen as the source of free grass that facilitates these traditions to sustain (i.e., place dependence). In chapter 3, we could read the testimonies of Aman who must confront the longstanding view of his sub-village about *ngarit* to reach his dream of education; Puteri who throve to become a successful dairy farmer but then must lose everything that she had in 2010; and Moga who witnessed the dynamic relationship of the state and people in the managing the forest and decided to return to his former home to get close to the forest.

Place attachment (i.e., people-place relationship) theme emerged from my respondents' reflections on the meaning of home and lands in Mount Merapi. The sub-themes of the place attachment theme unfolded here are place identity (e.g., "home as the place of birth"), place dependence (e.g., "home for self-expression", "source of life"), legacy, asset, nostalgic place (e.g., "feeling living in the past"), effects (e.g., homesick, satisfaction, dissatisfaction), and actions (e.g., visit, return, defend).

When dealing with threats of undesirable policies (e.g., relocation), the first three respondents use the subthemes of the place of birth, source of life, and heritage to resist. Using these subthemes, Aman tries to convince us of the implications of the separation from home on the victims' well-

being and encourages us to re-thinking relocation. The effect of this is homesickness which at a particular level could lead to stress and unexplainable sickness as once experienced by my other respondent, Krasan. So deeply rooted is her emotion in her former home that she decided to return to the place, regardless of the risks of the volcano even after the eruption. Living at the former home as she confessed allows her to continue *ngarit* and dairy farming, an activity that according to my other respondent, Puteri, would keep her busy, thus, helping her overcome the trauma.

Respondents' dissatisfactions with the relocation site come as the effects of the failures of planning in accommodating the victims' needs and facilitating the sustainability of their traditions (e.g., *ngarit* and farming). Distance to the forest, home yard, and size of the house, according to them, are three attributes of relocation that in the cases of Moga and Krasan promoted their actions of returning to the upper land.

It is worth noting that relocation can be counterproductive if the residents face challenges in adapting their lifestyles and cultures to the new setting (Lin & Lin, 2020, p. 3). Social issues in the relocation site that Rejo pointed out deserve significant attention. Social issues signal a new threat to the sustainability of the residents' livelihoods. Here, Rejo's use of 'throwing garbage in the home territory' illustrates the challenges of his people's adaptation to the relocation site Karang Kendal. Routine community meetings are ways that help them solve the problems and avoid any potential conflicts to arise in Karang Kendal.

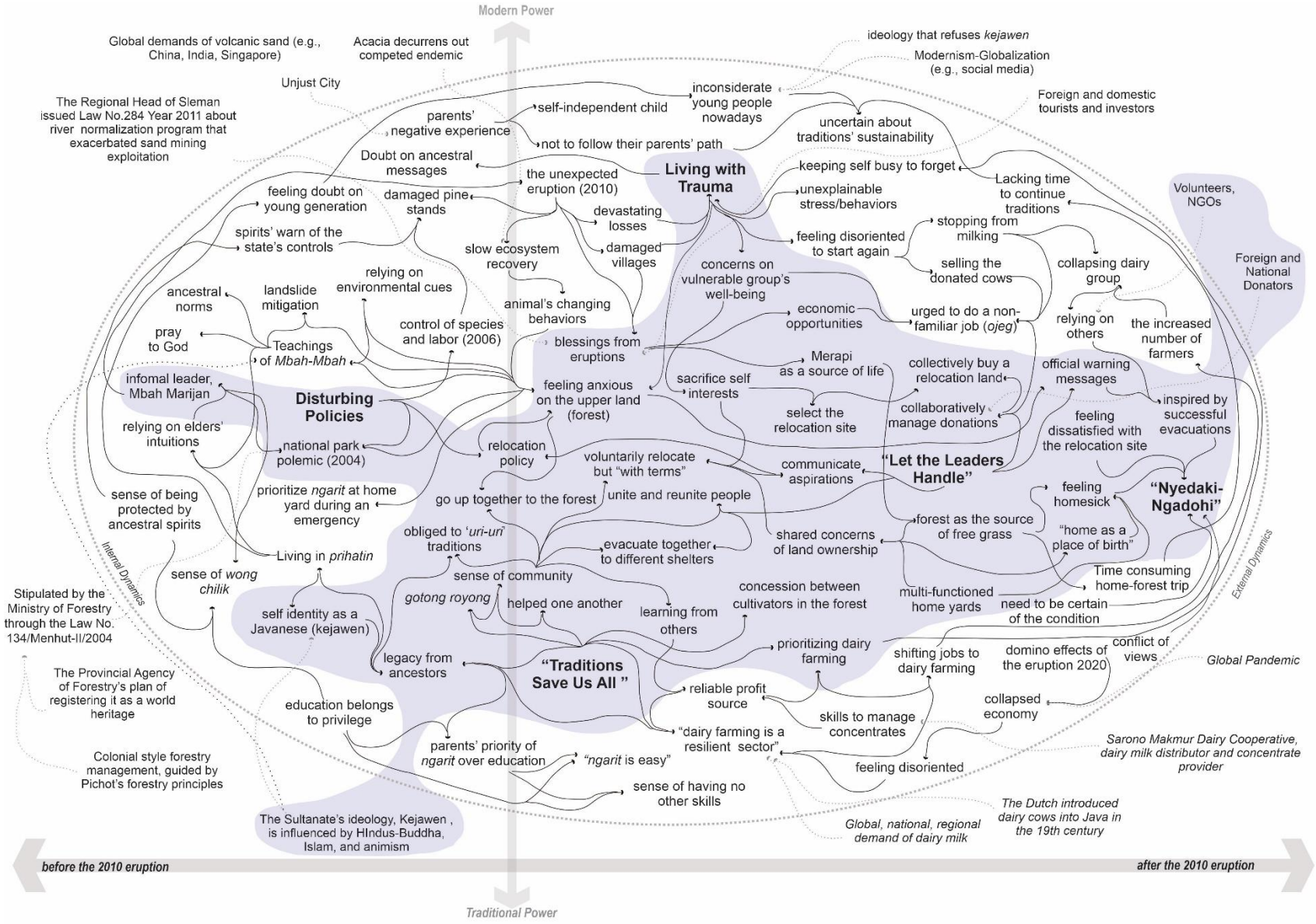

Fig. 3.7. The emergent theme "Place Attachment"

3.3.2. Theme 2: Sense of Community

A. Excerpts

The eruption in 2010 was obviously not the last test of the resilience of the close-knit Pelemsari community. In fact, the event forced them to encounter another disruption coming from the state, namely the relocation policy. Their prior dynamic relationships with authorities that were not all harmonious, coupled with the relocation experiences of other sub-villages, soon promoted an anxiety about the legal status of their damaged homeland.

The following excerpts showed how their traditions helped the Pelemsari people survive the terrors of multiple disturbances after the eruption in 2010. In this sub-section, I will begin with my last interview with Rejo at his home veranda at the relocation site Karang Kendal. Here, Rejo reflected upon the success of his community to finally rebuild a new life at Karang Kendal. I asked him what it is, according to his view, that allowed this to take place.

> "What do you think caused this to happen?"
>
> "It was a fruit of cooperation, a result of working hand in hand and being together of the victims of the Merapi eruption who, whatever it caused, tried to survive and to have their own money to *gotong royong* (i.e., work together) collectively buy this land."

Rejo answered my question enthusiastically. He could not hide the expression that he too often reflected on this, yet, was still surprised with the people's achievement. He used the terms "working hand in hand", "being together", "*gotong royong",* and "collectively" to emphasize that only from their strong sense of community could they finally restart their new life in a new environmental setting.

Then, I, acting like a co-collaborator, shared my own view of the harmonious life that I captured each time I observed the Karang Kendal just like that time. Then, he said,

> "Here since the first evacuation, we had been gathered, had been solid. Going there and there although for a while we were separated and then within hours, within days, we re-gathered. "

From my interview with Rejo back in 2021, I learned that the Pelemsari villagers, depending on the magnitudes of volcanic eruptions in 2010, must evacuate to five different shelters—the Umbulharjo Village center, the elementary school in Wukisari, Al Qadir Islamic boarding school, a house of a political figure and entrepreneur, Agus Kholiq, and finally, Plosokerep shelter. Rejo reflected on the togetherness of his community by associating it with their evacuation experience in 2010. Their decision to stick together during the evacuation evidenced that their sense of community is solid and the eruption in 2010 was a test of this.

My other respondent, Moga, shared his story of reuniting with his fellow villagers after being separated from them for a while.

> "That time. I evacuated in the Kalasan district. There were four or five households. Then, I was called by my neighbor in the Sleman. He said, *Mbah*, do you want to come here? If you want to, I will pick you up. Yes, I do, but if you want to pick me up please bring a car because there are some other families too. Then we were picked up from Kalasan to Sleman. In Sleman, *sak dusun jadi siji* (i.e., the whole sub-village became one). We were at the house of Agus Kholiq.

Moga's testimony of being separated and reunited evidenced Pelemsari's solid sense of community during the crisis. *Sak dusun jadi siji*, which literally means "the whole sub-village became one", suggests his being amazed by this event.

It is worth visiting what Puteri once said about her community's social ties. I asked her in 2021 about how the social network in her sub-village contributed to her life after the eruption. She immediately recalled the evacuation process in 2010 to address my question.

> "How does the social network here help you, for example, your neighbors?"
>
> "Because the part of our goal is to help one another. People who were ready to run in the past said that they wanted to stay to give a chance to others and that they wanted to wait to help others. Some of them were volunteers. Kids wanted to help those in the upper land. We would be here if anything happened but it turned out that they were victimized by the eruption."

In this excerpt, we can find that Puteri perceived the social network as "helping one another" which when dealing with disruption, one's sacrifices for other's safety could come as the consequence. She projected the meaning of the social network as what helped her and other villagers survived the eruption. Aligned with this, Aman once gave meaning to the victims from a spiritual standpoint.

> "Of course, there are victims and hopefully, they become *surada*, meaning that because they struggled, they become soldiers. Those who died, hopefully, are accepted by the Almighty God. Those who are alive must live and hopefully are given a fortune, ease in getting the fortune, and health. We pray for them so they who live in another world could become what we call holly."

My other respondent, Aman, described how the concern for the well-being of traumatized people, particularly, children forced them to collectively decide on a voluntary relocation. Aman's account was generated after I evoked his further thoughts about the people's choice of accepting the concession with the government who wanted the certified homes to be un-inhabited[68].

> "But, don't you think it will be better if people can still occupy their former homes?"
>
> "Well, indeed. But, some people are really traumatized. Some people refused to return. They do not want to stay here[69]. Particularly, the young people. None of them wanted to return because, during that event, they were still traumatized. At that time, they were just kids. For example, my children. At that time, they were

[68] Despite each resident of Pelemsari having held the certificate of his/her former home, the government regulated that the home should not be inhabited and could only be occupied for non-inhabitation purposes (e.g., plantation, farming).

[69] We held the interview at his former home on the upper land. I made this note to avoid readers' confusion about what his term "here" refers to.

> in junior high school and elementary school. They were only kids, very traumatized, very afraid."

From this excerpt, we find the people's priority on the well-being of the traumatized children and detect that there must have been some people who wanted to return to their homes. Advocating the sub-village's consensus of voluntarily relocating for this group thus means surrendering their own desire for a bigger interest, the sub-village.

It is worth noting that the government offered each of the affected residents a 100-square-meter land to compensate for their damaged homeland. The land, according to Aman, would be integrated into the national park plan. Aman, further reflected on the people's resistance as we can find in the following excerpt.

> "People nowadays are courageous but for the right cause. In other words, they fight. If you are right, then, what should you do? I think it is right that nobody wants to give up his or her land for a 100-square-meter land, who would want it? Besides that, for people who only had a few lands, where should they find food? Because if the lands are still theirs, they could grow something or do anything on those lands. And, how if they become a national park? It is not a national park but the land belonged to the government, why can we just say it that way."

The people's concern for their ownership of the ancestral lands made them "become courageous" to "resist power." Aman here stressed his concern for the future of landless people who relied on their ancestral lands to support their lives which shows "solidarity". The last statement of Aman in this excerpt suggests a longstanding distrust of the government. He sees the national park plan as the state's justification to legitimize its hidden agenda which is absolute control over the forest and peoples' lands.

When dealing with the oppressive power, meetings based on Wisnu's testimony were regularly held by the community.

> "We coordinated through meetings to find ways, so our upper lands were not controlled and managed by the authority for the national park expansion. Because the land is the ancestral heritage that will sustain our descendants."

The shared interest or concern for land ownership mobilized people to organize themselves and resist the oppressive power. Through community meetings, people coordinated and collectively found a solution for their livelihoods.

I asked him whether the Pelemsari community continues to perform the meetings after the eruption. He said,

> "After the eruptions in 2010, the Pelemsari or Kinahrejo community, as we lived at this relocation site, must not fight or separate from one another, unlike other people. People in other kampongs were dispersed over different shelters. Unlike us, they were not united in one place. If we could unite, it will be beneficial for managing the administration or if anything happens, we could easily manage it."

Wisnu views the community meeting as what contributes to reducing potential conflicts that may present in their new environmental setting while the people's unity in one site would help manage the sub-village's administration and coordination. His reflections came from his observations of other villages' relocation experiences.

Fajar[70], who was present during my interview with Wisnu, added her concerns about the well-being of vulnerable groups (elderlies, widows) as what motivated the people's cohesion. She said,

[70] Despite Fajar was not one of my research respondents, I took into account her insights into my dissertation. Her presence was a part of the natural setting of my interview with Wisnu; the setting that was advocated by phenomenology and ethnography.

> "After the eruption, there were many people who became victims, There were many widows, elderlies. So, if we separated from one another, how about them? What I mean is most of us are like brothers and sisters."

While Wisnu reflected on the community meetings and people's cohesion from their functionality (i.e., administrative management, coordination), Fajar introduces an affection/ emotional element into those terms (vulnerable group's well-being). Leadership played key roles in the relocation negotiation process with the government and the people's voluntary relocation.

> "We just followed our leaders to handle it. Basically, people do not agree but those who channel our aspirations were our leaders like the head of the sub-village, leaders of neighborhoods, and youth organizations."

Another testimony belongs to Krasan. Here, she recalled how the sub-village head motivated all the community members to stick together during the evacuation in 2010.

> "In the past, our sub-village head said if we could, all the village members become one sub-village again, re-unite so *alhamdulillah*. If we cannot, then how? We must. He said that. Yes, he was true. We reunited as a sub-village at Karang Kendal. Yesterday, he came here and asked me, how are you doing Mbah? I am healthy, Sir. Have you searched for grass yet? At 7 AM, I arrived. It seems that he came by around 8 AM.

Samar, when being asked about his view of the polemic, saw his and some people's desires to relocate as what was fully accepted by the whole members of the sub-village ("nobody argued"). He chose to accept the consequences of living at a relocation site rather than return to his home.

> "If we relocated, everything would be far away. Finding the grass would be far but safer. Much safer compared to living in that place again. I felt unsecured. If an eruption occurs, we must run again. Here, I felt much safer. If we did not relocate, I would be afraid. After that incident, I felt very scared and wanted to move. I and people who followed the relocation decided to relocate. Nobody argued. Nobody.

Fear that was triggered by the eruption boosted people's desire to relocate. Then, Samar, recalled how the villagers worked together to actualize their relocation plan.

> "At that time, we were about to relocate to the Plosokerep but other people, elders, chose this land. In the past, this land belonged to someone from Yogyakarta or somewhere. Then, people worked together to collectively buy this land. We paid for it together and took the money from the sub-village saving. After the eruption, there was the saving of the Lava Tour and *ojeg* groups. The *ojeg* group dominated the amount of the donation."

From the excerpt, we recognize that the decision to relocate to the current land, Karang Kendal, was made by considering the elders' desires. It is worth noting that my respondent once joined an *ojeg* (motor-taxi) group mobilized by the Pelemsari villagers themselves to recover from their collapsing dairy farming. They saw an economic opportunity as many tourists regularly visited their damaged sub-village and Maridjan's home soon after the eruption. Some parts of the group's money along with the income of the Lava Tour jeep group were used by the sub-village to buy the land. Samar's testimony evidenced the villagers' cohesiveness in dealing with uncertainty.

My other respondent, Moga, who is the head of the neighborhood II in the Pelemsari sub-village, shared his views about his community's recovery efforts.

> "We bought the land together. On the next day, we planned to build the houses slowly but surely and find ways how to afford the construction. There was REKOMPAK[71] that facilitated the post-disaster houses. We met frequently with REKOMPAK. Finally, each of us received a 30-million-house donation per household from them, but the construction was only to the roof. The final touch of the house was not included; it was only limited to the construction. Since living in the (Plosokerep) shelter, I collected all the donations coming to our sub-village and distributed a part of the totaled donation, so each household received 13 million rupiahs. I along with Badiman[72], who was very experienced while I was not, saved the donation. I was told by him to save them. Then we saved them and not all of the donations were distributed to the community. About 200 million rupiahs were saved at that time by the sub-village. To buy a house per

[71] REKOMPAK is Indonesia's community-based model for post-disaster housing reconstruction.
[72] The head of one of the neighborhoods in the Pelemsari sub-village

> household costs about 4.5 million rupiahs. The two million came from this savings while the rest 2.5 million came from each household. That is how it happened. It was such suffering."

The sub-village's recovery phase is considered painful in Moga's view. Not only he along with other villagers must go through an exhaustive negotiation with the government's reconstruction agency (met frequently with REKOMPAK) but also independently learned (who was very experienced while I was not) and organized the incoming donation for rebuilding their new life in Karang Kendal.

The strong sense of community of the Pelemsari villagers was attributed to the deep-rooted traditions of their ancestors and the farmers' identity. In my other interview session, Moga connected it with the farmers' identity, suggesting the common history shared by his community members.

> "All people here in the past were farmers. They were farmers who then became dairy farmers. In the past, when young people saw their friends doing something, they would help. If there were *sambatan* (i.e., occasions of working together in villages), we *gotong royong* (i.e., worked together) to build a house without any fees. The *sambatan* for building a house happened when I was a kid, starting from cutting the wood to the house construction."

He then added,

> "We could not afford to build a house. During the agricultural time, the yards were planted with corn or other crops. If we started planting corn but could not catch up with our friends, they would *gotong royong* (work together) to help dig and fertilize our land."

Moga stressed the specific traditions that were well-ingrained in the everyday life of farmers in villages. The mutual aids that existed among farmers during his childhood based on this excerpt were motivated by the "shared experience of living in suffering" (not afford to build a house) and

a "shared history" for their identity as farmers. When being asked about how he views *gotong royong* today, he said.

> "Today, people do everything on their own. If not, they just need to pay. Gotong royong still existed but not all do this. But in my neighborhood, neighborhood II, I encouraged my community members to work together so it is more advanced than others in the sub-village."

From Moga's view, we could find that the tradition of *gotong royong* was not as extensive as that in the past. His action of empowering and encouraging his people to work together emphasizes the significant roles of leaders in sustaining the tradition. My other respondent, Wisnu, felt that the people's cohesiveness at the relocation site is stronger than that before the eruption in 2010.

> "The people's cohesiveness is still strong, similar to that when we lived in our former homes on the upper lands. In fact, I feel that it becomes closer as people today live close to one another, unlike in the past when we lived at a great distance from each other. If we need anything now, we can just say to our neighbors."

The close-distant houses at the relocation site, he assumed, promote more effective communication between neighbors to occur. I asked him about *gotong royong* and the benefits of this tradition in his life.

> "It helped me ease the workload. Sometimes if we could not milk the cows, we could ask our neighbors' help because we never know when we get ill or not. Or, like one week ago, when we must leave Karang Kendal for attending the funeral of my mother, we asked our neighbors for searching for the grass and milking and taking care of our cows for one week. But, we asked those who could milk and farm cows because many of us no longer farm dairy cows."

It is worth noting that since he is not a native-born community member, different rules were applied to him in this regard. Free, automatic help based on the so-called *ikhlas* (sincerity) is only given to the native-born members.

> "If the people who had the mourning period are native-born, neighbors will automatically help take care of the cows and collect the grass for the cows."

Fitri added important insight to my respondent's testimony about the *kesripahan* (mourning period for a passed away family member) tradition.

> "They will do it sincerely. We do not need to do anything and just be quiet and let others take care of everything for us. Neighbors will think about everything for us. They do it sincerely and will not ask for money."

B. Explications and Analysis

The sense of community theme that emerged from the excerpts of the interviews entails essential aspects. Depending on the spatial-temporal contexts within which the interview and responses refer (e.g., before the eruption in 2010, evacuation, recovery, relocation), the aspects identified include "value" (e.g., common interest, community identity, shared history, sense of brother/sisterhood, leadership, being sincere (*ikhlas*), compassion), "goal" (e.g., find solutions, live in harmony, better administration, better adaption, ease workload, care for others' well-beings), "psychological effects" (e.g., becoming courageous, positive image of volunteers/rescuers, vulnerable groups priority, larger needs, trust, distrust, absolute concession), and "action" (e.g., stick together, save others' lives, gotong royong, mutual aid, sacrifices, community meetings, community mobilization, collective actions (e.g., voluntary relocation, find money, buy land, resist power).

Throughout the excerpts, the "values" aspect that repetitively emerged is "compassion", the virtue that moves a person to surrender his or her own good for others to alleviate their sufferings. This virtue is exhibited through the sacrificial act, another aspect of this theme that stands out from my respondents' testimonies. Puteri recalled the two aspects, compassion, and sacrifice when some

youths and volunteers canceled their evacuations to prioritize others. Aman accredited them with being soldiers in spiritual meaning. Sacrificing personal desires for the greater good and the well-being of vulnerable people can also be found in the testimonies. Fajar argued that the people's decision to live together at the current relocation site was also motivated by their concerns about the well-being of elders and widows. While Aman recalled the people's concern for the traumatized children that also encourage them to decide on a voluntary relocation and the landless people's economic capacity once their lands are converted into a national park. Samar gave his testimony about the people's decision of selecting the Karang Kendal aimed to satisfy their elders' desires. It consequently urges the sub-village to manage their saving for purchasing the land. It can be said that these sacrificial acts for others are present throughout the post-disaster phases: from evacuation to recovery.

The farmers' identity is characterized by the shared experience of living in suffering. Farmers' burdens to build a house or cultivate lands motivated the *sambatan* tradition in which they worked together with others to reach their personal goals. Another form of people's cooperation, *gotong royong,* sustains although in the face of the inevitable effects of globalization, it requires the leader's role to empower his community. The other tradition in the sub-village as described by Wisnu is the mutual aid between neighbors such as *kesripahan* (e.g., the funeral of family members). The shared history of the Pelemsari villages develops the sense of community that in turn help enhance their capacity to self-organize after the eruption in 2010.

The sense of community is the feelings of mutual trust, social connections, shared concerns, and community values that lead to neighborhood-level action and cooperation (Mihaylov & Perkins, 2014, pp. 68–69). From the respondents' testimonies of the post-disaster courses after the eruption

in 2010, the sense of community is consistently unfolded. During the evacuation phase, for example, the sense of brotherhood and sisterhood and the empowering leaders are key factors for the people's unity regardless of their forced mobilization from one shelter to another. Once one of their members was separated from them, they initiated the search and facilitate the reunion.

The Pelemsari's solid sense of community powerfully enabled them to resist external, undesirable power. Sharing the same concern of ownership of their homelands, people courageously refused the relocation and the government's compensation offer in 2011. At the same time, people must deal with the fact that they had no place to permanently reside. Community meetings, as we found in the excerpts, were regularly performed until they reached a single resolution that they wanted to voluntarily relocate but under some conditions. The success of the Pelemsari community to re-establish their living at the new relocation site was inseparable from leadership according to the testimonies of Wisnu and Moga. Trust invested by my respondents in their leaders to channel their aspirations to power and leaders' roles in managing the incoming donations helped them collectively purchase the land for the relocation.

The collective actions of the Pelemsari community were forms of people's resistance to power which enabled them to finally reach their goals: the issuance of the land certificates. It is worth mentioning that during the crisis when the people had lost dairy farming assets and the forest had not yet been restored, they mobilized *ojeg* and Lava Tour for the upcoming tourists to collect money for the land and house reconstructions. Parts of the income combined with the sub-village's savings were used to purchase the land.

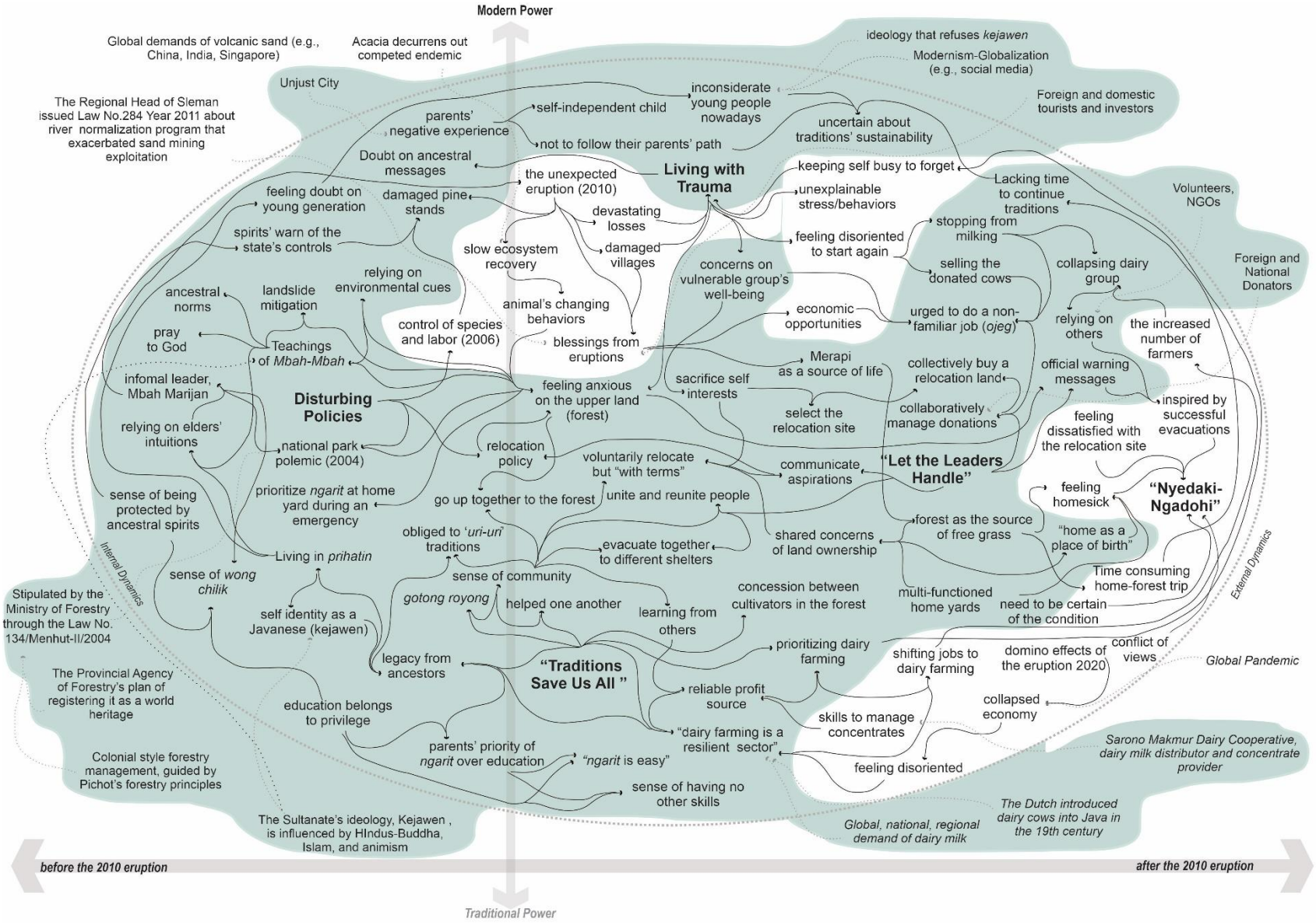

Fig. 3.8. The emergent theme "Sense of Community"

3.3.3. Theme 3: Local Knowledge

A. Excerpts

All of my seven respondents described *ngarit* as a tradition that had long been learned since their childhood. From the following excerpt, we can find what this tradition means according to my respondent, Aman.

> "*Ngarit* is the oldest tradition. Whenever I arrived from school, if I had not yet cut grass, my father or mother would be mad at me. Principally, *ngarit* was prioritized and education was not viewed as important during my childhood. So many failed because education was not important. *Seng penting iki kuwe iki sek ngarit* (i.e., what important is ngarit). Parents were like that so the encouragement for school was none. In other words, kids were let to do whatever they pleased. After graduating from elementary school, I wanted to continue my study. I have to go to school. My parents did not let me do this. My father and mother said, *ora sah sekolah, sekolah nggo opo* (i.e., do not go to school, what are the benefits of going to school?). No, I have to go to school."

From his account, we acknowledge the traditional view of the Pelemsari people in the past that valued *ngarit* over formal education. The persistent influence of the *ngarit* tradition at some level could create a sense of lacking skills once the farmer encounters undesirable conditions. Samar, for example, shows his disinterest in engaging with an economic sector outside the dairy farming after the eruption. He said,

> "Because if I have to involve in another economic sector, I did not have the skill. That sector (dairy farming) is the only skill that I had."

It is important to noting that *ngarit* and dairy farming are considered sustainably profitable and full of freedom. This insight was emerged after I asked Rejo how he transmitted the dairy farming skills to their children. He responded,

> "Yes, we introduced dairy farming to our children. We tell them how to take care of and manage cows. Because if they do not work as civic officials, this is a job that they can manage by themselves, free from others' controls although dairy farming is also inseparable from other people's experiences or guidance. Cutting grass is our ancestors' tradition. To this date, in the market, dairy milk does not seem to fall off. From an economic lens, it is always needed. The meat from the cow is needed throughout time. I hope that dairy farming can sustain, especially for our children so they will not be affected by other sectors."

From his complex reflection on dairy farming, we can find his view about an ideal job. Being a civic official is seen as a desired job for his children and being a dairy farmer could be an alternative as it offers an independency. He tries to convince us about the sustainability of dairy farming as the products will always be needed. Aligned to Rejo, Puteri believes that *ngarit* could enhance one's "sense of security" to deal with uncertainty in the future. Puteri said.

> "Collecting grass, when being done together with others, in my opinion, is the easiest job. You do not need to wear fancy clothes or to have a high education attainment level. The only thing you need is to work hard to be skillful since you were a kid. When you become an adult, you can then search for another experience. At that time, you can choose whatever job you want to do, and where to go. Going to school, for an instance, could be done at the same time as collecting grass. Then, once you graduate from college, if you want to continue doing dairy farming, you already had the theory. For example, you go to school, but you already have a job. You go to school and at the same time, you also already have the asset to do whatever you want. To my knowledge, people my age who were mostly involved in dairy farming could fund their children's education. The kids went to school and their parents were still relaxed. They *ngarit* and at the same time taking care of their children to go to school."

Being a dairy farmer in her view does not need a formal education except hard work and skills. Here, the farmer does not see it as necessary for a farmer to leave *ngarit* when pursuing his or her education. Albeit the difficulty to balance the two activities, the benefits that the farmer could gain in her view would be "greater options for their future" and "asset and knowledge of the tradition."

The unexpected eruption in 2010 forced the Pelemsari dairy farmers to better adapt to the environmental changes and to the consequences of living at the relocation site. The time-consuming trip of going back and forth between the current home at the relocation site and grass plots in the forest is one of the consequences that Samar must deal with. I asked him what is the most challenging part of dairy farming and he said,

> "Looking for grass, because the location of the grass is far away. None of my grass plots are located near my current home. It is really exhaustive work. I have to also walk (in the forest) and it just wastes time. My friends here, many of them, have fairly close-distant grass plots so they do not have to take a walk in the forest. So, at 8 or 9 AM they already arrive home. That is the case with my friends. Many of them have grass plots relatively close to their homes."

From this excerpt, we learned that dairy farmers' capacities to deal with risks vary, depending on many factors among them is the locations of the grass plots relative to the crater. In the case of Samar, he felt that he had no other options than collecting grass in the grass plots near the carter. It is important to note that farmers who possess grass plots near the crater such as Samar, would need time to carry grass by walking to a parking area. The time spent for *ngarit* in the forest alone is between 1-2 hours, depending on the distance between the grass plot and the parking area, the land topography, and the weight of grass. The techniques that farmers used are *nyunggi* (i.e., carrying things on the top of the head) or *gendong* (i.e., taking things on the back) while the weight of the grass each can carry is typically between 30 and 45 kilograms. To feed one adult cow (400-600 kilograms), they would need about 40-60 kilograms of grass. Farmers of Pelemsari typically combine grass in the forest and their former home yard to get an adequate amount of grass for their 2-4 adult dairy cows.

The Pelemsari villagers had relied on the forest for fertile and bountiful grass. Performing *ngarit* during the volcano's eruptive activities is, therefore, a risky activity given their locations that are typically near the crater.

> "Only when we are really not courageous to go up to the forest due to the volcano's eruptive activity that we will look for the grass at the downland. We go to these areas because sometimes some people sell grass there. We can also buy young corn plants for the cows. Typically, someone sells corn plants and we don't have to wait for them to have fruits. The areas are located in Pakem, Cangkringan around rice fields. If we run out of grass in the dry season, many people buy corn plants called *tebon* for their cows."

Farmers like Wisnu developed strategies to deal with this undesirable period of time. They would buy grass in downland areas or corn plants as an alternate to fodder.

Most of my respondents collect grass in the forest along with their spouses. Samar shared his testimony when he must deal with a dilemma during his *ngarit* activity near the crater as his wife refused to evacuate.

> "I was about 1.5 km from the crater. There, the volcano emitted hot clouds to the west. I asked my wife to run but she refused. I asked her to leave the grass, but she did not leave it. Finally, I did not run."

Typically, villagers would need to go further to areas nearby the crater in order to seek green and young grass during the dry season.

> "Sometimes I go to the forest with my friends as they too searched grass farther towards the crater."

The strategy that he used to increase his sense of security is by going together with other villagers into the forest. The areas that he and his friends go to could be grass plots abundant by old farmers

or people who no longer worked in dairy farming. He or his friends would ask for a permission from the former cultivators of the grass plots.

In general, the Pelemsari villagers had a lot of ancestral messages and develop environmental cues to predict eruptions and guide their actions to deal with eruptions.

> "If I hear a roaring sound, I then see the volcano, whether it is small or big. If it is big, okay. But I feel the eruption is dangerous if there is a great earthquake. If not, I think it is just an ordinary one. But in the past. when the second eruption occurred, the earthquake reached Yogyakarta. The seismic was tremendous. But earthquakes like these I think are ordinary and I think God still protects people who are close to Merapi and also believes in that who guard us.

I then asked whom my respondent means regarding this.

> "Those who create the tool must understand whether it is dangerous or not. There will be news from them."

A roaring sound from the volcano is used by my respondent, Margo, to predict a possible eruption and being influenced by the major eruption in 2006, he used the earthquake that happened a month earlier as another indicator of a large eruption. Despite his complex environmental cues, we can find the involvement of his feelings or intuitions to predict the magnitudes of disasters. Besides these cues, he relies on the early warning messages disseminated by who creates the tools (the Center for Volcanology and Geological Hazard Mitigation).

The volcano's visibility is the prerequisite for some farmers like Samar to be able to evaluate eruption threats. With this condition, people can view the directions of the hot cloud which is the main threat of the volcano.

> "I watch the volcano, if there is no mist, I could see the direction of the flow. If it goes to the West, it will not be dangerous. The hot clouds will rise up then the

> wind would cause the hot clouds to spread out. We should be worried if the flow goes southward. If it goes southward, maybe it can also reach the grass plots."

Besides hot clouds, Samar used the presence of thunder light to indicate a large eruption as what had been passed down over generations in the sub-village.

> "That is what the ancestors here said that when the volcano emits something, there will be first a thunder light. If there is no thunder light, it will not be big. If there is a thunder light, that will be big, just run."

Similar to Moga, Rejo stressed sounds as the first cue of predicting eruption before conducting the second examination, that is by checking the volcano's visibility, repetitive sound, and the presence of smoke.

> "If there are sounds coming from collapsing rocks, I will immediately look at the volcano to see whether it is apparent or not and whether the noise still occurs or not. If it continuously happens, I will be cautious and be ready to keep monitoring it. If the noise disappears, and I do not see smoke spewed by the volcano, I think nothing will happen."

According to Aman, people in the Pelemsari sub-village typically used environmental cues such as earthquakes, animal behaviors, and increasing air temperature to predict eruptions. He also thinks of the need for people to develop their awareness and be mentally ready for an unexpected eruption.

> "But the general signs could be in the form of earthquakes, and animals that run down the slope. It also happened. Or, maybe, the temperature increases and one might curiously ask why the weather is hot. So, people are like that. They are prepared for anything that might happen. I mean preparing their minds so they would not be afraid. At least, they are already prepared mentally to respond. Well, if they are afraid of something, well, just go away for a while. That is how people respond."

Most people in the sub-village trusted the local elders' intuitions of eruptions and follow their advice. My respondent, Krasan, shared her experience of being advised by the phenomenal gatekeeper, Mbah Maridjan, days before the eruption in 2010 finally took his life.

> "I was told, "Yu[73], there would be an occasion, a wedding, a major one tomorrow. Mbak Yu must leave. (She asked) "But, how about you?" (Maridjan replied)" I will not go, my struggles are here, I want to finish them here." That was what Mbah Maridjan told me. He called me Mbak Yu. I was told, Mbak Yu must leave. It (the volcano) wants to expel waste. Before the event, Mbah Maridjan had already known. I had been told this and this and I just obeyed him."

According to local beliefs, the gifted mystics such as Mbah Maridjan, receive *wisik* (i.e., mystical revelation) about the upcoming eruptions from their ancestral spirits through dreams

> "Elders who knew ways how to read the signs of eruption did exist. It depends on how they observe or respond as each person is different. I was told once that my father had a dream. He dreamt of meeting Mbah Retso, who was also Mbah Kaum and already passed away. So, he dreamt of meeting Mbah Retso who told him to be careful and that he wanted to expel waste to the West. Then, my father shared with me his dream and then I asked him about what we should do. Well, the most important thing is to be careful because Merapi wanted to expel waste or garbage. In 2004, the eruption hit Turgo."

Once the gifted mystics received the revelation through dreams, they would ask their descendent to be careful. When describing eruption, people in the sub-village are advised by their ancestors not to use negative comments or names. For example, as we can see from this excerpt, Maridjan said "the volcano expels wastes" rather than saying "the volcano erupts." To acquire the revelation ability, Moga, an elder who is also my respondent, said that gifted mystics must choose to live in suffering.

> "Elders in that time, some of them knew. They often advised their descendants to be careful as the volcano will expel waste. There was the time but kids

[73] 'Mbak Yu' is a title in Javanese tradition typically addressed to a woman relative or sister whom a person is very close with.

> nowadays did not want to know. People at that time mostly lived in suffering. But kids today seem did not. So I must admit suffering was hard."

Titen[74], he defined, is the knowledge that enables one to know something before it happens.

> "Ancestors are really like that, doing *titen* or something. *Titen* means they knew before it happened if an eruption will occur or not. Some of them knew. Like intuition or something. The intuition that something feels not right. For instance, maybe, there will be an eruption, big or small."

Fasting, not eating rice or salt for a particular period, and being awake throughout the day until the evening comes, are some of the techniques of *titen* that the ancestor should do to be able to foresee the future.

> "Only some of them who live in *keprihatinan*. For instance, fasting, often conducting fasting, or not sleeping in the afternoon. That is what we call *prihatin*."

I asked my respondent, Aman, to elaborate on how the messages were disseminated. He illustrated the conversation that typically happened between the gifted mystic and his neighbor.

> "Well, just during conversations. For example, he meets someone, then he shares his dream. I met Mbah Retso in my dream and he said that the volcano will expel waste to the west. So, it is not a serious talk just a casual conversation. Then, someone may ask, really, Mbah? Yes. Then, what should we do? Well, a dream is like that, a dream is a flower of sleep. It's the same with Mbah Hadi. Well, hopefully, there would be nothing happening, Mbah. Then the leader says, yes, but pray to God so we all are safe. That is like that. So, they are responsive to talks. yes, yes, we pray for the safety of us all. Just like that."

From this excerpt, we can find that the gifted mystics disseminated his vision of an eruption to neighbors or anyone whom they met unintentionally in the sub-village. Unlike what an official leader commonly do, the gatekeeper or other informal leaders will disseminate the visions or the

[74] The ancestral intuition in Javanese is commonly termed as *ilmu titen*, an intuitive knowledge formed by *petung*, that is the ancestors' accumulated records of good and bad events throughout the human life course. This local wisdom was then compiled in a book called *primbon* (Hartono, 2016, p. 267).

warning messages through daily, causal conversation or what we call a from-mouth-to-mouth method.

Wisnu reflected on the long-standing beliefs about the eruptions of their grandparents and questioned their relevance to the context within which their descendants live. It is worth mentioning that many elders including the grandparents of my respondent here refused to leave during the evacuation in 2010.

> "The people's belief in the past is that an eruption must have its own paths. Probably they believed that an eruption would not reach settlements and that it would be safe as the eruption went through lahar channels or rivers. Our grandparents before the eruption in 2010 relied on the messages from their ancestors who lived hundreds of years ago."

My other respondent, Puteri, shared her experience of attending a meeting before the eruption in a place in the Kali Adem area, which according to her ancestral belief, is safe from eruptions.

> "All of my friends went home and ran away so I also followed them. I felt very sorry for the host of the meeting. She became all alone. Nobody gathered after that. It felt very uncomfortable. At that time, people started to think about their families. Some walked here and there and watched the sky. If they sat in the meeting, they seemed very uncomfortable. Our last meeting was in the Kali Adem because people thought that the eruption would not reach this area. And stories in the past about Merapi also said that. But it just felt very wrong, so people were anxious and uncomfortable. And, the eruption did reach that area."

People who relied on their senses or gut feeling like Puteri may not be able to explain how they make such a judgment and a quick decision. What she knew is the sense helped her and those other villagers survived the disaster. She viewed the eruption as a real test for her after reflecting on the irony that she experienced before and after the incident.

> "Before the eruption in 2010, I received a lot of meeting invitations about eruptions from many places. But, unfortunately, I became a victim of the greatest loss after the eruption. It was such a test for me."

The Pelemsari villagers like Samar relied on the warning messages disseminated by the government. What we could emphasize in my respondent's testimony below is among others, the sub-village head's role in developing awareness due to the changing behaviors of the volcano.

> "I listened to the warning messages of the government, the sub-village head, and the village head. The government's agency from the city and the national disaster agency, BPPTK. The sub-village head will disseminate using the Mosque's speaker. During the *kenduri*, last night, he also advised people to be careful. Merapi could not be predicted today, different from the previous one which could be predicted. As of today, we could not predict it anymore."

In the excerpt, the sub-village head reminded the community about the unpredictability of the volcano nowadays. It is worth emphasizing that after the major eruptions in 1930-1931, the ash plumes of Merapi's eruptions drifted southward and southeastward, different from those before the 1931 eruption that consistently drifted westward-northwestward. Besides these unexpected changes, the collapse of the lava dome *Geger Boyo* (i.e., crocodile back) in 2006 also increased the exposure of villages on the southern flank to eruptions threats.

Wisnu viewed the eruption in 2010 as a traumatic event as it had caused high fatalities. He then used the eruption in 2010 as a standard to develop his awareness of eruptions regardless of the magnitude of the event.

> "I hope that an eruption like that in 2010 is not going to happen again. But, we must develop our awareness by always remembering where we place our motorcycle's key. If an eruption occurs, we can immediately run even though the eruption is not as big as the 2010 eruption. We have to be cautious because the eruption in 2010 was really traumatic as it had caused many death tolls."

The devastating effects of the eruption in 2010 had left a tremendous mark on my respondent's mind that he felt the event was a close distant one.

> "The eruption to me the 2010 eruption did not happen a long ago. The big event feels like it happens not a long time ago, does it? But it actually had happened 11 years ago so you know. After I felt it really felt scary but I should not be afraid. Because if I want to do something, I will become reluctant. What important is to be cautious."

I then asked him about how he viewed the ancestral messages after the eruption incident. He reflected on this question by comparing the ancestral messages to science.

> "If, we stick to the old beliefs, well, nature is never like it was before. So, we need to be cautious and follow the technology advancement. Nature cannot be predicted although technology advanced. We never know about nature. Predictions from technology regardless of its advancement cannot always predict nature. The predictions from technology and monitoring teams every day may not be precisely the same with Merapi that changes over time."

Here, my respondent views that the ancestral messages about eruptions may not be relevant to the dynamic changes in nature. In the meantime, technology although it is more reliable for disaster reduction efforts, still cannot escape from miscalculations due to the volcano's unpredictable behaviors.

B. Explications and Analysis

I use the term "local knowledge" for the third general theme in this analysis so it could be abroad enough to capture all the themes that emerged from my respondents' accounts. Before discussing their disaster mitigation knowledge, understanding what my respondents view and experience in regards to their longstanding *ngarit-dairy* farming tradition is important. Based on my fieldwork, I found that most of their everyday life (4 AM – 5 PM) is dedicated to performing the two inseparable traditions which from a resilience perspective would mean greater threats as they must collect grass lying within the zone of 2-5 kilometer from the crater.

The key aspects of the general theme knowledge include "knowledge of *ngarit*" (e.g., conflicting views, sense of lacking skills, freedom, sustainable profit, sense of security), challenges of *ngarit* (e.g., time-consuming trip, high-risk grass plots, evacuation dilemma, exposure to hazards; "mental model" (e.g., self-intuition, beliefs, experience); "warning messages" (the ancestral messages, gifted mystics' warning messages, government's early warning messages); "environmental cues" (e.g., thunder light, roaring sound, directions of the hot cloud, repetitive sound, smoke, animal behaviors, increasing air temperature); "warning messages dissemination" (e.g., mouth to mouth, local leaders, national disaster agency, Mosque, *kenduren*/ gathering traditions,); "precondition of assessment" (e.g., volcano's visibility); "orientations" (e.g., affective heuristics, listen to the government, the eruption in 2010 as the disaster risk reduction standard, combined environmental cues and government's early warning messages); "mental preparedness" (e.g., preparing minds to prevent fear, going away for a while) "perceptions of eruptions" (e.g., traumatic eruption in 2010, high number of fatalities, preceded by earthquake, preceded by thunderlight); and perceptions of DRR.

Conducting *ngarit* is a risky activity as the villagers must locate the grass in the forest, especially during the dry season. Strategies used by my respondents to reduce risks are buying grass in the downland areas, buying alternative fodder (e.g., corn plants), and going together with others into the forest during the dry season. When I asked my respondents about their views of ancestral messages and mechanisms used to reduce risks, without being prompted, they immediately associate the two concerns with their activities in the forest. It is very understandable considering the challenges or threats they faced during *ngarit* in the forest.

Learning from my respondents' testimonies, we find that most of them used more than one environmental cue and that the cues used varied across my respondents. The cues generally used by the respondents are roaring sounds. Rejo in particular did not only rely on the volume of the sound but also on its continuity. Experience plays important role in affecting responses to a disaster (Lindell & Perry, 1992, pp. 161–162). Regarding this, the perceptions of Moga and Wisnu of risks are influenced by prior eruptions. In the case of Moga, he *feels that the eruption just happened not a long time ago* which surges him to rely not only on environmental cues but also on those *who created the tools* (the national disaster agency). While for Wisnu, the experience urged him to use the eruption as a disaster risk reduction standard regardless of the eruption magnitude in the future.

The other aspect that deserves attention here is the respondents' affect heuristic, a feeling-driven judgment (intuition, instinct) that is shaped by an individual's unique characteristics and experience (Richard Eiser et al., 2012, p. 9; Slovic et al., 2005, pp. S35-36). My two respondents, Moga and Puteri, exhibit their affect heuristic tendencies when dealing with eruptions. Moga, feeling uncertain about the reliability of an earthquake as an indicator of a large eruption, says *I think it is just an ordinary one*. Puteri, during a meeting in 2010, felt something was very wrong.

One of my respondents, Wisnu, compared ancestral messages to the government's early warning messages when being asked about his view of the former. Despite his criticism of ancestral messages and his orientation to rely on the government's warning messages, he viewed that technology too had limitations inaccurately or precisely predicting eruptions due to the volcano's dynamic behaviors.

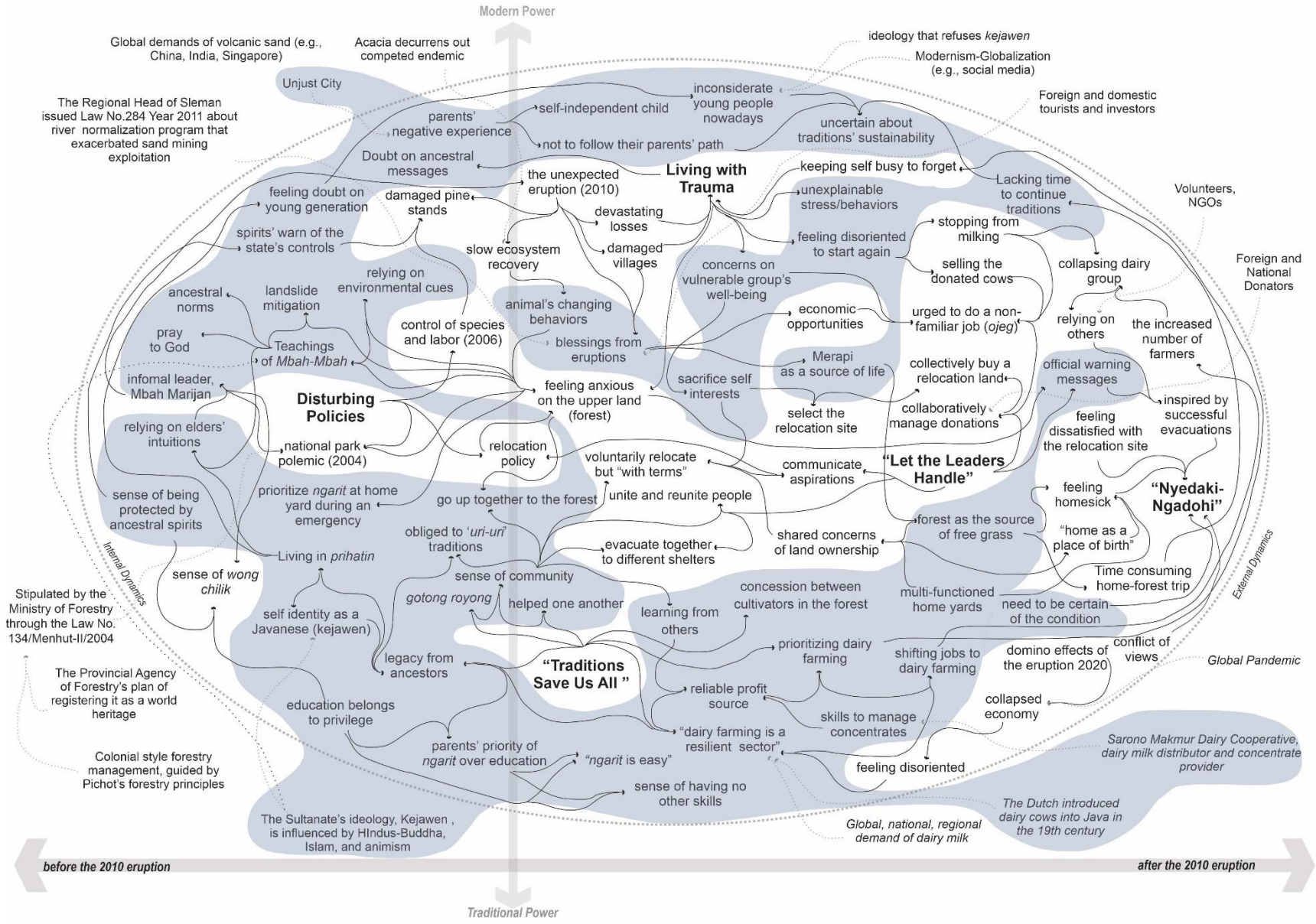

Fig. 3.9. The emergent theme "Local Knowledge"

3.4. Conclusion

The themes of the sense of community, local knowledge, and place attachment that emerged from the respondents' reflections on their experience of living with risks are the social capital[75] of resilience to deal with socio-politico-ecological disturbances. From the resilience lens, place attachment provides an anchor for the impacted people to self-organize after disruptions. It constituted the sub-construct place identity that manifests the world where a person lives (Cheshmehzangi & Heat, 2012, p. 254; Seamon, 2012, pp. 12–13), enabling people to transform a particular landscape into a symbolic manifestation of a self, and reinforces their emotional ties to that place (Hummon, 1992, pp. 258–260).

In the next chapter, we find that the *panarchy's* adaptive cycles allow us to develop metaphors by visualizing the social-ecological systems' interactions in Mount Merapi throughout periods and the influences of the government system through forest controls. The three adaptive capacities emerged from this analysis—place attachment, sense of community, local knowledge—that characterize the Pelemsari villagers may present over periods through the panarchical analysis. Nevertheless, it is worth mentioning the limited data of the Pelemsari's history, especially during the pre-colonial period may hinder my ability to identify those capacities. However, one thing we need to be sure of is the alienating of people from natural resources had long become a tradition in Indonesian's forestry.

[75] In Neah Bay, WA, for instance, the social capital was stressed by its isolated and close-knit coastal community as a critical substitute or supplementary of the goods and services of the built environment when disruptions occur. Social capital is also believed to enable them to self-organize in the aftermath of disruptions (Freitag et al. 2014:333).

CHAPTER 4

PANARCHY RESILIENCE OF THE PELEMSARI SUB-VILLAGE AND MOUNT MERAPI

4.1. Introduction

In this chapter, I will discuss my analysis of the interactions between Mount Merapi, the Pelemsari villagers, and the Government system by using the framework of *panarchy*. The data for this analysis came from the publications of the Mount Merapi National Agency, discussions with the agency's expert, Tri Atmodjo, the Pelemsari elders and respondents, and insights from the University of Indonesia's anthropologist, Suraya Afiff. The framework of my discussion is provided in figure 4.1. It illustrates the two-directional interactions of different systems in the Mount Merapi ecosystem: the forest as the resource system comprising units such as trees, grass, water, and animals; the Pelemsari community as the users, and the state (the national government) and the Sultanate (the traditional government) as the governance system. The volcano contributes to the government in the form of ecological services namely, the hydrological cycle, food security, climate change, biodiversity support, and alike. The outcomes gained by the community or appropriators include water, grass, *rencek* (i.e., dry woods), and volcanic sand. Place attachment, a sense of community, and local knowledge that emerged from the phenomenology are the social capital of the Pelemsari that enable them to be self-organized and self-governed when dealing with collective action problems in forest management. The sense of community and trust in particular could serve as ideal mechanisms against the problem of supplying or changing rules in institutions (Ostrom, 1990, pp. 42–43).

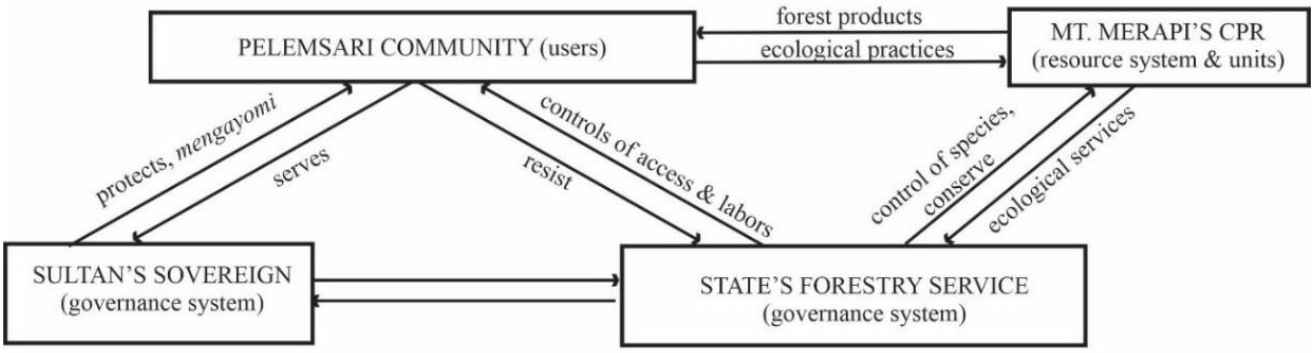

Fig.4.1. The complex interactions between the SES' elements

Besides *panarchy*, I also assessed the adaptive capacities of the Pelemsari villagers by using Ostrom's self-governed principles as the indicators. The *Panarchy* framework is useful to understand ecosystem dynamics which is "how the complex system of people and nature is organized and structured across spatial and temporal scales" (Allen et al., 2014, p. 578). Ostrom's set of self-governed principles is used to assess the dynamic adaptive capacity of the Pelemsari villagers by examining their institutions (e.g., customary rights, local knowledge) in managing the forest over time. Two approaches employed are synchronic and diachronic. The former helps examine the interactions of social-ecological systems in Mount Merapi and their patterns in each period while the latter helps examine the changes in the complex SES interaction dynamics over time (Chrisomalis, 2006, p. 397).

I order the structures of this chapter by primarily discussing the current CPR problems in Mount Merapi in concern with the forest access and use, followed by the descriptions of the social-ecological systems of Mount Merapi and its elements, adaptive cycles and self-governance assessment, and conclusion.

4.2. Collective Pool Resource Problems in Mount Merapi

The violent eruption of Mount Merapi from October 25 to November 14, 2010, caused devastating socio-ecological destructions that lasted for a long term. The eruption damaged the ecosystem and areas of about 1,128 Ha in the Resort Cangkringan and the Resort Pakem-Turi (fig. 5.2) and catalyzed the migration of wild animals like birds, tigers, and long-tailed monkeys (*Macaca fascicularis)* (BNPB, 2011, p. 41). Besides these effects, the eruption also claimed about 386 lives, displaced around 15,366 residents (BNPB, 2011, p. 25), and damaged 2,956 houses (BNPB, 2011, p. 21); not to mention the trauma[76] of the survivors that contributed to the collapse of the dairy farming sector in many villages. The relocation policy[77] launched by the government in 2011 that annexed areas directly impacted by the eruption (fig. 5.3) to the protected forest exacerbated the plight of the survivors. Of 3,612 households, 1,059 refused to relocate. These resisters mainly lived in the sub-villages of Kalitengah Lor, Kalitengah Kidul, and Srunen (Suryandari et al., 2013, p. 147). In 2014, the Ministry of Forestry expanded the national park to about 6,607.52 Ha (fig. 5.4) after the polemic surrounding its stipulation back in 2004. The ecological degradations in the Nature Reserve *Plawangan Turgo*, the sedimentation of two river streams, volcanic eruptions, and the intensified illegal sand mining were assumed to stimulate the decree's enactment. Civic movements of activists and environmental alliances rose as the result, censuring the government's lack of community engagement in decision-making and policy that would further marginalize the villagers from accessing the forest (A. W. Hidayat, 2009, pp. 81–91).

[76] Based on my fieldwork in the Pelemsari sub-village in 2022, the post-disaster trauma reached the unconscious level of the sufferers. Eruption-like noise coming either from the passing through heavy trucks or the roaring sound of the installed early warning systems caused most people to react inappropriately: running from the house, jumping out of the bed, or finding the keys to their motorcycles. The head of the sub-village would disseminate information through the Mosque speaker when there will be activities such as the big motorcycles convoys that emit the same noise.

[77] At the government level, the National Disaster for Disaster Management coordinated with the involved ministries and followed up their recommendations which among them was the conversion of the direct impacted high-risk areas into a protected forest (BNPB, 2011, p. 60).

Years after the eruption, all the impacted villagers, regardless of their diverse responses to the relocation[78], dealt with stricter forest regulations following the stipulation of Merapi's status as a national park. These controls of access to forests[79] were first imposed by the Dutch in 1912 and retained in the previous and the current forestry management. On the one hand, the continuation of the strict colonial forest decrees and practices successfully rejuvenated the mountain's critical hills like the *Gunung Bibi* (T. Atmojo et al., 2018, p. 126). On the other hand, the choices had by villagers to expand creativities and opportunities for their livelihoods related to the common-pool resources (CPR)[80] in the forest were threatened. With the stipulation of the national park, the kinds of activities allowed in the forest are more limited than those in the previous state. Before the enactment of the decree, villagers could practice mixed-cropping agriculture in the grass plots "lent" by the government. The compensation for this right was their obligation to plant and manage the trees in the grass plots. As of today, collecting grass and taking dry woods (i.e., *rencek*) are the only activities allowed in the forest.

Reflecting on the relocation and national park policies, one of the elders in the Pelemsari sub-village interpreted the unprecedentedly violent eruption as a warning of the ancestral spirits about the authority's control on people's access to the forest, which means a threat to their livelihoods and the sustainability of their farming traditions. Internally, the Pelemsari community must deal

[78] Some sub-villages such as Kalingtengah Lor, Kalitegah Kidul, Srunen, and Pangokrejo refused to relocate while the Pelemsari sub-village, based on my fieldwork, voluntarily relocated but proposed some written terms to the government. During a public hearing with the Governor (the Sultan) and other bureaucratic authorities, the Pelemsari villagers demanded the certifications of their homelands damaged by the eruption.

[79] Peluso (1992), in her compelling work "Rich Forest and Poor People," divided the forest controls in Java into three types: controls of land, controls of species, and controls of forest labor. These three controls were combined with the ideological control amalgamated in the forest decrees that legitimized its authority to this date. the ideology that she referred to is the Gifford Pichot's "the greatest good for the greatest number of people for the longest time" (Nancy Lee Peluso, 1992, pp. 7–8). Lukas and Peluso (2019) claimed that colonial forest decrees and practices in Java are the strictest in Southeast Asia and probably, the world (Nancy Lee Peluso, 1992, p. 971).

[80] Collective pool resource refers to a natural or man-made resource system capable of producing a maximum quantity of a flow variable without harming the resource system itself (Ostrom, 1990, p. 30).

with the negligence of the youths nowadays to engage in and preserve their ancestral ecological traditions. According to my respondents, this could be attributed to the post-disaster trauma or globalization effect that raises their doubts about the traditions' significance in their future. Economically speaking, dairy farmers are trapped by the high-cost concentrates needed to yield a high quantity of dairy milk and the fresh grass that can only be obtained in the forest.

4.3. The Social-Ecological Systems of Mount Merapi

In this section, I will discuss the social-ecological systems of Mount Merapi. The structure of the discussion is based on Ostrom's general framework of SES (Ostrom, 2009) and the study by Urgenson et al. (2010) that investigates the type and the extent of social-ecological change in the Upper Baiwu watershed in Southwest Sichuan, China (Urgenson et al., 2010). Respectively, it comprises the resource users that refer to the Pelemsari villagers, the resource system that refers to Mount Merapi, and the government system that refers to the State Forestry Agency. The characteristics of each of these elements of the social-ecological system are needed before discussing the *panarchy* resilience over periods.

4.3.1. Resource Users

A. *Location and the Number of Users*

It was estimated that about 1 million people live on Mount Merapi and the population density reached up to 500 people per km2 on its most fertile slopes. Merapi's volcanic ash enabled the soil to produce three harvests per year, which is very productive when compared with elsewhere in Indonesia. Such a condition compelled people living in less productive lands to further move up the volcano's flanks for a better living (Troll et al., 2015, p. 138). According to the monography document of the Umbulharjo Village in 2019, the village is located at about 400 meters above sea

level and about 36 kilometers from the city center of Yogyakarta. Its total area reaches 826 Ha dominated by 257 Ha of moorland and 336.45 Ha of home yards. Of 5,177 people, 1,074 people are peasants with privately-owned homelands and 518 are dairy farmers. More than a half of the totaled population is people aged from 22 to 55 and only 25% of it already completed education at the senior high school level. The complete profile of the village is provided in table 4.1.

Table 4.1. The demography details of the Umbulharjo Village in 2019

Data		Quantity	Unit
Area	:	**826**	Ha
1. Paddy field with half technical irrigation	:	23.09	Ha
2. Dry moorland	:	257.005	Ha
3. Home yards and gardens	:	336.455	Ha
4. Protected forest	:	75	Ha
5. People's Forest/ Private owned land	:	95	Ha
6. Private plantation	:	27	Ha
7. Sports field	:	1.85	Ha
8. Recreational park	:	2.8	Ha
9. Cemetery	:	7.8	Ha
Land Property	:		
1. *Tanah bengkok* for administrators	:	35.28	Ha
2. *Tanah Kas Desa*/ Village's moorland	:	12.5	Ha
3. Others	:	7.03	Ha
Employment	:		
1. Peasants with private owned farmland	:	1.074	People
2. Peasant worked on the farmland	:	24	People
3. Laborers	:	122	People
4. Craftsman/ small industries	:	34	People
5. Traders	:	320	People
6. Civic officials	:	59	People
7. Army	:	8	People
8. Retirees	:	57	People
9. Dairy farmers	:	518	People
Demography			
1. Number of households	:	1,785	Households
Males	:	2,587	People
Females	:	2,590	People
2. Number of residents based on age			
0-6 years old	:	483	People
7-12 years old	:	533	People
13-18 years old	:	476	People
19-24 years old	:	460	People
25-55 years old	:	2,586	People

	56-79 years old	:	766	People
	80 years old and above	:	73	People
	Total	**:**	**5,177**	**People**
Number of People based on Educational Attainment				
1.	No formal education	:	505	People
2.	Not graduated from school	:	898	People
3.	Elementary school	:	1,246	People
4.	Junior high school	:	970	People
5.	Senor high school	:	1,306	People
6.	Academia	:	68	People
7.	University	:	150	People
8.	Illiterate	:	34	People
	Total	**:**	**5,177**	People

Pelemsari is one of nine sub-villages of the Umbulharjo Village which is bordered by Mount Merapi in the north, Kepuharjo Village in the east, and the Wukirsari Village in the south, and the Hargobinangun Village in the west (fig.5.1.) Before the eruption in 2010, the total population of the sub-village was 84 households (261 individuals) comprising 135 males and 119 females (Wasito et al., 2012, p. 155). In terms of educational attainment in 2010, 73 out of 260 people, or about 28% of the total population attained elementary school where only one resident achieved a bachelor's degree. There were 46 dairy farmers and 90 laborers who were involved in the dairy farming sector in 2010. Compared to the population size about eleven years later, the population reaches only 241 (87 households) comprising 144 females and 97 males.

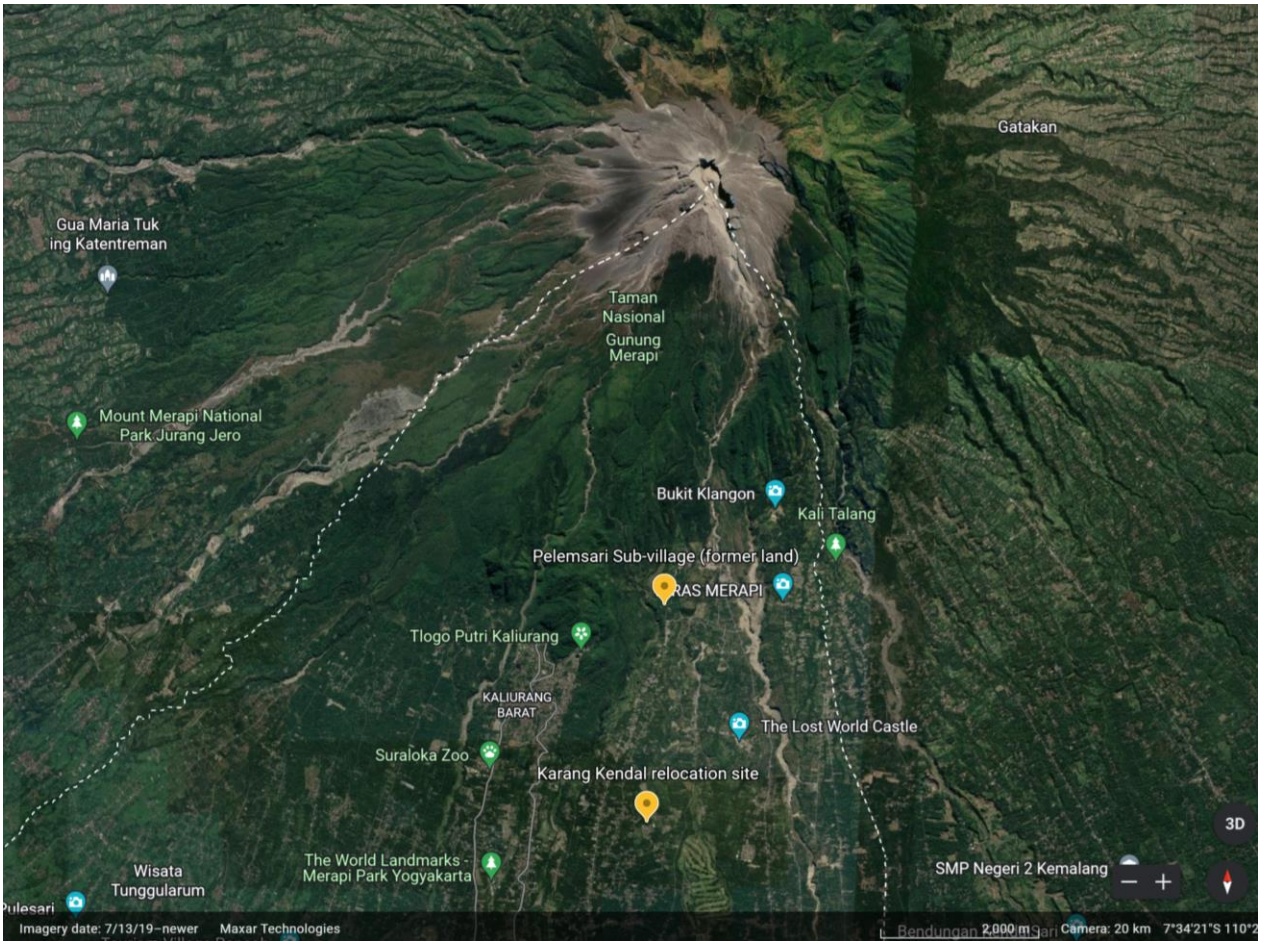

Fig.4.2. The satellite image of Mount Merapi shows landmarks (green text) around the volcano's foot and the locations of the Pelemsari sub-village on the upper land located about 1,000 meters above sea level and the Karang Kendal relocation site on the downland about 600 meters above sea level both in yellow icons. The image is retrieved from the Google satellite in 2022.

B. *Socio-Economic Attributes Of Users*

The diversity of economic sectors in the sub-village after the eruption in 2010 expanded. Besides dairy farming, tourism rose as an alternate source of income which attracted mainly its population aged under 40. Trauma coupled with the greater profits from tourism promoted job shifts in Pelemsari after the eruption. Nevertheless, some residents who do not work a full day in tourism, with support from their spouses, maintain dairy farming that had long been a part of their traditions. The assets needed by dairy farmers in the sub-village are grass, concentrate, dairy cows, dairy group, cowsheds, motorcycles, and traditions. The details of each can be seen in table 4.2.

Table 4.2. Qualitative surveys of the Pelemsari respondents' main assets of farming

Types of assets	Number of assets	Potentials of assets	Constraints
Grass in the land parcels/ plots in the forest (*sanggeman/* alas/ kontrakan)	2-5 grass plots in the forest (about 0.5 Ha – 1 Ha for each land)	Free fresh, young grass; abundant types of grass; increase cows' appetite and nutrients; fertilizers are not required	State's forest controls: – prohibited from cultivating the forest land (*tumpang sari)* – great risks as the young grass was mainly concentrated around the crater, especially during the dry season – long-tailed monkeys' threats – plant and manage the state's trees in the plots
	1-2 grass plots in the former settlement depending on the land inherited by their ancestors (about 0.5 Ha – 1 Ha for each land)	– Fresh, young grass depending on the soil conditions of the ground after the eruption in 2010; Freedom to exercise agriculture; – Plant the home yards with the *tumpang sari* system by combining palawija (agricultural crops), grass, and profitable trees (e.g., sengon) – fewer risks to eruption threats	– limited only to one or two types of grass such as *kalanjana* – the need for fertilizing the soil with cattle manure – expenses to hire truck services to transport manure from the relocation site to the former home yards – reachable for long-tailed monkeys to disrupt home yards
	1-2 grass plots inside the Karang Kendal relocation site	– reachable grass to feed cows	– having *tanah lungguh* for being a village administrator – renting the sub-village's *tanah lungguh*
Concentrate/ komboran	50-kilogram or one sack of concentrate	– increase the quantity of dairy milk extracted from a lactating cow – obtained from the dairy cooperative	– high-cost concentrate ranging from 230,000 Rupiahs to 300,000 Rupiahs (US$ 16-US$ 20) – sometimes urged the farmer to increase the grass amount to reduce the concentrate amount
Dairy cows	2-5 cows	Preference for lactating cows	Having *pedhets* (young calves) and an unpregnant *ndara* means extra cost to feed them as the concentrate bought from the income generated from the lactating cows needs to be shared with these cow types.
			The more the cows the more the need for the grass and the concentrate

			Lacking the ability to manage concentrates for fodder may lead to misfortune.
Dairy group	1 group	– Facilitate the needs of each farmer – Record each farmer's dairy milk production twice a day – Distribute the monthly salary from the dairy cooperative depending on the farmer's recorded milk production – Solve problems collectively – Knowledge exchange of dairy farming – Having a milking center means an efficient dairy milk	The collapse of the local dairy farming directly affects the dairy group's productivity
Cowshed	1 collective cowshed	– Compact cow shed where all processes are centered – Regular meeting – Increased social cohesion	– Conflicts for using the utilities such as water and electricity when no regulations are developed – Cleanliness concern of the collective shed – Issues in sharing responsibilities to clean the cows' room
Motorcycle(s)	1-3 motorcycles	– Have one to three motorcycles depending on the farmer's affordability; – Used to carry grass from the parking area to the cowshed	–
Traditions		Increased community cohesion especially through these traditions: – *Kenduren* (celebrating the births of two calves at once with neighbors) – *kesripahan* (mutual assistance for the grieving dairy farmer/ neighbor)	Threats to the sustainability of farming: – The decreased interest of young generations to sustain dairy farming – Some children are prohibited to cut grass in the forest after the eruption (i.e., post-disaster trauma effects). – Reduced capacities to advance agriculture and forestry as the state's forest controls today are more restrictive.

Ngarit-mugut (cutting and collecting grass) is a tradition that had long been passed down over generations in Mount Merapi. Before farming dairy cows or the so-called *sapi poang*, people in the region farmed Javanese cows type. The low productivity of this type urged them to shift to *sapi poang*. The dairy cow was once introduced by the government's Agency of Animals Husbandry (i.e., *Dinas Peternakan*) which worked together with the UPPT Kaliurang dairy cooperative. Before the eruption in 2010, the Pelemsari farmers delivered the dairy milk to this cooperative center located about four kilometers to the south of their former settlement.

In 2011, the Pelemsari villagers started their new living in the Karang Kendal relocation site located about three kilometers to the south of their former settlement. Almost all dairy cows were killed while those that survived were sold by the owners during their evacuation to temporary shelters. Despite each household finally receiving a one-cow donation from the government in 2014—that is after the government's agency, REKOMPAK, established the collective cow shed in the Karang Kendal—, none of the dairy farmers milked the donated cow. Some of them, especially the young farmers, chose to sell the cow to buy a jeep for involving in a tour business following the post-eruption tourism boom. The trauma after the tragedy, according to my respondents, had made most farmers feel disoriented and unprepared to return to dairy farming. Many were confused about where they had to deliver the dairy milk since their group which formerly handled and coordinated the milk distribution was not yet active.

Although farmers finally started to milk again, not until 2021 that the dairy farmer population could reach the cooperative's minimum bar for free milk transportation to its storage facility in the Wukirsari located about five kilometers to the south of the Karang Kendal. Having less than 15 farmers, the Pelemsari sub-village relied on their neighboring dairy group, the Mantap dairy group

in the Karang Kendal sub-village. The milking center of this dairy group was located about 200 meters from their new settlement. Each farmer, typically riding a motorcycle, brought a 15-liter stainless steel container of dairy milk to the center, a trip that was quite problematic for an over 60-year-old farmer to do. Not only because of the physical s concern, farmers of this age, unlike younger farmers who could ride a motorcycle, must walk to reach the center.

As of today, there are 31 out of 87 households in the Pelemsari sub-village who work in the dairy farming sector, while the rest work in the tourism sector and the civil services. A respondent said that the increased farmer population from less than 15 in 2020 to 31 in 2022 was compelled by the ongoing effects of the global pandemic and eruptions that occurred in the same period. The social distancing measures and the temporary closures of tourist objects in the region caused many jeep drivers who previously shifted their job from dairy farming in 2010 to return to this sector twelve years later. The increased customers' demand for dairy milk, as argued by the respondent, made the sector relatively resistant to those disturbances.

Since November 1, 2021, the Pelemsari sub-village reorganized its dairy group. The re-establishment of their dairy group was inseparable from the advice of the Sarono Makmur dairy cooperative. As the number of farmers in the sub-village had reached fifteen, the cooperative promised to pick up the milk directly in their settlement. In other words, the continuous growth of the Pelemsari's farmers' population became to exceed the carrying capacity of the neighboring dairy group to handle the more complex administration stuff in their milk center.

The new group of the Pelemsari's dairy farmers is organized by five personnel where the sub-village head sits as the chair. With this establishment, the local farmers would have their milk center inside the Karang Kendal relocation site. The dairy group's office is located within the

collective cattle shed compound in a nine-square-meter room where all the containers of all farmers' dairy milk are also placed. All of these containers must be ready for a pick up by the truck of Sarono Makmur cooperative that occurs twice a day at 5:35 AM and 3:40 PM. This means that a dairy farmer who has one pregnant cow must milk it at least one hour before the pick-up time. The pressure increases as the number of dairy cows being milked increases. Thus, those who have more than two or three lactating cows will typically involve the whole members of the household: spouse, children, grandchildren, son-in-law, daughter-in-law, and so forth. Recall the experience of my respondent before the eruption who is the most successful dairy farmer in the sub-village. To take care of and milk her twelve cows, she required participation from all her family members.

When a farmer does not have a cow to start the family business, the dairy cooperative facilitates this by providing a cow credit system called *gaduhan*. The *gaduhan* system required the farmer to return the debt in the form of a first-pregnant young female cow (i.e., *dara*) to the lender/cooperative, similar to the type of cow that he/she receives. If the cow being born is a male, it becomes the possession of the farmer or the debtor. The interactions of different sub-systems of dairy farming in the Pelemsari sub-village could be seen in fig.4.3.

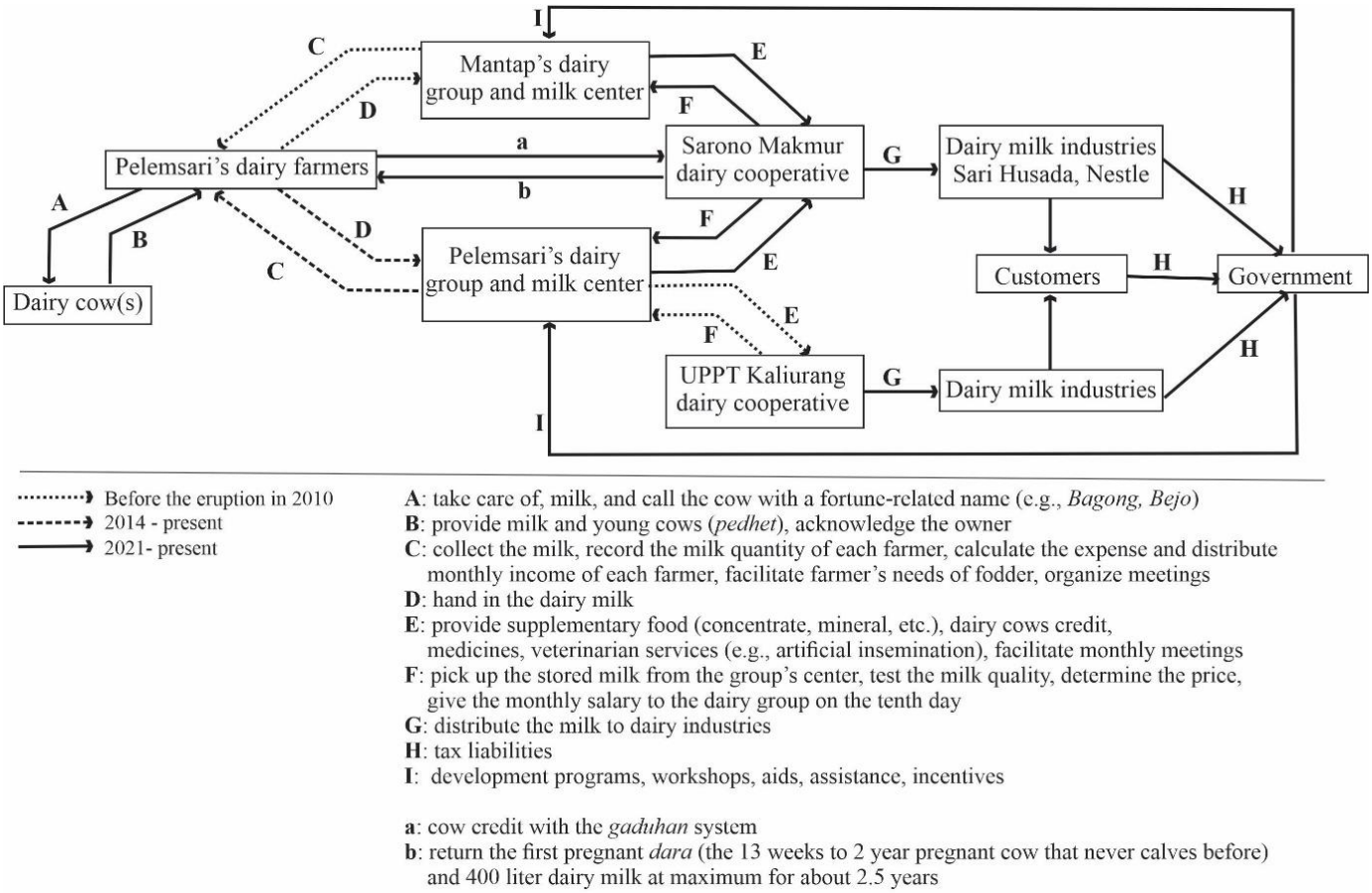

Fig.4.3. The dairy milk process of the Pelemsari farmers in the Karang Kendal relocation site.

There are at least two entities in dairy farming that directly contribute to the welfare of each farmer, the dairy group and the dairy cooperative. The dairy group is developed directly by the farmers and has managerial and administrative tasks of recording the quantity of milk stored by each farmer, coordinating with the cooperative to fulfill the farmers' needs in terms of fodder, medicine, and veterinarian' services (e.g., artificial insemination), ensuring the availability of the supplementary food in the center, organizing meetings among the dairy farmers, and supervising the pickup of the milk by the dairy cooperative. While the dairy cooperative has tasks to provide services and products needed by farmers such as good quality fodder, dairy cows credit, medicine, veterinarian services, consultations, running monthly meetings, testing the quality of the dairy milk, determining the price, and buying the dairy milk, and distribute the milk to the dairy

industries. In terms of the *gaduhan* system, the cooperative lends a pregnant young dairy cow (*dara*) to a farmer and once the cow gives birth, the debtor should return the first young pregnant cow including 400 liters of dairy milk in 2.5 years. Besides this, each farmer should also pay 500 thousand Rupiahs for a one-year cow life insurance. If the cow dies, the farmer will receive the substitution. In this system, the dairy cooperative is funded by the Regional Bank of Sleman and the national oil company, Pertamina (Cooperative, 2022).

To increase the quality and the quantity of the dairy milk production of a lactating cow[81], the farmers should carefully manage the composition of the fodder. Each cow regardless of its condition requires green grass and concentrate locally termed *komboran*. This additional food *komboran* is the mixture of fibers and minerals as the cow's source of protein and nutrients that can trigger dairy milk production. The *komboran* or concentrate could only be obtained from the Sarono Makmur dairy cooperatives. For a high-quality concentrate, the farmer needs to pay about 300 thousand Rupiahs for a sack of a 50-kg-concentrate. At least 3 kilograms of concentrate and 20 kilograms of grass should be fed to a young cow with a 3 to 6-month pregnancy. After its seven-month pregnancy, the cow is not milked but farmers need to increase the quantity of the fodder to 30 kilograms of grass and 6 kilograms of concentrate each day to increase the milk production once the cow gives birth.

The price of one liter of dairy milk determined by the cooperative Sarono Makmur based on the fieldwork in 2022 is Rp. 4,000-Rp.7,500. A healthy lactating cow could produce at least 10-15 liters of dairy milk per day. The farmers then used the profit to buy concentrates sold by the cooperative which per kilogram, costs about Rp.5,000-Rp.6,500,00, depending on the quality of

[81] Lactating cow is the dairy cow that has a 305-day period of producing dairy milk after giving birth

the concentrate. A farmer must buy at least a sack of 50-kilogram concentrate to feed one lactating cow to which, on daily basis, he or she must feed with at least 5 kilograms of concentrate. Without careful fodder management, clearly, farmers could be trapped in misfortune.

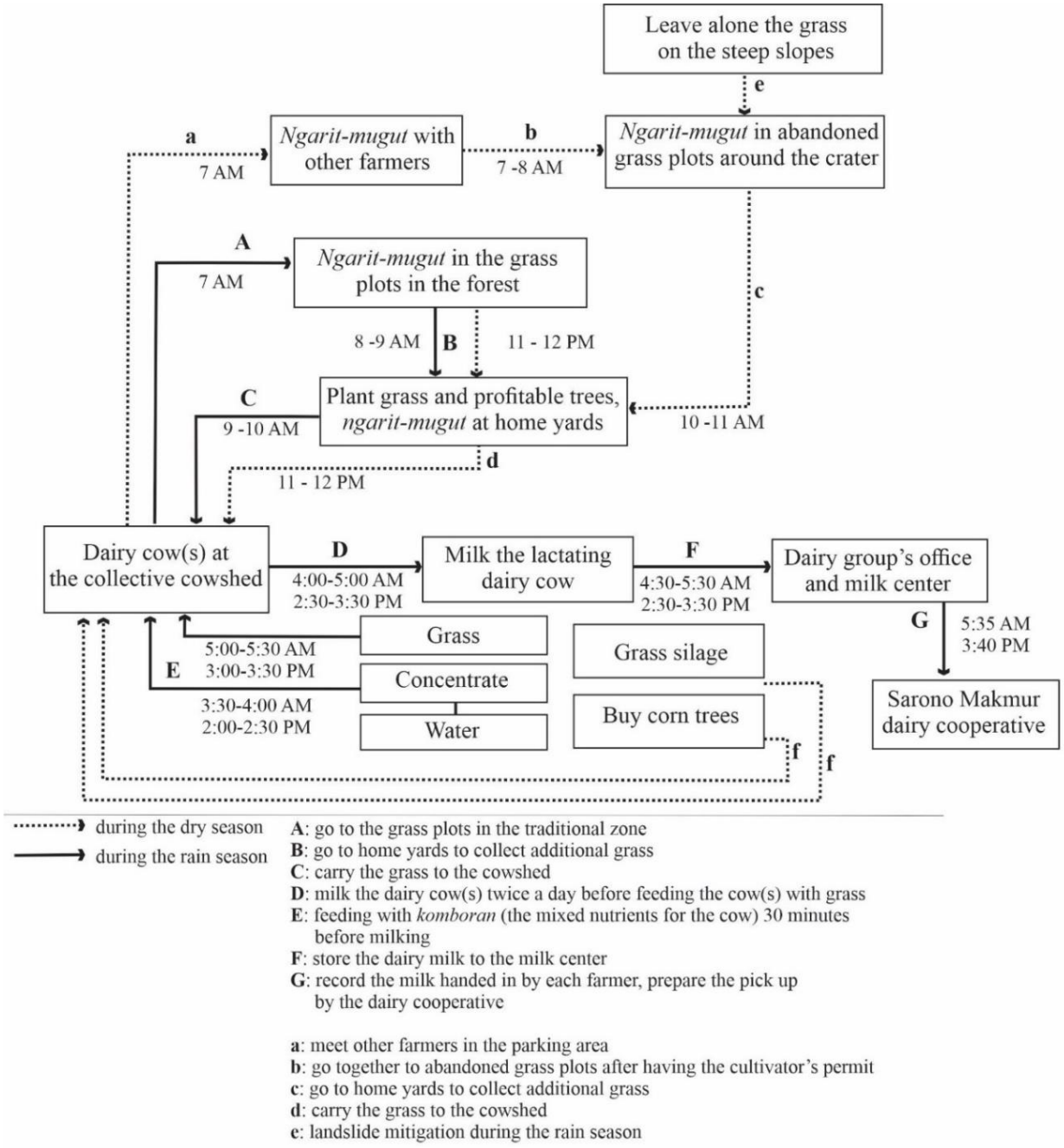

Fig.4.4. The *ngarit-mugut-dairy milk* activities of the Pelemsari farmers. The diagram was based on the field observations and interviews in 2021-2022.

Here, we can see the pressures had by dairy farmers in the sub-village. It is worth noting that this misfortune does not belong only to one or two or all my respondents. They competed with time (storing the milk too long in the container will reduce the milk quality) and having no other choices, directly face threats (eruption in the forest). On the one hand, dairy farming is the only skill that Merapi farmers had for their living. On the other, dairy farming could situate the farmer in the dilemma if he/she wants to expand the business to an industry level, which means milking at least five lactating cows in the same period. Collecting high-quality grass in the forest is undisputable while buying a high-cost concentrate is unavoidable. One way to solve this for one of the respondents is taking greater risks by going farther into the forest and to make it more effective, collecting the grass with his skillful and courageous wife. Once he arrives at the cowshed, adding the quantity of grass to feed his four cows perhaps could reduce the concentrate cost. It had been a hit for the farmer to learn that the previous month, he gained no profit except debt for buying the substance. Something that a rational farmer like him would avoid in the future.

C. *History of Use*

Historically speaking, villagers had long relied on Merapi's forest mainly for fodder. The grass collecting activity or *mugut* had begun before the Dutch designated the volcano as a forest area in 1912. During the Dutch period, villagers were banned from clearing forests and grazing in the forest. As the result, it forced at least three shifts: the change of the cultivating system to a permanent farming system, the grazing in the forest to domesticating cattle in certain fields, and the location of settlements inside the forest boundary to outside the zone at the lower slopes (Umaya et al., 2020, p. 989). To this date, farming is a dominating economic sector in the Umbulharjo Village where 2,849 out of 5,177 people work as farmers.

D. *Leadership*

In the Pelemsari sub-village, the formal leadership is held by the sub-village head and the informal leadership is held by the gatekeeper. While the gatekeeper's duties are mostly related to the palace to which he must be responsible to prepare the rite Labuhan and provide spiritual advice or guidance to visitors and people about Mount Merapi, the sub-village head's work deal with the village's bureaucracy and the community's affairs of which he must be aware 24 hours a day. Despite the seemingly unrelated duties between the two figures, they collaborate in advancing the welfare and the security of their community. When the *Labuhan* was about to be held, the sub-village head mobilized the community to participate in cleaning the road or providing assistance for the success of the ceremony. While the roles of the gatekeeper revolve around spiritual issues, those of the sub-village head touches almost all aspects of the community's livelihoods. For instance, the sub-village head also serves as the protector of their new dairy farming group and the official disseminator of early warning messages about disasters.

Despite this, no one should undermine the informal leader's role in the people's politics. When dealing with a polemic such as the national park issue in 2004, their influence could dishearten the authorities especially knowing that the same figure(s) won people's hearts when refusing the Sultan's order of evacuation. The most regarded elder like Mbah Maridjan, for example, could be more powerful in forcing the state to accept their terms. From my respondent's testimony, we recognized Mbah Maridjan who during the meetings with the agency's officials said, "the national park is allowed but my people must be allowed to cut grass in the forest. If they are unallowed in the forest, I will not allow the plan."

Besides these two leaders, the Pelemsari sub-village comprises people with entrepreneurship skills and talents and is respected as local figures. The eruption in 2010 made the roles of these individuals become more apparent such as the pioneers of the Lava Tour jeep and the motor taxi driver. Talented individuals such as this pioneer mobilized people who were unemployed after the eruption devastatingly hit their dairy farming. Leaders organized the income from tourism for establishing a new life at the relocation site. Their persistence had forced the government to finally fulfill their promise of issuing certificates of their damaged homelands.

E. *Norms*

People's mystical beliefs are manifested through their norms and traditions that dictate their behaviors and responses to disasters. Whenever they pass through sacred and haunted places around the river streams such as the River Kuning or caves in the forest, villagers would not cuss, complain, and comment about Mount Merapi and its activities. Instead, they would also ask for permission from the invisible creatures before cutting the grass in particular places. People in the sub-village also held a strong belief in their ancestral messages that eruptions would not reach their settlements as the ancestral spirits and deities in the volcano protected them. Despite the cultural degradation they face today, people continue conducting traditions like *Labuhan, slametan* or *kenduren, nyadran, tolong-menolong,* and *gotong-royong*. *Slametan* or *kenduren* in dairy farming was held by villagers to celebrate the rare event of a cow that gives birth to two young cows or *pedhets* at the same time. According to one of the respondents, despite their religion is Islam, they have an obligation to *uri-uri* or preserve their ancestors' traditions. The other traditions that need to be mentioned here are *kesripahan* and *nembung*. When native-born resident experiences *kesripahan* or grief for their family members who pass away, neighbors would instantly and voluntarily take care of the dairy cows and fodder. The custom, however, does not apply to a non-

native villager or someone whose family members die in areas outside the sub-village. If for some reason, someone lacks grass or fodder, he or she could *nembung* (i.e., ask for help) with neighbors.

In the grass plots, farmers established agreements with the neighboring farmers about the grass plots' borders or the so-called *kikis*. The borders could take various forms such as bamboo, trees, and trenches; those natural barriers that could only be understood by them. During hardships such as the dry season, farmers go deeper into the forest with others and collaborate to find the abandoned plots for fresh and young grass. Before this, the villager would ask for a permit from the cultivator who worked on that grass plot.

From the interviews with local elders, there are norms shared among farmers in the forest. The right to use the grass plot is inheritable and could be transferred to another farmer or cultivator as long as he or she is a Pelemsari resident. If the previous cultivator, for some reasons like health concerns, could not finish planting trees in the grass plot as required by the state, the right could be transferred to another farmer who requests it. However, if the descendant of the previous farmer reclaims the right to use the grass plot, it is the obligation of the farmer to return it.

It is worth mentioning that the grass plot in the forest is "lent" by the state to the villager. The size of the grass plot was determined based on the agreement between the forest police and the farmer. It was measured by the physical capacity of the farmer to manage the state's trees within the area. For instance, in the field, the farmer said that he will take care of the land in front of him by appointing a bamboo or a tree as the border and calculating in his mind the physical capacity that he had to plant the seeds given to him one day. Then, the forest police would ask him to commit his promise. As of today, the national park agency tried to track and record the people's grass plots given by the preceding authority for their future policymaking.

F. *Knowledge of SES*

Lahars that burn *alang-alang* on the upper slopes accelerate the forest rejuvenation which contributes to preventing landslides. Before the Dutch designated the Merapi forest as a protected forest, this natural succession was imitated by farmers by burning the moorlands at the end of the dry season in October. The techniques called "slash and burn" were used to expedite the growth of the young grass at the beginning of the rain season and to avoid the spread of the wildfire reaching other forests or areas (Lucas Sasongko Triyoga, 1991, p. 122).

As of today, farmers no longer are able to perform the slash and burn technique to clear land and depend on their grass plots in the forest and their former home yards for fodder. They conduct regular cutting with a shifting system from one plot to another. A rotation system is a solution for keeping the grass abundance throughout the year. The first cutting of the grass, especially for the *kalanjana*, after the first cultivation is performed after the grass reaches about two months of age. After that, the rotation can be performed according to the needs. The grass aged 20-30 days is the most ideal time for harvesting young and delicate grass. Old grass whose age is more than 30 days reduced the nutrients of the fodder and because of the hardened texture, it would be difficult to digest by the cow. When cutting the grass, farmers will leave out about 30 centimeters to allow it to regrow. Typically, farmers fertilized the soil in the home yard with cattle manure; something that they could not do in the forest as it is considered a violation of the forest rules.

When resource users share common knowledge of relevant SES attributes, how their actions affect each other, and rules used in other SES, they will see a low cost of organizing (Ostrom, 2009, p. 421). Regarding this, the Pelemsari dairy farmers shared the knowledge that the green and young grass in the deep forest would be beneficial for the high-quality dairy milk. Many respondents who

have lactating cows feed them with a combined grass type to increase the cow's appetite, thus, the quality of the dairy milk. In practice, they then added the grass obtained from the forest to those available in their own home yards in the former settlement. During the dry season, sharing the same interests, farmers organized to go together with others to the deep forest to seek the high-quality and diverse types of grass. According to the national park agency (2018), there are at least 24 grass species in the forest which covered about 80% of the total area under the tree stands. Among them are *alang-alang* (*Imperata cylindrica*), *kalanjana* (*brachiaria mutica*), PB, and *iserbumi* (*paspalum conjugatum*) (T. Atmojo et al., 2018, pp. 128–129), not to mention *indres* grass and *anggring* leaves (*trema cannabinahat*).

G. *Importance of Resources*

Merapi villagers including the Pelemsari depended on forest natural resources for their economy. The "free" fresh and young grass is collected from the forest on a daily basis to ensure the high quality of the dairy milk that later determines the profit gained from the dairy cooperative and *rencek* or dry wood that freed them from the chain of the global market, namely gas. In these two factors, "depending on the resource system for a substantial portion of the livelihoods" or "attaching a high value to the sustainability of the resource" that the effort of maintaining a self-governing system by the users is worthed (Ostrom, 2009, p. 421).

Merapi villagers had relied on their economy on dairy farming since 1994 (Nugroho & Sutaryono, 2015, p. 123). To feed the cows, they usually forage grass (source of fiber) and legumes (source of mineral and protein) either in the forest or in-home yards. During the dry season (April-September), the intensity of foraging in the forest increases. Sometimes, they go together to the deep forest after meeting at a parking lot where they usually parked their motorcycles. Walking in

the forest, they locate the available fresh grass (2-3 months aged) based on the valuable information shared by another farmer. This abandoned grass plot usually belonged to other farmers who are no longer able to plant trees and cut grass or those who no longer work in dairy farming.

In regard to the safety concern in the foret, farmers adopted the local knowledge that cutting grass on the steep slopes should be avoided, Therefore, they would prefer to move to other potential areas for fresh and young grass which is preferable for producing high-quality milk. To ensure the grass availability in the forest, they will leave out about 30 centimeters of the grass to grow again. While in the former home yards, they would plant grass and fertilize it with cattle manure. To transport the manure from the collective cattle shed in the Karang Kendal to their former home yards in the upper land, people in the sub-village could collectively rent a truck driver. Those who do not have cows could *nembung* or ask other dairy farmers for the manure. Together, they then share the fee for the driver who will transfer the grass to their agricultural farms on the upper land.

H. *Technology*

After the eruption in 2010, people began to rely on mobile phones to receive early warning messages from the authority or to update information about the volcano. As the intensity of eruptions, they are urged to find further information from the national disaster agency's website called "Merapi Live Streaming" which visualizes the raw data from the monitoring stations in the volcanic region. Social media such as Twitter, Instagram, and Facebook were also accessed through their mobile phones. Besides this channel, WhatsApp is the application that most villagers intensively use to exchange information and receive warning messages from the sub-village head. Most people, after the eruption, bought radio HT online with the price ranging from less than 300 thousand rupiahs to about 1 million rupiahs. According to the respondents, the radio HT boost their awareness of eruption during their *ngarit* and *ngrencek* activities in the forest.

Motorcycles are the most common vehicles people used during the *ngarit* activities before going to the forest. There are at least two transit areas where they usually park the motorcycles identified in this research which are the areas around the *Rudal Monument* and the Pelemsari neighborhood. From these areas, they go to the forest and if preferred, along with other farmers whom they meet at the transit area, they go to the forest by walking, Once, the grass is collected, they are carried by placing them either on the farmer's back (*gendong*) or head (*sunggi* method). When they arrive at the transit area, the grass is then tied to and carried with the motorcycle to the collective cowshed in the Karang Kendal. Farmers to date maintained the use of a curved blade to cut the grass and avoid the use of a machine. According to the respondents, the gasoline will contaminate the grass thus there is a likelihood that the dairy cows will not eat them.

Given the challenging route in the forest, farmers invent ways to reduce fatigue by building a rest area in the forest. Two long bamboo trees that were found by my respondents, for example, were attached to a big tree to form a triangular frame structure that can hold the grass's weight. The farmer could take a rest beneath it and get protection from the heat. It will not be difficult for him to carry the grass again with his back or head, given the grass is placed in such a way using that structure. Interestingly, other farmers who noticed the respondent's invention imitated his actions. Others, with a permit from him, could take the benefits of his creation. The technology built by this skillful farmer is a small example that demonstrates how he and his fellow villagers take the benefits from the volcano without harming its sustainability.

4.3.2. Resource System

A. Sector and Size of Resource System

The national park of Mount Merapi covers areas of about 6,410 Ha and administratively lies within two provincial jurisdictions: Central Java (Regencies of Magelang, Boyolali, and Klaten) and

Yogyakarta (Regency of Sleman). The national park in Central Java is designated as a protected forest while the national park in Yogyakarta is assigned for three uses: protected forest (± 1,041,38 Ha), Nature Reserve Plawangan Turgo (± 146.16 Ha), and Nature Park Plawangan Turgo (±96.45 Ha). The national park consists of five zones: core zone, wilderness zone, utilization zone, and other zones. The 1,041.2 Ha of Core Zone covers areas around the summit and *Gunung Bibi*. This zone is aimed at preserving the ecosystem and the authenticity of the volcano's biodiversity. The 2,980.19 Ha of Wilderness Zone is functioned to preserve the core zone and the use zone. Areas within this zone includes Forest Pathuk, Kumpulrejo, Gunung Pasir, Block 45, Block Koci, Gemer, and Bokong Semar. The 461.73 Ha of Utilization Zone covers areas located in Plawangan Turgo, Kalikuning, Kaliadem, Gandok, Hutan Bambu Tritis, Jalur Pendakian Selo dan Deles, Deles Indah, *Goa Jepang* (Japanese Cave), Gumuk, ad Jurang Jero which are aimed for nature-based tourism. The 1,504.62 Ha of Traditional Zone covers areas that are intensively worked on by villagers such as collecting grass for fodder. The 11.57 Ha of Spiritual, Cultural, and Historical Zone facilitates the local's socio-cultural activities in Mount Merapi. It includes Alas Bedengan and Petilasan, the cemetery of Syekch Jumadil Kubro, and the harbor of Labuhan Gunung rite, the Srimanganti (Kendit Hill). The 418.42 Ha of Rehabilitation Zone is aimed at restoring habitats and covers areas of Alas Gandok, Resort Srumbung, and Resort Kemalang. The 189.88 Ha of Special Zone of Mitigation and Reconstruction covers areas such as River Putih, River Gendol, and River Woro including the spots of the installed devices of the Agency of the Investigation and Development of Geological Disasters Technology in Labuhan Deles, Pasar Bubrah, Klatakan, and Plawangan. This agency has the authority of issuing the hazard zone map.

The renewed hazard map after the eruption in 2010 regulates the land uses and the kinds of development permitted in the designated zones. Accordingly, the Merapi's hazard zone is

classified into three: *Kawasan Rawan Bencana III* (i.e., the third level hazard zone) covering areas close to the crater which are prone to pyroclastic flows, lava flows, tephra, and ash rainfalls; *Kawasan Rawan Bencana II* (i.e., the second level hazard zone) comprising areas that are prone to volcanic clouds, pyroclastic flows, lava flows, and lahars, and *Kawasan Rawan Bencana I* (i.e., the first hazard zone) covering areas that are prone to lahars, lava flows, and pyroclastic flows (BNPB, 2011, pp. 72–73). The infrastructure needed for the disaster mitigation purposes are accomodated in the national park map as the special zone (fig.4.5). The total size of this area is 189.88 Ha of the totaled 6,607.52 Ha of the national park (table 4.3).

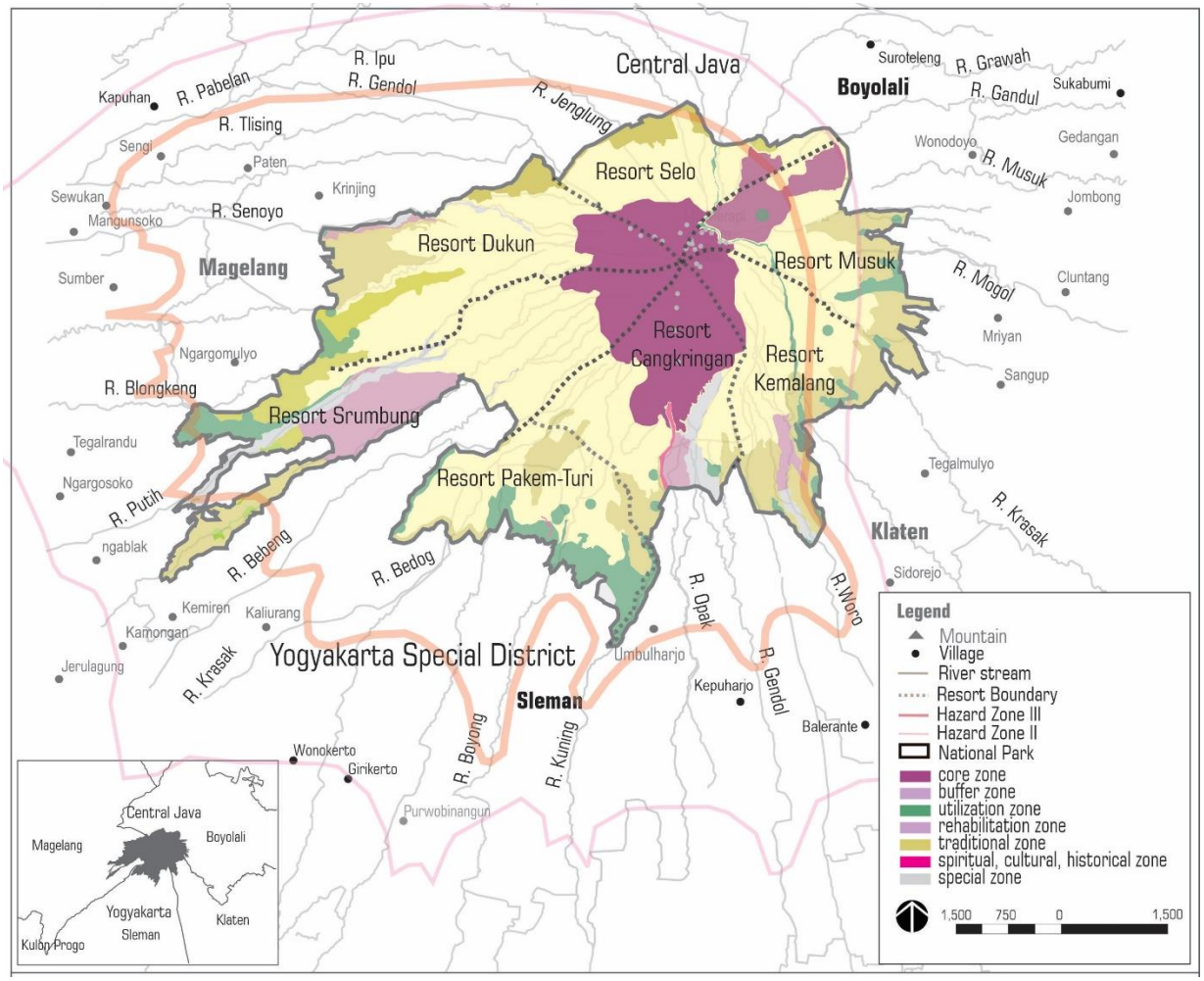

Fig. 4.5. The territory of the Resort Cangkringan within which the Umbulharjo Village/ the Pelemsari sub-village is situated. The image was created by the author by adapting to the official zonation map of the Mt.Merapi National Park Agency, 2022.

Table 4.3. The details of the Mount Merapi national park's zones according to the Mount Merapi National Agency (2022)

Zone	Size (Ha)	Areas	Functions
Core Zone	1,041.2	Around the summit and *Gunung Bibi*	Preserve the ecosystem and the authenticity of the volcano's biodiversity
Wilderness Zone	2,980.19	Forest Pathuk, Kumpulrejo, Gunung Pasir, Block 45, Block Koci, Gemer, and Bokong Semar	Preserve the core zone and the use zone
Utilization Zone	461.73	Plawangan Turgo, Kalikuning, Kaliadem, Gandok, Hutan Bambu Tritis, Jalur Pendakian Selo and Deles, Deles Indah, *Goa Jepang* (Japanese Cave), Gumuk, Jurang Jero	Nature-based tourism
Traditional Zone	1,504.62	Areas that are intensively worked on by villagers such as collecting grass for fodder	
Spiritual, Cultural, and Historical Zone	11.57	Alas Bedengan and Petilasan, the cemetery of Syekch Jumadil Kubro, and the harbor of Labuhan Gunung rite, the Srimanganti (Kendit Hill).	Facilitate the local's socio-cultural activities in Mount Merapi
Rehabilitation Zone	418.42	Alas Gandok, Resort Srumbung, and Resort Kemalang	Restore habitats
Special Zone of Mitigation and Reconstruction	189.88	River Putih, River Gendol, and River Woro including the spots of the installed devices of the Agency of the Investigation and Development of Geological Disasters Technology in Labuhan Deles, Pasar Bubrah, Klatakan, and Plawangan. This agency has the authority of issuing the hazard zone map.	

To supervise the enforcement and the implementation of the state's forest regulations and controls, the national government established an agency called *Balai Taman Nasional Gunung Merapi* (BTNGM) or Mount Merapi National Park Agency in Cangkringan District, Sleman Regency. Since then, the forest management of the volcano was divided into two sections of management and seven resorts or areas The forest was divided based on the agency's studies that considered the physical conditions of the volcano, biodiversity, the socio-ecological conditions of the community, threats, and the human resources available (BTNGM, 2018a, pp. 8–9).

Table 4.4. The summarized forest management and resorts (BTNGM, 2018a, pp. 8–9)

Sections of the Forest Management	Resort	Size (Ha)	Villages	Regency
Section I	Dukun	1,426.66	1. Paten 2. Krinjing 3. Keningar 4. Ngargomulyo	Sleman
	Srumbung	1,108.77	1. Ngablak 2. Ngargosuko 3. Kemiren 4. Tegalrandu 5. Kaliurang 6. Mranggen	
	Pakem Turi	812.67	1. Wonokerto 2. Girikerto 3. Purwobinangun 4. Hargobinangun	
	Cangkringan	985.95	1. Umbulharjo 2. Kepuharjo 3. Glagaharjo	
Section II	Kemalang	884.05	1. Balarante 2. Sidorejo 3. Tegamulyo	Klaten
	Musuk Cepogo	562.87	1. Sangup 2. Mriyan 3. Cluntang 4. Wonodoyo	Boyolali
	Selo	841.83	1. Samiran 2. Suroteleng 3. Lencoh 4. Jrakah 5. Klakah 6. Tigolele	Boyolali

The area of study, the Pelemsari sub-village in Umbulharjo Village lies within the territory of the Resort Cangkringan. Besides Umbulharjo, the other two villages that administratively belong to the resort are Glagaharjo and Kepuharjo. The resort's territory is bordered by the Selo District and the peak of the volcano in the north, the Pakem and Ngempak districts in the south, the Balarante Village, Kemalang District, Klaten Regency in the east, and the Pakem district in the west (fig.4.5). The personnel who are responsible include the resort head (i.e., *Kepala* resort), two forest ecosystem controllers (*pengendali ekosistem hutan*), and one forest police for supervising about 988.95 Ha-forest resort.

Table 4.5. The national park's zones within the Resort Cangkringan (BTNGM, 2019, p. 66)

No	Zone	Size (Ha)	Portion of the National Park's Zone
1	Core	385.86	1,041.2
2	Wilderness	372.30	2,980.19
3	Utilization	29.98	461.73
4	Traditional	91.14	1,504.62
5	Rehabilitation	24.07	418.42
6	Mitigation and Reconstruction	74.05	189.88
7	Religion, Culture, and History	8.54	11.57
	Total Area of the Resort Cangkringan	988.95	

Based on the agency's document, there are 31 types of understory plants and 13 types of tree species that grow in this resort. The 13 trees species include *engelhadria spicata* (i.e., sawo), *Pinus merkusii* (i.e., pinus), *acacia decurrens* (i.e., akasia decuren), *homalanthus populneus* (i.e., krembi, kareumbi), *stachyris melanotharax* (i.e., kaliandra), *syzgium polyanthum* (i.e., salam), *Schima walichii* (i.e., puspa), *Chycas rumpii* (i.e., pakis haji), *Ficus fistulosa* (i.e., Wilodo), *Brachiaria mutico* (i.e., kolonjana), *Dodonaea viscosa* (i.e., tesek), *Cupressus sp* (i.e., bintama), and *Erythrna lithosperma* (i.e., dadap duri), and orchid.

In the context of the forest, large territories could impede the self-governed institution due to the expensive process to define the boundaries, monitoring the use patterns, and gaining ecological knowledge (Ostrom, 2009, p. 420). Moreover, the enormous size of forests used as common-pool resources may create problems in monitoring and controlling (Chhatre & Agrawal, 2008, p. 13290). There is no rule of thumb of an ideal ratio between the forest size and users to promote communal governance given the unique characteristics of each forest, socially and ecologically. Chhatre and Agrawal (2008) gave an example that a 5,000-hectare forest led to ineffective monitoring as the size of groups who could watch closely the forest is inadequate or small (Chhatre & Agrawal, 2008, p. 13290). However, it is worth noting that supervising each resort, regardless of the size of the resort, relies on one resort head, one forest police, one forest ecosystem controller,

and one forestry consultant. It is almost impossible to expect the field officials (forest police, forest ecosystem controller) to present and ensure the law enforcement.

Overall, the division of the national park into seven resorts and two managerial sections in Mount Merapi seems very promising in increasing the forest rules enforcement in the field. However, it may not contribute to forest sustainability, especially after learning from the slow forest regeneration in 2010. Excluding the community from involving in forest monitoring would make the envisioned ecosystem sustainability and forest regeneration become too far from being accomplished. Moreover, a self-governed CPR—or giving back the right to manage the forest to the local hands—advocated by Ostrom (2009), Chattre and Agrawal (2008), or other scholars was not yet regarded as a long-term goal of the current or previous governments.

B. Clarity of System Boundaries

The state' s forestry agency issued the national park zones in 2004 and recently issues the update in 2021. In the map, the sanggeman or grass plots are distributed around the boundaries of the national park's territory. According to the sub-village head, not all his community members can recognize the boundaries when they conduct their *ngarit* traditions. At least, not until they encounter the forest police who guard at that moment. It is also worth mentioning that the socialization of the national park zonation through meetings was only limited to the sub-village's officials: the sub-village head and the neighborhood heads. The information was then disseminated by the sub-village officials to the whole community.

Oftentimes, people who recognized the national park's border signs did not feel discouraged to enter the prohibited zones in order to collect fresh and young grass for fodder. Every time the forest police are not on the spot, some villagers will silently enter these zones. It seems many villagers who observed the time schedules of the forest police knew when these officials will not be

available in the field. One of my respondents in 2019 confessed that this made her feel like a thief anytime she needed to sneak out from the authority for taking the grass from the prohibited zones.

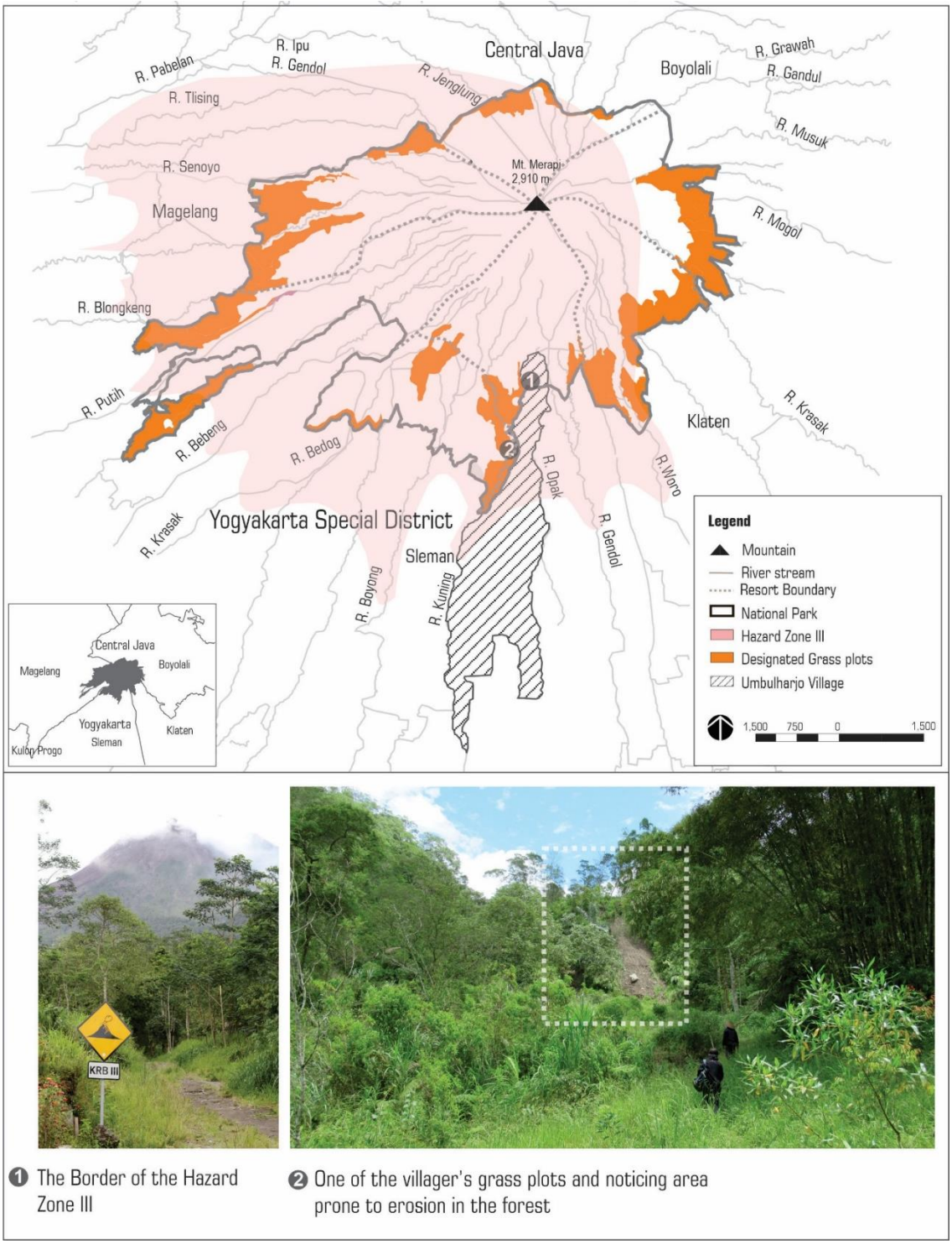

Fig. 4.6. The grass plots are distributed in the national park zone.
The map image is adapted from the map of the BTNGM, 2022

C. Productivity of System

The residents of 30 villages around the national park mainly access the forest for collecting grass, fuelwood (i.e., *rencek*), woods for charcoals, and water, besides developing tourism, exploiting sand, hunting animals, extracting honey, enhancing orchids, and cultural interactions (T. Atmojo et al., 2018, pp. 75–87). Water besides grass is the resource unit that most people relied on. During the dry season from April to September, villages located in the highest location periodically dealt with the scarcity of potable water. These three villages were Balarante, Sidorejo, and Tegalmulyo (fig.5.7)[82] within the jurisdiction of the Klaten regency (Siswanto, 2021).

Unlike the three villages, people living in other areas such as the Pelemsari did not face water crises, particularly, after they moved to the Karang Kendal which is located farther down the southern flank. However, the major problem faced by these villagers during the dry season is mostly related to the lack of fresh grass for fodder in the forest. This condition often forced them to go farther to the deep forest situated about 1.5-3 kilometers from the crater. One of the respondents whom I interviewed in 2022 admitted that he had been trained on how to make grass silage, the alternative fodder, during workshops back in 1995. The lack of time, space, and tools required for the grass silage seemed to have impeded him to adopt this agricultural technology. Most villagers preferred to take risks by going farther into the forest, sometimes altogether with farmers from other villages.

People need to observe the availability of natural resources before investing themselves in a self-governed institution. Ostrom (2009) raises her concern about the tendency where people at a certain point do not see the necessity to manage the resources for the future once the resources are

[82] According to the Research and Technology Development of Geological Disaster, the eastern part of the volcanp is old Merapi that had been formed since 60,000 years ago. The lava sedimentation contained in the soil caused the water rain could be retained throughout seasons (Kirjito, 2018).

either exhausted or very abundant, creating what she called “a curvilinear effect of the system’s productivity on self-organization” (Ostrom, 2009, p. 420).

D. Predictability of System Dynamics

The Javanese people in Mount Merapi relied on the ancient Javanese calendar called *Pranoto Mongso* (i.e., “the conditions of seasons”) to guide their agricultural activities. The calendar was developed based on the ancestors’ observations of natural phenomena such as rainy seasons, dry seasons, flowering seasons, stars constellations in the sky, the effect of seawater tides, and so forth that had occurred for thousands of years. The calendar, similar to the Gregorian calendar, is divided into 12 months and each month consists of 23-43 days. It was developed by following the solar rotation whose cycle is 365 days or 366 days. The calendar serves as a guideline in ecological practices like farming and fishing and a guidance for disaster preparedness (e.g., flood, drought, an insect pest. pandemic). Agricultural kingdoms such as the ancient Mataram and the Islamic Mataram relied on the calendar. Each season in the calendar described the behavioral patterns of crops, animals, and humans as well as information on biotic-natural resources that enable farmers to forecast the seasons. According to S.W.Atmodjo (2021), *pranoto mongso* has four seasons (*mangsa*): 1) *Mangsa Labuhan* which starts at the beginning of the rainy season at the end of September or October when farmers start to plant *padecreeija* or agricultural crops; 2) *Mangsa Rendengan* (October-November) where the rain falls were intensive and farmers start to plant rice or transplant to the field; 3) *Mangsa Marengan* (March) where the rainfall decreases and the *padecreeija* planted in the *Mangsa Labuhan* is harvested and farmers start to plant in dry cultivation land (i.e., *tegalan*) again, and *Mangsa Kemarau* (April-May) is the season where farmers can start to harvest the rice cultivated in the *Mangsa Rendengan* and plant *padecreeija* and rice when water exists or padi *gadu* when the rice planted in limited water condition. In terms of climate change, the *pranoto mongso* provides a guideline for developing the disaster awareness:

mangsa rendeng (December-February) is the month of storms, rains, floods, and landslides and *Kawolu* (February-March) is the month for the farmers to anticipate plant diseases, plagues, floods, storms, landslides (S. W. Atmojo, 2021, pp. 40–42).

Users' capacity to predict the system dynamics, as argued by Ostrom (2009), could help them estimate the consequences of establishing particular rules of harvesting (Ostrom, 2009, p. 421). The Javanese people especially those living on Mount Merapi had long recorded the volcanic environment's dynamics in favor of their agricultural activities and predicted the season changes accordingly. Through the Javanese calendar, farmers, mostly elders, in the Pelemsari sub-village predict when the dry and the rain seasons occur along with their intensity. With this prediction, he determines the appropriate time for collecting grass into the forest. During my interviews with this elder, he mentioned the period from *mongso papat* to the *mongso pitu* as the time when the rains occur, and that from *mongso Songo* to *mongso ten* as the time when the rain frequency decreases but the intensity becomes greater. The capability of the calendar to predict the seasons, unfortunately, was not as precise as those in the past. Climate change requires evaluation and updates of this local knowledge. The other challenge that needs to be mentioned here is the lacking interest of the young farmers to use the Javanese calendar.

Dealing with threats forced their ancestors to learn from their nature and develop knowledge of disaster mitigation accordingly. In the past, people predicted the occurrence of eruptions. An elder whom I interviewed explained that people in the past believed that small-scale eruptions occurred at least once a year during the month of Sura, the first month of the Javanese calendar in which people would conduct sacred rituals (Triyoga, 1991, p. 122). The eruption in 2010 was beyond people's expectations. Before the eruption, there was a long-standing belief that an eruption (i.e., pyroclastic flows) would not reach their settlement in the southern flank. An elder whom I

interviewed admitted that this incident had caused a major shift in his community's belief in their ancestral messages. Another resident, aged about 30, saw the eruption as a lesson that the ancestor's predictions may not be relevant to the current environmental changes and that science, regardless of its capacity to monitor the dynamics of the environment, is still unable to provide an accurate prediction about the volcano's changing behaviors.

Despite the different attitudes had by the Pelemsari villagers toward ancestral beliefs, most of them as of today relied on environmental cues such as thunder light, black smoke, hot temperature, and animals in the forest that suddenly go down the slope. Besides using this mechanism to develop an awareness of eruption, people also rely on the government's warning messages disseminated through the local leaders (e.g., WhatsApp group, speaker of the Mosque) and radio HT. These mechanisms are particularly critical for the 'risk takers' like villagers who collect grass into the forest during the volcano's eruptive activity.

Table 4.6. Pranoto Mongso and the specific seasons of agricultural practices (S. W. Atmojo, 2021, pp. 42–43)

Mangsa (seasons)	Main Seasons	Length of season	Metaphoric Characteristics	Natural Identifiers	Farming Guidelines
Kasa (Kartika, kahiji)	The third-light	June 22-August 1 (41 days)	*Sesotya murca ing embanan* (i.e., diamond is falling from its box, meaning leaves are falling).	Leaves fall, woods dry, grasshoppers enter the ground	Farmers burn rice straws in the field and start to plant *padecreeijo*
Karo (Puso, kadua)	The third-famine	August 2-24 (23 days)	*Batala rengka* ("earth breaks", meaning that the surface of the ground cracks).	Soil dries and cracks, and kapok and mango trees begin to bloom	*Padecreeijo* starts to grow, kapok and mango trees begin to bloom and soil starts to crack
Katelu (Manggasri, Katilu)	The third, *Semplah*	August 18-Set 25 (24 days)	*Suta manut ing bapa* ("children obey their fathers").	Crops are climbing up the lane, and bamboo shoots are emerging	No crops in the field because of the heat; *padecreeijo was* harvested and various types of bamboo grow
Kapat (Sitro, Ka-opat)	*Labuh, semplah*	September 19-Oct 13 (25 days)	*Waspa kumembeng jroning kalbu* ("tears flood the heart, meaning that many springs are dried up).	Wells are dry, kapok to begin bear fruits, and small birds start nesting and laying eggs	Padecreeijo is harvested, but fields are not or are rarely planted because of the dry season. farmers cultivate their lands for dry rice and banana.
Kalima (Manggak, ala, Kalima)	*Labuh-Samplah*	October 14-November 9 (27 days)	*Pancuranmas sumawuring Jagad* (golden shower waters the world, meaning the rain starts to fall).	Heavy rains start to fall, the young leaves of the Javanese tamarind tree start to emerge, caterpillars begin to appear, and flying ants are out of the burrows. Bitter *ginger*, turmeric, and finger root begin to sprout.	Field trenches are fixed, allowing water to flow at the edge of the rice fields. Farmers start to transplant dry rice to the fields
Kanem (Naya, kagenep)	Labuh Udan	Nov 10-Dec 22 (43 days)	*Rasa mulya, kasuciyan* (fruit trees start to bear fruits).	Fruits (durian, rambutan, mangosteen, others) appear. Grouse start to appear in watery places.	Farmers spread rice, and seeds in the nursery and begin to cultivate their lands.
Kapitu (paguna, katujuh)	*Rendheng-Udan*	Dec 23-Feb 3 (43 days)	*Wisa kenter ing maruta* (poison drifts with the wind, meaning many diseases).	Many rainfalls, many rivers overflow, floods, storms, and landslide seasons.	Farmers start to transplant rice seeds to the fields/ start to plant in the fields.
Kawulo (wisaka, kadala-pan)	*Rendhen-pangare-arep*	February 4-28/29 (26 or 27 days)	*Anjrah jroning kayun* ("the expression of heart", meaning the breeding season of cats and other animals).	In the breeding season of cats, rice becomes green, white grub larvae start to emerge.	Rice becomes green.
Kasanga (jita, kesimbalan)	*Rendheng-pangarep-arep*	March 1-25 (25 days)	*Wedharing wacana mulya* ("the emergence of noble voices", meaning the mating calls of some animals that attract the opposite sex).	Rice is flowering, crickets start to appear, cicadas vocalize their mating calls, floods may still occur, and flowers of wild sugar cane fall.	Rice is flowering and the gains start to appear.

Kasepuluh (srawana, kasupi-uh)	*Mareng-pangarep-arep*	March 26-April 18 (24 days)	*Gedhong minep jroning kalbu* ("buildings are caught in hearts", meaning that many animals are pregnant).	Rice is yellowing, many animals are pregnant, and small birds start to hatch their eggs.	The rain grain is filled. The color varies between green and yellow. Some of the rice fields are harvested.
Desta (padrawa-na, kasabe-las)	*Mareng-*harvest	April 19-May 11 (23 days)	*Sesotya sinarawedi* ("the glorious diamond, meaning that the birds' eggs are hatching and the mother starts to feed their chicks).	Birds feed their chicks; kapok trees shed cotton.	After the harvest of short-lived crops, there is still time to plant *padecreeija*.
Sada (asuji, kadua-belas)	Mareng-light	May 12-June 12 (41 days)	*Tirta sah saking sasana* ("water leaves its house", meaning that farmers rarely sweat because of cold and dry air).	Air temperature decreases. The environment feels cold (*bediding*).	Farmers start to dry their rice under the sun and put it into the granary. Only rice straws remain in the field, It is time to plant *padecreeija* (soybean, Indigofera, cottonwood trees) and corns

4.3.3. Resource Units

A. Resource Unit Mobility

The volcanic sand and water flowing through the river streams are two major resource units that mobilize in the Merapi region. After an eruption, Mount Merapi will emit volcanic materials that flow through 13 major river streams in the region. This brings an economic opportunity for villagers nearby to involve in the mining sector type C. Those who mine the volcanic sand were villagers who developed a group of 4-5 people typically the whole family members and the foreign and domestic companies who worked together with the community in the two provinces (Kusmiyati, 2019, pp. 3–4).

Sand mining began to operate in Mount Merapi as the volcano released lava flow in the 1930s. Millions of m^3 of volcanic sand were carried by the lava flow down the volcano and deposited around the river streams of Opak, Gendol, and Kuning. The miners, mainly men aged between 20 and 40 years, work either as illegal miners or laborers of a legit mining company. As the market demand for sand increases, sand exploitation also increases. In some villages such as Balarante and Sidorejo, some miners even rented private farms to dig the sand by using a backhoe (Muhammad, 2010, pp. 113–119).

Mining production cycles begin with an eruptive activity that releases abundant volcanic materials and is followed by a secondary impact in the form of cold lava or lahars. Lahars carry volcanic materials that flow from the crater or upstream to downstream. After the 2010 eruption, lava deposited in the river channel attracted miners to collect the sand. About 70% of the lahars were found around River Progo on the western slope while the remaining 30% was around River Opak on the southern slope. When rain occurred, the rain along with the lava will flow downstream to areas such as the Jero Jurang around the River Putih. When sand decreases, miners sought for the

sand in the forest area, dig deeper into the soil, or cut the river bank. Research shows that the average number of trucks involved in sand mining could reach 133 trucks per day with 700-800 laborers. In general, each sand miner group consists of five persons who work as diggers, sieves, collectors, and transporters to load the sand into the truck. A truck driver was typically paid about IDR 750,000. the sand was then sold in depots around the area for IDR 1.5 million or IDR 130,000 per cubic meter, thus, the driver and the truck owner could gain a profit of IDR 300,000-350,000 per trip. However, sand mining around river banks has long been banned by the national park authority (Umaya et al., 2020, p. 990).

The use of this heavy equipment including trucks undoubtedly had negative environmental implications on the Merapi region. The massive exploitation had reduced the water table in the Merapi region. In the Srumbung village, for instance, the water table in people's private wells annually decreased between one and two meters on average from 2004 to 2005. At worst, some villages in the Klaten district failed to crop due to this crisis. To solve the problem, local farmers must buy water pumps (Muhammad, 2010, pp. 113–119). In 2020, however, the water crisis continued to raise people's concerns as the government still issued a mining licenses to private companies. For example, the agency head of the License and Investments in the Yogyakarta Special Districts approved the mining request of a company around the River Boyong. In the meantime, there are eight villages: Ngandong, Turgo, Kemiri, Boyong, West Kaliurang, East Kaliurang, Ngepring, and Wonorejo that consistently use water from the river not only for fulfilling the needs of their households but also for the livestock. As of today, people flow the water directly to their homes through the water pipes. They worked together to plant trees to preserve the water and stand guard over hunters around the protected forest. People criticize the government's centralistic process of the mining license, ignorance of the ecological consequences

of the license issuance, and weak decree enforcement as the community control was not yet involved (Pasarua, 2022). The protected forests on the slopes of Mount Merapi in the Province of Central Java and Yogyakarta are aimed at preserving water sources for the livelihoods of the adjacent communities and protecting plants and animal species. Villagers living nearby the volcano connected these water sources to their settlements and manage their distribution and use with other residents. Since the pipelines and reservoirs could be easily destructed by pyroclastic flows, it is not rare that the villagers with assistance from the government and NGOs must repair the water system buried under the volcanic materials.

To manage the water sources, the Mount Merapi National Agency survey and monitor the use of the available water sources. In 2017, there were 23 water sources in the national park, and in 2018, the number increased to 43. The water flow to Yogyakarta comes from the volcano's river streams: Rivers Boyong, Krasak, Opak, Gendol, and Kuning. Two water sources stemming from River Kuning are *Umbul Lanang* and *Umbul Wadon* which are locally called *Umbul Temanten*. Besides the two water sources, the Resort Cangkringan also had *Umbul Bebeng*, *Umbul Dimas*, and *Umbul Cemoro* (BTNGM, 2019, p. 73). The distribution of these rivers can be seen in fig.5.13. Villagers living in the western and southern parts of the national park generally have water discharge from *Umbul Temanten* located on the southern slope including Sapu Angin and *Tuk Muncar* located on the eastern slope. Those living in the northern part of Merapi, however, must channel water from Mt. Merbabu through pipelines to their homes. Each sub-village has different water management. The water management in West Kaliurang was done by installing a water meter at each house, while that in Ngandong which is adjacent to River Krasak, did not install a water meter as they gained direct access to a large water discharge. Despite this, local leaders would advise residents to use water wisely to ensure its availability for eight sub-villages. Differ from the two sub-

villages, residents of the Turgo sub-village could obtain water from three sources: *Umbul Lanang, Umbul Wadon,* and *Tuk Candi*. In Umbulharjo Village, the government built *Umbul Temanten* in 1923 to provide clean water for communities living in the city of Yogyakarta and for commercial use. The waterpipes network was built after 1945 and managed by Tepas Tirto Marto, the forerunner of Yogyakarta City Tirtamata PADM. The *Umbul Temanten* supplies clean water for all people in Yogyakarta and most parts of the Sleman Regency while the *Umbul Wadon* is used specifically as the water source and the *Umbul Lanang* is aimed for irrigation.

During the lahar floods in 2021, *Umbul Wadon* was shut down and the infrastructure was totally damaged. Despite the *Umbul Wadon* being located within the national park's authority, it does not seem that repairing the infrastructure is a part of the agency's responsibility. Only after the Umbulharjo Village took the charge that the repair of the water source could be performed. He held an urgent meeting with all heads of the nearby village to raise funds for repairing the damaged water pipes and protecting them with the *bronjong* structures from lahars in the future.

B. Number of Units Economic Values

There were 107,488 people who lived in the 30 villages adjacent to the national park. The population growth rate is 1.97%, indicating the likelihood that the population size will increase significantly in the near future (T. Atmojo et al., 2018, p. 72). These villagers mainly access the forest for collecting grass, fuelwood (i.e., *rencek*), woods, water, honey, extracting sand, and hunting animals. Among these resource units, water, grass, and dry wood are the most common forest products consumed by the nearby villagers. In 2015, the national park agency ran a survey to estimate the economic contributions of the natural resources of Mount Merapi to their livelihoods.

Table 4.7. The extracted naturals sources used by the villagers in 2015

Natural Source Types	Villages	Sub-Villages	Households (in thousands)	Quantity	Value (Rp.)
Water (m3/year)	32	71	62.77	1,106,717	2,932,798,725
Grass (kg/year)	32	71	46.41	77,618,630	19,404,657,502
Rencek for dry woods (ties/year)	26	60	16.35	183,553,175	3,671,063,500

Based on the data in table 4.7., water is the primary resource unit used by the villagers followed by grass and fuelwood (i.e., *rencek*). It is found by the agency that 84.51% of the adjacent villages still used *rencek* as fuelwood but the trend decreases in the last 2-5 years. It is assumed that the increased use of electricity and gas promoted the change in people's preferences. Besides charcoal and fuelwoods, *rencek* was also sold by 20% of the total villagers in the markets. Among the 71 sub-villages in the 30 villages in Mount Merapi, only 41 sub-villages in 22 villages are involved in the sand mining sector (T. Atmojo et al., 2018, pp. 75–87). They mined the sand not only within the national park but also in areas outside the national park such as the Jurang Jero.

The eruption in 2010 resulted in the contamination of several rivers (Gendol, Opak, Kuning, Wordan, Krasak) that urged the Sleman regional government to issue a policy of river normalization via dredging with the use of heavy machinery. Merapi eruptions in 2010 increased the welfare of the nearby villagers but the extensive sand mining exploitations that seemingly were left unchecked by the local officials caused critical ecological degradations such as the annual decrease in the water table in the region. The policy was stopped in 2013 and the discontinuation was in effect for all sand mining activities that used either heavy machinery or traditional methods (Susanto, 2013). After the 2010 eruption, about 55 vegetation species were found in the forest. Among them are the exotic tree species (e.g., *acacia decurrens)* that dominated the forest. When asked about how the invasion of *Acacia decurrens* affects their *ngarit* activities, a resident of Pelemsari stated that the tree did not harm the grass growth except the close distance between them

could impede the growth of the grass and other understory plants in the forest. Months after the eruption, the rapid invasion of this species in the highly damaged areas became more apparent. Despite there were seedlings for the regrowth of endemic species like *puspa* (*Schima wallichii*), *anggrung* (*trema oreiantalis*), *tutup ijo* (*macaranga triloba*), *sengon gunung* (*paraserianthes lopantha*), and *wilodo* (*ficus fistulosa*) in damaged areas, all these trees could not compete with *Acacia decurrens.*

After the eruption in 2010, long-tailed monkeys had entered villagers' home yards, damaged vegetable and fruit crops, and eaten grass (i.e., *indres, kalanjana*) in the grass plots in the forest. A resident said that the strict regulations of the agency prevented them from controlling (i.e., killing) the animal that had become pests to their grass and crops. Others raised their concerns about potential threats from the increased wild animals (i.e., tigers) when collecting grass in the forest during a meeting with the agency's officials in 2004. The long-tailed monkeys' changing behaviors that threatened the farmers' grass and crops evidenced the decreased diversity of the forest after the eruption in 2010. One of the residents said that these monkeys typically eat a different kinds of fruits that among them are *becici*, the rare species gondang (*ficus variega blume*), and *kelodo*.

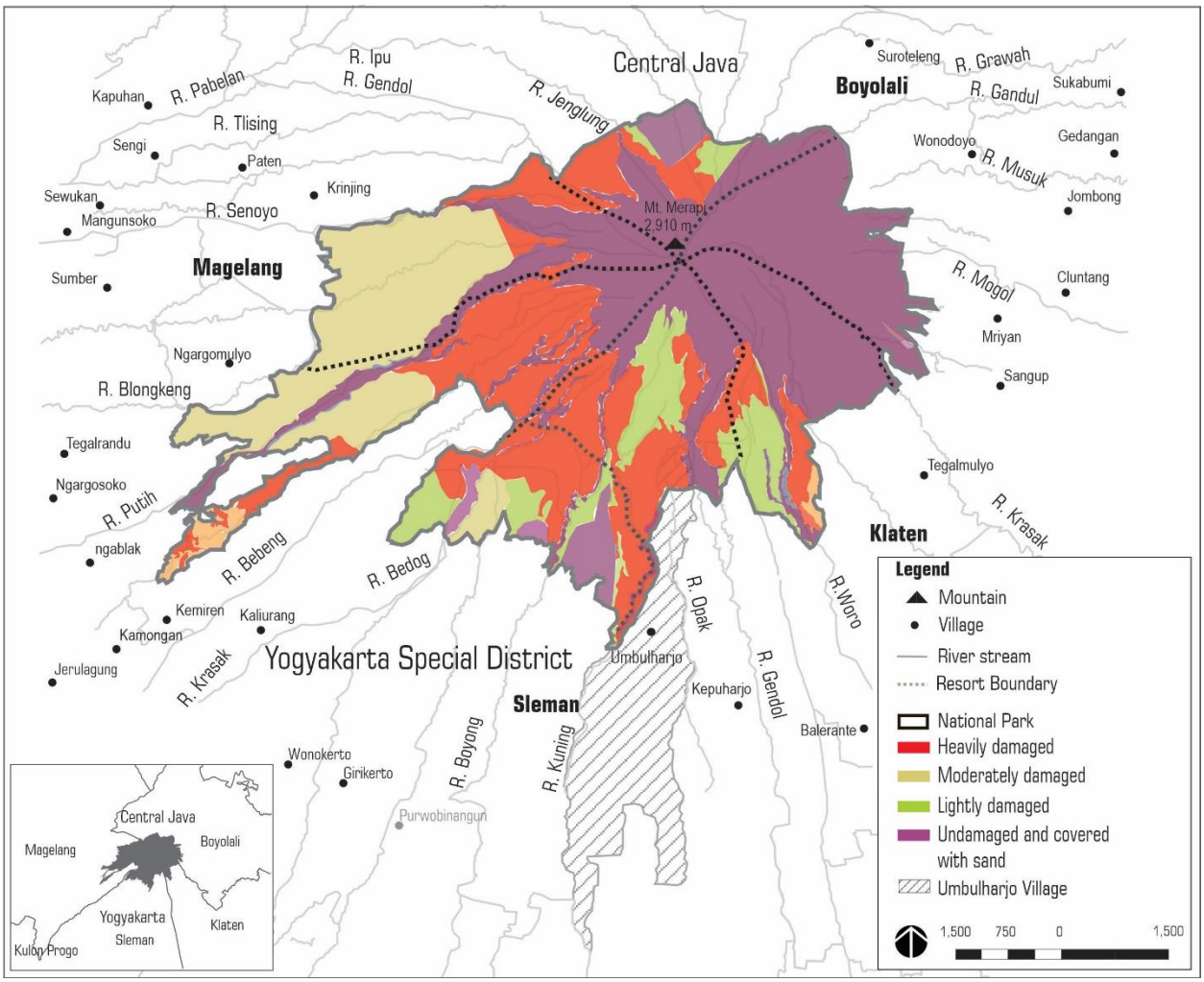

Fig. 4.7. The areas impacted by the eruption in 2010. The most impacted zone is colored in red. The image was obtained from the Mount Merapi National Park Agency, 2022.

This species could rapidly grow in severely damaged areas (Gunawan et al., 2013; Sulfiantono, 2012, p. 24). but not in lands that had already been colonized by other species. Open, vacant land and exposure to sun rays are the conditions preferred by this species. Further, this species is characterized by its highly mass seed production, seed germination triggered by high temperature, high potential to spread, and ability to produce root sucker (Sulitijorini & Setyawati, 2017, p. 44). The invasion of this species could create monoculture thickets that reduce the growth of the endemic species. In the Resort Cangkringan, native species were rarely found as the land was

invaded by *acacia decurren*s. The changes in the forest composition and loss of diversity could certainly negatively affect the sustainability of wildlife (Sulitijorini & Setyawati, 2017, p. 41).

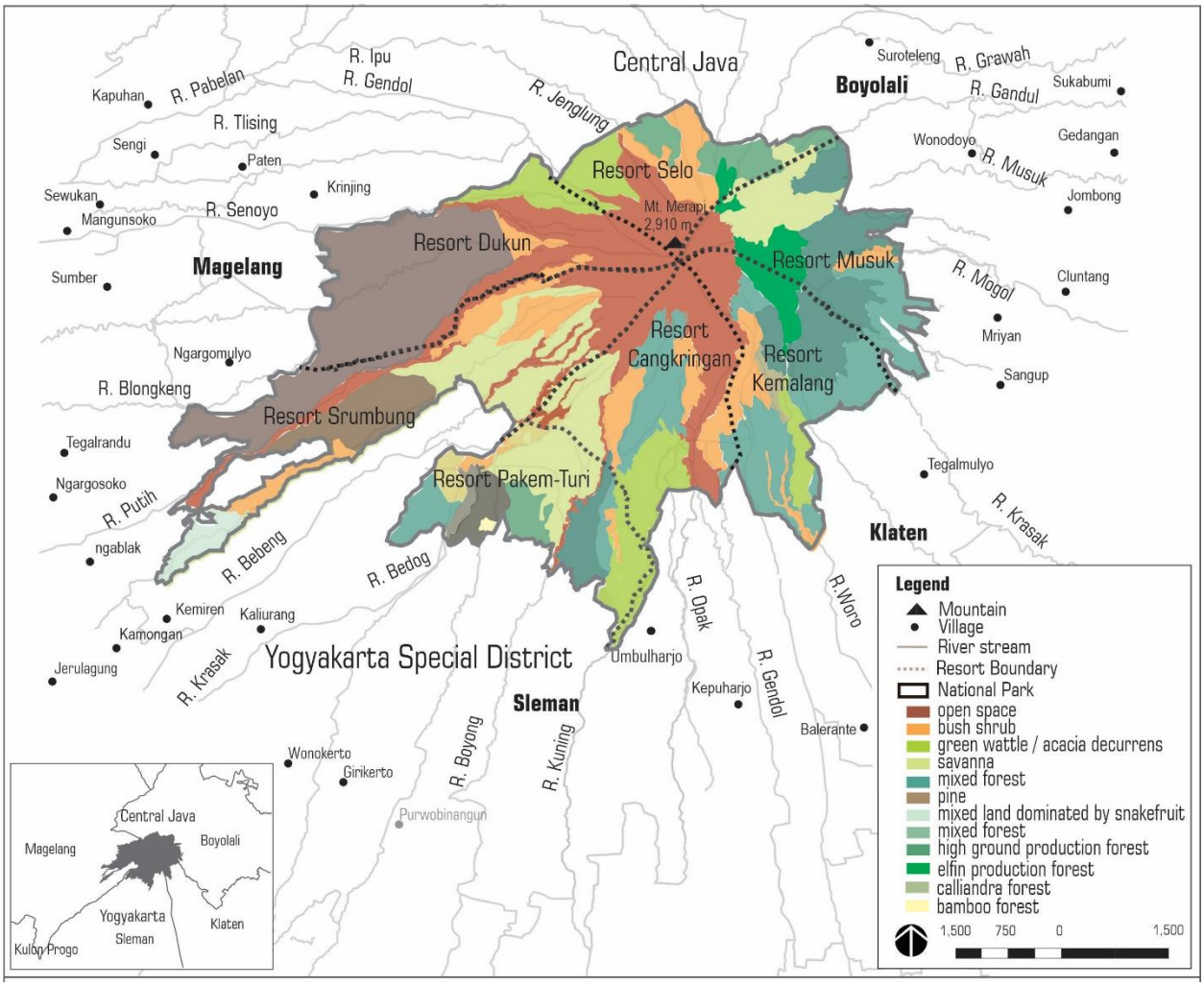

Fig.4.8. The distribution of Acacia decurrens after the eruption in 2010 is indicated in the symbol "6" . The image was adapted from the map of BTNGM in 2017.

4.3.4. Governance System

A. Government Institutions

To supervise the enforcement and the implementation of the state's forest regulations and controls, the national government established an agency called the Mount Merapi National Park Agency or *Balai Taman Nasional Gunung Merapi* (BTNGM) in Cangkringan District, Sleman regency in November 2006 to replace the Natural Resources Conservation Agency (*Balai Konservasi Sumber*

Daya Alam Yogyakarta). The nationa park agency's organization comprises functional units which from the top to the bottom are: the head of the agency, the head of the administration unit, the head of the national park's management section I, the head of the national park's management section II, groups of functional departments, and groups of forest protection and hazard mitigation. The history of forest management based on the reigning forest service agency in the Mount Merapi region (Umaya et al., 2020, p. 987) can be seen from Table 4.8.

Table 4.8. The history of the forest services in the Mount Merapi region according to Umaya (2020)

Year	Sleman, Yogyakarta	Decree
1905	-	Perhutani : Document and map "Proces verbaal Grensregeling van het Wildhoutboschcomplex G. Merapi, Districten Salam en Moentilan Afdeeling Magelang Residentie Kedoe, in Staatablad 1905 Nu. 42
1912	The Forest area was managed by the Dutch	BPKH XI: "Document and map Proces verbaal Grensregeling van de Reboisatie Gng. Merapi, Districten Klegoeng-Balong en Kedjambon, Regenschap Kalasan en Sleman, Afdeeling Mataram, Residentie Jogjakarta, June 18, 1912"
1918	-	BPKH XI: Map "Proces verbaal Grensregeling van de Reboisatie Goenoeng Merapi, Districten Bojolali en Ngampel, Afdeeling Bojolali, Residentie Soerakarta, August 15, 1918"
1942	The Forest area is managed by Japan entity *Ringyo Tyuoo Zimusyo* (RTZ)	-
1945	Forest area managed by Jawatan Kehutanan Republik Indonesia (JKRI)	-
1950	7,016 Ha forest area at Yogyakarta managed by the provincial government	KPH Yogyakarta: Constitution No. 3 (1950) concerning forest management in Yogyakarta
1961-1972	-	Perhutani 2017: Government 1972 Regulation No. 17 (1961).
1972	198.5 Ha Nature Reserve Plawangan Turgo and 30 Ha Nature Park Plawangan Turgo	Map of Nature Reserve and Nature Park Plawangan Turgo, October 26, 1972
1975	198.5 Ha Nature Reserve Plawangan Turgo, 30 Ha Nature Park Plawangan Turgo, and watershed protection forest managed by Yogyakarta Forestry Service	Minister of Agriculture Decree No. 147/Kpts/Um/8/1975
1984	Nature Park Plawangan Turgo was enlarged to 131 Ha	Minister of Forestry Decree No.155/Kpts-II/1984
1989	282.25 Ha of a nature reserve and nature park Plawangan Turgo and 1,146.13 Ha of watershed protection forest managed by Yogyakarta Forestry Service	Minister of Forestry Decree No.758/1989
2004	Mount Merapi National Park managed by Yogyakarta Nature Resource Conservation (BKSDA Yogyakarta).	Minister of Forestry Decree No. 134/Menhut-II/2004; total area 6,410 Ha
2007	Mount Merapi National Park managed directly by the national government through BTNGM	
2014	Mount Merapi National Park managed directly by the national government through BTNGM	Minister of Forestry Decree No. 3627/Menhut-VII/2014; total area 6607.52 ha

The state-people tensions following the enactment of the ministry of forestry's decree No. 134/Menhut-II/2004 on May 4, 2004, were silenced by the violent eruption that occurred from the end of October themed-November 2010. The eruption caused 367 fatalities and 277 injuries (Bakkour et al., 2015, p. 167), killed 1,961 cattle comprising 1,780 dairy cows, 147 beef cows, and 180 goats and sheep (Muhammad, 2010, p. 43), and forced 15,366 people to evacuate (BNPB, 2011, p. 22). The eruptions emitted volcanic materials with a volume ten times greater than that in the 2006 eruption (Muhammad, 2010, p. 63) and were followed by over 240 rain-triggered lahars. The lahars then formed avulsions[83] on the distal slopes that could threaten the inhabitants in the densely populated areas (Bakkour et al., 2015, p. 174). The volcanic ash covered about 435,000 ha of Merapi's land where 20% of it comprises agricultural farms, horticultural farms, plantations, shrubbery, settlements, and forests. It is worth mentioning that before the 2010 eruption, the hazard map was made to only respond to less than VEI-3 eruptions (Jenkins et al., 2016, p. 82). The larger magnitude of the 2010 eruption urged CVGHM to extend the exclusion zone to 10 km and issued an immediate evacuation of tens of thousands of people in 35 villages on October 25, 2010 (Mei et al., 2016b, p. 362).

During the rehabilitation and reconstruction process, the national disaster agency established coordination with other ministries and agencies. Here, the Ministry of Forestry recommended the annexation of the impacted areas in the Hazard Zone III to the national park. This means that thirty sub-villages lived living in this zone must relocate (BNPB, 2011, pp. 72–73). Supporting the ministry of forestry's recommendation to annex about 1,310 Ha of the damaged settlements to the forest, the government planned to relocate the residents of the 30 villages and compensate for the

[83] Avulsion is the process by which a new channel is initiated by drawing discharge away from a former route that may later become abandoned. Avulsions cause redistribution of floodwater and sediment over the delta plain (van Asselen et al., 2017, p. 1694).

loss in the form of land to each impacted household. The relocation plan raised a dispute between the regional government and villagers. Of 3,612 households, 1,059 refused to relocate. These dissenters mainly lived in three sub-villages in Cangkringan District, Kalitengah Lor, Kalitengah Kidul, and Srunen, located less than 5 kilometers from the summit (Suryandari et al., 2013, p. 147).

The Pelemsari village had different attitudes from their counterpart villages in responding to the relocation. The sub-village head, Ramijo, recalled that his community routinely coordinated through meetings during their evacuation to five shelters in 2010. People decided to relocate voluntarily given the psychological shocks experienced mainly by children and elderlies. When the governor conducted a public hearing in the Plosokerep shelter where people from the Pelemsari temporarily resided, the sub-village leaders proposed that they would voluntarily relocate but the government must issue the certificates for their damaged lands and the relocation site. Waiting for the slow response from the governor who promised to consult their demand to the central government, the Pelemsari sub-village initiated what they called a quick move to force the certification of their homelands. This close-knit community, mobilized by skillful and talented members, developed a group of *ojeg* (i.e., motor-taxi drivers) after seeing the tourism opportunity in their homeland. Indeed, after the eruption, numerous curious visitors came to their former settlement, in particular, to the house of the phenomenal gatekeeper, Mbah Maridjan. The local leaders comprising the head of the sub-village and the four neighborhood leaders managed the income donated by the *ojeg*, the later jeep tour, and other external funding sources. Some of the donations were distributed to their 84 households, orphans, and widows, while the rest were saved to purchase the land for their future living. This community accommodated the desire of their elders to move to the land in the Balong sub-village rather than accepting the government's offer of providing them with houses in the Plosokerep. The relatively short distance of the land from

their former and disrupted settlement, the administration's effectiveness in maintaining its integration with the Umbulharjo Village, and the concerns about the well-being of the most impacted victims were the factors why people decided to unite and plan their move to the desired land. The land was once mined by the owner for its volcanic sand after the people living nearby the site refused his plan to build a chicken barn. The owner then decided to accept the Pelemsari community's negotiated price despite being much below that in the market. With the government's reconstruction assistance and donations, the Pelemsari community could re-establish their new living on the land which later was named the Karang Kendal *hunian tetap* (i.e., permanent housing). No less importantly, they received not only the land certificates for their relocation site in 2011 but also for their former homes three years later.

Aside from the experience of the Pelemsari, as its residents said, "what had been planned (by the government) must be done", the Ministry of Forestry updated the Ministry's decree No. 134/Menhut-II/2004 and issued the new decree No. 3627/Menhut-VII/2014 that stipulated the forest zonation that previously covered about 6,410 Ha into 6,607.52 Ha. The eruption in 2010 that changed the volcano's physical conditions forced the government to update the zone map in 2012. During this year, the forests in the field involved the community in identifying the areas where people performed their *ngarit* and *rencek* traditions to solve the ongoing dispute with the government. The result of this was the integration of the traditional zone into the national park zone. The traditional zone comprising the people's grass plots was designated at around 100-200 meters from the national park's border to reduce people's risks when collecting grass and to rejuvenate the areas around the crater. From 2015 to 2016, the traditional zone was extended as the data regarding the people's grass plots expanded. In 2018, the Ministry of Energy and Mineral Resources endorsed the legality of the community's traditional activities. In 2018, the agency

started a more detailed process of surveying the people's grass plots in the forest (T. Atmojo et al., 2018, pp. 111–112). There was an optimism that the designated *mugut* (i.e., collecting grass) areas around the border in 2012 could accommodate the people's needs for fodder, albeit the complete information about the people's *mugut* areas had not yet been gained and not all the communities from the adjacent villages were yet involved.

An elder whom I interviewed regarding the 100-200 meters from the park's border said that the stipulation was unlogic given the limited carrying capacity of the zone to facilitate the numerous need for fodder, not to mention the farmers' need for fresh grass that can only be obtained near the summit. Further, each farmer, on average, had a one Ha grass plot in the forest whose right of use was inherited, presumably, since the administrations of the state's enterprise Perhutani and the provincial agency of forestry. The other concern that he raised was the potential conflict that may arise between farmers when sharing the plots within the designated traditional zone.

The principal tasks of the Mount Merapi National Park Agency are to protect the ecosystem, preserve biodiversity, and utilize natural resources without risking the natural ecosystem of the volcano. In their researcher's publication, it is explained that the agency envisioned good forestry governance in which the state becomes the facilitator of the people and forest interactions, and the people become the subject of the forest management. The principles of this approach are legal clarity, participation, transparency, accountability, economy, and ecology. People as the resource users would develop a sense of belonging to the forest as they gain access to forest products and the state would be benefitted as this would help protect the forest for the whole population (T. Atmojo et al., 2018, pp. 154–155). It is also worth mentioning that the agency expected that the grass collection activity of the locals could be legalized through the so-called *Perjanjian Kerja*

Sama (i.e., collaborative agreement) in the traditional zone. Despite its status is not as strong as a decree, the legalization in the agency's belief would yield people's trust and sense of belonging to the forest as their activities and existence are formally acknowledged. As the result, they would voluntarily participate in ensuring the security of the forest. Through this contract, the agency also planned to restore the ecology through silviculture intervention that is based on local knowledge to determine, for instance, the cultivation pattern and types of plants.

It is undeniable that the rules associated with the forest management in Mount Merapi had been highly centralized at the national level without considering the social-ecological aspects of Mount Merapi. The policymakers did not engage the villagers who were subjected to the policy in the national park's designation process, nor did they transparently disseminate the plan to them before 2004. Only after 2012, that is after the eruption in 2010, did the agency attempt to restore its networking with the community by engaging them in decision making. The result of this, as the agency claimed, was the incorporation of the people's traditional activities of *ngarit* and *inference* as a traditional zone into the national park. The national park zonation was also made adaptive to changes such as the increased data of the grass plots that led them to expand the traditional zone in 2018.

Despite the seemingly promising approach of the agency, the regulations on forest use were not changed. Villagers are prohibited from cutting trees and planting either grass, trees, or agricultural crops. or *palawija* (mixed-cropping). Their rights to using the natural products are limited only to grass and dry woods (*rencek*) in the traditional zone, set aside the right to continue the monarchy's cultural ceremony, *Labuhan Gunung* in the spiritual zone. In other words, the state recognized the villagers' cultural and economic activities and their reliance on forest products. The compensation for the right to collect grass and *rencek* is the villagers' obligations to, *first,* plant and manage the

state's trees in the grass plots and, *second,* to report to the agency once they a gap between the tree stands is noticed. During my fieldwork, I often heard the desire to plant in the forest, similar to the condition before the volcano becomes a national park. Others also mentioned the people's desires to be included in deciding what tree species should be planted. Pines are not preferred as they could kill *suket,* the local term for grass. The pine stands limit the sunlight to get through the grass and out beat grass when competing for water. Moreover, the pine seeds were planted at a very close distance, hampering the grass on the ground to grow.

The right of use here implies the ownership of the grass plots that refer to the state, not to the villagers. The main concern of the state had been the conservation of the water sources for the good of the greater population but unfortunately, ignored the needs of those who had historically interacted with the forest. Only recently, there is a movement inside the agency about the need to engage the community in policymaking. Despite this, it is still difficult to identify whether the agency envisioned the forest management that is independently governed by the villagers with minimum interference from the state.

In 2015, various forest crimes occurred in the Resort Cangkringan. The crimes include hunting wild animals, illegal logging, the theft of dry woods, transporting logs out of the forest without permission, and damaging the signage (Nugraheni, 2017, p. 49). To reduce the forest crimes, the forest police had the authority to do preventive (e.g., patrolling, identifying risks), repressive (e.g., receiving a report about forest crimes, investigating the crimes), judicative actions (e.g., conducting a comprehensive investigation), and involving in social activities (e.g., saving lives in the forest) (Nugraheni, 2017, pp. 38–41). Further, the forest regulation about *rencek* is perceived variedly by my respondents. Some respondents believe that only fallen dry woods on the ground are allowed while cutting branches from trees is not allowed. Others believe that taking dry woods

on the ground is prohibited as they are seen by the state as natural fertilizer to the forest soil. The unclear forest regulation about *rencek* leave the villagers with confusion but many of them chose to blind eyes to their fellow villagers' act of theft in the forest. They argued that as long as the dry woods being taken are small and not too many, such an action is considered tolerable.

B. Property right system

Merapi forest is a natural resource system that contains the stock of variables that are capable of producing a maximum quantity of a flow of variables without endangering the forest itself. The forest becomes a common pool resource as villagers nearby including the Pelemsari's shared the natural resources (e.g., grass, water) with other users from different villages.

Defining the property system of Mount Merapi, however, is not as simple as it may seem. Firstly, the grass parcels within which the grass is collected belonged to the state. To be clear, the grass-plot was "lent" by the state, thus, the farmer's right to use the plot is very much controlled by the owner. These controls include the types of the tree species and how the trees are planted. Secondly, whether the rules shared among farmers in the grass plots were established by the forest officials or the villagers themselves remains unclear. Nevertheless, based on my fieldwork, I found that all those rules were developed primarily based on the state's concern, that is how the grass plots are planted with tree species selected by the state and how the trees are well-managed by the villagers.

C. Operational Rules Collective Choice Rules

In the context of Mount Merapi, the operational rules include those that are made between neighboring farmers about the grass plots' borders or the so-called *kikis*. The borders could take various forms such as bamboo, *sengon* (Albizia Chinensis), and trenches; those natural barriers

were set up and recognized only by these farmers along with the forest official who initiated and witnessed the land division process on the spot.

Schlager and Ostrom (1992) in detail, explain the operational rules and collective choice right in regard to common-pool resources (CPR). The operational rules shared by the Pelemsari farmers are the right to inherit the use of the grass plots to their descendants and to transfer the right to another farmer or cultivator as long as he or she is a Pelemsari resident. Here, the farmer also needs to remind him/herself of the greater rule set up by the proprietor (i.e., state or the landowner) that the plot could not be leased or sold to anyone.

If the previous cultivator, for some reason, could not continue to plant and manage the state's trees in the grass plot, the right could be transferred to a farmer who requests it. However, if the previous cultivator or his/her descendant claims the right to use the grass plot again, it is the obligation of the farmer to return it. This kind of right is defined by Schlager and Ostrom (1992) as the right of alienation, which is a collective choice right that permits its holder to transfer part or all of the collective choice rights to another party. Alienating those rights means that the former right holder is no longer able to exercise any authority in the grass plot at least for a particular period. However, the unique matter about the property system in Mount Merapi that probably had not been touched on by Schlager and Ostrom (1992) in their postulate about the property system is the ability of the former cultivator or his/her descendant to regain the authorities. Such a right perhaps could be called the right to re-claim.

The right of management is a collective choice right of authorizing its holders to devise operational level withdrawal rights governing the use of rights (Schlager & Ostrom, 1992). The farmer holds rights of management in their own grass plots in the forest, thereby, possessing the authority to determine how, when, and where to harvest the grass as long as they did not intentionally plant the

grass and protect the state's trees. The other rules that he/she must keep in mind pertaining to the use of the grass plot are not planting the grass plot with any crops including grass and taking branches from the trees. To fulfill the needs for fodder, thereby, the farmer is pushed to move from one plot to another which is sometimes situated in another location.

The farmer possesses the right of exclusion, which is a collective choice right authorizing its holders to devise operational level rights of access. Here, the Pelemsari farmers have the authority to determine who could access the resource (grass plot) by using /her criteria. For instance, they may let /her family members or anyone with whom he/she is familiar enter and collect grass from /her grass plot. *Nembung* or asking for one's help is a tradition that Merapi villagers have to lift the burdens of their fellow villagers. During a hardship such as the dry season, farmers could *nembung* to a cultivator once they noticed that his grass-plot was left abandoned or unmanaged in the forest. Only after getting his/her permission that the farmers access and withdraw the grass from that plot. Sometimes the first noticer informs other farmers so they could go to the plot together in the forest and get through the so-called *panceklik rumput* (grass crisis) during the season. Here, the cultivator's act to grant the rights to access and withdraw the grass to another farmer is based on a sincere help or *ikhlas*, meaning he/she does not expect something in return from those who request the right. Since his action to do so is not defined by others who hold the collective choice rights of management and exclusion, it is difficult to define the grantor as an authorized user when using the postulate of Schlager and Ostrom.

The state or the forestry agency's officials are proprietors who possess the collective choice right to participate in management and exclusion but not in alienating either of these collective choice rights (Schlager & Ostrom, 1992). Merapi farmers then develop their own property rights over the inherited grass plots lent by the state. The rights at the level of the users are *de facto* rights as they

are, if not ignored, not fully recognized by the authorities. For the proprietors, the main concern is the farmers fulfill their promises of planting and managing trees and grass in the given plot.

Learning from these farmers' property rights systems, I wanted to show that the right, rules, and property regimes in the Merapi's resource system are not merely based on mechanistic principles but more nuanced by their traditions. The latter gives flexibility, especially, when a crisis (e.g., drought) comes and tests their resilience as a community. To illustrate the property rights system among the Pelemsari farmers in their grass plots in the forest, I supply this section with fig.5.5.

D. Monitoring and Sanctioning Process

Ostrom (1990) states that this enforcement is an essential condition to promote the so-called "quasi-voluntary compliance", a contingent behavior enhanced by the users' confidence after knowing that others are cooperative and joint benefits are present (Ostrom, 1990, p. 95). The internal enforcement of the Merapi users is aimed to discourage those who are tempted to break rules and ascertain quasi-voluntary compliers that others also comply with.

When an appropriator or a farmer sees his or her fellow villager violating the rules set up by the government, there is a likelihood that he/she will blind eye to this action. For example, the resident in the sub-village once mentioned that other villagers took *rencek* or dry woods from the tree, rather than taking those on the ground. The farmer's attitude of not reporting what was considered by the state as theft exhibits compliance with the act, and therefore, is a part of political resistance to the state's control (i.e., state). Scott (1985) once called this an everyday resistance to suggest an implicit disavowal of public and symbolic goals; it is informal, covert, and concerned with immediate *de facto* gains yet preferred by the subordinates as it provokes a less rapid and fierce confrontation (Scott, 1985, pp. 33–37). Farmers may exhibit symbolic conformity to the state

officials but there could be slow, cacophonous, and quiet struggles beneath it. A complaint such as '*ra entuk nandur neng alas*' (i.e., could not plant on the grass plot) uncovered during my fieldwork shows the villager's protest against the state. The freedom that he once possessed under the administration of the previous agency (e.g., able to plant mixed crops) made him reflect on the current rules exercised by another administration. In short, he compared the two conditions, and the result does not seem to satisfy him or anyone in the sub-village. What he and other farmers have to date is patience and the hope that it will not get worse.

Such a blind eye does not apply when encountering a theft that occurs on the property of their fellow villagers (Nancy Lee Peluso, 1992, p. 15). Here, the transgressor loses status while the individual who finds the act gains prestige[84] (Ostrom, 1990, p. 97).

In dealing with the monitoring and sanctioning process, the appropriators of Merapi's CPR in the Pelemsari sub-village established some rules. For instance, they are not allowed to transfer the right to use the land to those from other sub-villages. The other rule related to disaster mitigation is the prohibition to cut grass in steep areas as this would increase the risk of erosion during the dry season. The state's control of people's access to all zones of the forest plays a major role in causing the reduced capacity of this community to monitor the changes in the forest and to control violations against their own rules in their grass plots. It is also worth emphasizing, that trauma after the eruption in 2010 had hindered people's willingness to access the forest. To some extent, this psychological distress may lead a greater decrease in their capacity to monitor the forest use and to actively audit the CPR conditions.

[84] Ostrom (1990) argues that if the appropriators adopt contingent strategies each one needs to be sure that others comply and that their compliance emits the expected benefits. The monitoring of the others' behaviors could also provide lessons about the degree of quasi-voluntary compliance in the CPR. If nobody breaks the rules, this suggests that they all agree to comply. Nevertheless, once a transgressor is found, there is a necessity to examine the current quasi-voluntary compliance (Ostrom, 1990, p. 97).

Although there were no special local officials appointed by the appropriators to conduct patrols in the forest, each of the appropriators could report to other farmers or their sub-village head about what he or she encountered in the forest. The instant and free messaging application WhatsApp on mobile phones is the most common medium used by the appropriators to exchange information about the CPR conditions (e.g., eruptions) and their social-political dynamics. Besides IT, community meetings, specifically, dairy farming group meetings are conducted to exchange information and knowledge with one another.

The Pelemsari community routinely holds community meetings to solve problems and mediate disputes among the CPR users. The appropriators also preserve traditions of *kenduren* that allow them to enhance the social ties or discuss any concerns that the people had. For instance, during a *kenduren* in 2022, the sub-village head disseminated early warning messages about eruptions. It is hoped that people developed their awareness when collecting grass in the forest due to the eruptive activities of Mount Merapi.

Among the members of this community are residents who work in the national park agency or other government institutions. According to a respondent, the number of residents recruited by the agency increased after the polemic in 2004. People in Pelemsari often relied on these individuals for eruption-related information, updates about the CPR conditions, or regulations of the national park. For example, a villager consulted his plan to ride his motorcycle to a certain level in the forest. He then received feedback from an agency's staff that the action is prohibited and that such behavior could be followed by other villagers in the future.

4.4. The *Panarchy* Categories of Forest Management in Mount Merapi

There are two frameworks that I used to address the last two questions about the complex systems' interactions and the Pelemsari villagers' adaptive strategies: *panarchy* and Ostrom's self-governed principles. The *Panarchy* framework is useful to understand ecosystem dynamics which is "how the complex system of people and nature is organized and structured across spatial and temporal scales" (Allen et al., 2014, p. 578). Ostrom's set of self-governed principles[85] is used to assess the dynamic adaptive capacity of the Pelemsari villagers by examining their institutions (e.g., customary rights, local knowledge) in managing the forest over time. Two approaches employed in the analysis using the two frameworks are synchronic and diachronic. The former helps examine the interactions of social-ecological systems in Mount Merapi and their patterns in each period while the latter helps examine the changes in the complex SES interaction dynamics over time (Chrisomalis, 2006, p. 397).

To analyze the SES adaptive cycles of the Pelemsari sub-village, I use political ideology and regime as the basis to divide the historical periods. Each political regime has different characteristics despite the state's ideology in regard to forest management after the colonial period remaining unchanged. These six periods are: 1) the reformation period 2004-onward 2) the

[85] These principles include: 1) clearly defined boundaries where the individuals who have withdrawal rights of resource units from the CPR must be clearly defined; 2) congruence between appropriation and provision rules and local conditions where the appropriation rules restrict time, place, technology, and quantity of resource units are related to local conditions and provision rules requiring labor, material, and/or money; 3) collective-choice arrangements where most individuals affected by the operational rules can participate in modifying the operational rules; 4) monitoring, where the monitors who actively audit CPR conditions and appropriator behaviors are accountable to the appropriators or are the appropriators; 5) graduated sanctions, where the appropriators who violate operational rules are likely to be assessed, graduated sanctions by other appropriators, by official accountable to these appropriators, or by both; 6) conflict-resolution mechanicsm, where appropriators and their officials have rapid access to low cost local arenas to resolve conflicts among appropriators or between appropriators and officials; 7) minimal recognitions of rights to organize where the rights of appropriators to devise their own institutions are not challenges by external governmental authorities; 8) nested enterprises where the appropriation, provision, monitoring, enforcement, conflict resolution, governance activities are organized in multiple layers of nested enterprises (Ostrom, 1990, p. 90).

reformation period from 1998 to 2004; 3) the new order period from 1965 to 1998; 4) the Independent period from 1945 to 1965 (Cycle II Release Ω—Renewal α), Japan's invasion period from 1942 to 1945 (Conservation K —Release Ω), the colonial period from 1912 to 1945 (Cycle I-II Release Ω—Renewal α), and the precolonial period from 1300 to 1912 (Cycle I Exploitation r— Conservation K). The characteristics of each period can be seen in table 4.9.

Table 4.9. Timeline of Ecological and political change in Mount Merapi CPR

Cycle and phase	Political regime	Norm-Scale	Major events	Goals	Enforcement mechanisms	Adherent principles
Cycle I: Exploitation r— Conservation K (1300–1755)	Traditional	Local	The split of the Mataram Islam, the Giyanti Treaty (1755), the split of Kalangs	Sustainable resource use, tributes to the Sultan	Myths, rituals, norms, *gotong royong,* meetings, labor tax	Satisfied
Cycle I-II: Conservation K-Release Ω (1755-1945)	Colonial	National, regional, Local	Cultuurstelsel, moorlands' annexation for protected forest (1912), romusha (1942-1945), starvation, public insurgents, eruption in 1930	Forest use for the state's revenue, the good for the greater population	*Devide et impera,* military forces, the treaty with the Sultanate, *Cultuurstelsel*, *tumpang sari* for free labor (Dutch); *romusha* (Japan)	Unsatisfied
Cycle II: Release Ω - Renewal α (1945-1965)	Guided democracy, communism	National	Revolution, mass killing, public insurgents, corn movement to stop rice import	Return to the Dutch forestry routines, advocate the watersheds' preservations for the state's revenue	Reforestation as foresters' political means; *tumpang sari* for free labor	Unsatisfied
Cycle II: Renewal α - Conservation K (1965-1998)	The new order, authoritarian	National	Timber trade, illegal logging, community development, eruption in 1970	Forest use for the state's revenue, the good for the greater population	Military use in law enforcement, community engagement in locating thieves, *tumpang sari* for free labor	Unsatisfied
Cycle II-III Conservation K- Conservation K (1998-2004)	Reformation	National, regional. local	The fall of the new order, eruption in 2006, the national park designation (2004), and people's resistance	Forest use for the state's revenue, the good for the greater population	Resort Head, forest police, *tumpang sari* for free labor, community development	Unsatisfied
Cycle III Conservation K - Release Ω 2004-onward	Reformation	National, regional. local	Eruption in 2010, relocation policy, people resistance	Forest use for the state's revenue, the good for the greater population	Resort Head, forest police, *tumpang sari* for free labor, community development	In progress

4.4.1. Cycle I: Exploitation r— Conservation K (1300–1755)

A. Government System and Resource Users

According to a history publication of Indonesia's Ministry of Education and Culture (1997), the ancient Hindus-Buddhist values began to influence Yogyakarta's culture in 1,000 AD. During this period, the Javanese society had established complex agriculture, managed by skillful individuals such as the *Hulu air* (the head of the farmland's water management) and the *Wanga* (the official who determined the cropping and harvesting time). Each village was ruled by a leader called *Rama desa* supported by five assistants called *pamong desa* and *wineka*. All matters pertinent to the village affairs were discussed in a community forum and the members, with a spirit of mutual assistance or *gotong royong*, were bound together to implement the decisions. The villagers, however, had the right to determine their governance model. Affairs managed by the monarchy were limited only to tax and religion (Depdikbud, 1997, p. 52).

When the Majapahit reigned over Java (13^{th} -16^{th} CE), the ruler regularly traveled throughout the monarchy for displaying power, collecting tributes, and developing relationships with villagers. Sometimes, he ordered villagers to create grassland. As a reward, the king permitted them to access the land for their own needs such as grazing the cattle. By granting access to the forest or at least not restricting it, Sultan secured the villagers' loyalty. Villagers, on the other hand, took benefit from the Sultan's sovereignty pronouncement. They could recall his name if strangers attempted to lay claim to the Sultan's lands that they occupied in the forest (Nancy Lee Peluso, 1992, p. 35). As the tension within the royal family and the exclusion from overseas trade increased, Majapahit began to lose its power. The power void caused an outright conflict between Muslim and non-Muslim communities and reached its peak when the Islamic Sultanate Demak took over the throne (Encyclopedia, 2022b). In the 15^{th} century AD, the remaining followers of the kingdom tried to

escape from the Islam influence in Java's lowlands by migrating to Mount Merapi (Inandiak & Dono, 2010, p. 58).

After the Demak was defeated by the Pajang kingdom in the 16th century, followed by its submission from the Mataram Islam, the victorious ruler began to reign Java in the 17th century AD. Both Majapahit and Mataram kingdoms, asserted by Peluso (1992), were not interested in the land but more in controlling the people for expanding power (Nancy Lee Peluso, 1992, pp. 33–34). Forest land thereby was a means for the kings to control villagers through mandatory labor services (e.g., building infrastructures, cultivating crops) as the compensation for the right of access to the forest.

In 1755, the Dutch initiated the Giyanti Treaty that divided the Mataram kingdom into two monarchies: Yogyakarta and Surakarta. Accordingly, Mangkubumi, who rebelled against the reigning king, Paku Buwono II, would earn some parts of Mataram and become a king with the title Sultan Hamengku Buwono I (Depdikbud, 1997, pp. 83–93). The split resulted in the division of about 6,000 households of *Kalangs* to serve each of the new monarchies (Nancy Lee Peluso, 1992).

B. Resource System

The countryside landscape during the pre-colonial period was covered with forests and composed of populations concentrated around the courts and dwellings on the slopes of the volcanoes (Nancy Lee Peluso, 1992, p. 29). Teak grew well on Java due to the climatic zone and the well-drained soil containing limestone deposits. In the forest land, there were areas where villagers opened with slash and burn techniques while others in the forms of settled-wet-rice. The land was cleared for agricultural production and occasionally for creating grasslands to attract animals for hunting and food. Besides this, cutting trees in the forest was used to provide the rulers with woods for the

royal needs and the villagers for building humble houses and cooking (Nancy Lee Peluso, 1992, p. 31).

Throughout time, villagers performed agriculture in the forest by adopting shifting cultivation that urged them to move from one place to another. Once a farmer arrived at one place, he or she slashed and burnt the woody vegetation followed by one to three years of cultivation. When the soil was no longer productive, the land was abandoned for years, and new land was opened with the same technique. To give a sign to the areas that had been cultivated, a farmer gave a sign in the form of trees such as jackfruit or bamboo. The agricultural mobilization pattern is called *masa bero* or farming rotation which is the time range between the time the land was abandoned and the time it was re-cultivated. The purpose of the *bero* was to return the soil fertility until the soil could be cultivated again. One period of a *bero* system was normally about four years (Kuswijayanti et al., 2007, p. 48). Besides this, the sandy and rocky lands which were too infertile for cultivation were abandoned for a considerable amount of time to let *alang-alang* (*Imperata cylindrica*) grow while the fertile lands by the local farmers, were cultivated with *tumpang sari* (i.e., mixed-intercropping technique). Besides cultivating, cattle were also grazed in the forest (Lucas Sasongko Triyoga, 1991, p. 76).

The other resource unit of Mount Merapi was the water source. Based on my interview with the local elder in 2022, his ancestors in the Pelemsari sub-village during the dry season were used to taking water from one of the volcano's water sources named *Tuk Pitu*, located around the River Kuning stream. When taking the water, each household waited in line before taking turns in using the water source. Despite the water debit today being small, it was the only water source that survived several eruptions. Hindu pilgrims occasionally went to this place to pray and drink the

water that they considered sacred. There is a belief that anyone who drinks from the water source could get anything that he or she desires.

C. Institutions

The local institutions in this period were run by the Merapi villagers as Sultan exercised a relatively loose control of the forest. Sultan allowed villagers to clear the land and determine where, when, and how to cut and use woods. *Kalangs*, however, were obliged to pay taxes to the Sultan in the form of labor services.

The institutions during this period mostly conform to Ostrom's design principles (Ostrom, 1990, pp. 90–101). The boundaries of *alas* or cultivated land were clear to which villagers used natural elements like trees and bamboo, thus, they conform with principle 1. Local knowledge of disaster (e.g., prohibitions to access high-risk areas around the crater) embedded with myths and ecological management (e.g., water management, cultivation and harvest periods, shifting cultivation, *bero* system, *tumpang sari*) show the congruence with the principle 2. Community problems were discussed in a community forum and the decisions were implemented by the whole members thus it conforms with principle 3. People in this period monitored eruptions (e.g., small eruptions once a year), water availability through *Hulu air*, and seasons through *wanga*, but whether they monitor other villagers' use of natural resources was unknown. The presence of a leader called *Rama desa* with the assistance of *pamong desa* and *wineka* and the community meetings to discuss the village's problems represent the congruence with principle 6. Provided Sultan gave the villagers the right to control and manage land where the compensations are tax liabilities and labor work thus their institutions would be free from the king's interference showing their conformities with the principle 7. The institutions run by the villagers were nested in the local and monarchy's jurisdictions conforms the rule's compliance with principle 8.

D. Adaptive Cycle Analysis

During the pre-colonial period, villagers who fled the influence of Islam occupied the unexploited territory of the Merapi's forest. Once they arrived, the survivors expanded and accumulated potentials from the forest, namely grass, *rencek* (dry woods), or other resource units, and regulated their uses. At the beginning of the exploitation r phase, the connectedness among the survivors was weak as they adapted to the foreign environment of the Merapi forest. However, the connectedness grew throughout time, and being united with the spirit of mutual assistance (gotong royong), they worked together to start a new living in the forest. The village community was buttressed by talented individuals such as *Hulu air* and *wangan* and led by *Rama desa.* The connectedness between these interrelated entities increased as it was fostered by traditions and community meetings.

As the connectedness (e.g., community cohesion) increased and potentials (e.g., land, grass) were accumulated, villagers' controls over them became so rigid that they tried to prevent competitors (other villagers, strangers) from benefitting from the same assets. For instance, to retain ownership of land, they installed a sign on the land that would be abandoned during the *bero* period.

As these villagers developed from the exploitation to the conservation phase, the refugees from the Islamic influence in the lowlands united as a new entity in the forest. They enhanced their social cohesion or connectedness as they developed towards the conservation phase and increased assets such as lands for agriculture. The villagers also competed with other entities outside their territory in claiming lands in the forest. Thereby, they gave a sign of ownership on the cultivated land to indicate that they would return after the *bero* period ended. With the right to access and use the forest that they attained from Sultan, villagers maximized the benefits of their environment while at the same time, managing the natural resources. For example, a respondent in Pelemsari

states that people were prohibited from cutting grass on steep areas in the forest to prevent erosions. Another technique commonly performed was slash and burn for land clearance[86]. Throughout the transition of these phases, they observed the changing conditions of their environment (e.g., eruptions) and then, invented new ways to manage the forest and reduce disaster risks. The new knowledge was presumably integrated with their cultural beliefs or myths such as *pranoto mongso,* and enforced by norms and cultural traditions. The knowledge of ecological and disaster mitigation management was then accumulated and passed down to their descendants. In 1755, the Dutch with its *divide et impera* initiated the Giyanti Treaty to solve the royal conflicts in the Mataram Islam. The outcome of this treaty was the split of the kingdom into two parts leading to the disintegration of the *Kalangs* from their constituents in the sub-village. The fissure weakened the connectedness among the community members of the sub-village.

The dynamics of the social system of the Pelemsari influence those of Mount Merapi's ecology. In the release phase, the villagers burned the vegetation felled on the ground during the dry season before the rainy season. The nutrients were then released from the soil after the burning process and expanded to create fertile soil as they grow from the release phase to the renewal phase (Encyclopedia, 2022a; Kleinman et al., 1995, p. 237). Carbon dioxide will be released into the atmosphere and when accumulated, it triggered global warming. In the exploitation phase, the

[86] Traditional practices typically focus on the phases of release and reorganization whereas conventional practices focus on the phases of exploitation and conservation(Berkes & Folke, 2002, pp. 124–125). In the release phase, a traditional community imitates a natural disturbance to promote important sources for renewal and initiates small-scale disturbances to slow the progress of an unexpected disturbance, thus, enhancing their resilience. To support this practice, they use the disaster management and ecological knowledge amassed in the prior phases (front-loop). This knowledge specifically assists them to monitor, decide the time for disturbance practices, and imitate the frequencies and magnitudes of natural disturbance. This ecological practice turns out to improve the habitats for waterfowl and ungulates (diversity of the ecosystem), thereby, hunting practices. Such practice will prevent an accumulated disturbance from moving across scales and furthering up in the panarchy and promote a rapid change in the release and reorganization (Berkes & Folke, 2002, p. 131).

fertile soil was created and was ready for cultivation. These crops grew together with older trees from the previous fallow forest, the young trees being planted, and trees developed from seeds (Fox, 2000, pp. 2–4). The accumulated diverse trees created a secondary forest. In the conservation phase, however, eruptions could make the forest potential to leak away, not to mention the forest controls of the Dutch that came in the next period.

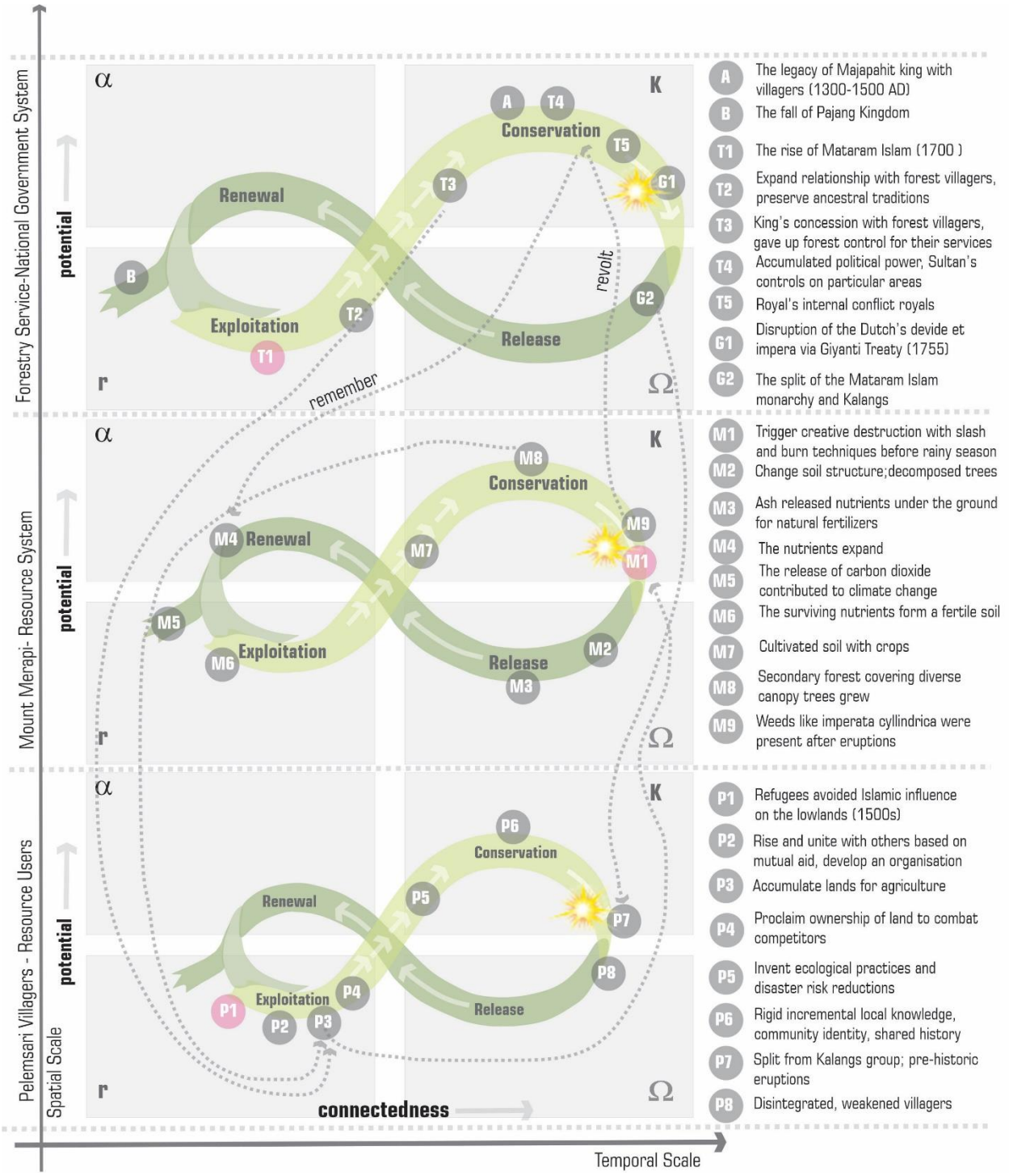

Fig. 4.9. The SES dynamics of Mount Merapi across spatial-temporal scales in the pre-colonial period.

From figure 4.9, it is found that the small, fast adaptive cycle (sub-village) in this period was controlled by the larger, slow adaptive cycle (traditional ruler) through the concessions about

villagers' rights and obligations toward the Merapi's forest (CPR) and decisions for dividing *Kalangs* following the Giyanti Treaty. The interactions between the small, fast cycle and the intermediate cycle (Mount Merapi) took the form of the slash and burn technique incited by the forest villagers to optimize benefits from the land. The volcano provided the villagers with fertile land for obtaining natural products and delivering tributes to Sultan. The "revolt" was formed by eruptions as agents of change to the Sultan's policies such as the decision for migrating to an area outside the volcano.

The *panarchical* connections also show the direct control of the traditional ruler to Mount Merapi was absent and was only facilitated through the villagers' services. It conforms the Peluso's postulate that kings in Java typically did not invest interests in lands but in populations living on those lands. In other words, the land becomes a medium for the kings to control the forest villagers whose lives relied on the forest products.

4.4.2. Cycle I-II: Conservation K-Release Ω (1755-1945)

A. Government System and Resource Users

After the Mataram split in 1755, the first king of the newly Yogyakarta monarchy, Sultan Hamengku Buwana I, planned the city's development by adopting the Hindus-Buddhas' cosmology *axis Mundi*. Respectively, the Sultan situated the palace on a direct line between Merapi to the north and the Java Sea to the south. This spatial order symbolically linked the humans' world (micro-cosmos) to the gods' world (macro-cosmos) where the palace[87] served as

[87] To lead the rite *Labuhan Merapi*, Sultan Hamengku Buwono VII (1839-1931) appointed a resident in the Kinahrejo neighborhood in the present-Pelemsari sub-village. The neighborhood[87] was once a forest dominated by cinchona trees (Ghafur, 2012, pp. 47–48) where a hermit, named Kyai[87] Wonodriyo refuged from the Dutch *Cultuurstelsel.* In the Merapi forest, he cleared the forest land to establish new dwellings and by his followers, the Kyai was appointed to become their *bekel*, or a village head. Since *abdi dalem* (i.e., the royal servants) annually passed through his territory to carry out the *Labuhan Merapi*, they recommended the reigning sultan to delegate the task to Kyai Wonodriyo. Since then, the kyai was mandated the tasks of leading the rite and overseeing their ancestors' cemeteries around the volcano and bestowed the title *Mas Ngabehi Amongrogo* (Lucas Sasongko Triyoga, 1991, pp. 22–23).

the custodian of the men-God relationship (Troll et al., 2015, p. 148). While the traditional ruler of Java directed the city plan to spiritual aims, the Dutch used the city to accomplish its capitalistic goals. When Daendels arrived in 1808, Java was divided into nine prefectures to intensify the *contingenten* system that required the commoners to pay taxes in the form of natural products. He also appointed some officials to become ministers in the monarchy whose presence was immediately refused by the Sultan and led to a conflict that caused Sultan to lose his throne. Besides imposing changes on the monarchy's traditions, the Dutch also limited the Sultan's land territories and hegemony. The Dutch, not less importantly, had caused starvation in some areas which led to the decreased populations in villages after being affected by cholera or dysentery (Depdikbud, 1997, pp. 182–185).

In Java, Daendels introduced scientific forest management with strict controls on land, species, and laborers. The boundaries between forest and agricultural land were clearly defined on maps and police forces were established to limit people's access to forest products. Daendels re-organized the teak forest exploitations, passed edicts for controlling the forest use, and secured the government's monopoly on teak, forest labor, and shipbuilding. The Daendels' system laid down some philosophical importance of forest management in present-day Java. Accordingly, the state is an enterprise that has absolute domains overall forests, therefore, the forest must be managed for the state's benefit and the management must be seen as a civil service. Villagers were restricted from logging teaks for commercial purposes except for collecting deadwood and nontimber products. Villagers who were caught red-handed would be sent to imprisonment. To ensure its enforcement, Daendels hired ex-soldiers named *bosgangers*. He also imposed rules in which each laborer must divide the work into two seasons: eight to fourteen days of laboring in the forest and another eight to fourteen days of resting (Nancy Lee Peluso, 1992, p. 45).

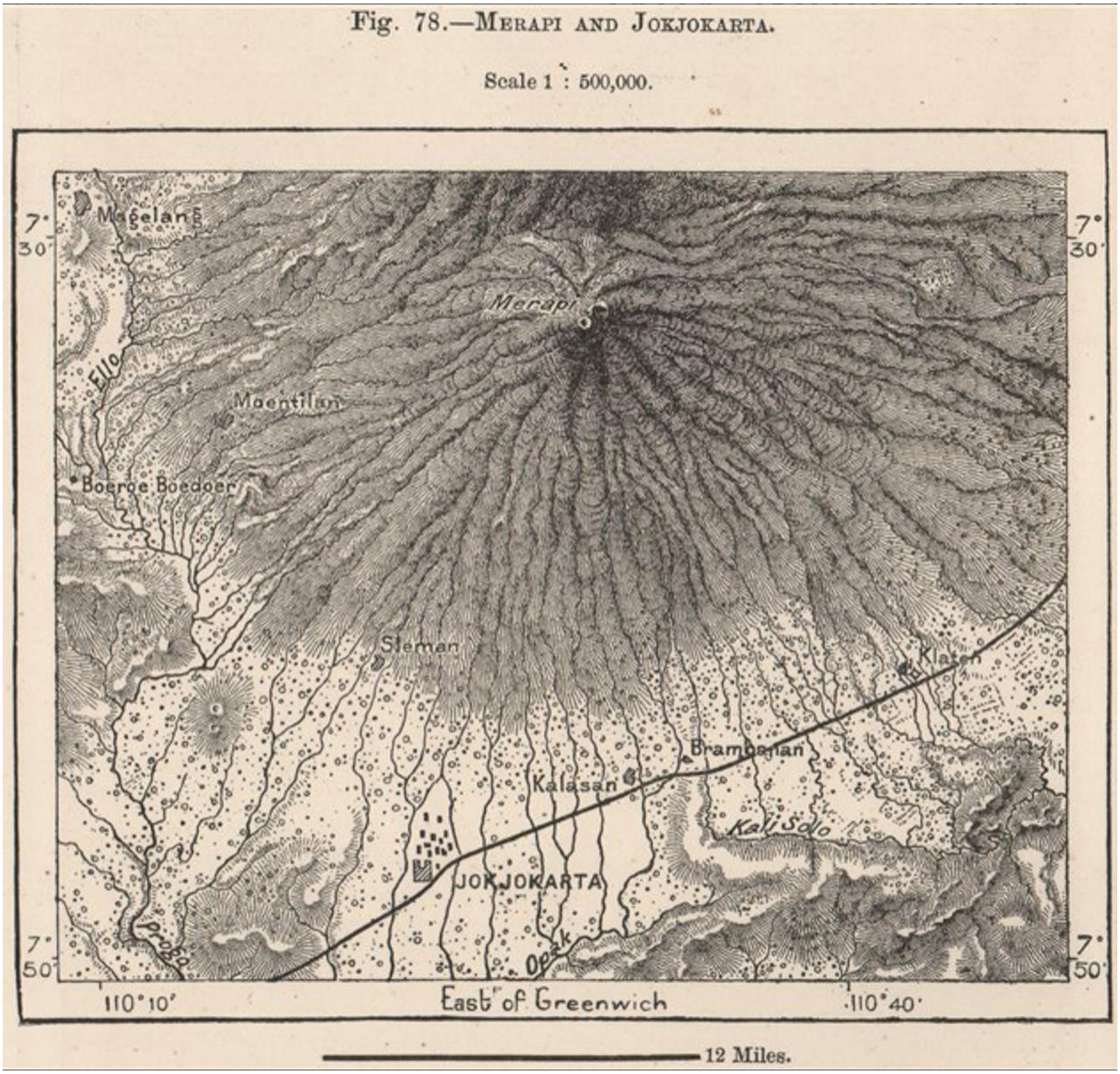

Fig.4.10. The Mount Merapi forest in the 1885. Source:

In 1812, the British reigned over Java and the Daendels regulations were reformed. Here, Raffles reserved the largest and best forests in Java for the state, gave access to entrepreneurs to lease and log the rest, and parceled out the forest for local elites. Disapproving the Dutch laborers' exemption from taxes, Raffles stipulated that all laborers must work 8 to 12 months a year and guard the forests for the next 4 months in exchange for the exemption from land rent. All villagers were also

responsible for providing labor and buffalos and half the working men of a village were expected to work the rice fields at any time during the work season.

In 1816, the British returned the lands to the Dutch, but the Raffles' ideas were retained. To decentralize the control over forests in Java, the tasks of the previously Forest Board were transferred to the Dutch resident in each district. Forest villagers in Java, under the Cultivation System (*cultuurstelsel*) in 1832, were forced to work in the forest for the government's crop exports and each village must subsidize the state's forest activities with their agricultural products. Teaks were excessively logged to build factories, housing compounds, and fuel plantation industries. At worst, these industries were assigned forests in which they could cut trees without reforestation mandatories.

Public insurgents arose throughout Yogyakarta, among them were set off by Prince Diponegoro. In 1830, the prince was finally arrested (Depdikbud, 1997, pp. 128–130). From 1839 to 1848, a series of revolts spurred again which among them was by Sarip Prawirosentono along with his 1,600 supporters. Until 1848, the Dutch relatively could cease local revolts with some support from rulers and princes to whom the Dutch gave rewards such as the General of Nederland Lion title. Dutch did not want any insurgences to re-occur then they passed regulations regarding the tenure and rent system to prevent land misuse of the European residents.

From 1822 to 1850, villagers in Java were permitted to cut fuelwood and timber for their daily needs but beginning from 1851, they must obtain a permit for wood cutting from the local authority. In 1865, the rules became more restrictive. They were only allowed to collect deadwood,

stem, and woods from the forest thinning[88] but were banned from collecting firewood, cutting wood, and grazing cattle in the forest. Landowners could cut teak trees on their private lands without the government's permission but they must pay a 10 percent tax if the trees were sold.

In 1865, the Dutch began measuring the forests and adopting specific management for each designated land. In the same year, the *blandongdiensten* was abolished in favor of a free labor system. Accordingly, laborers must work in the forest and pay for the woods if they want to use them for building houses. Anyone taking wood from the forest without the state's permission was considered a thief. Many villagers in Java resisted the forest controls by migrating, protesting plantations, mobilizing civic movements, and rebelling (Onghokham, 1975, pp. 214–215). Besides this, the resistance form commonly found was the collusion among the villagers to avoid reporting new forest clearances to the authorities. Otherwise, they must pay the imposed taxes to the Sultan.

In 1870, the Dutch issued an Agrarian Law that stipulated all land without ownership evidence would be claimed as state property. To promote teak harvest, the Dutch persuaded villagers in each district to plant teak trees on the state land. Each district, however, must develop its reforestation strategies. Unlike cutting trees that generated profits, reforestation required the Dutch to pay laborers on daily basis for clearing, planting, and weeding the land. Buurman van Vreede then introduced *tumpang sari* system in 1873. The system not only allowed reforestation to be effectively made but also reformed the farmer-forest relationship. Here, villagers cleaned the already-clear-cut forest areas and planted them with teak seeds which were normally performed between August and September. To compensate, villagers were permitted to cultivate crops of

[88] Forest thinning is partial removal of trees used for a variety of commercial and non-commercial purposes, including reducing competition among closely spaced stems in young stands to accelerate growth of remaining trees and reduce flammable vegetation (fuels) (ScienceDirect, 2018).

their own for one or two years in the forest. Besides this right, they were paid with cash and until sometime later, were also allowed to collect deadwood. The *tumpang sari* system unarguably attracted laborers to work nearby the remote forests. The system benefitted them as they could use the land for household production and the state as it could help them reduce labor wages.

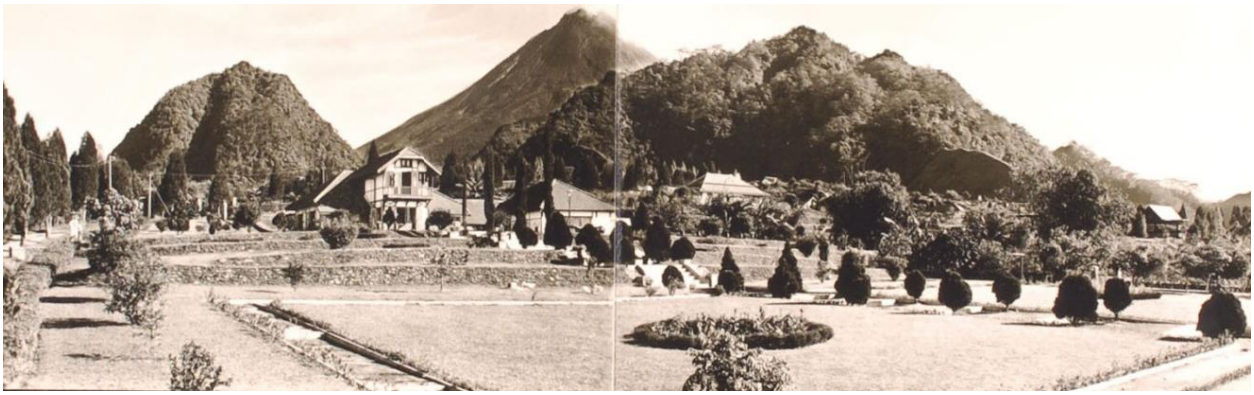

Fig. 4.11. The view of Kaliurang towards Mount Merapi with editing from Ginaris. The image was retrieved from Ginaris, 2018

Since 1095, the Dutch government granted access to free trade and foreign investment in Indonesia. The policy incited mass investments from other countries and gave a rise to capitalism in Indonesia. As a result, exploitations of its natural resources including those in mountainous areas increased significantly. Numerous plantations were erected which in the case of Yogyakarta included coffee, tea, coconut, sugarcane, tobacco, and cotton. Some private companies required Dutchmen or employees to control the operations in small villages or towns. Irrigations, street networks, and health care providers were built to serve the Dutch employees. Some strategies used by the private companies of the Dutch to reduce competition with the local's agricultural farms by imposing taxes or controlling rents and markets. During this period, land rent business was arranged by private enterprises with Sultans and the region heads. With their support, these enterprises could possess fertile soils and farmlands. The Javanese commoners had no courage to refuse the king's orders. In their view, it was the king who had the supreme power over lands and

they only had the right to use and work on the lands. During the Dutch period, farmlands were converted into plantations for trade purposes. Farmers who lost their farmlands and occupations then worked as plantation laborers (Depdikbud, 1997, pp. 200–202).

In 1940, the Governor-general reformed the political contracts with kings in Java. Despite this, the Dutch continued to hold unlimited authority over the monarchy. People's resistance in Yogyakarta emerged in the early twentieth century, mostly, in education. The movements envisioning the betterment of education for all Indonesian youths regardless of their social status were pioneered by many nationalist and Islamic figures in Yogyakarta. Among these figures are Budi Utomo in 1908, Ahmad Dahlan in 1912, and Ki Hajar Dewantara in 1922 (Depdikbud, 1997, pp. 187–200).

The Dutch surrendered their power to Japan on March 9, 1942. Before Japan invaded, the Dutch destroyed their legacies which include forest offices. Villagers took the chance by looting the remaining log yards and openly claiming territory in the forest. In June 1942, Japan established the Japanese Forest Service (RTZ), kept some Dutch forest district officers, and appointed some Indonesians to managerial positions in forestry. The Dutch's forestry routines were neglected, pushing district managers to organize the reforestation on their own. To support the warfare industries, the Japanese created villages in the forest to exercise agriculture and reforestation. The establishment of forest villages meant a new beginning for the villagers to return to their agricultural traditions after the strict controls of the Dutch. According to Peluso (1992), the Japanese policy boosted villagers' belief that they had the right to forest access, especially during food stress. Despite this, *romusha* caused deleterious effects, socially and environmentally. Many of the laborers died due to starvation and environmental decline occurred as all trees, regardless of their age, were cut off (Nancy Lee Peluso, 1992, pp. 97–98).

In Yogyakarta, the Japanese exercised *romusha* and established a committee in every region to ensure the availability of labor forces. Women aged from 16 to 25 and laborers who worked in other sectors were urged to participate. Many villagers in that age range as the result died because of starvation and poverty. Rice robberies in factories, warehouses, and shops increased in 1942, and farmers were obliged to give up rice to Japan without any compensation. Different from the Dutch, the Japanese directly confronted the commoners thus the implications were direct. Japanese influenced the belief system through Islamic teachers or kyai. In July 1943, military drills programs were introduced to the Islamic teachers to nurture spirits of war that would benefit their war-related interests (Depdikbud, 1997, pp. 287–327).

In April 1945, the Japanese divided the government structures of Yogyakarta into the municipality of Yogyakarta and Sleman. Each regency was led by *shi-co* or a regency head. They also elected municipal police or *pamong Praja* to handle administrative and war-related issues and to enforce people to participate in wars.

Japan withdrew from Indonesia after being defeated by the US and its allies on August 14, 1945, during WW II. Soekarno and his colleagues immediately returned to Indonesia to fill in the vacancy in Indonesia's governance and proclaim its independence soon after hearing about the news. Indonesia's independence was finally declared on August 17, 1945.

In Yogyakarta, the Japanese were disarmed by local fighters. Nineteen days after the proclamation, Sultan HB IX announced that the Yogyakarta monarchy was a special district under the authority of the newly independent country (Depdikbud, 1997; Lukas Sasongko Triyoga, 1991, p. 23). The President of the Republic of Indonesia, Soekarno, responded by issuing charters that officially specified the positions of the Sultan HB IX as the head of the Yogyakarta monarchy on August

19, 1945 (Depdikbud, 1997, pp. 304–305; Djunaedi & Sudaryono, 2015, p. 238). In September 1945, the Yogyakarta people took over fifteen factories possessed by Japan. The money collected from this seizure was then given by Sultan to the national government of Indonesia.

After the Yogyakarta monarchy was integrated with the newly independent country of Indonesia in 1945, under the reign of Sultan Hamengku Buwana IX, the *bekel* (i.e., sub-village head) was detached from the gatekeeper position. Despite this change, the roles of the informal leader were still considered culturally important. People perceive the gatekeeper as a gifted mystic from whom they could ask advice on their life matters and who understands the volcano's behaviors (Lucas Sasongko Triyoga, 1991, p. 23).

B. Resource System

The Dutch *Cultuurstelsel* in 1832, forced people including a hermit named Kyai Wonodriyo to refuge in Merapi's forest. Here, he cleared the forest land to establish new dwellings and by his followers, the Kyai was then appointed to become their village head. To preserve the *Labuhan Merapi* tradition, the reigning Sultan appointed Kyai Wonodriyo to serve as his *abdi dalem* by leading the rite (Lucas Sasongko Triyoga, 1991, pp. 22–23).

The forest management in Mount Merapi changed after the Dutch issued the *Staatsblad* 497 in October 1909 and the *Staatsblad* 594 two months later which gave foundations for the stipulation of the so-called *Ordonantie tot Bescherming wan Sommige in Het Levende Zoogdieren en Vogels* (i.e., Law for Protection of Wild Mammals and Birds) on July 1, 1910. Moorlands of the resource users living on Merapi's southern flank were annexed by the Dutch to the protected forest in 1912. As justification, the Dutch argued that the policy would protect Yogyakarta, Surakarta, and

Magelang, from floods and erosions triggered mainly by land clearance practices in the forest (T. Atmojo et al., 2018).

The regulation forced resource users to shift their agricultural system from *peladangan* (i.e., shifting cultivation[89]) to *tegalan*[90] (fallow system) (Kuswijayanti et al., 2007, p. 49; Lucas Sasongko Triyoga, 1991, pp. 120–121) that required manure to replace the *bero* system. The Dutch's protected forest stipulation restricted people not only from cultivating but also from grazing cattle in the forest. Villagers shifted the grazing into the domesticating system that consequently required them to seek fodder in the deep forest. To increase their growth, farmers must walk the cattle around the village once a day. A cattle shed was built near the house using bamboo, wood, and *alang-alang*. The cattle manure was periodically removed and dried off in an open area to remove the water and smell. Then, the dried manure was transported to home yards to fertilize their crops (Lucas Sasongko Triyoga, 1991, p. 76).

The stipulation of Mount Merapi as a protected forest was inseparable from the Dutch's expansion of hill station (i.e., rest areas) around the volcano's foot, similar to those in other parts of Java (Spencer & Thomas, 1948, pp. 643–644). In 1919, some officials proposed to the authority to let them build villas and resorts in the present-Kaliurang district located about 888 meters above sea level. The proposal was finally approved, and some land lots were designated as *Vrijdomein* or

[89] Shifting cultivation system is a cultivation system in which a plot of land is cleared and cultivated for a short period of time then abandoned and allowed to revert to producing its normal vegetation while the cultivator moves on to another (OECD, 2001).
[90] *Tegalan* is a dry land cultivated with one-season crops, separated from the home yard, and attended for permanent uses.

free lands. The Dutch geologists ran studies on the eruption effects on this area and concluded that it was relatively safe from eruption impacts (Ginaris, 2018).

On May 4, 1931, the Dutch issued *Gouvernements Besluit* Number 4197/B that stipulated about 6,472.1 Ha of Merapi's land in Yogyakarta and Central Java as the protected forest. In Yogyakarta, the Dutch specified the forest functions not only for hydrology but also for botany and aesthetics. Here, the Dutch made an agreement with Sultan about land concessions, water management, plantation (e.g., coffee), agriculture, and forestry. The forest regulations of the Dutch similar to that in 1912, were aimed at protecting water sources, rivers, and the life support systems of Sleman Regency, Yogyakarta, Klaten, Boyolali, and Magelang (T. Atmojo et al., 2018, p. 32).

The conditions of forests in Java between the two periods were strikingly different. During the last six decades of the Dutch occupation (1935-1940), the reforestation program had already created about 12,300 ha of teak forest and about 7,600 ha of non-teak forest to grow. The invasion of Japan stopped the reforestation to be further advanced. Regardless of their ages, the Japanese cut off teak near railways and roads for their warship-related industries. It was estimated that it would need a reduction by 30 percent of teak production over the next 30 years to return the forest to its prewar condition (Nancy Lee Peluso, 1992, p. 96). In Yogyakarta, specifically, Japan built villages in forests to support reforestation and produce food supply for their warfare industries. In Mount Merapi, about 30 protective caves were also built by villagers especially those living nearby Kaliurang under Japanese pressure. The materials were shipped weekly by villagers from different locations with a rotating system until each cave was completed (Umaiyah, 2020).

C. Institutions

During this period, the Dutch played dominant roles in shaping forest management in the country. Under the governance of Daendels, the Dutch introduced the scientific forest management and forest controls[91] (land, species, and labor) and retained the Raffles' policies of laborer's tax exemption. The Japanese, who invested deeply in warships, exploited forests in Java by recruiting the Dutch and Indonesian foresters to manage the land.

As the Dutch controlled the forest management, the welfare of the resource users significantly declined due to the loss of forest access and autonomy, burdened tax, the Cultivation System (*cultuurstelsel*), the exile of their fellow villagers who revolted, and the Japanese' *romusha* that led to the high rate of the immortality of young-aged villagers. People's resistance occurred in various forms, from migrations, civic movements, and public insurgents led by Prince Diponegoro to the collusion to avoid reporting forest clearances to the authorities.

The Dutch's adoption of the *tumpang sari* system may be seen by the resource users as an opportunity to reform their relationship with the forest. However, the strict forest controls imposed on the resource users consequently led them to fail to have an optimum capacity to develop self-governed forest management. The resource users' knowledge and practices were limited to the land track given by the Dutch. Besides that, the forest controls had disregarded their ecological knowledge by forcing the resource users to change their longstanding ecological practices.

[91] Control of land represents the foundation of the agency legitimacy and without land, the agency had no power. Control of species in which species were selected for game protection, timber protection, and watershed protection. Control of forest labor is to ensure the profitable exploitation of trees and products on forest land (Nancy Lee Peluso, 1992, pp. 17–18).

Japanese confrontation with the resource users deserves special attention here. Both the spirits of war nurtured in villages and the mandatory rice deliveries had led to starvation and the decreased population of the commoner. The Japanese' warship program, therefore, weakened the institution's adaptive capacity. This means the violations against all design principles outlined by Ostrom (1990).

D. Adaptive Cycle Analysis Conservation K-Release Ω

During the colonial period, the Dutch's decree of annexing villagers' moorlands into the protected forest of Mount Merapi in 1912 is an unexpected shock. The rigid knowledge of ecology management that had characterized the villagers' culture long before the pre-colonial period was disparaged by the Dutch. In the Conservation (K) phase, the rigidity of this knowledge was tested by the Dutch's scientific forest management through the annexation. The justification of their act was to protect areas on the southern flank from erosions that could be triggered by the people's slash and burn practices in the forest.

The annexation disrupted the connections of elements involved in the villagers' ecological tradition. For example, people were pushed to collect grass in the forest not only because they no longer could graze in the forest but also because they had to shift their agricultural practices into the fallow system. Unlike the slash and burn and *baro* systems, the system required fertilizers from the manure. Manure could only be produced by cattle that needed grass for fodder.

As the villagers' new practices expanded towards the renewal (Ω) phase, these entities saw an opportunity for accumulating their assets through the Dutch's reforestation program with *tumpang sari* (mixed-cropping). Here, the villagers' weak connections and internal controls cause the external agency like the Dutch could invade and transform their states. As villagers lost their

farmlands for the Dutch's plantations, many of them starved to death and became poorer. The condition forced them to work as plantation laborers[92].

People's skills in agriculture were not lost and indeed, they only needed a trigger for making them appear and function again. The Japanese invasion in 1942 in the exploitation phase came as the new regime that changed the villagers' livelihoods. As the Japanese created villages in the forest, people could have greater access to the forest for agriculture and reforestation and enhanced social cohesion with one another. Although the products must be given to the Japanese, a sense of belonging soon emerged among the forest villagers. Moreover, Japan's policy boosted the villagers' awareness of their right to access the forest (Nancy Lee Peluso, 1992, pp. 97–98), especially during a food crisis. Presumably, as they expanded from the exploitation phase to the conservation phase, their struggles for obtaining rice intensified and community cohesion became rigid. At the critical point of rigidity in the conservation (K) phase, the connectedness and potential could leak away after being intruded on by an external agency.

[92] During my fieldwork, a Pelemsari resident admitted that he could gain profits from coffee which was once introduced by the Dutch around the 1930s into the volcano. Coffee began to rise again in 1984 and was evidenced to be able to increase the economy of people living in the Villages of Kepuharjo and Turgo since then (Rosana, 2022).

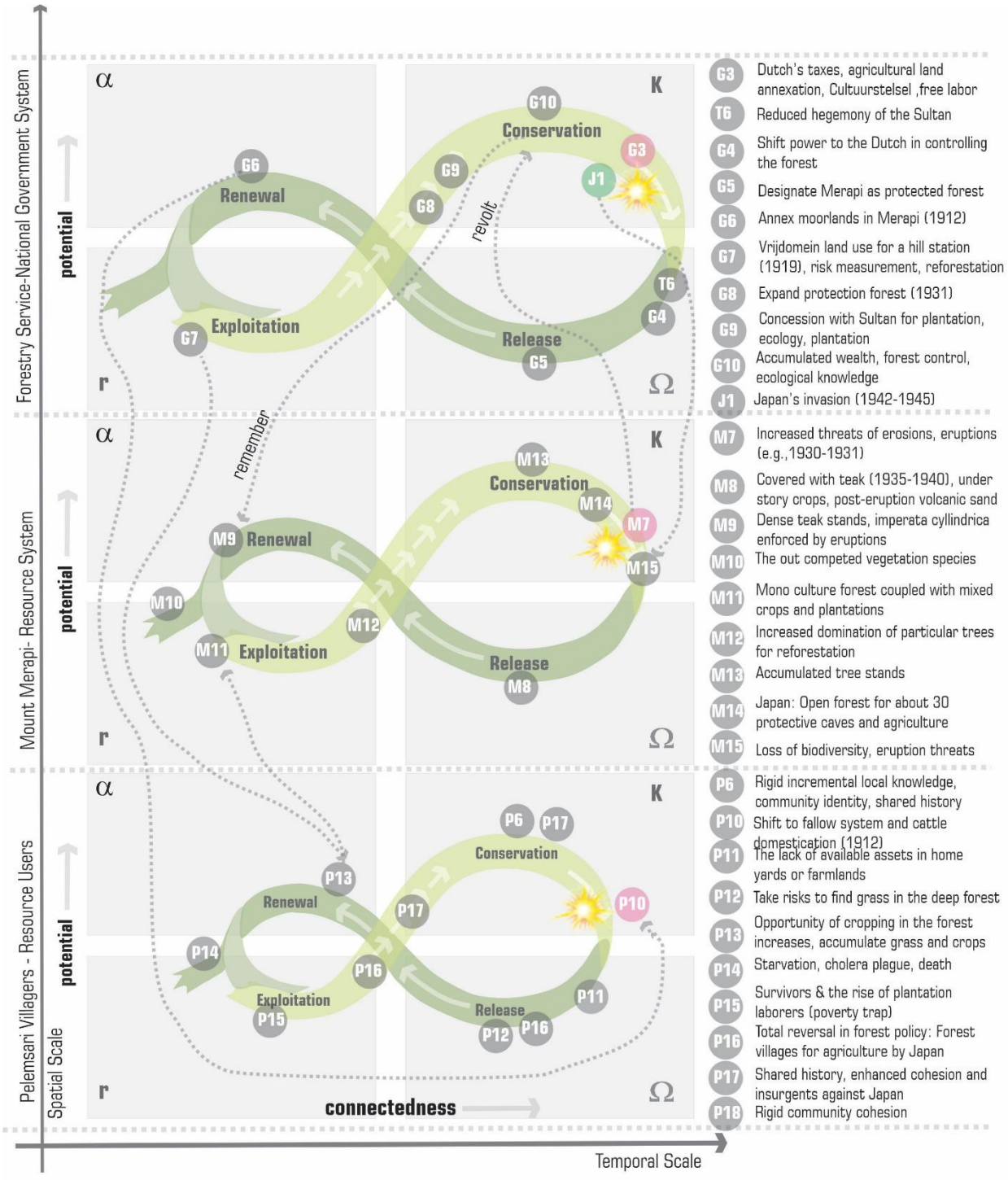

Fig. 4.12. The SES dynamics of Mount Merapi across spatial-temporal scales in the colonial period.

As seen in figure 4.12, the *panarchical* connections show the complex interactions between the fast adaptive cycle (sub-village), the intermediate size and speed cycle (Merapi), and the large,

slow cycle (government). The erosion potentially triggered by villagers' slash and burn practices served as a revolt against the Dutch policy, set aside the Japanese whose reign from 1942 to 1945 was not marked by eruptions. The practices became foundations for the Dutch to exercise greater control on Mount Merapi by converting the forest into a protected forest. The experience of performing reforestation in previous decades served as the legacy of the past (remember connection) that would give a direction to the actualization of the protected forest of Mount Merapi.

The Dutch reforestation and plantation programs lasted until the Japanese took over control in 1942. During this new regime, the reforestation effort was far from being equal to the deforestation intensively performed to serve Japan's warship interests.

4.4.3. Cycle II Release Ω - Renewal α (1945-1965)

A. Government System and Resource Users

After proclaiming Indonesia's independence, Soekarno Hatta established a new forestry agency called *Jawatan Kahutanan* (forest service) and made a pledge that Indonesians would be self-sufficient in food production (NYTimes, 1964b). The Dutch, however, with support from its British ally, attempted to re-occupy the newly independent country. The British attacks in Bogor forced Indonesia's forest service to move to Yogyakarta in which they developed new forestry policies that considered the discontinuation of the Dutch-German management system. Internal dispute rose as conservative nationalists wanted to return to the Dutch forestry routines and advocated the watersheds' preservations for the state's revenue (Nancy Lee Peluso, 1992, pp. 97–98). Despite the Dutch leaving the country in 1949, Indonesia's forest agency still struggled with determining its service direction. It was then decided that the provincial managers handled the marketing, management, exploitation, and protection of the forest products but the policies must

be made at the national level. The agency that carried out the centralized management was *Jawatan Kehutanan* which remained part of the Ministry of Agriculture until 1957. Internal conflicts were intensified as the members were ideologically divided with the presence of these four political extremes: 1) the Darul Islam and the Islamic Army of Indonesia (*Darul Islam/ Tentara Islam Indonesia*); 2) the government's armed forces; 3) the Indonesian Communist Party (*Partai Komunis Indonesia*); 4) the Indonesian Nationalist Party (*Partai Nasional Indonesia)*. PKI, in particular, saw the Forest Service as an extension of a colonial bureaucracy that had not changed its social relations with peasants. Squatters, landless peasants, and forest laborers who had no legal rights to the forest joined this party. Besides them, Forestry Workers Union was also affiliated with the communist party and expanded its recruitment from only foresters in 1945 to laborers by the end of the revolution. They influenced many forestry policies to advocate peasants' rights to the forest land and the welfare of the lower-level officials (Nancy Lee Peluso, 1992, pp. 102–109).

DI/TII used guerilla warfare as its rebellious strategy and the wooded hills as their covert place, therefore, a high dense forest was highly preferable. Villagers who cut down trees were shot and only grazing cattle was allowed. Oftentimes, their cattle were consumed by the rebels. The villagers' responses to the DI/TII varied across regions. Some could be corporative with this group while others chose to flee and abandon their lands. Foresters tried to get sympathy from villagers by involving them in a reforestation program using the *tumpang sari* system. In exchange for replanting with the given seeds, villagers were granted access to the forest land for a year or two. The program however was far from successful as most villagers were too afraid to plant the seeds nearby the DI/TII bases. Large tracts of the forest land, as the result, remained untended and were covered with *Imperata cylindrica* grass. In the villages, being suspicious of one's loyalty to the republic became commonplace. In Yogyakarta, Islamic teachers who during the colonial period

helped the Indonesian army against the Dutch aggression, collaborated to seize the rebels (PKI) from 1947 to 1949 (Dwiyono, 2012, pp. 6–7).

In 1957, the military chief of East Java pronounced that squatter who claimed forest land before August 1 would be provided with lands outside the state forest land. However, the PKI and BTI felt unsatisfied with the concession. By 1964, they encouraged peasants to engage in unilateral actions by occupying private estates and cutting down trees. The strength of the PKI grew significantly, and their efforts became more daring. In the forest, their resistance materialized in the form of open confrontations with foresters. In the response, non-communist political groups in the Forest Service strengthened ties with other governmental agencies. They expanded membership to foresters who were already civil servants and worked together with regional authorities to expedite the forest crimes trials. Mass trials occurred in villages where hundreds of PKI followers were prosecuted. Illegal teak houses were torn down, convicted offenders were sentenced to jail, and the members of SARBUKSI were fired from their jobs in the agency.

It is worth mentioning that rather than engaging forest villagers in their programs, foresters had labeled them squatters. Further, of all wood products sold by the agency, only a small fraction was dedicated to villagers. Most of them, especially the best ones, were sold through auctions to manufacturers. In 1960, a law was passed, and accordingly, squatters could be evicted from state land without a court order and the military could be used for this purpose. Another law was passed in 1961asserting the establishment of a State Forest Enterprise or Perhutani. The goal of this enterprise was to manage a commercial business and ensure the forest products could supply industries (Nancy Lee Peluso, 1992, p. 116).

Further, in 1964, about 2 million people in Java faced a food crisis thus many of the impoverished villagers entered big cities including Yogyakarta to beg on the streets. The failing rice harvesting in the country coupled with the president's campaign to crush Malaysia that removed the rice import shipping made Soekarno mobilize people to eat corn. The Communist party rose giving support to Sukarno and criticized certain officials for their failure to serve the people. Rice replaced the rupiah currency and civil servants and armed forces received monthly rice rations along with salaries (NYTimes, 1964a). People in Mount Merapi during the reign of Soekarno were obliged to cultivate corn in the designated land tracts under the *tumpang sari* system. The harvested corn was then delivered to the forestry

B. Resource System

Forest conditions in Java during 1946, according to Peluso (1992), were devastating. About 220,000 Hectares of state forest were destroyed and of these, almost half were damaged by fires presumably triggered by armies or individuals. The rest, which reaches about 110,000 hectares was occupied by forest villagers. From about 3 million hectares of forest land inherited by the Dutch to the Indonesian Forest Service, much of it had been damaged. Forest land was barren and exposed to erosions and extreme heat during the dry season (Nancy Lee Peluso, 1992, p. 109). Moreover, as forests in Java became bases for the DI/TII and forest villagers were urged to convert forests to agriculture by the Indonesian Communist Party, the destruction of the forests enhanced during this revolution period (N. L. Peluso & Poffenberger, 1989, p. 334). In Mount Merapi, according to the Pelemsari respondent, people were forced to cultivate corn crops including cassava under the trees stands in the state's designated land tracts. The corn product once harvested, must be handed into the forestry office. If he produced 5-quintal corn, then the 1 quintal

must belong to the agency. Nevertheless, the rule was flexible that each could only give the agency 50 kilograms of corn. The seeds were provided by the forestry agency and must be carried from the Kaliurang district by walking and *sunggi*.

C. Institutions

Despite Indonesia having gained its independence from the Dutch, the forest management during the period afterward was not very much different from that in the colonial period. In fact, the internal disputes rose in the agency but were won by the conservative members who were mostly high-rank officials. What happened next was predictable. Local institutions were dictated by the colonial-affected-forest services which in the case of Yogyakarta were the *Jawatan Kehutanan Republik Indonesia* or the Regional Forestry Department of the Republic of Indonesia (1945-1950) and the Yogyakarta Forestry Agency Unit (1950-2004). The dissatisfaction with the agency's extension of colonial forest management fueled the revolts of the left-wing ideology partisans. On the one hand, these parties facilitated the local peasants' aspirations for access to the forest, on the other, they developed a fear among them. In Mount Merapi, the enforced corn, as well as cassava in the land tracts, mean the reduced opportunity for the villagers to benefit from *tumpang sari*.

D. Adaptive Cycle

In the release phase of the independent period, villagers were enforced to plant corn and cassava under the pine stands as the effect of the Soekarno's corn movement. The release is marked by the rise of corn as the main food not only for the government officials but also for the villagers. As the system expands toward the renewal phase, the people's source of carbohydrates increases. In the renewal phase, these villagers had greater security of food in terms of corn including cassava. The

previous jobs such as cattle farmers were outcompeted as *imperata cylindrica* was replaced with corn and cassava. Aside from this history, according to the local elder, in the 1990s, the government introduced dairy cows to villages. The longstanding corn and Arabica coffee were soon replaced by grass to feed dairy cows.

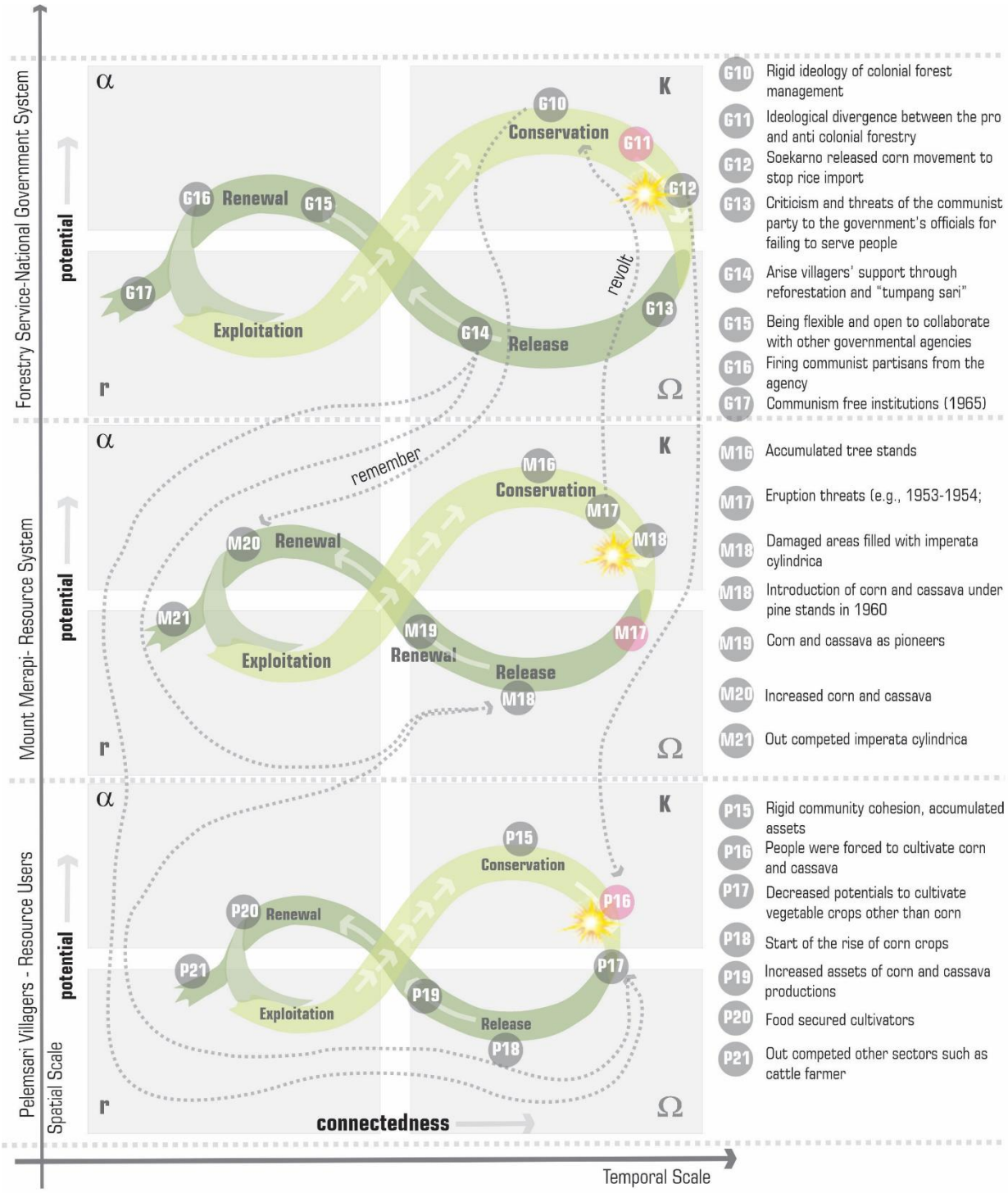

Fig. 4.13. The SES dynamics of Mount Merapi across spatial-temporal scales in the independent period.

Figure 4.13 displays the reforestation program that akin to the colonial period was the only channel that linked the Pelemsari villagers to the forest. The reforestation program as represented in the

diagram was a top-down program that was run only to serve the state's goal by excluding the well-being of the forest villagers. Moreover, the program was maneuvered by the foresters to involve the villagers in their fight against rebels who hid in the forest. Similar to the previous periods, the "revolt" feature in the *panarchical* cycles came from s a series of eruptions in this period that persistently demanded the authorities modify their policies.

4.4.4. Cycle II Renewal α - Conservation K (1965-1998)

A. Government System and Resource Users

The forestry management in Java during the reign of Soeharto was almost indifferent to that under the presidency of Soekarno. In 1967, the General Directorate of Forestry held a meeting in Kaliurang, Yogyakarta, and issued Law No.5/1967 about Principles of Forestry. The law provided opportunities for timber companies outside Java to extract forest products on Java by granting them the right called *Hak Pengusahaan Hutan (HPH)*. As a result, timber exports exponentially increased in 1978 which caused major deforestation throughout Java (Isnaeni, 2021). In the meantime, the structures, laws, and policies of the forest service still adopted the colonial forest ideology. The Forest Service which later became the State Forest Cooperation (SFC), however, applied a not less strict control over the forest use. The military was used to enforce the forest rules if necessary, while at the same time, the national principles, Pancasila, were integrated with scientific forestry. Similar to its predecessors, this agency disregarded local knowledge and saw villagers as backward and ignorant of the meaning and functions of the forest (Nancy Lee Peluso, 1992).

In 1969, the Ministry of Agriculture was established. The SFC that was once responsible for the ministry, became a separate entity in 1983. The lowest rank of officer in this agency is the *Resort Head* or *Mantri,* assisted by at least four *mandors* who specifically supervised the planting and

logging activities. Unlike *Mantri* who were periodically transferred across sites, *mandors* work and stay in their home villages. They were familiar with local conflicts and enjoyed their status as government officials despite their low-rank status in the agency's structure. Due to the low wage, *mandors* often sold access to forest lands to villagers. It is also worth noting that there was an unwritten rule during this period where a forester could only get a job promotion if he/she was affiliated with GOLKAR, the party of the reigning president. Similarly, reforestation laborers who were GOLKAR partisans could easily gain access to the forest (Nancy Lee Peluso, 1992, pp. 130–131).

The SFC continued the Dutch legacy of exercising three types of controls: controls of land, species, and labor. All traffic of people and goods must be monitored by forest officers. Preventive measures were run to control territory and protect the state's properties by patrolling the forests, increasing familiarity with the territory, and acknowledging people living nearby the forest. In conducting their tasks, the police and *Mantri* worked with village informants to locate the thieves. In the 1970s, the SFC initiated community forest programs, however, almost none of them were successful in alleviating poverty or stopping forest encroachment. Peluso (1992) argued that the underlying goal of the SFC programs was to control forest access by lessening the local's dependence on forests. (Nancy Lee Peluso, 1992, p. 155).

In Mount Merapi, after the 1960 eruption, the government ran transmigration programs for villagers of Dukun and Srumbung who lived near the crater. The settlements and yards abandoned by these refugees were transformed into pine forests by Perhutani. This agency also required the villagers who remained on Mount Merapi to tap the standing pine trees for sap and to hand over the product to the agency (T. Atmojo et al., 2018).

The national Agriculture Enterprise Unit (*Perhutani*) launched the reforestation programs from 1988 to 1993 in Mount Merapi, Central Java. In the first three years, villagers were allowed to plant mixed crops between the standing tapped pines including collecting grass in the forest, but they had to tap the pine sap for the state. During this period, villagers began to shift the type of livestock from goats and cattle to cows. Perhutani then introduced *kalanjana* (*brachiaria muticathat*) grass to the farmers who previously relied on *Imperata cyllindrica*, *blabakan,* and *iser* as fodder. In the Resort Cangkringan, pine (*Pinus merkusii)* and *acacia decurrens* species were presumably introduced by the Yogyakarta Forestry Agency Unit which had the authority to manage forests in the province through reforestation with the *tumpang sari* system. The forest lands where villagers planted these species with the *tumpang sari* system are called *sanggeman*. The land had a clear boundary, and the management was supervised by a *Mantri*. The right to use the *sanggeman* land could be passed down to their descendants but the ownership remains in the state. *Mantri* had tasks to manage the land division and size of the *sanggeman* land located on the edge of the forest (T. Atmojo et al., 2018, p. 46).

A Pelemsari respondent shared his experience of involving in the reforestation program of the provincial forestry agency. People during this period were allowed to cultivate the so-called *sanggeman* or *alas* where land concession between the foresters and the cultivators as well as cultivators and their neighboring cultivators was built. Among the cultivators themselves, they could make agreements in terms of barriers and the types of the barriers by using bamboo or land contours. There are also customs that regulate how the right to use the land is transferred and whether the former cultivator could re-claim the right to use the land.

With the foresters, the cultivator was bounded to the term of cultivating the land with mixed crops for no more than two years. The dimension of the land was determined in accordance with the physical capacity of the farmer to manage the state's trees. Here, the state's agency determined not only the type of tree species (*Albizia chinensis*, *Altingia excelsa*, bananas, *Chincona*, *Schima wallichii*) but also the types of crops to be cultivated. The seeds of the plants must be carried by the cultivator from the determined pick-up station located about 5-6 kilometers from the forest's land tract by walking and using the *sunggi* (on top of the head) method. He along with other cultivators was required to hand in the harvested corn to the agency. When he, for example, harvested 5 quintals of corn, one quintal of it must be transferred to the agency. Although in practice, the agency was flexible enough that he could hand in less than the required amount. After the land was no longer cultivated or the contract was due, people started to cut grass on the same land parcel or tract.

The same resident shared his view about the Yogyakarta Provincial Forestry Agency Unit. During its administration, the agency periodically held informal meetings with the cultivators at their official houses. Here, they performed *arisan*, a form of combined peer-to-peer banking and lending with the group members. To develop ties with the cultivators, they also conducted competitions for planting bamboo or pines in the forest tract in which the winner could get a goat from the agency.

B. Resource System

Under the *tumpang sari*, the forest was planted by forest villagers with tree species determined by the SFC. The forest species designated by the SFC include teak, pine, and *rasamala* which were all intended for large-scale production. The SFC was responsible for the seeds but planting them

required laborers. In exchange, access to the reforestation lands and planting crops were granted to villagers. Typically, the agency paid farmers for carrying the seeds to the forest plots either from the *mandor'*s house or a nearby station.

The SFC possessed all living parts of the species while villagers were only allowed to collect leaves from teak trees over ten years old. SFC also had the right to determine when trees could be cut and the intervals between trees for new seeding and land markers[93]. On top of that, SFC controlled the kinds of agricultural species that farmers could plant in the forest. Planting tree crops were not allowed due to their long period of growth, shades over the major crops, and because this activity may rise a sense of ownership of the state's land. Agricultural species like papaya, banana, or cassava were also prohibited because of their negative effects on the growth of the main species. Only dry field rice, corn, peanuts, vegetables, or alike were permitted as they would not harm the primary species and were relatively easy to be removed.

Not only the types and plantation techniques of the forest species during this period, but the SFC also imposed controls on the marketing of the forest product. Farmers could indeed plant the state's forest species on their private lands but once they were about to be sold or transported from the owner's land, he/she must pay some fee to the SFC

C. Institutions

The New Order regime was marked by the expansive deforestation for timber business and stricter law enforcement in the forest which involved military services to overcome illegal logging. In the Pelemsari sub-village, for example, around the 1980s, forest police caught a local villager who cut

[93] In Java, planters have rights in the trees they planted and sometimes to the lands under or around the trees (Nancy Lee Peluso, 1992, p. 136)

bamboo in the forest. After a gradual sanction of a three-time warning, the police sent the transgressor to jail for about three months. Since then, nobody, at least in the sub-village, dared to violate the state's rules. This law enforcement conforms to Ostrom's principle 5.

During this period, the forestry agency developed not only reforestation programs, but also community programs aimed at alleviating poverty. People's longstanding negative stigma about the government's real agenda was one of the problems raised by Peluso (1992) to explain why the government's programs seemed unsuccessful. The stigma in people's minds is undoubtedly created by negative experiences of the government's post-disaster assistance in the past. A respondent in the Pelemsari sub-village once recalled that during the eruption in the 1970s, the government did not adequately and quickly respond. For some time, in the absence of government assistance, they must rely on the survived crops in the field and leaves for food and the River Kuning for water. During the crisis, the government only provided 3-4 kilograms of corn to each household in the sub-village.

However, the forest contains not only grass but also water sources, wildlife, and so forth. The agency's continuation of colonial forest management and controls of land, species, and labor had significantly hampered the resource users' capacity to develop their own ecological knowledge and forest management. In short, it is no way that they could satisfy all design principles of Ostrom if the access to the forest was highly limited to only the grass plots which are in total only a small fraction of the entire ecosystem of the volcano.

D. Adaptive Cycle Analysis

Under this regime (Soeharto's presidency), colonial forest management persisted despite changes in the forest service organizations. What distinguished this period from other political regimes were the intensive law enforcement in the forest and the community development programs which were aimed at decreasing forest crimes.

The renewal phase of the Pelemsari system in this period begins with the fall of communism in the previous cycle. During the exploitation phase, the surviving forest villagers developed themselves and saw new opportunities to expand their farming as the forestry officials at that time, the Yogyakarta Forestry Agency Unit, distributed the right to use some lands and introduced species such as *kalanjana* (*brachiaria mutichathat*) as the alternative to *Imperata cylindrica* for fodder. Based on my fieldwork, the residents in Mount Merapi typically plant *kalanjana* in their home yards as this grass is considered by them a high-quality fodder for their dairy cows. Further, the land division among farmers forced them to build land concessions or customary rights. Each farmer could collect grass only within his/her land territory but anyone could *nembung* or ask for grass from other farmers when necessary such as during the dry season. Mutual aid persisted among farmers in the forest and increased their connectedness.

As the system expands from exploitation to the conservation phase, the connectedness among farmers who together used forest lands for their living increased and so did their assets as they were introduced by the forestry agency. The different kinds of species introduced to the forest such as *kalanjana* which further expanded dairy farming sector. Since dairy farming was seen as more profitable in 1990, farmers began to cultivate *kalanjana* and left Arabica coffee crops behind. As the result, the understory level of the forest was dominated by grass.

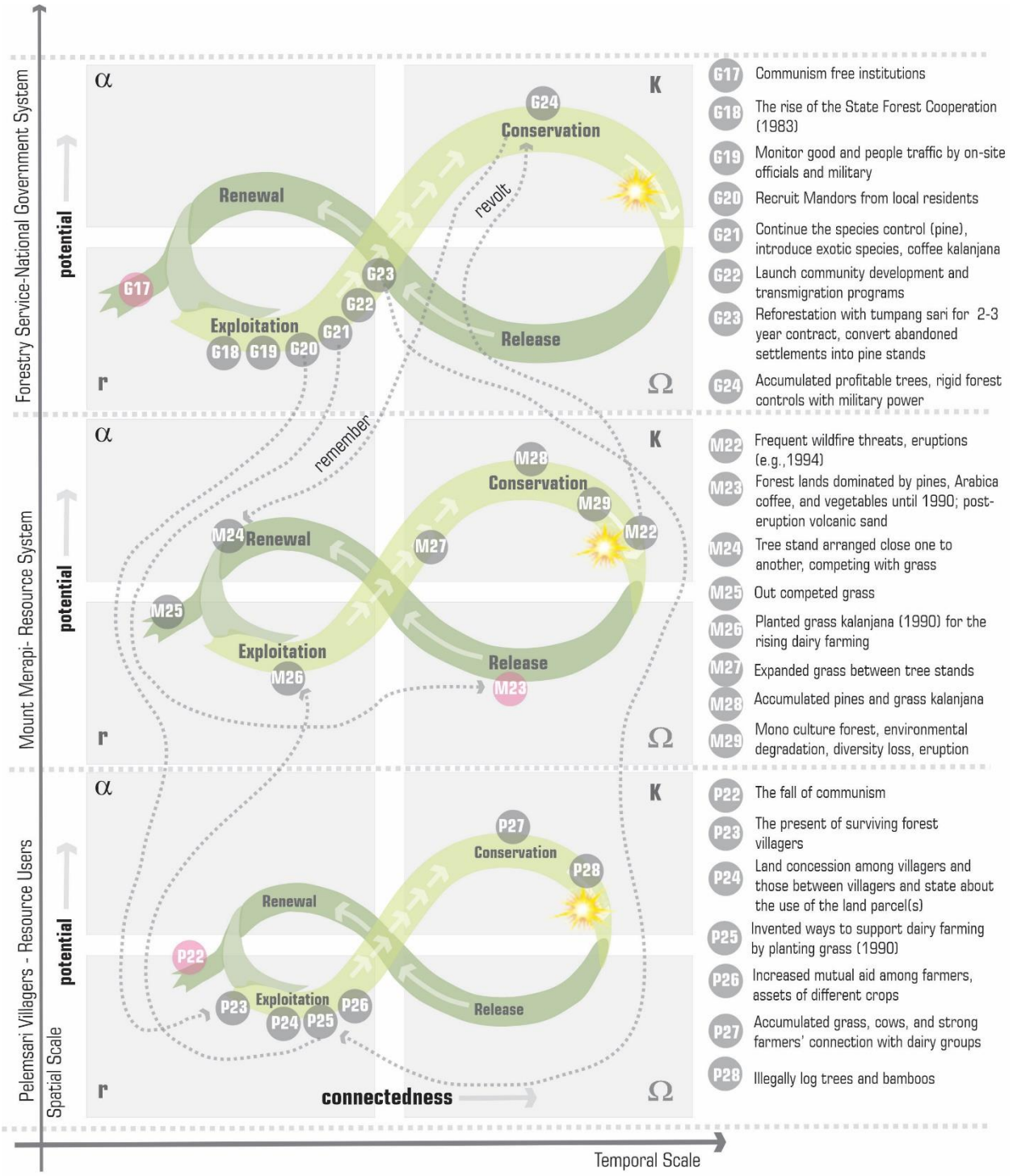

Fig. 4.14. The SES dynamics of Mount Merapi across spatial-temporal scales in the new order period.

As displayed in figure 4.14, similar to the colonial periods onward, the *panarchical* connections show the controls of the large, slow cycle (government) to the forest (the intermediate size and

speed cycle), and the sub-village (small, fast adaptive cycle. The “revolt” was present in the form of eruptions during this period that urged the government to respond accordingly.

4.4.5. Cycle II-III Conservation K- Conservation K (1998- 2004)

A. Government System and Resource Users

The regime’s failure in grappling with the crisis spurred public unrest throughout the country. Soeharto finally resigned in 1998 but the transitional era following his fall was beclouded by uncertainties. From the first phase of the transition to this date, negotiations between the survivors of the old regime and new political forces continue influencing Indonesia’s politics. Conspiracies among politico-business blocks also flourish with orientation to market-based policies through natural resources exploitation (Ulum, 2020, p. 31).

In 1999, the Indonesian government passed Decree No. 41 in 1999 that stipulated all forests and all materials contained are managed by the state and subjected to the prosperity of the whole population (Fredaur et al., 2014, pp. 32–33). Forests in Sumatra, Kalimantan, Sulawesi, Nusa Tenggara, Maluku and Papua, and some production forests in Java and Bali, are managed by the state’s owned enterprise, *Perum Perhutani*. Forest management in Yogyakarta is shared between two agencies: the Yogyakarta provincial agency of forestry and plantation (i.e., Dinas Kehutanan dan Perkebunan Provinsi DIY) aimed to supervise the production forest (+ 13,851 Ha) and the Ministry of Forestry’s General Directorate of Forest Protection and Conservation aimed to handle the protected forest (+ 2,057.90 Ha) (Isnaeni, 2021).

The reformation period reigned by Susilo Bambang Yudhoyono is marked by state-people tensions following the enactment of the ministry of forestry’s decree No. 134/Menhut-II/2004 on May 4, 2004. The decree stipulated the forest of Mount Merapi as a national park and the change of uses of the Protected Forest, the Nature Reserve, and the Nature Park. The ecological degradations in

the Nature Reserve Plawangan Turgo, the sedimentation of two river streams, volcanic eruption activities, and illegal sand mining were assumed to stimulate the enactment of the decree.

The decree's enactment raised protests from the villagers who received legal assistance from activists and environmental alliances such as WALHI. They accused the government of being ignorant of engaging villagers in Mount Merapi in their policymaking. The term national park, they argued, would only marginalize the locals from accessing the forest and benefitting from the natural resources that they had long depended on (e.g., grass, dry wood).

B. Resource System

In Java, the tree species that dominated the production forest from 2012 to 2019 was *Albizzia Falcataria*, locally known as *sengon* (BPS, 2019, p. 14). Besides *Albizzia*, other tree species that contributed to log production are mixed forest[94], teak, mahogany, pine, and *Acacia decurrens*. Production forests managed by the state's enterprise, Perhutani, in this period, however, were threatened by serious illegal logging and deforestation. Ironically, the deforestation rate increased during the reformation (2000), reaching nearly 2 million hectares per year (Isnaeni, 2021). This rate surpassed that during the new order regime (1985-1998) which reached 1.6-1.8 million hectares per year. Environmentalists claimed the reformation period in 1998 as a chaotic period largely marked by a massive forest robbery. Many illegal loggers took the wood to revenge the environmental injustice in the past. Some laws were then enacted in 1999 to stop such crimes to expand in Java's forests (Fredaur et al., 2014, p. 30).

[94] A mixed forest is a forest unit, excluding linear formations, where at least two tree species coexist at any developmental stage, sharing common resources (light, water, and/or soil nutrients) (Bravo-Oviedo et al., 2014, p. 525).

Mount Merapi erupted in 2006 and triggered the collapse of the volcano's lava dome, *Geger Boyo*. This incident caused the pyroclastic flows to travel 4 km southeastward to the Gendol Valley, damaging the nearby villages, Kaliadem and Bebeng, and burying two men who hid in a bunker (Wilson et al., 2007; Wunderman, 2007). About 15,000 villagers in Kaliadem were evacuated but many villagers were reluctant to leave their farms and livestock behind (Donovan et al., 2012, p. 310; Wilson et al., 2007, p. 54). People in the Pelemsari sub-village chose to rely on the intuition of Mbah Maridjan, who during the 1994 eruption refused the Sultan's evacuation order. Instead of obeying the order of the Sultan and the national government, Maridjan meditated at a site nearby the crater. The eruption event was unexpectedly followed by the invasion of *Acacia decurrens* in the damaged district of Kaliadem. This phenomenon raised public concern as the invasion changed the authentic vegetation composition of the forest which once was dominated by endemic species like *rasamala* (*Altingia excelsa*), *puspa* (*schima waliichi*), *Casuarina* (*Casuarina equisetifolia*), and pine. Some studies show that this species could grow into a pure stand and become weeds as it pressed the growth of the native species (BLH, 2020).

C. Institutions

Despite the seemingly promising future of Indonesian politics after the fall of the New Order, the reformation period did not yet show a significant change in its leadership. In Yogyakarta, it was materialized through the national park polemic in 2004 where the national government (i.e., the Ministry of Forestry) did not engage the communities in the policymaking, nor were they transparent in communicating the plan with the impacted villages.

The Pelemsari residents recalled this disruptive event as what further deepened the community's distrust in the authorities. It was through NGOs that they could receive the news about the national

park and evidence that it was not a rumor. The implications of the policy on the people's livelihoods were clear. It would remove people from their cultural roots in their ancestral land and alienate them from the forest that they had depended on over generations. In the face of this event, people consolidated power with NGOs, activists, and local forums to challenge the minister's decree.

D. Adaptive Cycle Analysis

While people living nearby production forests in Java were threatened by deforestation, those in the protected forest of Mount Merapi must deal with the stricter forest controls of the authority. The connectedness of the volcano's social system, however, gradually expanded from the conservation phase (K) to the next conservation phase. Here, the potential of the social system took the form of the support of external entities such as activists, environmentalists, and NGOs, providing them the confidence to challenge the state as the competitor. Besides the presence of the supportive NGOs, the people's shared history was the sub-system that fueled their struggles.

As the connectedness increased, people had greater control and potential to determine their future. According to Holling and Gunderson (2002), the future in this phase becomes more predictable and less controlled by external forces which in this case came from the authority. Many diverse local groups arose from this conflict such as the forum of *Masyarakat Peduli Merapi* (i.e., People Caring Merapi Forum) and *Rakyat Korban Merapi* (i.e., the Merapi's Victims Forum), indicating the intensifying concerns with the state's policy. At the Pelemsari sub-village, leaders from the formal to the informal played central roles in expanding people's resistance to the national park plan. Mbah Maridjan, the former gatekeeper, for example, proclaimed that he would not approve the national park plan unless his community was let to continue their *ngarit* activity in the forest.

As the social system evolves from the exploitation toward the conservation phase, the connectivity among the dispersed local groups and villagers such as the Pelemsari villagers become tight. At the local level, the sense of community (e.g., common goals, shared history as farmers) grew and preserved through their community traditions (i.e., *gotong royong*, mutual aids), but began to prevent new entrants from penetrating their system. The government's community development programs, for example, must deal with people's prejudice as they were perceived as nothing less than the attempts of disintegrating people from the forest and their longstanding dependence upon the forest products (Nancy Lee Peluso, 1992) through *ngarit-mugut-dairy farming*. During my fieldwork, the Pelemsari respondents said that the Sleman regional government had introduced them to silage grass as a fodder alternative during the dry season, homemade yogurt, and biogas, yet none of them were sustained in this sub-village to date.

The tight cohesiveness of the villagers' system (small, fast adaptive cycle) and the rigid control of the state (large, slow adaptive cycle) are two factors that could reduce the resilience of the Merapi ecosystem. For example, after the eruption in 2006, *acacia decurrens* began to invade the damaged areas of the Kaliadem district, impeding the growth of native species such as the *Schima walichii*. However, there were no significant efforts made by the authority to prevent the rise of the monoculture *acacia decurrens* from taking place. Instead of engaging the community to specifically solve this ecological problem, the government focused on running reforestation programs in the damaged areas.

In the next phase of this period, the *panarchy* resilience theory helps us understand the consequences of the people's long-standing resistance and the state's forest controls after the occurrence of an unexpected shock, the eruption in 2010.

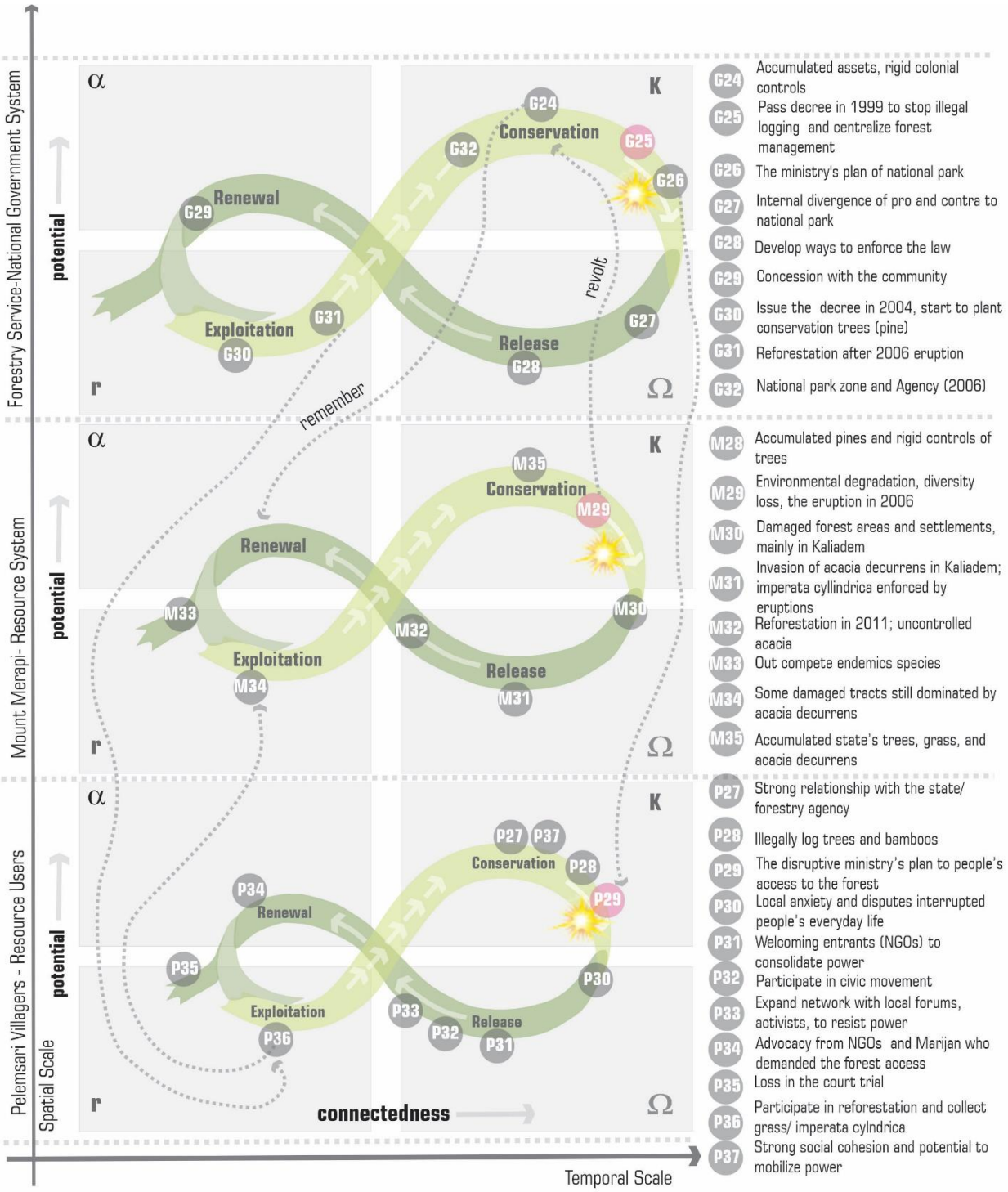

Fig. 4.15. The SES dynamics of Mount Merapi across spatial-temporal scales in the reformation period.

The *panarchical* connections in fig.4.15 show the interactions of the three cycles. The slow, fast adaptive cycle (sub-village) was controlled by the large, slow cycle through reforestation while the control on the intermediate size and speed cycle, Mount Merapi, was through the hazard zone modification and relocation policy. The eruption in 2006, therefore, served as a "revolt" against the government's policies.

4.4.6. Cycle III Conservation K - Release Ω (2004-onward)

In this subsection, I will analyze the next phase of the Pelemsari villagers' adaptive cycle by primarily discussing the local institution's resilience according to Ostrom's self-governed laws followed by the adaptive cycle. The details on the resource users, system, unit, and governance system are provided in the first section of this chapter.

A. Institutions

The state's strict controls of the resource users to plant crops, cut trees, control wildlife, and access other zones outside the traditional zone had reduced the resource users' capacity to develop a self-governed institution of forest management. The presence of the long-tailed monkeys that damaged people's farmlands and grass plots is an indicator of an ecological imbalance that was triggered by the lack of monitoring of the *acacia decurrens* invasions after the eruption in 2006.

Based on my fieldwork, the users had knowledge of long-tailed monkey diets and the types of tree species that were typically consumed before the eruption. The reduced diversity of the forest after the eruption in 2010, according to his observations, was what caused monkeys to go down the slope and began to harm users' farmlands and grass plots.

B. Adaptive Cycle Analysis

According to Holling and Gunderson (2002), the shift from the *k-phase* to the Ω-*phase* is marked by extremely intensified connections and rigid growth that paradoxically could make the system leak away. Reflecting on the case of Mount Merapi during this period (2004-onward), the relocation policy after the eruption in 2010 triggered the extreme rigidity of the villagers' cohesion and control (e.g., beliefs) to leak away or disintegrated.

In the conservation phase, the internal vulnerability of the villagers was created by the devastating losses of families, cattle, properties, and other assets that evoked a crisis in their dairy farming sector. Not to mention the trauma that caused their potential (e.g., skills) to be significantly depressed.

Their potential did not further leak away only when they mobilized to slow the losses towards renewal. The villagers have low potential temporarily but as their rigidity broke away, they would have flexibility that allowed them to form a novel reorganization. Villagers consolidated through meetings in the shelters. The connectedness and potential increased as they shared the same goal and history over their former homes. They finally reached a collective decision that they would voluntarily relocate as long as the government issued the certificates of their damaged homelands. Leaders became pioneers who deliver the demand to the governor. The sub-village's skillful entrepreneurs and youths mobilized to actualize the relocation plan and became the pioneers of renewal.

As they expanded from the release to the renewal phase, their connectedness and controls were weak but the condition allowed novel recombination or association to develop and a new idea to penetrate their system. They saw an opportunity to economically recover after seeing the incoming

visitors to the Maridjan's house and their damaged sub-village. They mobilized to develop motor-taxi business during the renewal phase. Choosing not to wait for the government's response to their demand, the villagers, through their leaders, managed the collective income and donations to buy land for their relocation. Throughout the transition from the renewal to the exploitation phase, the motor taxi declined as it was outcompeted by the jeep tour business.

During the exploitation phase, the jeep tour business became the winning agent that still operates to date. In this phase, the business must compete with their old practices, dairy farming which recently attracted people to return to dairy farming after the global pandemic. Not only did the villagers successfully establish their relocation with their collective fund, but they also received the certificates of their homelands and had their dairy farming sector to be restored.

As they grew from the exploitation to the conservation phase, the social cohesion and assets increased. Their accumulated assets (i.e., dairy farming) and strong cohesion would be tested by the high-cost concentrate and the long-tailed monkey that damaged their grassplots in the forest.

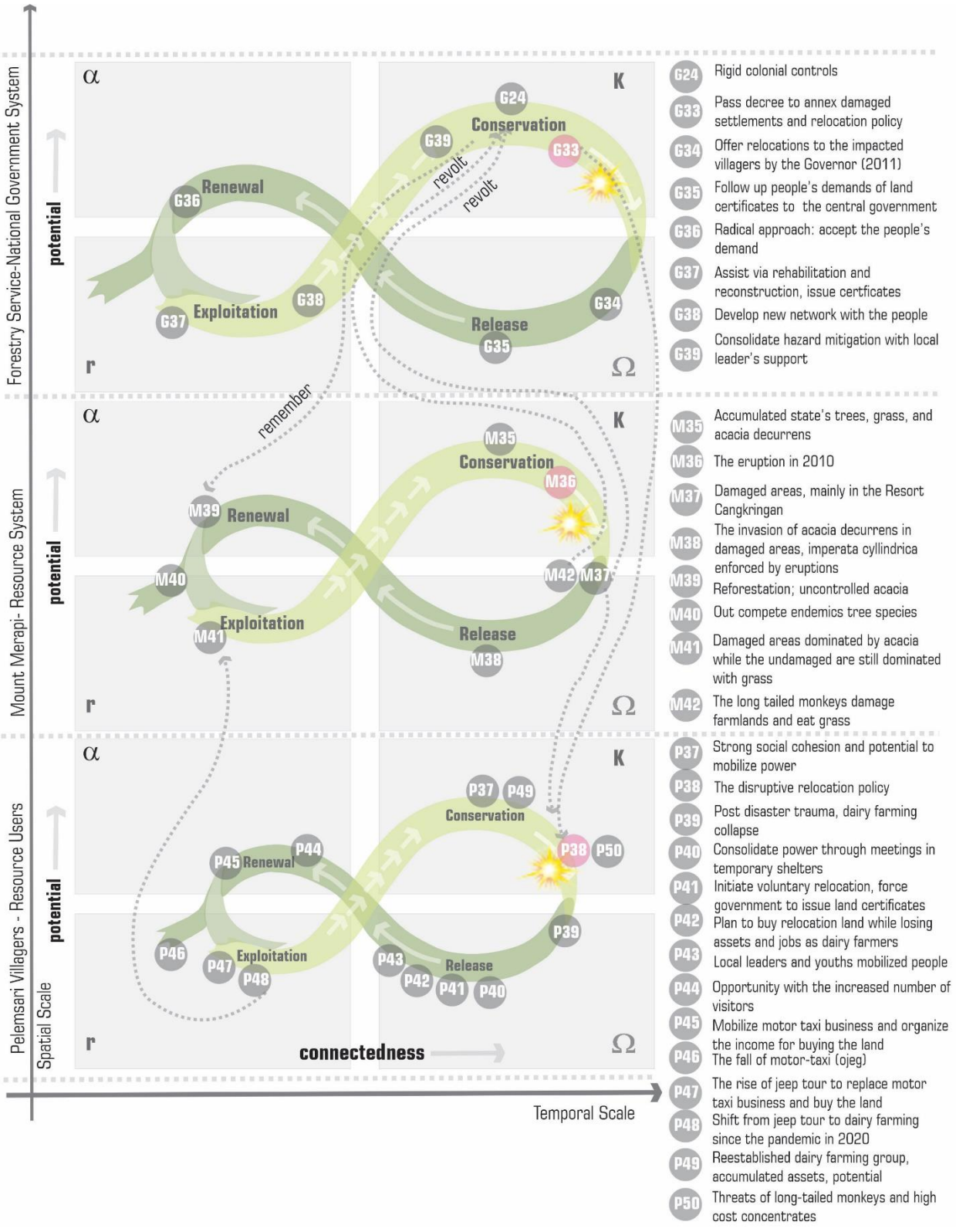

Fig. 4.16. The SES dynamics of Mount Merapi across spatial-temporal scales in the reformation period.

The *panarchical* connections in fig.4.16 show the controls of the large, slow cycle (government) to the fast adaptive cycle (sub-village) and the intermediate size and speed cycle (Merapi). The "remember" facilitates the renewal of the forest by letting the growth of acacia decurrens after the eruption. The "revolt" agents against the government from the cycle one level below it, the volcano system, were the impacts of the eruption in 2010 and the long-tailed monkeys which represented the ecological imbalance after the eruption in 2010. Ecologically, the eruption severely damaged the forest land. Of 435,000 ha of ash-covered land, about 20% were agricultural farms, forests, horticultural farms, plantations, shrubbery, and settlements, not to mention about 367 fatalities, 277 injuries (Bakkour et al., 2015, p. 167), and the loss of 1,961 cattle (Muhammad, 2010, p. 43). About 43% of the totaled 6,410 Ha of forest land was damaged by the violent eruption. It was estimated by the Head of the national park agency that it needed 40-50 years to restore the forest. (Zakaria, 2010). Many studies showed that almost all damaged lands became monoculture forests due to the rapid invasion of *Acacia decurre*ns that was once introduced by the state's enterprise back in the 1980s (T. Atmojo et al., 2018, p. 48). This species in the Resort Cangkringan outcompeted native species such as *Schima Walichii* that once dominated the forest. However, its existence was left alone by the national park agency with an assumption that such an action would expedite the rejuvenation of the forest.

After the eruption in 2010, the long-tailed monkeys went down the slope, entering and damaging the grass plots in the forest and home yards in people's former settlements for fruits, vegetables, and even grass. A Pelemsari resident said that this phenomenon could be attributed to the decreased diversity of tree species after the eruption. Typically, monkeys would need a great variety of fruits from trees such as *becici*, gondang (*ficus variega blume*), and *kelodo* for their daily consumption.

Since these kinds of trees were no longer available in the forest, they began to eat young grass which was also preferred by people's dairy cows.

Some of the Pelemsari respondents complained of the changing behaviors of long-tailed monkeys. Catching or hunting them, as once raised by one of these respondents, was not the option in a natural park. However, it is obvious that the behaviors made monkeys become considered pests by local farmers who in their everyday life sought young and fresh grass nearby the crater. The revolting element, from the *panarchy* perspective, was the long-tailed monkeys that provided feedback on the need for monitoring and control of the forest. People's lacking capacity of running the two functions was mainly caused by the state's excessive forest controls that had long excluded them from forest management.

4.5. Conclusion

No historical record specifically described what the Pelemsari villagers performed during the Dutch and the Japanese occupations. However, public insurgents occurred in Yogyakarta against the Dutch from 1830 to 1848 and Japan from 1942 to 1945. The insurgent shows the shared history that is one of the features of the sense of community that mobilized people in this period to take collective actions against the oppressive power.

During the New Order period, community programs were enhanced and dairy farming began to rise, leading to the replacement of corn with grass in the forest. Dairy farming routine is characterized by regular meetings as I found during my observations in the sub-village. Besides that, people in the Pelemsari had some dairy cow-related traditions such as *kenduren* for farmers whose cows give birth to one calf at once. The other tradition is the ceremony of piercing a cow's

nose. Dairy group meetings and *kenduren* traditions, I assumed, facilitated their sense of community.

In the face of the national park polemic in 2004, the sense of community became stronger as they shared the common goal, which is to maintain ownership of the ancestral land and access to the grassplots and homes. The presence of Mbah Maridjan who defended the people's right against the forest agency understandably boosted their spirit to retain their right to access the forest. The sense of community of the villagers was tested during the eruption in 2010. Here, as we had learned the sense fueled or empowered them to plan for their own future with minimum interference from the government.

Based on these findings, it could be argued that the Pelemsari villagers' sense of community did not occur only in the event of the eruption in 2010. Instead, they and their ancestors had long experienced a structural and systematic marginalization by the state.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Disasters had long been embedded with human existence that requires ways to live with the phenomena. Nevertheless, human interventions such as government policies and development practices often exacerbate the severity of the impacts. Such complex realities led an anthropologist, Oliver-Smith (1999) to define a disaster as follows.

> *"A disaster is a collectivity of intersecting processes and events—social, environmental, cultural, political, economic, and technological—that transpire over varying lengths of time. As they unfold, all dimensions of a social structural formation and the totality of its relations with its environment may become involved, affected, and focused." (Oliver-Smith & Hoffman, 1999, p. 31).*

The volcanic eruption in 2010 revealed the complexity of the Pelemsari villagers' multidimensional interactions that demonstrate conflict (e.g., relocation policy) and resolution (e.g., voluntary collective relocation), control (e.g., forest controls), and resistance (e.g., violations of cutting bamboos), certainty (e.g., daily routines) and uncertainty (e.g., eruptions). Living with risks for the Pelemsari villagers in Mount Merapi, therefore, is a matter of survival not only from eruptions but also state's control. Moreover, the increased unpredictability of Mount Merapi's eruptions since 1930 and its designation as a national park involving stricter forest controls made living in this volcanic region become uneasy for the residents.

This chapter will discuss the answers to the four research questions—what is the meaning of living with risks according to the villagers after the 2010 eruption; how are those meaning-related insights applied to their traditional ecological practices; how do these practices affect and are

affected by other systems outside those of the sub-village; and what strategies do the villagers develop to maintain the sustainability of these practices in the face of uncertainty—followed by the discussion about the reliability and validity and the recommendations for future research.

5.1. Meaning of Living with Risk After the Eruption in 2010

In regard to the first research question, I used the five categorical themes of my seven respondents' reflections on the "meaning of living with risks". To reveal these themes, I used inductive or bottom-up analysis and practice *deliberate naivete* by being open to new and unexpected phenomena (Brinkmann & Kvale, 2015, pp. 33–34) and bracket personal presuppositions (Brinkmann & Kvale, 2015, pp. 33–34) throughout the process. The salient themes that emerged from their reflections are "*nyedaki ngadohi* (get close to and go away from the volcano)", "let the leaders handle", "traditions save us all", "disturbing policies", and "living with trauma".

First, living with risk after the eruption in 2010 is generally understood to mean being flexible by going back and forth between home and other places depending on the magnitudes of the threat and, therefore, requires one's capacity to deem the conditions. Here, "place attachment" is present as the impulse of the behavior that a home is a place of birth ("place identity"), the home yard serves as a multi-functioned space, Merapi is the source of life, and the forest is the source of grass on which they rely for the dairy farming ("place dependence"). The Pelemsari villagers' willingness to stay close to their former settlement after the eruption in 2010 and wish to return implies their' anchored emotions to a place (Lewicka, 2014, p. 49). The decision to maintain the proximity[95] is shaped by the positive experiences that exceeded the negative ones of infrequent eruptions in their former settlement (Giuliani, 2003, pp. 151–152). These positive experiences

[95] Seeking physical proximity to a particular place considered as a safe haven where ones can retreat from threats or gain emotional relief is an expression of place attachment (Scannnel & Gifford, 2014, p. 26)

include but are not limited to, the childhood memories of learning about *ngarit* in the forest or others whom they were emotionally closed with (place identity) and the *ngarit-mugut* that rely on the forest's natural resources (place dependence). *Second*, living with risk after the eruption in 2010 also means having trust in their leaders who had roles in consolidating power and mobilizing the Pelemsari villagers so they could remain together as a resilient community. *Third*, living with risk after the eruption is associated with anxiety about the potential loss of their "traditional ecological practices" namely *ngarit* and dairy farming due to the effects of globalization. *Fourth*, the meaning of living with risk after the eruption in 2010 also means dealing with potential tensions with authorities whose policies continue marginalizing them from accessing the forest's natural resources, therefore, acquiring protection from the volcano's spirits is needed. *Fifth*, respondents perceived living with risks after the eruption in 2010 as a negative experience that created a serious psychological implication, namely trauma. Trauma had disabled the villagers from immediately restoring their dairy farming tradition, caused a serious overreacting response even to simple stimuli like roaring sounds, and made the protective parents begin to isolate their children from *ngarit* and the forest. Based on these general definitions of living with risk, three salient themes emerged in relation to their resilience are "place identity," "place dependence", "sense of community", and "local knowledge."

5.2. Disruptions, Perceptions, and Community Response

To address the second research question about how the meaning of living with risks after the eruption in 2010 affects people's traditional practices, I employ the place attachment model of Milhaylov and Perkins in 2014 (fig.6.1). The model illustrates one direct effect of disturbances on community responses (Mihaylov & Perkins, 2014, pp. 64–65) after going through a mental process. In regard to this study, I focused on the dimensions of "place dependence", "place

identity", and "sense of community" as they are themes that are present in my phenomenological analysis. In addition to this, the "local knowledge", that is the cognition aspect of place attachment (Scannell & Gifford, 2010, p. 3) is displayed as what influences people's attachment to place.

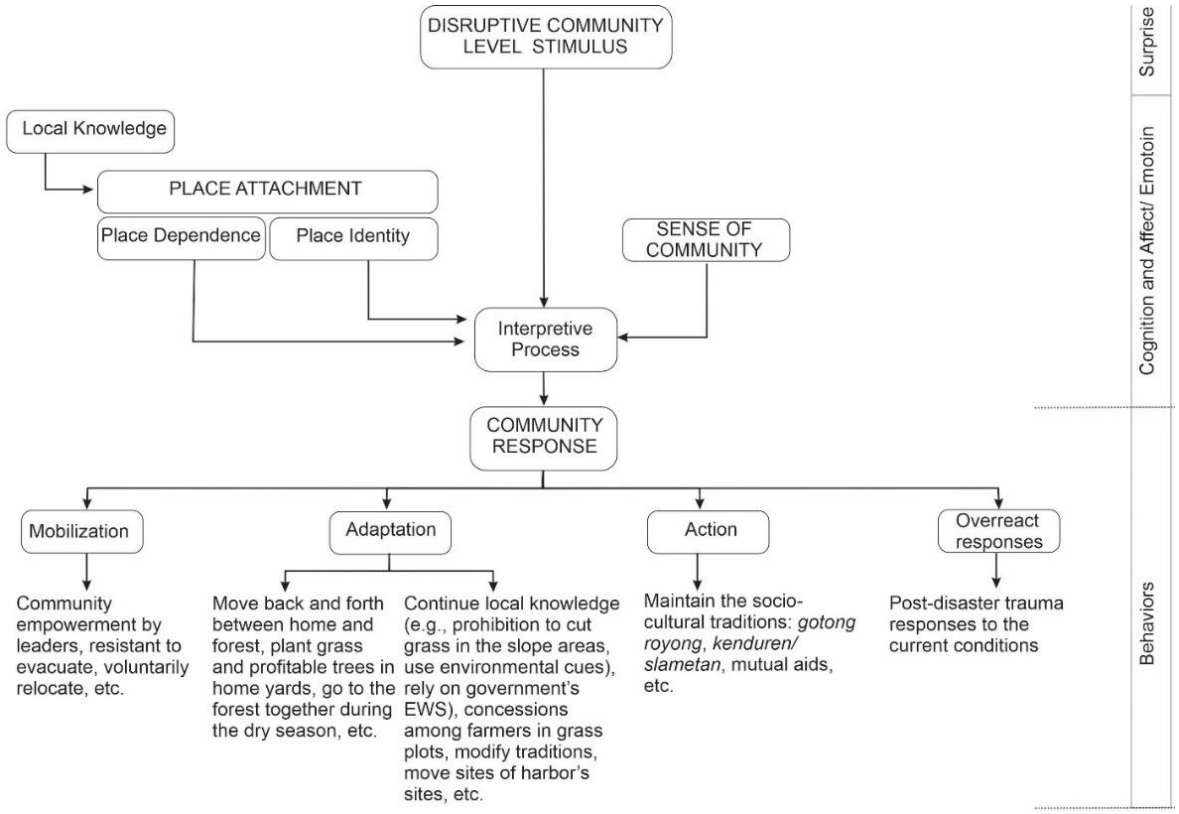

Fig.5.1. A model of the Pelemsari's place attachment in dealing with disruptive community level stimulus. The model was adapted from Mihaylov and Perkins (2014) and fieldwork.

Respectively, the community level disruptions namely eruptions and government policies (e.g., relocation in 2011, national park policy in 2004) experienced by my respondents are interpreted and evaluated in the interpretive process. In this phase, their place attachment (place dependence, place identity), sense of community, and local knowledge influence their interpretations, leading to particular responses. For instance, Aman's perception that "living with eruption means being

able to recognize the volcano's behaviors." Such a perception may result in the response of moving back and forth between home and Merapi's forest (e.g., source of threat).

In the context of Merapi villagers, the knowledge intertwined with the local beliefs such as *pranoto mongso* provides a guide for agricultural activities based on seasons. Beliefs and local knowledge, however, are found by Donovan (2010) as factors that could hinder the Pelemsari villagers' adoption of protective behaviors during the eruption in 2006. Accordingly, people chose to wait for forest animals ascending down the slope and *wisik* from the ancestral spirits through dreams (Donovan et al., 2012, p. 310) before deciding to evacuate. Besides this, people also believed in their ancestral messages that eruptions would not reach their settlement (Donovan, 2010b, p. 124; Donovan et al., 2012, p. 310).

Reflecting this on the sequential, multi-stage Protective Action Decision Model (PADM) by Lindell and Perry (1992), people's belief that the eruption would not reach their sub-village is inseparable from their experiences of having no fatalities and damages during the event in 2006. Indeed, the eruption in 2006 mainly damaged other areas around River Gendol, Kaliadem, and Bebeng, causing two men hiding in a bunker to lose their lives and about 15,000 residents of Kaliadem to evacuate. The unprecedented eruption in 2010, however, based on my fieldwork changed the Pelemsari people's attitudes in making decisions for protective actions as their long-standing and rigid beliefs that their ancestral spirits would protect their sub-village from the eruption collapsed. The absence of readable cues prior to the eruption, according to my respondents' testimonies, made the eruption in 2010 extraordinarily an unexpected event. Moreover, the pyroclastic flows finally hit their sub-village, claiming the lives of their 37 fellow villagers and forcing them to move from their homelands. Many people then associated the

eruption's unpredictability and devastating impacts with the loss of the protective wall *Geger Boyo* in 2006.

After the eruption, the Pelemsari respondents' attitudes changed from previously quite persistent againts the government's early warning messages to becoming reliant on this agency's assistance. Local leaders such as the sub-village head and neighborhood heads since 2010 became effective channels to disseminate early warning messages from the regional disaster agency through public announcements with Mosque speakers, local meetings, and *kenduren* traditions. In fact, the Sultanate obliged the Pelemsari's informal leader or the current gatekeeper to be able to cooperate with the national disaster agency and used this as a term for selecting a new gatekeeper.

At the community level, people, specifically, farmers began to rely on technology. As I described from the respondents' testimonies in Chapter 3, they used mobile phones to receive the updates on the volcano's behavior which tend to become unpredictable after the eruption in 2010. They also used the devices as ways to address their curiosity when their environment seems unconducive (e.g., explosion sound, mist covering the volcano) by visiting the national disaster agency's website called "Merapi Live Streaming", Twitter, Instagram, and Facebook. Besides this channel, the local WhatsApp group, "Pelemsari City" is also the application that most villagers intensively use to exchange information about disasters and receive warning messages from the sub-village head. Also, most people especially farmers bought radio HT online with the price ranging from less than 300 thousand rupiahs to about 1 million rupiahs. The radio HT enhanced their awareness of eruption during their *ngarit* and *ngrencek* activities in the forest. The respondents' characteristics and adoptions of protective actions can be seen in table 5.1.

Table 5.1. The respondents' characteristics and adoptions of protective actions are based on interviews from 2021 to 2022.

Respondent (pseudonyms)	Age	Gender	Educational attainment	Indigeneity	Disaster Risk Reduction Strategies
Rejo	50	Male	Senior high school	Native-born	– Environmental cues: falling rocks, the visibility of the volcano, repetitive sounds, smoke – Radio HT – Merapi Activity Live Streaming – Government (e.g., Disaster Agency, National Park Agency)
Puteri	50	Female	Elementary school	Native-born	– Affective heuristics (self-intuition) – Head of the sub-village, government (e.g., Disaster Agency, National Park Agency) – Merapi Activity Live Streaming, WhatsApp
Moga	70	Male	Elementary school	Native-born	– Environmental cues: roaring sound, the presence of earthquake based on the experience or eruption in 2006 – Affective heuristics (self-intuition) – Head of the sub-village, government (e.g., Disaster Agency, National Park Agency) – Family members/ relatives – Merapi Activity Live Streaming
Krasan	70	Female	Elementary school	Native-born	– Environmental cues: falling rocks, pyroclastic flow – Head of the sub-village, government (e.g., Disaster Agency, National Park Agency) – Family members/ relatives
Wisnu	30	Male	Senior high school	Non-native born	– Environmental cues: pyroclastic flow – Merapi Activity Live Streaming
Samar	50	Male	Elementary school	Native-born	– Environmental cues: the visibility of the volcano, pyroclastic flow, thunderlight – Radio HT – Head of the sub-village, government (e.g., Disaster Agency, National Park Agency)
Aman	50	Male	Bachelor degree	Native-born	– Merapi Activity Live Streaming – Head of the sub-village, government (e.g., Disaster Agency, National Park Agency)

It can be seen from Table 5.1 that most of the Pelemsari respondents relied on environmental cues and the early warning messages disseminated by the head of the sub-village through channels like WhatsApp, Mosque, local meetings, and *kenduren* traditions. In terms of the environmental cues, it is understandable that pyroclastic flows dominate their overall responses as it is the primary hazard of Mount Merapi.

Two Pelemsari residents—who were in their 70 and fled the Karang Kendal relocation site for their former homes in the upper land—relied on their family members, the government, and the head of the sub-village for their safety concerns. It is also worth noting that the successful evacuation of one of these returnees in the upper land during several eruptions had inspired the other to finally follow her step. In relation to the PADM, the other member's behaviors are social cues that in this case influence one's decision toward protective actions.

5.3. Government System and Forest Controls

5.3.1. The Resilience of the Mount Merapi Socio-ecological Systems

Based on the analysis of Mount Merapi's social-ecological systems, it is found that the government system had a dominant power in dictating the interactions of the volcano and the villagers under study. Regardless of the different political regimes, rigid controls over the forest and villagers remained since the colonial period. In fact, in the last two decades, the forest controls became stricter following the stipulation of the forest's status as a national park in 2004.

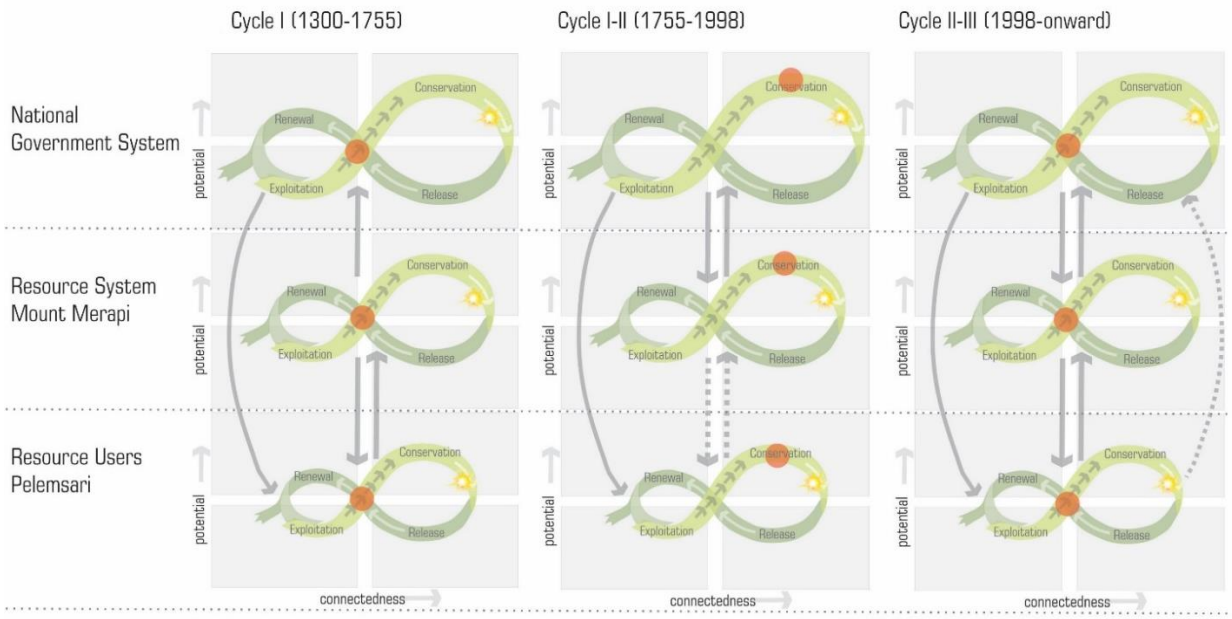

Fig. 5.3. The SES dynamics of Mount Merapi across spatial-temporal scales in the reformation period.

Figure 5.3. shows the dynamics of the social-ecological systems in Mount Merapi that occurred from pre-colonial to current periods and the expected interaction in forest management. The pre-colonial period or cycle I (1300-1755) is marked by the forest control of the villagers (small, fast adaptive cycle) that dominated the use and management of Mount Merapi forest (CPR). These interactions were materialized into their agricultural practices in the forest such as slash and burn techniques, *bero* system, *tumpang sari* system, and cattle grazing. The interaction between the two adaptive cycles is symbolized with bold arrows. The forest villagers' absolute control in this period was permitted by the traditional ruler. With this right, villagers could optimize the benefits of their environment and capacity to manage the forest that in return, enhancing their sense of belonging. In exchange for this right were the villagers' obligations to serve the king. In the pre-colonial period, the forest control of the traditional ruler (large, slow adaptive cycle) to Mount Merapi was performed through the villagers (small, fast adaptive cycle) who were bounded to a concession between the two agencies. "Revolt" moves up to the traditional ruler (large, slow adaptive cycle)

in the form of eruptions where “remember” that moves down to the volcano (intermediate size and speed adaptive cycle) was in the form of myths embedded to particular lands such as haunted places around the crater. Myths were created both by Sultan and villagers as the result of the *Kejawen* beliefs in order to limit people’s access to dangerous areas or increase the sense of security. Myths that need to be mentioned here is *Endhog Dunia* which according to the current gatekeeper gave rise to the rite of the Sultanate, *Labuhan Merapi*.

The cycle I-II from 1755 to 1998 (colonial-new order periods) shows the forest controls of the reigning authorities to the intermediate size and speed adaptive cycle (Mount Merapi) and the small, fast adaptive cycle (Pelemsari sub-village). Eruptions that characterized the volcano continuously provide feedback (“revolt”) to the authorities, forcing the Dutch to revise and improve the disaster mitigation and forest policies.” Remember” takes the form of reforestation programs with *tumpang sari* for hydrological and ecological purposes. During the independence period, the authority of independent Indonesia maintained the colonial forest controls; the legacy of Gifford Pinchot that forests should be managed to provide “the greatest good for the greatest number of people for the longest time” but without specifying people living around the volcano (Nancy Lee Peluso, 1992, pp. 7–8). The interaction flow from the authorities is therefore a top-down style where “no bottom-up policies” came from the small, fast adaptive cycle (Pelemsari) present throughout these periods. The villagers’ response to the Dutch’s oppression and Japan’s romusha was materialized through public insurgents.

The dashed line arrows of the interactions between the small, fast cycle (Pelemsari) and the intermediate size and speed cycle (Mount Merapi) represent the people’s “limited” access to the forest and thereby the “limited” forest products that they could obtain and knowledge that they could develop. The state’s forest controls had become serious barriers to the development of local

potential to manage the forest resources for centuries. Throughout history, the space that could be used by villagers was limited to those designated by the Dutch through the *tumpang sari* system where the types of species being planted were controlled by their foresters.

Finally, cycle II-III from 1998 onward (reformation period) shows the persistent forest controls of the reigning authorities in both the intermediate size and speed cycle (Mount Merapi) and the small, fast cycle (Pelemsari sub-village). Eruption in 2010, specifically, became the "revolt" that required the authorities not only to revise the hazard zone map but also plan to relocate people living in areas less than five kilometers from the summit. Similar to its predecessors, the Ministry of Forestry responded by annexing the impacted settlements to the national park. The "remember" interaction from the government to the volcano, akin to the colonial approach, is reforestation with controlled species, lands, and forest laborers.

The desired forest management in the future should facilitate active feedback from all scales. This suggests the need for the state to start decentralizing forest management by engaging the community and considering their local knowledge and aspirations in policymaking. In practice, this also needs the estate to open the forest access beyond the current zone for the villagers so they could detect unusual changes in the forest and act accordingly while optimizing benefits from its natural resources. According to Ford et al. (2020), capacities to perform observations, be familiar with local conditions, and use social-ecological memory embodied in their indigenous knowledge (Ford et al., 2020, pp. 532–533) are conditions needed by forest villagers to be able to manage natural resources. By doing this, the Pelemsari farmers like Samar, could have an opportunity to plant grass in the forest and expand the number of lactating cows to a business scale, Moga whose knowledge about traditional agriculture, forest endemics, and long-tailed monkeys could save the forest biodiversity, and Rejo whose bamboo plants saved lives of evacuees in Kaliadem could

plant and protect their existence in hazardous areas. For the government, empowering people to manage the forest means a great reduction in the annual expenses required for reforestation. In short, with forest access being transferred to them, the community will voluntarily participate in monitoring, recording, and responding to environmental changes in the forest.

5.3.2. Qualitative Assessment of adherence to Ostrom's Self-Governed Principles

Based on the analysis of the self-governance capacity of the Pelemsari villagers in managing the forest during the pre-colonial period, it is found that it satisfied Ostrom's design principles . The rigid forest controls exercised by the reigning rulers since the colonial period, however, had reduced this capacity to reach the whole parts of the forest. It is understandable since their access was limited only to the land tracts designated by the state through reforestation programs with tree species that were also entirely determined by the state. Given these limitations, villagers were unable to advance their local knowledge of forest management. It was very contrast to the pre-colonial period in which their ancestors had opportunities to monitor environmental changes and build ecological knowledge through trials and error processes.

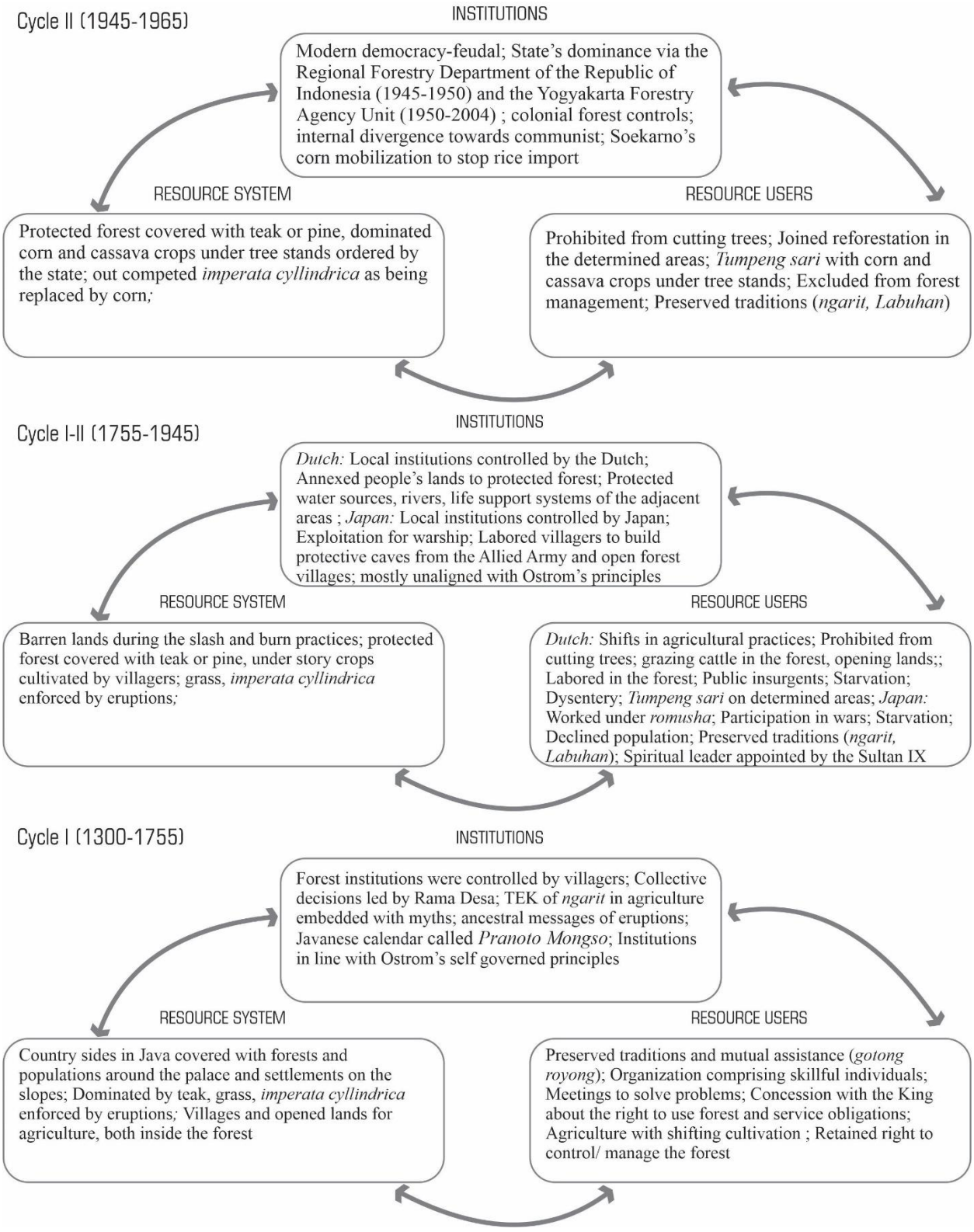

Fig. 5.4. A summary of key changes in institutions, resource systems, and resource users in Mount Merapi and their interactions from the pre-colonial period (1300) to the independence period (1965)

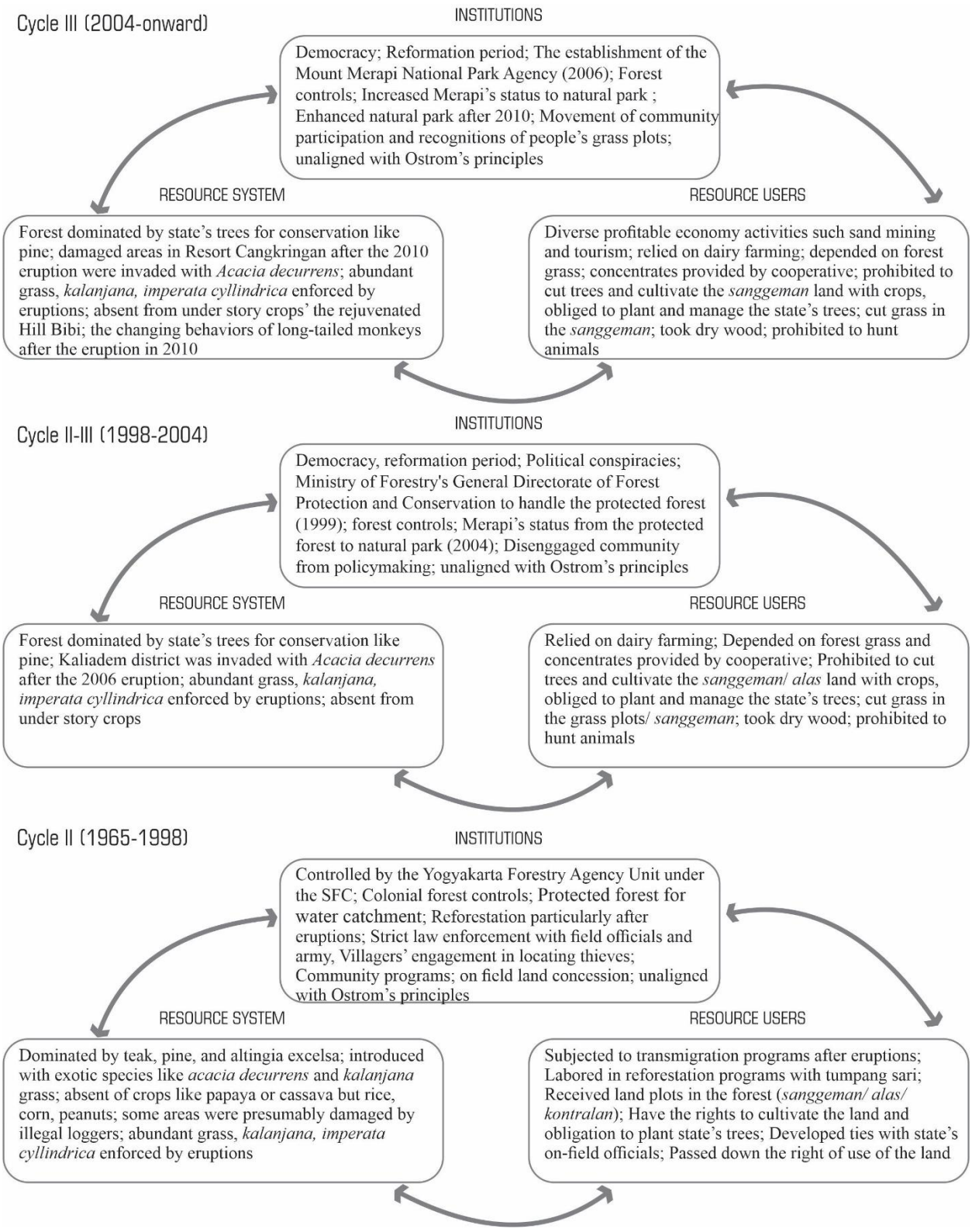

Fig. 5.5. A summary of key changes in institutions, resource systems, and resource users in Mount Merapi and their interactions from the new order period (1965) to onward

The diagrams in figures 5.4 and 5.5 show the continuation of colonial forest management across political regimes in Mount Merapi. It should be recalled that villagers' access to land was limited to the designated land of *sanggeman* or *alas* or *kontrakan* where the *tumpang sari* (mixed cropping) system was exercised under the reforestation program. The controls were stricter as the status of the forest was increased from protected forest to national park in 2004. In my interviews with the Pelemsari elder who witnessed the forest management changes in the last three periods, villagers as of today were not allowed to 1) cut trees; 2) cultivate crops including grass and therefore fertilize soil; 3) hunt animals; 4) take dry branches directly from trees except those fall on the ground. Indeed, allowing people to cut grass, *Imperata cylindrica*, could help reduce wildfire threats and expand the survival of the state's tree species.

Since the villagers' access was only limited to the *sanggeman*, the Pelemsari villagers' institutions revolved only around these places. *First*, when it comes to the borders between their grass plots, they made an agreement about the grass plots' borders and the types of *kikis* as the sign. The borders could be in the form of bamboo, trees, and trenches. *Second*, during the dry season, it is possible for some farmers to locate fresh and young grass in groups and cut the grass once they acquire a permit from the cultivator. *Third*, the right to use the grass plot is inheritable and could be transferred to another farmer or cultivator as long as he or she is a Pelemsari resident. If the former cultivator could no longer manage the state's trees in his or her grass plot, he could give up the right to another farmer who is also a resident of the same sub-village. The descendant of the previous farmer, however, could reclaim the right to use the grass plot from the new cultivator.

5.4. Strategies to Sustain the Ecological Practices

The Pelemsari's experience of environmental and political disturbances evidenced their strong social capital, namely "place attachment," "sense of community," and "local knowledge." Their

attachment to place (home, Mount Merapi, forest) facilitated their resistance to relocation policy, demand for the issuances of certificates of their former homes, and mobilization to voluntarily relocate. With their strong "sense of community," the Pelemsari villagers collaboratively planned and re-established their new lives at the Karang Kendal relocation site. Their institutional memory (i.e., local knowledge) of dairy farming before the eruption in 2010 helped them restore this industry, albeit trauma had once impeded them to optimize the benefits of the cows received from the government. The other evidence that needs to be mentioned here is the experience of the Pelemsari villagers before the eruption in 2010 in accessing the water source named *Tuk Pitu*, located around River Kuning. With a rotation system, they managed the use of the water source among households during the dry season.

Fig. 5.6. The historic *Tuk Pitu* water source is located in River Kuning, Mount Merapi. The image was taken during the fieldwork in 2022.

These social capitals are the Pelemsari villagers' potential to develop a self-governed institution in managing the forest in the future. Their sense of community, in particular, could facilitate

collaborations and cooperation based on a mutually beneficial relationship when dealing with collective-action problems (Ostrom, 1990, pp. 42–43).

Nevertheless, the sustainability of Mount Merapi forest also lies in the hand of the local young generation. Pelemsari respondents complained about the current young people's attitudes who ignore their *ngarit* and dairy farming traditions. The strategies that the Pelemsari villagers developed to ensure the sustainability of their *ngarit* and dairy farming traditions based on my interviews are explained as follows.

First, before the eruption devastatingly damaged their sub-village, farmers typically involved their children in their activities in the forest. The objective of this was to introduce the young generation to the forest and the *ngarit* tradition. Nevertheless, the traumatic eruption in 2010 stopped some young parents from familiarizing their children with *ngarit*. *Second*, the Pelemsari villagers engage the young generation in local traditions and ceremonies by giving them responsibilities for particular tasks. Although these cultural traditions did not directly link to *ngarit*, giving them an understanding of their cultures gradually is viewed as a better way to sustain traditions. During the Labuhan rite in March 2022, for instance, local youths were involved to welcome Labuhan's tributes in the Cangkringan District office.

Fig. 5.7. The Pelemsari's youths in red uniforms were involved in the opening ceremony of *Labuhan* at the Cangkrngan District Office in 2022. The image was taken during the fieldwork in 2022.

Third, the Pelemsari villagers introduce dairy farming to their children about how to manage dairy cows and convince them that dairy farming sustains over time as dairy milk is always demanded and that dairy farming could create a sense of security to deal with uncertainty in the future. Having a greater number of options and knowledge of dairy farming traditions would help people prepare for unexpected circumstances. Indeed, many young people in the sub-village finally returned to dairy farming after the global pandemic and eruption in 2022 hit their jeep tour business in Mount Merapi. The government exercised social distancing measures and closures some vital tourist objects, leaving them to misfortune and with no other options than to return to the economic activity they are familiar with, that is dairy farming.

Fourth, sustaining the tradition of *Labuhan Merapi* over generations around the crater does not only allow the Pelemsari villagers to secure access to the deep forest but also symbolically, displays the power of their cultural tradition in the face of the state's supremacy and science. It is worth emphasizing that the state recognized the people's traditions by officially indicating the area (dark pink line) of the rite's route as the spiritual zone. The success of the current gatekeeper in returning the *Labuhan*'s harbor from the previously Alas Bebengan post in 2011 to the Sri Manganti post in 2013 could not also be ignored in regard to securing access to the deep forest. During those processes, hundreds of people from various elements—local youths, volunteers, tourists, army—mobilized themselves to voluntarily repaired the damaged harbor Sri Manganti and cleaned the rite's route from fallen trees caused by the eruption in 2010. Similar to his predecessor, the informal leader does have the power to mobilize people not only from inside but also outside the sub-village.

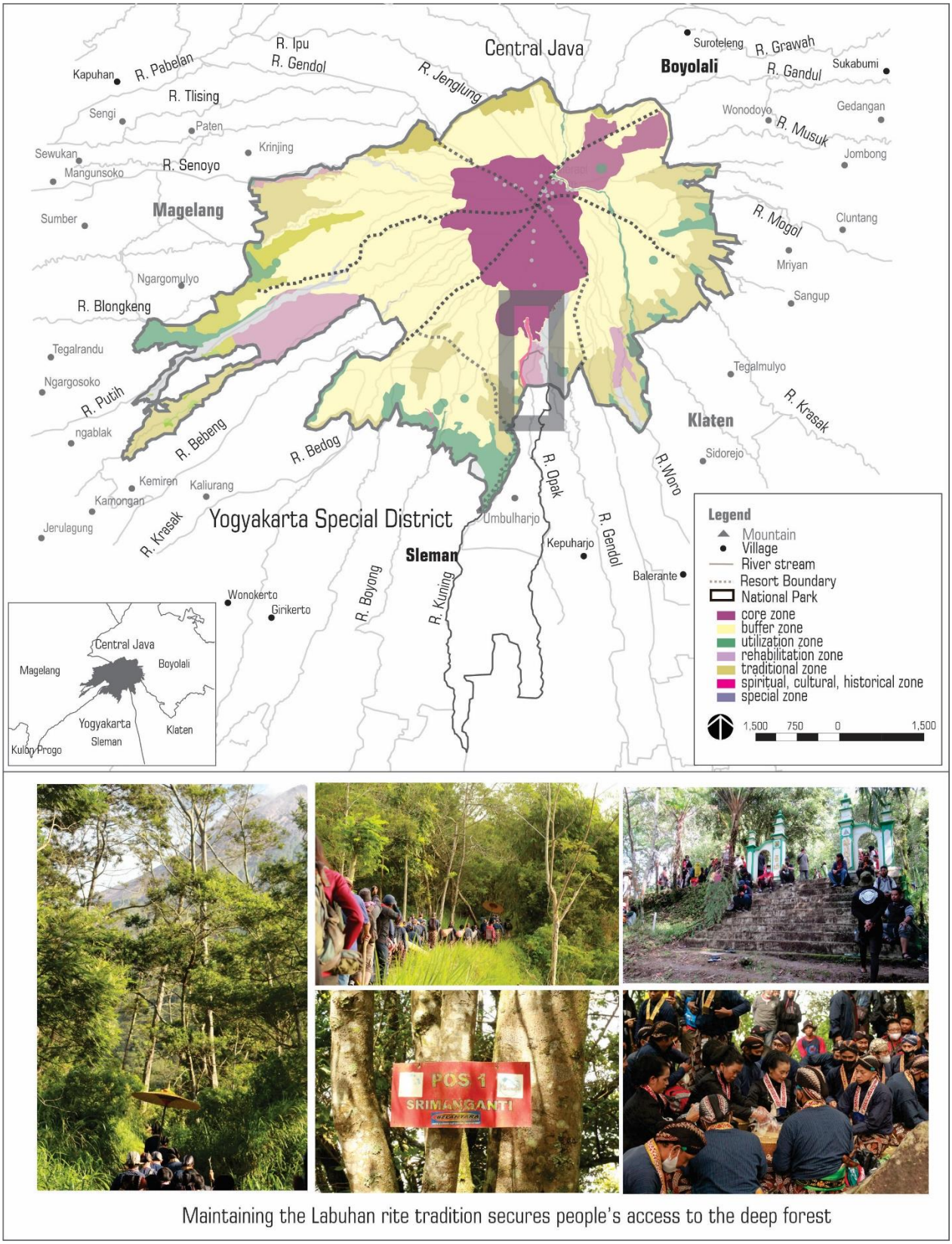

Fig. 5.8. The Pelemsari's youths in red uniforms were involved in the opening ceremony of *Labuhan* at the Cangkrngan District Office in 2022. The image was taken during the fieldwork in 2022.

5.5. Research Validity and Reliability

The research "credibility or internal validity" of this study lies in many aspects. *First,* the prolonged involvement invested in learning about the relationship between people and the volcano, leading to their complex interactions with the government whose roles cannot be excluded from the attempt to understand the meaning of living with risks.

Second, the respondents are selected based on "snowball sampling" that is through recommendations of the local leader. For instance, I interviewed Puteri as she was recommended for her experience of managing twelve dairy cows in the sub-village. Besides this sampling technique, the "purposive sampling" with criteria and the "heterogeneous sampling" with considerations of the diverse characteristics of respondents are used to select my respondents, thus, increasing the accountability of the themes.

Third, the research's interview guide was developed based on the principles of "blurring boundaries between me and respondents" and "developing a mutual exchange and an interactive conversation" (Salmons, 2015, p. 81), allowing the study to reach credible and trustworthy testimonies of the respondents. Here, I avoid polluting my respondents' answers by inducing my conceptions into their responses. The "jointly co-constructed meaning" was reached after re-affirmation was obtained from my respondent. For example, my respondent explained that the spirits in Mount Merapi created fires or lahars through the 2010 eruption as a disapproval of the national park plans. I asked her whether it means the eruption is a sort of warning, and she agreed. The theme is salient that during the development of the diagram, I included it as the representation of the Pelemsari's cultural characteristics although this theme is not present in other respondents' interpretations. Here, my subjectivity as a researcher plays role in determining the themes represented to my audience. I explain this as an issue of this study later.

Fourth, the test of misinformation, for instance, about the existence of a possessed tree inside the relocation site presumably used to increase their sense of security. Here, I did cross-checking from one respondent to another respondent.

Fifth, persistent observations in the field enabled me to recognize *ngarit* as a tradition that among many factors, mediates people's attachment to the forest. As told by my respondent, for this specific factor, Maridjan confronted the authority that he would not agree with the national park unless their access to the forest for *ngarit* is opened. The other findings were the people's testimonies of mobilizing from one shelter to another as a group, trauma as the trigger of their voluntary relocation, and the roles of skillful individuals and leaders in mobilizing recovery through the ojeg and jeep tour business. Not to mention the ecological imbalance caused by the decreased biodiversity after the eruption and its continuation to date as the reforestation program is conducted in phases. Triangulation is implemented by cross-checking the local elder' information about corn-cultivation-mandatory during the New Order regime with the history of this regime under the reign of President Soekarno. No less importantly, the insight from an Indonesian scholar who had expertise in ecology-politics of Indonesian forests, Suraya Afiff, stated that the villagers' sense of powerlessness is what needed to be addressed by NGOs before the forest management was handed over to them. People's sense of community is therefore critical for self-organization but the history of this spirit needs to be explored: the actors who helped maintain it, and the events that facilitated its presence. In the case of the Pelemsari, the role of the local leaders and entrepreneurs in mobilizing people during the relocation process contributed to the local's sense of community. Regular meetings from sub-village to village level and the internal dairy group meetings facilitate and *kenduren* tradition facilitated their sense of community. *Sixth,* the research's interview guide was developed based on the principles of "blurring boundaries

between me and respondents" and "developing a mutual exchange and an interactive conversation" (Salmons, 2015, p. 81), allowing the study to reach credible testimonies of the respondents.

In terms of "reliability and objectivity", I examined the data by cross-checking them with literature and information given by other respondents or experts. The villagers' concession towards the grass plots or *sanggeman* land in the forest, the long-tailed monkeys that threatened not only one farmland or grassplot but most of those places belonged to all respondents, including people's decision of evacuating and relocating together are data that I found consistent across my respondents. Here, I cross-checked the data across respondents through separate interviews. To increase the objectivity, I used notes, an audio recorder, and sketches, to record the raw data.

However, there are also some issues related to the research reliability and validity that deserve attention here. *First,* although I used inductive analysis in discovering the themes according to my respondents' views during the thematic analysis and bracketing off my conceptions of resilience when selecting the themes inside the text with highlight and line by line approaches, naming the theme under one notion is itself reductionistic. However, I returned this to Van Manen (1990), the well-reputed hermeneutic phenomenologist, that a theme is always a reduction of a notion as it has limitations to unlocking the deep meaning and the full mystery of an account (Van Manen, 1990, p. 88). *Second,* my subjectivity in including themes salient to this project as I represented in Chapter 3.3 may suggest a methodological inconsistency. For this, I again returned to what Van Manen (1990) postulated that theme analysis should not be seen as "an unambiguous and fairly mechanical application of some frequency count or coding of selecting termes in transcripts or texts or some other break-down of the content of protocol" (Van Manen, 1990, pp. 78–79). Instead, it is "a process of insightful invention, discovery, or disclosure— grasping and formulating a thematic understanding is not a rule-bound process but a free act of seeing meaning." This is why

I avoid using new computer programs during analysis as it would hinder my capacity to insightfully understand the nature of a human experience in the sub-village. It is worth noting that the transcriptions were made manually. Although the process was time and energy-consuming, the technique helped me develop an understanding of their experience of living with risks. *Third*, in terms of panarchy, despite it having the power to allow us to understand the social-ecological systems' interactions, the lacking historical data of each system at each level may reduce its robustness. In this study, as I admitted in Chapter 4, I highly relied on the interviews with the local elder and limited archives at the sub-village level. In fact, the documents about the forest history based on my fieldwork is still in the process of re-organizing. Many agencies had been administered and replaced as regimes changed in the country. Re-organizing the dispersed documents of the forest management of Mount Merapi would need a considerable amount of time. Fourth, selecting which events to be presented in the panarchical adaptive cycles are also problematic given the limited accessible sources available.

5.6. Recommendations

There are some recommendations that I present in this sub-section after reflecting on the whole process of my dissertation. Some of them relate to methodology and methods, and others connect to the potentials of hermeneutic phenomenology in resilience study, albeit the researcher's subjectivity also plays role in analyzing the themes for the concerns of research interest. Despite the loose nature of the thematic analysis, I maintained the objectivity of the findings by cross-checking the findings with my respondents and by listening to the interview records, and reading the transcripts repeatedly.

First, employing hermeneutic phenomenology in concern with the "meaning" of a lived world would lead researchers to understand the characteristics of the community and the essential capital of resilience through the trustworthy narratives of the respondents. It requires an in-depth, qualitative interview in order to reach the richness, the complexity, but also the deep essence. It is a bottom-up analysis and is executed to raise the voices of the marginalized community to the surface so they could aspire to future planning.

Second, the categories of the *panarchy* adaptive cycle allow researchers to develop a framework that reinforces interpretations of a social-ecological system in a particular setting in a qualitative way. I had described these interactions in the form of adaptive cycles while being open to other possibilities as many events that are not yet well-recorded or are not yet accessible could better inform the models. Interdisciplinary researchers in applying panarchy categories, either qualitatively, quantitatively, or in a hybrid mode, would increase the robustness of the model, thus interpretations.

Third, in terms of people's hazard risk reduction, the experience of the eruption in 2010 had changed the meaning the people assigned to their ancestral beliefs into a questioning act of their reliability. It had provided ways for the national disaster mitigation agency to further play their roles in informing the early warning messages to this close-knit community through the local leaders. Despite this, due to the complex factors that influence people's cognition and affection, researchers may find local people who are ambivalent in regard to local knowledge and science. The Pelemsari villagers used many channels to obtain early warning messages but the WhatsApp group called "Pelemsari City" is the main channel for the dissemination of early warning messages. The other finding that is worth being stressed here is villagers' trauma which decreased their tolerance for loud noises. People's negative experience of the eruption in 2010 that was marked

by explosions and ambulance sirens or alike presumably had reminded them of the traumatic event. In fact, according to my respondent's testimony, one of the villagers outside the Pelemsari passed away due to a heart attack that most people believed was triggered by the unexpected loud noise of the convoying motor trails around her house. Based on my interviews, the strategies to overcome this issue exists at the community level in which the heads of the Village and the Sub-village levels collaborate to acquire any event organizers whose activities would emit such noise to inform them about the events in advance. The event organizers are also obliged to acquire official permits from local leaders. Once the permit is granted, the sub-village heads will disseminate the upcoming events to the community through channels such as WhatsApp or the Mosque's speaker. Performing this helped increased the local's anticipation or awareness of the unexpected noise. It could be concluded that local leaders' roles in disseminating early warning messages could increase people's awareness of unexpected noise thus reducing their anxiety of threats that appear in their imaginations.

Fourth, Pelemsari's strong sense of community has been evidenced to be able to mobilize the community to self-organize despite the loss of capital that they experienced after the eruption in 2010. With this capital, the Pelemsari community should be able to develop self-governed forest management. Based on my observations, the sense of community sustains as it is reinforced by traditions such as *kenduren*, community meetings, and dairy group meetings.

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Appendix A. INTERVIEW GUIDES

1. Perform the interview in the respondent's natural setting (e.g., home, Merapi forest, farmland, cattle shed),
2. Perform the interview by negotiating the openings, extending turns and shifting the topic, and
3. Perform the interview by using simple, open, and straightforward questions
4. Explain the interview's purpose and what tools are involved
5. Ask the respondent if they have any questions related to the researcher's explanation before the interview
6. Recognize the respondent's anxiety
7. Clarify particular statements, when necessary
8. Ask the respondent whether he/she wants to bring something up before the interview ends
9. Consider the respondent's request if he/she wants to talk more even after the interview ends or the recorder is switched off
10. Ask for the respondent's permission to include some valuable statements from informal discussions/ conversations in the report
11. Set aside some time to reflect on the insights that emerged during the interview and to interpret the respondent's vocalization, facial expression, and body gestures
12. Explicitly report the contexts so readers can fully grasp the respondent's statements
13. Ensure that the data required to develop the adaptive cycle metaphors are well-described by the respondent

Appendix B. Interview Questions

Research Questions	Interview Questions	Specific Materials/ Information
Question 1: What is the meaning of living with risks according to the villagers after the 2010 eruption?	1. Could you please explain your daily routines? 2. How do you manage those different activities each day?	Daily routines (types of activities, place, time, actors, tools)
	3. Could you please explain the process of your main activity (e.g., dairy farming) and its specific time? 4. How do you personally learn ~~from~~ doing this activity (i.e., traditional practice)? 5. How do you go from home to your workplace? (e.g., route map, vehicles, tools, places, time)? 6. *Follow-up: You mentioned the forest, why do you need to go to this place? How do you handle the anxiety when approaching the volcano (e.g., EWS)?* 7. How do you increase the quality of your product? 8. What assets (e.g., social networks, rules, rites, tools, funds, places) are critical for this goal, and how? 9. What does each of these assets personally mean to you (functional, cultural)?	Respondent's ecological practices: a. types and roles of assets (e.g., cows, grass, walkie talkie for warning messages) b. process of the ecological practice c. traditional ecological knowledge transmission d. place ballet (home-workplace route, meaning of place, time, tools, regular activities, surprises) e. meanings and symbols (functionally/culturally) attached to the practice through assets (e.g., norms, rites, places) Experience in managing resources (Exploitation–Conservation): a. strategies to increase productivity and competition b. types of critical assets and their mutual and tight relationship c. strategies to conserve the assets d. mechanisms to control the external variability (e.g., norms) e. competition with other individuals
	1. How does the volcano ecologically contribute to your activity? 2. You state that Merapi has positively contributed to your life, how do you then ensure its sustainability? 3. Learning from the 2010 eruption, how did it affect your activity? 4. How do you cope with those effects? 5. Are there any systems (external) that help you sustain this activity (e.g., ecological practices)? How?	Experience of disturbance and reorganization (Release – Renewal): a. type of external (e.g., eruption) and internal (e.g., rigid customs) forces causing a collapse in 2010 b. effects on the assets/resources c. remaining assets/ biotic legacies d. unexpected opportunities, innovation/creativity e. invasion of new entities (e.g., NGO, technology, *Acacia decurrens*) f. roles of external systems (e.g., affiliation, government) g. personal perceptions of risk
	1. Why do you decide to continue performing this activity (e.g., dairy farming)? (e.g., tradition, skill) 2. How does this practice define yourself as a person?	Meaning of ecological practices (factors of place attachment)
	How do you prepare for future risks after learning from the 2010 eruption?	Personal knowledge of hazard mitigation

Research Questions	Interview Questions	Specific Materials/ Information
Question 2: How are those meaning-related insights applied to their traditional ecological practices?	1. How do you ensure the sustainability of those (socially, economically, spiritually, culturally) meaningful assets in the future? 2. How do you apply symbols to those assets?	Individual knowledge of ecological management: a. effects of beliefs in ecological practices (e.g., when/how to cut grass or evacuate during an eruption) b. symbols used in the ecological practices
Question 3: How do these practices affect and are affected by other systems outside those of the sub-village?	1. How meaningful is your workgroup/affiliation (e.g., dairy farmer groups) in supporting your activity? 2. How does your affiliation contribute to other villages, Sleman, and Yogyakarta? 3. How do you contribute to your affiliation? 4. How is your work affiliation different from other groups? 5. Regarding the traditional knowledge, how does your affiliation adopt it into practice? 6. After the 2010 eruption, how do the coordination between you, your work affiliation, and Sleman authority take place?	SES relationship across levels: a. Pelemsari's ecological knowledge and practices - types of ecological practices (i.e., traditional economic activities) - relationship among the ecological practices - types of resources/assets - hierarchy of authority, resources, workflow - experience of managing the ecological practices (exploitation, conservation, release, renewal phases) after the 2010 eruption - social mechanism (knowledge, the structure of organization and workflow, cultural internalization: rites, rules, customs, worldview/beliefs) - characteristics of local ecological practices b. Sleman/Yogyakarta government's ecological management - hierarchy of authority, resources, workflow - experience of managing the ecological practices (exploitation, conservation, release, renewal phases) after the 2010 eruption c. Relationship and coordination across systems: respondent, local management, regional level management after the 2010 eruption
	How important is your local knowledge in increasing your and the affiliation's resilience to uncertainty? (adaptation)	The perceived adaptive capacity of Pelemsari's ecological management institution
Question 4: What strategies do these villagers develop to maintain the sustainability of these practices in the face of uncertainty?	After learning from many disturbances in the past, how does your community ensure that this activity (e.g., dairy farming/ecological practices) can be sustained in the future?	Local knowledge of: a. managing hazard risks/ disturbance b. managing resources/ assets c. unique ecological adaptive practices (e.g., use cows' manure for crops fertilizer)

Appendic C. Interview Transcript Sample

INTERVIEW BILINGUAL TRANSCRIPT - Fieldwork Phase I, October 2021

Title: Traditional Ecological Practices Towards Panarchy-based Resilience Case Study: the Pelemsari Court-Village, Mount Merapi, Yogyakarta, Indonesia
Ph.D. Student/ Dissertator: Catharina Dwi Astuti Depari
(Interdisciplinary Ph.D. Program in Urban Design and Planning, University of Washington Seattle)

Recording Time	10/18/2021 (Indonesian Time)
Place	The respondent's house in the current site at Karang Kendal (new Pelemsari)
Time	15:00 - 17:30 WIB (03:00 -05:30 PM in local time)
Session	I
Name	Puteri (Code: R2)
Age	50
Gender	Female
Position	Pioneer of dairy farming, former manager of the local dairy group
Indigeneity	Native-born
Occupation	Housewife, dairy farmer, royal servant of the sultanate (preparing gifts of the labuhan Merapi rite)
Transcribing Time	10/30/2021 (Indonesia Time)
Transcribtion Technique	Manual
Translating Time	7-Nov-21

Introduction

I introduced myself and my research. I then explained how I knew her (from the head of the sub-village) and the interview protocol. I stressed that: 1) I would not reveal her identity in my report (pseudonym) except to my supervisory committee members; 2) she could ask me to remove her statements from the transcribed interview and decide not to answer my questions; 3) she could refuse the recording if she feels uncomfortable with it. I started the interview and recording after gaining her approval.

Time-Lapse Feature:	Party	Question and Answer
00:00:00	CD	Apakah bisa Ibu ceritakan kegiatan Ibu sehari-hari? ***Could you please share with me about your daily activities***?
00:00:03	R2	Hmmm..Nanam kayu (laughing)…nanam rumput biar nyarinya nggak jauh-jauh..di kebun sudah bisa ***Hmmm. Planted trees (laughing), planted grass so when looking for them, it should not be done in a long distant location. You can get them from your own field.***
00:00:14	CD	Itu setiap jam berapa Bu kalau Ibu merumput? ***What time do you usually forage, Mam?***
00:00:20	R2	Kalau ngerumputnya sich udah anu…yang dikasi makan kan cuma sedikit jadi satu unting sudah cukup ***The foraging has been, well, those that I feed now only requires one unting****
00:00:26	CD	Cuma dua tadi ya Bu? ***It's only two, right, Mam?***
00:00:30	R2	Hmm..dua tiga..jadi satu unting* sudah cukup… ***Hmm..two three, so one unting* is enough***
00:00:33	CD	Sekarang sudah ada yang bunting? ***Is there an already pregnant cow?***
00:00:37	R2	Sekarang iya? Iya. Sudah bunting ***Now, right? Yes, it has already been pregnant.***
00:00:41	CD	Meras susu juga? ***Do you milk the cow too?***
00:00:46	R2	Oh. Belum, sekarang belum meras. Baru bunting. ***Oh. Not yet, I have not yet milked it. It is just now pregnant.***
00:00:50	CD	Kalau sudah ternak sapi di rumah ya, Bu, banyakan, istirahat ya? ***After you finished taking care of the cattle, Mam, do you mostly take a rest?***
00:01:20	R2	Hmmm..hmmm..Kalau pagi habis ngurusin sapi..ke kebun….ngurusin kebun..kalau sudah waktunya makan sapi ya turun..makan sapi..kalau sudah makan sapi bisa santai (laughing) istirahat ***Hmmm..hmmm. In the morning, after I finish taking care of the cattle, I went to the field. I take care of the field. When it is time to feed the cattle, I will move down. to feed the cattle. After feeding them, I can be relaxed (laughing), taking a rest.***
00:01:32	CD	Kalau Ibu ikut wisata merapi juga? ***Do you involve in Merapi tourism too?***
00:01:51	R2	Iya, tapi suami saya yang di atas terus. Kalau saya ngurusin itu, ngurusin sapi dan ngurusin kebun. Suami saya yang di atas ngurusin apa, wisata terus. ***Yes, it is my husband who is always in the upper land. Me, I take care of the cattle and the field. My husband in the upper land will take care of the tourism.***
00:01:54	CD	Berarti ibu tidak ikut kegiatan di wisata ya ***So, you do not involve in tourism.***
00:01:55	R2	Nggak ***No***
00:02:02	CD	Ibu selain dengan suami juga dengan anak juga, putera-puteri…. ***Mam, besides with your husband and your children (discontinued)***

00:02:05	R2	Tapi kan anak saya kan sudah mental semua ***But my children are all now mental*****
00:02:08	CD	Maksud ibu? ***What do you mean, Mam?***
00:02:14	R2	Sudah keluargaan semua. Sudah punya ***They all have raised their own families. They all have.***
00:02:35	CD	Anak ya Bu ya. Cucu berarti ya Bu? ***Children, right, Mam. Grandchildren are what you mean, Mam?***
00:02:35	R2	eheh…anak saya kan dua sudah punya anak semua jadi sudah punya rumah sendiri-sendiri….ya sudah…..sudah itulah..semua sudah punya dapur sendiri-sendiri ***Eheh. I have two children, each has his own house. Well, that is it. They have their own kitchens.***
00:02:37	CD	Masing-masing…mengurangin beban capek ya Bu? ***Each one of them, so it does reduce your fatigue, Mam?***
00:02:52	R2	Anak saya juga senang ngurusin sapi perah juga. Yang satu, yang satu ngurusin wisata, yang satu ngurusin ternak juga ***My children also like to take care of cattle. One of them. One takes care of the tourism and the other takes care of cattle too.***
00:02:54	CD	Puteranya berapa orang Bu? ***How many sons do you have, Mam?***
00:02:56	R2	Dua ***Two***
00:02:59	CD	Dua-duanya ikut ternak sapi? ***Do they involve in dairy farming?***
00:03:11	R2	Yang satu nggak.. Yang satu ngurusin ternak yang satu di ekonomi di wisata ***One of them does not. One takes care of cattle while the other has the economy in tourism***
00:03:19	CD	Puteranya dua-duanya tinggal di sini juga? Di Pelemsari ***Do they live here too? In Pelemsari?***
00:03:20	R2	Nggak ***No.***
00:03:38	R2	Di..yang satu di Kepuharjo, itu, di Kali Adem itu lain kelurahan. Kalau yang satu sak kelurahan, yang satu beda kelurahan ***In. One of them lives in Kepuharjo, that, in Kali Adem in another village. One of them lives in the same village and the other lives in another village.***
00:03:48	CD	Kalau sore-sore begini sendiri ya, Bu? ***Are you usually alone in the afternoon, Mam?***
00:04:06	R2	Hehe (laughing). Karena anak kan sudah punya rumah sendiri dan cucu juga sudah pada gede-gede dan sudah punya kesibukan sendiri-sendiri ***Hehe (laughing). Because my children have their own houses and my grandchildren have grown up and had their own businesses.***
00:04:12	CD	Lebih tenang di sini, Bu, daripada di atas dulu sebelum erupsi? ***Do you feel calmer here, Mam, compared to that in the upper land before the eruption?***

00:04:47	R2	Kalau belum erupsi dulu kan di atas juga tenang-tenang karena sudah nenek moyang sudah hidup di situ. Kalau erupsi merapi itu kan yang gede kan nggak tiap puluhan tahun. Kalau yang korbannya banyak seperti kemarin kan kata orang tua dulu setiap ratusan tahun ***Before that eruption, it was calm in the upper land since our ancestors had once lived there. Merapi's large eruption occurs not every ten years. The eruption that caused a lot of victims like that one before according to ancestors happens every hundred years.***
00:04:48	CD	Maksud ibu erupsi tahun 2010 ***Do you mean, Mam, the 2010 eruption?***
00:04:56	R2	Hmhm..kalau yang paling banyak korbannya kan yang 2010 itu ***Hmhm. That event which caused a lot of victims is that in 2010.***
00:05:09		2000 eh 1994 ke arah barat itu ada korbannya 38 atau berapa ***2000 eh 1994 that went through the westward caused about 38 victims or something***
00:05:11	CD	Yang di Turgo ya, Bu? ***Those (victims) in Turgo, Mam?***
00:05:21	R2	Ehemm ***Ehemm*** Kalau yang 2006 itu kan korbannya cuma dua itu kan dia pas di bunker ***The one that happened in 2006 only caused two victims who were in the bunker.***
00:05:22	CD	Yang di bunker itu ya Bu ***Those people in the bunker, Mam***
00:05:29	R2	Kalau yang 2010 itu kalau nggak salah 300-an. Korbannya 300-an ***The one in 2010, if I am not mistaken caused about 300 victims. The victims are about 300***
00:05:45	CD	Kalau Bu Poniyem mengatur waktunya bagaimana Bu antara ternak sapi dengan meladang itu Bu? ***Mrs. Poniyem, how do you manage the time, Mam, between the dairy farming and taking care of the field, Mam?***
00:06:20	R2	Ya kalau misalnya mau meladang itu kan. Ngurusin sapinya kan pagi habis subuh, habis subuh. Kalau meras, sebelum subuh sudah selesai. Kalau nggak meras ya subuh dulu baru ke kandang. Oh, nanti kalau sudah selesai di kandang, terus aktivitasnya di kebun, ngurusin kebunan ada kayu-kayunya. ***Yes, if, for instance, you go to take care of the field, doing the dairy farming is after subuh*. If milking the cow, it should be finished before subuh. If not milking the cow, I will do subuh first then go to the cattle shed. Oh, once I finish with the cattle shed, I then do some activities in the field, to take care of the field where there are woods.***
00:06:21	CD	Kebun di atas ya Bu, di rumah Ibu yang dulu ***The field in the upper land, Mam, in your old house.***
00:06:22	R2	Hmm ***Hmm***
00:06:27	CD	Luas ya, Bu, kebunnya? ***Is it large, Mam, the field?***
00:06:33	R2	Ya (doubtful), termasuk agak luas ***Yes (doubtful), quite large***
00:06:37	CD	Nanam apa Bu di kebun? ***What do you plant in the field, Mam?***

00:07:15	R2	(Laughing) Kalau dulu ya macam-macam. Kalau sekarang aku cuma punya yang bisa dipanen cuma pohon kayu sengon. Kayu sengon kan nanam terus kalau ada yang gede bisa dijual nungguin yang kecil kan lama sudah gede terus dijual (laughing). Preng sama bambu juga bisa dijual. ***(Laughing) In the past, there has been a variety of plants. Like today, I only crop sengon trees. The sengon tree is planted all the time and if there are the big ones, they can be sold. Waiting for the small ones takes a long time. Once they become big, they can be sold (laughing). Preng and bamboo can be sold.***
00:07:17	CD	Jadi untuk bahan-bahan konstruksi ya bu ***So they are for construction materials, Mam.***
00:07:19	R2	Hehe ….. ***Hehe …..***
00:07:27	CD	Kalau daunnya untuk apa, Bu, daun sengonnya, bisa untuk sapi ya, Bu? ***What do you do with the leaves, Mam, the sengon leaves, can they be consumed by the cows, Mam?***
00:07:41	R2	He hhee.. Kalau cuma sedikit gitu buat campuran…tap kalau sapinya sedikit daunnya banyak ya kebanyakan daun sengon nggak bagus ***Hehe. If there are only a few, we can mix them (with grass) but if the cattle are only a few of them, but the leaves are too many, it will not be good.***
00:07:42	CD	Kenapa bu ***Why not, Mam?***
00:07:45	R2	panas ***It's hot.***
00:07:49	CD	Harus ada takarannya, Bu? ***Should there be a measure, Mam?***
00:08:01	R2	Ya.. Kalau daun sengon kan panas jadi kalau sapi bunting kalo ngasi cuma sedikit begitu... Nggak campur-campur ***Yes. Sengon leaves are hot. For pregnant cows, they are given a small amount, unmixed.***
00:08:07	CD	Tambah ilmunya saya bu ***I have more knowledge now, Mam.***
00:08:10	R2	(laughing) ***(laughing)*** Kalau dulu sebelum erupsi kan tiap-tiap lahan kan punya ada kayu-kayunya buat anu bangunan rumah ***In the past, before the eruption, each field grows trees for house constructions***
00:08:20	CD	Sebelum erupsi, Bu? ***Before the eruption, Mam?***
00:08:21	R2	Hem hem..Ada kayu nongko, kayu mindi, kayu sengon, kayu waru, pokoknya semua kayu-kayu di kebun itu semua bisa buat bangunan tapi kan setelah kena erupsi .. setelah erusi yang hidup cuma kayu sengon…yang lainnya belum bisa pulih seperti dulu ***Hem..hem.There were trees of nongko, mindi, sengon, waru. All these trees planted in fields can be used to construct buildings. But, after the eruption, it is only the sengon tree that can grow, others cannot be recovered as they were used to be.***
00:08:54	CD	Tetapi ibu tetap nanam yang lainnya itu bu, kayak pohon apa tadi bu? mindi ***But you still planted other trees, right, Mam, similar to what trees, Mam? Mindi?***
00:09:04	R2	ada…kayu mindi, nongko, ada tapi belum gede kayak dulu ***There are mindi, nongko. They exist but are not big yet like they previously were.***
00:09:07	CD	tetapi ibu biarin aja kan?

		But, do you leave them as what they are?
00:09:12	R2	Ya buat campuran karo pelindung (laughing) Yes, for a mix and protection (laughing)
00:09:13	CD	Kalau rumput bu? Juga di situ ibu tanam? Ibu juga menanam rumput? ***How about grass, Mam? Do you also plat them there? Do you also plant grass?***
00:09:40	R2	Hemm..kalo di kebun itu kan ya nanam rumput dirabok juga.. Biar ini biar tetap hijau kalau ngarit nggak jauh-jau…di kebun sudah bisa..kalau di kebunnya tidak punya harus ke hutan ***Hemm. In the field, the grass is also planted and fertilized too. To make them green so I do not have to collect grass in a long distant place. You could get them from the fields. If they are in the fields, you do not have to go to the forest.***
00:09:41	CD	Sering ke hutan juga bu? ***Do you often go to the forest, Mam?***
00:09:58	R2	Iya kalau dulu kalau masih makanin sapi yang banyak dulu ya ditambahin ke hutan..kalau sekarang di kebun saja sudah cukup (laughing/smiling) ***Yes, in the past when there were a lot of cows that need to be fed. It should be added with those from the forest. As of today, grass in the field is enough (laughing)***
00:09:59	CD	Kualitasnya podo bu? ***Is their quality the same, Mam?***
00:10:22	R2	Nggeh..nek..kalau dulu kan rumput tidak begitu panjang-panjang seperti sekarang..kan dulu kan pohon yang lain kan banyak gede-gede gitu..kalau sekarang kan cuma sengon-sengonan…. Jadi rumputnya banyakan sekarang daripada yang dulu ***Yes, in the past, the grass was not too long as what they are today. In the past, trees were big. Today, there are only sengon trees so the grass is now more abundant than before.***
00:10:31	CD	yang di kebun ya bu rumput yang banyak sekarang? ***Is it the grass in the field, Mam, which are abundant now?***
00:10:35	R2	bisa dirabok ***They can be fertilized.***
00:10:36	CD	Dirabok maksudnya dipupuk bu? ***Does dirabok mean to be fertilized, Mam?***
00:10:41	R2	Dipupuk kan cepat tumbuh lagi ***Fertilizing them will make them grow faster***
00:10:43	CD	Pupuknya pakai apa bu? ***What kind of fertilizer, Mam?***
00:10:44	R2	Pupuk kandang…. ***Compost fertilizer***
00:10:45	CD	Pupuk kandang ya ***The compost fertilizer, right?***
00:10:52	R2	Raboknya kandang nggak dipakai kan sayang-sayang ***The compost from the cattle shed, if they are not used, will be such a waste***
00:10:55	CD	Itu kan yang kemarin yang kalau kita angkut kotoran sapi dengan trolley ***Isn't that the cattle waste that we carried using a chart, Mam?***
00:10:59	R2	angkong ***Angkong***
00:11:02	CD	pakai angkong

		With angkong?
		terus dari situ pupuknya ya bu
		Then, the fertilizer came from it, Mam?
00:11:09	R2	Pupuknya dibawa ke atas untuk nanam rumput
		The fertilizer was sent to the upper land to plant grass.
00:11:12	CD	Cuma itu saja bu tida dicampur dengan yang lain?
		Is that all you need, Mam, not mix them up with others?
00:11:38	R2	kalau di kebun saya, saya campur pakai kotoran ternak ayam..kalau yang lain mungkin ada yang entah dicampur ada yang nggak....kalau pupuk kandang nggak dicampur saudah baik mbak..nggak dikasi apa-apa sudah bagus ***In my own field, I mixed it with chicken waste. Some people probably mix it while others do not. If the composite is not mixed, it is already good, Miss. You do not have to mix it, it's already good.***
00:11:44	CD	kalau ibu dicampur dengan kotorang ayam supaya lebih baik?
		Do you mix it with chicken waste in order to make it better?
00:11:50	R2	nyambung..buat nyambung-nyambung
		To tie. To tie them.
00:11:52	CD	iya bu (laughing)
		Yes, Mam (laughing)
00:12:00	CD	Kalau rumputnya sendiri, Bu? Ibu ada caranya supaya rumputnya tetap ada..supaya subur, dikasi pupuk …kalau motongnya ada tekniknya bu?
		How about the grass, Mam? Do you have some techniques to ensure the grass to be available? In order to make them abundant, you fertilize them. Do you have techniques to cut the grass, Mam?
00:12:00	R2	Nggak, saya cuma pakai tangan saja..maksudnya pakai mesin itu to?....kalau mesin itu kan…pakai sejenis bensin atau opo…itu nggak .baunya bikin nggak doyang..bau itu lho bau…yang bikin motong rumput itu lo..bensin atau opo… ***No, I just use my hands. You mean whether I use a machine, right? The machine uses some kind of petroleum or something. It will not, well, the smell will make, the smell, the smell is too stinky. That which is used to cut the grass, you know, petroleum or something,***
00:12:59	CD	Iya, Bu
		Yes, Mam.
		Kalau Bu Poniyem, kan sehari-hari misalnya kalau mengambil rumput di daerah rumahnya ibu itu kan ada jalurnya sendiri atau rutenya..rutenya selalu itu-itu saja bu?
		Mrs. Poniyem, in your everyday life, when collecting grass in your old home field, do you have a specific path or route? The route that you usually use, Mam?
00:13:19	R2	Hehe…jalurnya cuma itu-itu saja
		Hehe… The route is always the same.
00:13:20	CD	Bisa diceritakan kan Bu rutenya ke rumah untuk merumput dari mana saja bu?
		Could you please tell me, Mam, the route to your home to collect the grass from which places, Mam?
00:13:35	R2	Iya, naik ..(laughing)...kan saya nggak bisa naik motor sendiri…jadi saya kalau naik itu sama suami saya…nanti saya yang cari rumput, bapak saya yang kerja di wisata gitu…
		Yes, when going up (laughing) because I could not ride a motorcycle by myself. So, if I go with my husband, to the upper land, I will be the one who collects the grass, my husband will work in tourism.
00:13:56	CD	Kalau merumput naik motor ya, Bu? Dengan bapak, Bu ya?
		If you go to collect grass, do you ride a motorcycle, Mam? With your husband, Mam?

00:14:04	R2	Yang mencari rumput nanti ibu ya terus bapak langsung ke tempat wisata ***The one who collects the grass is you Mam then your husband will go directly to the tourism site.***
00:14:10	CD	Kalau pulangnya bagaimana Bu? Klaau Ibu habis merumput? ***How do you get home, Mam? After collecting the grass, Mam?***
00:14:28	R2	Bapaknya yang jemput..Kalau sudah waktunya aku mau ke kandang lagi, saya dijemput dulu dipulangkan ***My husband will pick me up. If it is the time, I want to go to the cattle shed again, I will be picked up first and then dropped at (the current) home.***
00:14:30	CD	Berapa lama Bu kira-kira Ibu kalau cari rumput? ***How long does it take, Mam, to collect the grass?***
00:14:45	R2	Oh..kalau cari rumputnya kan cuma sedikit… satu setangah jam sudah balik sudah pulang..paling lama 2 jam ***Oh, the grass is only a few of them. Within one and a half hours, I will be at home. Two hours is the longest.***
00:14:47	CD	Cari rumputnya pagi atau siang Bu? ***Is the grass collected in the morning or afternoon, Mam?***
00:14:50	R2	Pagi ***Morning***
00:14:52	CD	Kenapa bu pagi-pagi? ***Why is it in the morning, Mam?***
00:15:01	R2	Kalau siang kan sudah panas nggak nyaman…siang kan kadang ada acara ***At noon, the weather is hot, uncomfortable. There are occasions at noon.***
00:15:07	CD	Sekarang acaranya apa saja Bu, kegiatan-kegiatannya selain ini? ***What occasions do you have now, Mam, the activities besides this one?***
00:15:20	R2	Kalau dulu sich kegiatannya selalu ada tetapi sekarang saya sudah mengundurkan diri jadi di rumah saja ***In the past, there were activities but now, I resigned so I am mostly just at home.***
00:15:22	CD	Tapi kan pasti ada undangan juga kan Bu? ***But, there must be still some invitations, Mam?***
00:15:35	R2	Iya, seakan-akan itu selalu ada. Undangan itu selalu ada (laughing)....acara juga selalu ada ***Yes, like they always exist. The invitation always exists (laughing), occasions always exist***
00:15:51	CD	Bu, kalau Ibu cari rumput di atas itu…ada alat-alat lain yang juga Ibu gunakan…misalnya jika was-was..Ibu was-was juga tidak misalnya? ***Mam, if you collect grass in the upper land, are there tools that you need, Mam. For instance, if you feel anxious. Do you also feel anxious, Mam?***
00:16:28	R2	Di atas? Ya iyalah lah ya.. Lha kalau di atas itu, hp selalu ditaruh di tas (laughing)…kalau ngarit itu kan anu sedikit-sedikit selalu diikat nanti misalnya ada apa-apa kan kita tinggal lari.. ***In the upper land? Yes, of course. In the upper land, my mobile phone is always in my bag (laughing). When cutting the grass, each a few of them, I tie them up, so when something happens, I will just run.***
00:16:35	CD	Kalau Hp itu, ibu ada WA begitu maksudny Bu..kalau ada-apa maksudnya apa bu? Hp itu fungsinya untuk apa Bu?

		About the mobile phone, you do have WhatsApp, is that what you mean, Mam. If anything happens, what do you mean by that, Mam? What is the function of that mobile phone, Mam?
00:17:28	R2	Kalau di atas kan…selalu punya hp kan kalau ada acara apa-apa yang mendadak gitu kan bisa lihat itu…terus sebenarnya belum pulang tapi terus berhubung ada acara ada WA ada apa kan...terus lalu pulang…tapi saya kalau di atas agak nyantai soalnya saya di atas rumah saya kan agak lebar…terus saya bikin rumah di rumahnya yang dulu dekat jalan gini ..jadi kalau capek gitu bisa istirahat di rumah di pinggir jalan... ***In the upper land, I always carried a mobile phone so when there were sudden occasions, I could see. Then, I should not go home but due to those occasions and with WhatsApp, I could go home. But if I were in the upper land, I could relax because my house was quite big. Then, I constructed a house above the (former) house situated nearby the road like this one (current home). So if I was tired, I could take a rest at home close to the road.***
00:17:31	CD	Bangun baru lagi, Bu, setelah erupsi? ***Did you construct a new house, Mam, after the eruption?***
00:17:33	R2	Iya istilahnya cuma tenger gitu ***Yes, it is called as tenger.***
00:17:35	CD	Pendopo ya Bu? ***Pendopo, yes, Mam?***
00:18:01	R2	Kalau dulu…rumahnya situ kan lantainya dulu kan masih pondasinya juga masih.. Di tempat saya kan itu keramiknya masih semua..jadi saya di atas bikin rumah tapi cuma kecil…Cuma buat istirahat kalau di kebun gitu (smiling) ***In the past, the floor of the house existed including the foundation. In my place, all ceramics remained. So, I just built a house (above it) but just a small one. It was for me to take a rest if I work in the field (smiling)***
00:18:02	CD	Leyeh-leyeh ya Bu? Istirahat ***Leyeh-leyeh* Mam? Take a rest.***
00:18:16	R2	Di atas kan…jadi tempat wisata.. Jadi kalau capek bisa istirahat sambil lihat orang-orang jalan ***In the upper land, it became a tourist site. So if am tired, I can take a rest and watch people walking around there.***
00:18:49	CD	Jadi rumah ibu dekat juga ya dengan area wisata atau di daerah wisata? ***So, is your house nearby the tourist site, Mam?***
00:18:50	R2	Iya..rumah saya kan sebelum mbah maridjan..mbah maridjan masih di atas lagi..saya agak di bawah..di tempat saya kan di dekat jalan…jadi misalanya nggak ada acara, nggak ada acara yang...kita kan bisa santai-santai di situ ***Yes, it is. My house was located before the house of Mbah Maridjan**. Mbah Maridjan's house was located much upper and mine was below his. Since my house was nearby the road so if there were no occasions that, the occasions that (discontinued), we could relax there.***
00:18:56	CD	Setiap hari ya Bu? Mencari rumput kan setiap hari ibu? ***Every day, Mam? Do you look for grass every day, Mam?***
00:19:07	R2	Ehem. ***Ehem.***
00:19:08	CD	Perasaan ibu bagaimana Bu..Bisa ibu ceritakan sedikit Bu bagaimana perasaan Ibu di tempat tinggal yang ibu kemarin? ***How do you feel, Mama? Could you share with me a bit, Mam, how you feel living in your former house?***

00:19:09	R2	Di tempatnya dulu begitu? ***In my former home?***
00:19:10	CD	Ya Bu ***Yes, Mam.***
00:20:02	R2	Nyaman je mbak (laughing)..kalau di tempat yang dulu itu merasa nyaman je...sepertinya masih menempati rumah yang dulu jadi (laughing)…tapi kalau sapi kalau di atas kan..Iya bikin ndadak harus bikin kandang sendiri…Kalau di sini kan kandangnya sudah dibikinin pemerintah tinggal nempatin...kalau misalnya makanin sapi di atas kan haru kandangnya buat sendiri..kandangnya yang dulu kan sudah habis..jadi kandangnya enaknya di sini jadi bisa bareng-bareng sama teman-teman yang lain... ***Comfortable, Miss (laughing). If I was at my former home, I felt very comfortable. It seems like still living in my former home (laughing). But if the cattle were in the upper land, well, I had to construct a cattle shed by myself. Here, the cattle shed was already built by the government and be immediately used. If for example, the cattle were fed in the upper land, the cattle shed must be built on our own. The former cattle shed was damaged so the cattle-shed here is more convenient as there are friends too.***
00:20:05	CD	Tetapi selalu kangen ya Bu? ***Do you always miss it, Mam?***
00:20:16	R2	Ehem… ***Ehem…***
00:20:40	CD	Kalau Ibu sendiri belajar ternak sapi dari mana dulu, sejarahnya Bu? ***How do you learn about dairy farming, the history Mam?***
00:20:45	R2	Dari teman.. Dari teman saya…Saya kan dulu..keluarga baru itu lho..terus saya kan punyanya dulu kambing…sudah jadi banyak kan ngurusinya kan repot…terus saya jual buat beli sapi..terus..buat beli sapi..terus dulu kan sapinya nggak ini nggak sapi perah ***From friends, from my friends. I once raised a new family then I had goats. I have plenty of them so taking care of them was troublesome. Then, I sold them to buy cows. Then, I bought cows but they were not dairy cows.***
00:20:56	CD	Sapi potong bu? ***Beef cows, Mam?***
00:20:58	R2	Nggak sapi Jowo kalau dulu katanya ***No, Javanese cows are what people called them.***
00:20:59	CD	Itu untuk apa, Bu, potong? ***What are they for, Mam, beef?***
00:21:00	R2	Iya buat nambah ekonomi ***Yes, to increase the economy.***
00:21:02	CD	Apanya yang dijual bu? ***What parts of it that you sell, Mam?***
00:21:40	R2	Tapi kalau sapi Jowo itu kalau diharapin itu hasilnya kan lama banget gitu lho…terus saya dikasi tahu sama teman saya tukarin yang sapi perah saja gitu..kalau sapi perah kan bisa tiap tahun beranak..susunya bisa untuk makan (laughing)..susunya itu kan bisa untuk makannya sendiri bisa untuk makannya sapi gitu... ***But the Javanese cows, hoping for their production took a long time, you know. Then, I was told by my friend to trade them with dairy cows. The dairy cow calves every day. Their dairy milk can be used for meals (laughing). The dairy milk can be used to feed the cow itself, for its meal, you know.***
00:21:55	CD	Tapi susu sapi di sini belum pernah ini, ya, Bu misalnya diolah menjadi bentuk-bentuk yang lain misalnya menjadi yoghurt? Tidak termasuk begitu ya di Pelemsari?

		But the dairy milk here is never transformed into other forms of food, Mam, like yogurt? It is not what happens in Pelemsari, right, Mam?
00:22:00	R2	Belum. ***Not yet.***
00:22:02	CD	Ada pikiran seperti apa Bu selama ini dari Ibu dan warga? ***What ideas do you and the community have, Mam?***
00:22:10	R2	Dulu itu sudah ada yang pernah beri pengarahan di tempat saya dulu tapi ditawarin sampai sekarang belum ada yang berhasil mencoba gitu. **Once, there were some instructions in my place in the past. But to this date, nobody accepts the offer yet to try them.**
00:22:12	CD	Berarti sudah pernah ya berarti…sudah ada coba-coba tapi nggak ini. ***So, there have been some efforts to experiment but they did not (discontinued)***
00:22:53	R2	Iya, tapi kalau praktik ya cuma praktik saja. Habis itu nggak, nggak ini, sepertinya kayaknya nggak sempat gitu lho...kalau sudah ngurusin sapi banyak kan sudah ada pemasukan setiap bulannya itu sudah bisa untuk makan jadi kalau ngolah susu masak susu dibikin ini ini..sudah nggak apa, nggak telaten, ngurusin banyak. ***Yes, practices are only practices. After that, they did not, did not, it seems that there was no chance, you know. If you take care of a lot of cattle, you already earn a lot of money every month and can use it to buy meals. So, if you transform and cook the dairy milk to make this and that, it would not be, it would not be done carefully. Too many things to handle.***
00:22:56	CD	Berarti istilahnya karena nggak punya waktu itu ya Bu. Nggak sempat ya. ***In other words, you have no chance for that, right, Mam. No chance.***
00:22:58	R2	Ehem… (laughing) ***Ehem… (laughing)***
00:23:27	CD	Terus kalau Ibu puya perasaan cemas kan ya Bu kadang-kadang… misalnya was-was dengan Merapi apalagi setelah kejadian erupsi 2010 yang dulu ya Bu. Ibu puya trik-trik, cara-cara agar was-was itu hilang atau berkurang begitu Bu? ***So you do have an anxiety right, Mam, sometimes. For example, being anxious with Merapi especially after the 2010 eruption in the past, Mam. Do you have tricks, ways so the anxiety could disappear or be reduced, right, Mam?***
00:24:02	R2	Iya kalau saya kan dulu termasuk korban yang terbanyak…Jadi ya..anu, apa itu,…saya juga kan ini gara-gara korban terbanyak, terus depresi to lalu saya sampai syaraf gitu lho ...mata saya kan agak ini…ini dulu anu apa depresi.. terus lama kelamaan kena ini kena syaraf .... ***Yes, in the past, I was a person with the greatest losses. So, what is it, since I was the victim with the greatest losses, I felt depressed, and the depression attacked my nerve system, you know. My eyes became a little bit, this is because of the depression. In the long run, it hit my nerve***
00:24:07	CD	Sampai sekarang masih ke dokter, Bu Puteri? ***Do you still go to a doctor, Mrs. Puteri?***
00:24:15	R2	Yo…kadang masih ke dokter syaraf, vitamin sudah, terapi sudah ***Yeah. Sometimes I still go to a neurologist. I got vitamins, therapies.***
00:24:23	CD	Sudah lebih baik ya, Bu? ***Have you become better now, Mam?***
00:24:33	R2	Ya namanya saja depresi…jadi ya perlu waktu lama..bersabar ***Yeah, it is depression so it needs some time. Just be patient***
00:24:34	CD	Berserah ya, Bu?

		Just be resignative, Mam?
00:24:35	R2	Iya ***Yes.***
00:24:48	CD	Kalau mencari rumput di atas Bu, apa cara-caranya Bu supaya kira-kira perasaan cemas itu bisa ditekan, Bu? ***If you collected the grass in the upper land, Mam, so what strategies do you have to reduce the anxiety, Mam?***
00:25:20	R2	Ya kadang dibikin lupa saja..jadi kadang nggak usah dipikirin terus...dibikin santai-santai saja terus saya ngurus apa-apa.. Bikin nanam..bikin kayu bikin ini-ini..sepertinya saya semangat gitu..supaya bisa terlupakan gitu ***Yeah, sometimes just forget it so I do not have to remember it all the time. Just make it relax then I take care of all things. I plant, plant trees, do this, and that. So I become motivated to forget it***
00:25:32	CD	Kalau kekerabatan warga banyak bantu ya Bu, misalnya tetangga-tetangga Ibu ***Do you find the social network here also helps you, Mam, for example, your neighbors?***
00:26:19	R2	Iya..tapi dulu kan sini kan di atas itu dusun yang terakhir…jadi korbannya banyak yang di atas…jadi waktu itu kan orang-orang yang masih di atas itu kan orang-orang yang siap lari... lansia dan balita sudah diturunkan..terus orang-orang yang di atas itu orang-orang yang siap lari tapi belum sampai lari sudah duluan sama dari merapi ***Yes, but in the past, the place is the last sub-village (to be evacuated). So, a lot of victims there. So, that time, the people up there were those who were ready to run. Elderlies and infants were already evacuated. Then, people up there were ready to run but before they run, the eruption has already reached them.***
00:26:28	CD	Kalau warga bayak memberi ini ya Bu yang penting dukungan moral ya Bu ***Did the community give you moral support, Mam?***
00:27:13	R2	Ehe…Kan sebagian itu kan tujuannya kan nolong-nolong gitu lho Mbak. Kalau orang yang siap lari itu kan di sini dululah nanti masih ada orang-orang lain. Kita nunggu di sini anu bantu-bantu gitu. Sebagian kan namanya kan relawan..anak-anak itu tujuannya untuk bantu-bantu di atas ada gitu. Kita di sini kalau ada apa-apa tapi ternyata malah kena. ***Because part of the goal is to help with one another, Miss. People who were ready to run in the past said (to themselves) to stay to give a chance to others. We would wait to help. Some of them were volunteers. Those kids had a goal to help those in the upper land. We would be here if anything happened but it turned out that they were hit.***
00:27:28	CD	Takdir Tuhan ya Bu kita sekarang kan berserah..seperti ibu tadi itu…oasrah dan melakukan apa yang bisa ya Bu. Mencari kesibukan ***It was God's faith, yes, Mam. We just give it up just like what you said, Mam, to become resignative and to do whatever we can, Mam. Looking for activities.***
00:27:35	R2	bikin kegiatan sibuk-sibuk biar nggak ingat (laughing) ***Doing busy things in order to forget (laughing)***
00:27:58	CD	Ibu Puteri, kalau Ibu sekarang, sapi ibu kan ada tiga ekor. Ibu punya target-target, Bu, misalnya supaya bisa meningkatkan produksi susu itu bagaimana..atau untuk sementara apa renacanya Bu untuk sapi-sapi? ***Mrs. Puteri, you now have three cows. Do you have some targets, Mam, for example, to increase the dairy milk or to temporarily, what do you plan, Mam, for the cattle?***
00:28:21	R2	Kalau saya lho Mbak..saya berjuang untuk sapi perah sudah paling duluan..saya sudah pernah satu keluarga saya sudah pernah makanin 12 sapi. ***In my case, Miss, I thrived the dairy farming at a very early time. I and my family had once fed 12 cows.***
00:28:22	CD	Makan apa, Bu? Makan 12 sapi?

Fed what, Mam? 12 cows?

00:29:01	R2	12 ekor gitu lho...jadi kan kesibukan..capek, nggak sempat istirahat kan itu sudah lama gitu..istirahatnya cuma kalau sudah sore…kalau sekarang saya rasanya sudah ini....nggak mau seperti dulu lagi (laughing)....aku sekarang pinginnya opo...hmmm...pikirannya santai terus tenaganya kan banyak istirahat gitu lho, Mbak...nggak seperti dulu lagi... ***Twelve cows, you know. So, too many things to do. I had no time to take a rest for a very long time. I just took a rest in the afternoon. Like today, I feel that I, I, do want to be like this anymore (laughing). I today want, what is it, hmm, my thought should be relaxed and the energy was saved by taking a rest, Miss. Not like in the past.***
00:29:08	CD	Seperti yang Ibu bilang tadi hanya untuk hiburan ya? ***Similar to what you said before, right, Mam, for entertainment?***
00:29:39	R2	Hehe.….kerja cuman untuk hiburan. Ya, cari penghasilan tapi cari kesibukan (laughing) yang penting sudah aktivitas. Sudah kerja sudah ini, sudah, ngurusin kebun sudah capek. Kalau sudah capek kan istirahat kan enak. ***Hehe… Work is only for entertainment. Yeah, it is for earning money but I also look for a busy thing to do (laughing). The important thing is you have activities. I have done this or done that. I took care of my field, I became tired. If I am tired, I could have a good rest.*** *(Interview selesai dan dilanjutkan dengan pembicaraan diluar topik wawancara serta dengan suguhan yang disajikan oleh responden. Pembicaraan seputar kegiatan si peneliti, kakak responden yang berada di Amsterdam, dan agenda interview kedua dan kegiatan observasi di ladang responden di rumah sebelumnya keesokan harinya)* *The interview was finished and continued with a conversation beyond the interview topic and with meals and beverages served by the respondent. The conversation was about the activities of the researcher, the respondent's sister who lives in Amsterdam, and the second interview agenda and observation plan in the respondent's former home yard the next day.*
00:39:16	CD	Ternak sapi itu punya makna tersendirilah ya bagi Ibu ***The cattle has its own meaning for you, right, Mam?***
00:39:18	R2	Iya ***Yes.***
00:39:19	CD	Apa maknanya Bu? ***What does it mean to you, Mam?***
00:39:40	R2	Ya kalau sapi perah itu kan banyak lebih dari lima kotorannya bisa untuk biogas itu loh mbak…aku dulu kan pernah...di atas kan saya sudah ngurusinnya banyak..saya sudah pernah pakai biogas..erupsi itu saya sudah pakai biogas sudah satu tahun.. ***Well, if the dairy cattle is more than five, the manure can be used for biogas, you know, Miss. I once in the upper land took care of many of them and used biogas. (Before) the eruption, I have used biogas for one year.***
00:40:24	CD	Sebelum erupsi, Bu? ***Before the eruption, Mam?***
00:40:27	R2	sebelum erupsi…pakai biogas itu lho..gas dari ternak itu…sudah satu tahun…eh..bikin biogas satu tahun ya terus tahu-tahunya kena dari Merapi itu…jadi ya...(smiling) sudah nggak bisa dipakai lagi...sapinya sudah terbakar semua..terus pipa-pipa salurannya sudah terbakar… ***Before the eruption. Using biogas, you know, the gas from the cattle waste, for one year, the one-year biogas, then it was hit by the Merapi eruption so, yeah, (smiling) it could not be used anymore. All cattle were burnt and the pipes were burnt.***
00:41:00	CD	Kalau biogas dulu Ibu dapat pengetahuannya dapat darimana, Bu?

How do you learn about the biogas, Mam?

00:41:11	R2	Kan suami saya kan dulu…berhubung dia ngurusinnya kan banyak kan dia jadi ketua kelompok…sering kumpul-kumpul sama orang-orang yang berpengalaman gitu…saya bisa pakai biogas dari ternak itu…jajane praktis lho mbak biogas dari ternak itu…tinggal kotorannya tiap hari kan buang terus…nggak usah nggak beli sekali kayak sekarang ***My husband, in the past, since he took care of many cows and was a group leader, often gathered with highly experienced persons. I used the biogas from the cattle. It was actually very practical, Miss, the biogas from the cattle. Only picking up the waste which is produced every day. You do not have to buy once like what it is now.***
00:41:12	CD	Lebih murah ya, Bu? ***Is it cheaper, Mam?***
00:41:42	R2	Hemm..kalo sekarang kan pakai gas gitu…kalau dulu kan nggak...gasnya tinggal dimasukin situ, gasnya sudah nyala terus…semakin banyak pemakaian semakin bagus..terus..ya itu..sekarang sudah tinggal pengalaman...kenang-kenangan saja… ***Hemm…***
00:41:47	CD	Ibu juga bantu dulu yang biogas itu dengan bapak? ***Did you also involve with the biogas with your husband?***
00:42:04	R2	Hehmmm…kan disaring mbak…kalau yang buat biogas kan nggak seperti yang lain….ini kan misalnya ini kandang…. ***Hmmm…It was filtered, Miss. Making biogas is not like others. This one is from cattle-shed***
00:42:14	CD	ibu, nuwun sewu ya Bu.. Ibu mau gambarin bu ***Mam, I apologize for asking this, would you sketch it, Mam?***
00:45:11	R2	Ini misalnya ini kandang..panjang sampai segini...misalnya ini yang nggak diperas..terus ini yang diperas..misalnya ini..kalau ini dikasi anu aopa itu...jalur gitu lho..(ini yang diperas Bu?)..ehehmm…yang diperas kan paling nggak kan lima…ini bisa masuk ke itu...ini kan lubang dulu…lubang penenampungan itu lho...yang kecil dulu..yang ini saluran yang gede..yang paling gede…terus ini....kalau yang buat..kalau yang buat gas ini kan ngggak nggak …jangan sampai kena anu suket gitu lho..(apa itu bu suket?)...jadi kotoran yang di sini harus bersih..di sini kan ada saringannya...jadi kotoran yang masuk sini kan yang bisa..yang bisa mengalir begitu lho jangan sampai kena rumput...rumputnya kan...kalau disaring kan rumputnya berhenti sampai di sini....yang di sini kan kotoran yang bersih.. kotoran khusus..jadi terus ini...kalau sudah sampai sini..ini kan bisa dikasi pipa.. sampai rumah misalnya begini....terus anu..buat sampai rumah (di dapur kan bu maksudnya)..sampai rumah terus di dapur..paling nggak 10 meter dari penampungan ini...dari penampungan kotoran ini kan sampai rumah itu paling nggak 10 meter...jadi dulu di tempat saya...kan sini jalan sini rumah salurannya kan di belakang..agak jauh...di rumah saya buat pertemuan buat kumpul-kumpul gitu nggak ini nggak sampai bau (laughing) ....kan agak jauh itunya... ***This one is, for example, a cage. The length is like this. For example, this one is not milked, that one is milked. For example, this one is for this or that. A path, the ones that are milked are at least five. This can be entered into that, the hole, the chamber, you know. First, the small one and this one is a big chamber, the biggest one. Then, this one is made for, this one for gas could not be, could not be mixed with suket*. So the waste here must be clean so there is a filter here. So the manure entered this one must be able to flow and should not be mixed with grass. The grass, if the grass is filtered, will stop here. Then, the manure here must be clean, special manure. Then, if it arrives here, it can be given some pipes towards the house like this. Then, to reach the house, reach the house at the kitchen, at least about 10 meters from the chamber. Here and this road, the house, and the pipes are at the back. Quite far away. At my house, I set up some meetings to gather with others so it will not smell or stink. Because it is not too far.***

00:45:19	CD	Itu ditanam semua pipanya? Di dalam tanah? ***Were the pipes buried? Beneath the ground?***
00:45:21	R2	iya..dikubur 10 cm dari atas..misalnya kan ini tanah to...paling nggak 10 cm dari atas..terus ini kan bisa di sini ini pakai kompornya..kompornya sudah…(laughing)…aku nggak anu mbak... jurusan terpelajar… ***Yes, planted them about 10 cm from above. For example, this is the ground. At least 10 cm from above. Then, this can be here. This is for the stove. The stove had (laughing), I am not, you know, an educated person.***
00:46:01	CD	Ini apik bu. Apik koq sketsanya, Bu. ***It looks good, Mam. The sketch looks good, Mam.*** Ini saringan ya Bu ***Is this one the filter, Mam?***
00:46:03	R2	Ehe…kalau nggak disaring nggak apik mbak…kalau nggak disaring...suketnya melebu nggak urip..kalau nggak disaring ***Ehe. If it's not filtered, it will not be good, Miss. If it's not filtered, the suket* will enter, and then, (biogas) could not be used to make a fire. If it is not filtered.***
00:46:17	CD	Ini kotoran sapi yang bersih ya bu..kompor..pipa 10 meter bu ya…jadi to kan bu.. ***This one is a clean cattle manure, right, Mam. The stove, the 10-meter long pipe, yes, Mam. It's done Mam.***
00:46:38	R2	Pipa ditaruh dalam tanah jadi nggak ini…nggak opo..nggak semuleng kalau kepukul atau kepidak-pidak ***The pipe should be buried beneath the ground. So it won't, you know semuleng* if being hit or stepped on.***
00:46:50	CD	Kalau dari pemerintah tidak ada gerakan gini tidak ada penyuluhan soal biogas gitu ya Bu sebelum erupsi ***From the government, where there are any movements such as counselings about biogas, Mam, before the eruption?***
00:46:57	R2	Ya, itu dari kooperasi, Mbak. Penyuluhan itu dari koperasi ternak. ***Yes, it came from the cooperative, Mam. The counseling came from the dairy cooperative.***
00:47:05	CD	UPPT itu ya bu ***UPPT, right Mam.***
00:47:06	R2	UPPY, ya. ***UPPT, yes.***
00:47:12	CD	Kalau sekarang nggak ada lagi ya bu ***As of today, does it still exist, Mam?***
00:47:13	R2	Ada ***Yes***
00:47:15	CD	Biogas juga? ***Including biogas?***
00:47:40	R2	Tapi dari biogasnya nggak tahu apa masih ada atau nggak gitu…tetapi kalau UPPTnyamasih ada di kaliurang..di Kaliurang kan masih utuh kan nggak kena erupsi….jadi di sana masih utuh...terus sekarang orang pada ekonomi dari sapi meras kan bisa distorkan ke sana lagi ***But about the biogas, I do not know if it still exists or not. But the UPPT exists in Kaliurang. In Kaliurang, it was still complete and not impacted by the eruption so it (the UPPT) still exists there. Then, people's economy is now from dairy cattle and the milk can be still stored again in that place***
00:47:42	CD	Tapi wilayahnya kerjanya masih di sini, Bu. UPPT Kaliurang

		But does the scope of its administration still reach this place, Mam? The UPPT Kaliurang.
00:47:46	R2	Ehe, iya
		Ehe, yeah.
00:47:50	CD	Beda lagi dengan koperasi sarana makmur Bu?
		Is it different from Sarana Makmur Cooperative, Mam?
00:47:58	R2	Iya, beda koperasi tapi hampir sama…beda koperasi tapi ya hampir sama saja
		Yeah, different cooperative but they are almost the same. Different cooperative but they are similar.
00:48:06	CD	Baginya bagaimana, Bu. Ada warga yang ke sini ada warga yang ke sana. Itu sukarela, Bu?
		How do you divide it, Mam? Some people go here while others go to another. Is it voluntarily, Mam?
00:48:14	R2	Tergantung masing-masing. Niatnya mau ikut yang mana dipersilahkan
		It depends on each self. The motif to follow which cooperative is reliant on each person.
00:48:16	CD	Kalau ibu sendiri?
		How about you, Mam?
00:49:05	R2	Aku... Sekarang aku nggak meras..jadi saya..apa..kalau dulu waktu masih meras kan capek ngantuk juga..jam segini harus berangkat..(laughing)…maksudnya kan jam meras kan harus meras jadi mbok ngantuk mbok kesal kan harus mangkat mbak gik desek.... sekarang..jadi selama di sini aku sudah nyantai gitu lho...(laughing)...tapi sekarang sudah banyak juga koq yang meras itu..yang dulu yang nggak meras sekarang meras ***I, today, do not milk cows anymore. So I, what is it. In the past, when I still milked cows, I could feel sleepy and very tired. At this hour, I had to leave (laughing). I mean during the miking hour, I had to milk so despite I was sleepy or mad, I had to go in the past, Miss. Now, I am relaxed (laughing), but now, many have been milking cows. Those who never milked in the past are now milking the cows.***
00:49:08	CD	Ini berkat ibu juga ya beritahu..beri latihan juga ya?
		This is also because of your roles in educating and training them (community), right, Mam?
00:49:53	R2	Ya..dulu kan di atas kan saya sudah pernah berhasil…jadi..istilahnya iki.. Tidak..kalau ngurusin sapi itu..amit sewu..nggak usah sekolah nggak usah skolah yang banyak banyak..dia sudah kerja di lapangan gitu kan..udah..udah.. lama-lama sudah bisa…Cuma teori ya penting..kalau sekolahnya tinggi kan yo teori-teori pintar ***Yeah, I once succeeded in it so in other words, managing dairy farming, my apologies, does not require a high level of educational attainment. One just needs to work in the field, and as time goes by, he/she will be skillful, But, theories are also needed, If one has a high level of education, he/she will have smart theories***
00:49:58	CD	Iya Bu tetapi praktiknya belum tentu (laughing)
		Yes, Mam, but probably not in terms of practices (laughing)
		Bu, misal Ibu sudah capek, bisa ini ya Bu... saya dipotong saja ya Bu
		Mam, I would like to remind you, if you need a break in this interview, please just let me know.
00:50:05	R2	Iya terserah (laughing)
		Yes, it is just up to you (laughing)
00:50:09	CD	Bu, kalau untuk ternak sapi ibu ini..selama ini.. apakah sebelum erupsi ataupun sekarang, menurut Ibu modal yang paling besar supaya kita bisa berhasil apa Bu?
		Mam, related to the dairy farming, throughout this time whether be before or after the eruption, what is the most vital capital for you to succeed, Mam?
00:50:30	R2	Modal yang… bikin modal gitu?

		The capital that, do you mean that creates a capital?
00:50:36	CD	Apa modalnya Bu, maksud saya apa hal yang paling penting kalau kita mau sukses di ternak sapi Bu? ***What is the capital, Mam? What I mean is the most vital factor for succeeding in dairy farming, Mam?***
00:51:49	R2	Oh..saya.. kalau saya dulu beli gitu..lama-lama jadi banyak..anu...sapi banyak sendiri semua gitu..tapi kalau misalnya minat ya bisa sak jane kredit juga bisa.. Kredit di koperasi juga dilayani… kalau nggak kredit, ya sak jenis gadok itu ya bisa..tapi kalau aku dulu itu modal wedus.. dibikin.. dijual buat dibeli sapi..satu dua tiga.gitu (laughing).....kalau sapi perah itu cpeat koq mbak..satu tahun lebih itu sudah ini..sudah beranak ...babonnya masih..anaknya masih terus susunya untuk makan..bantu-bantu makan.. ***Oh, I, in the past, as the long time goes by, it became many, well, the cattle became so many. But, if, for example, someone is motivated to foster cattle, he/she can actually use a credit system. The credit is also provided by dairy cooperatives. If not from a credit system, he/she could also get it from gadok*. But in my case, I used my wedus* to (discontinued) to buy cows, one, two, three, like that (laughing). The growth of dairy cows is so fast, Miss. Only within one year or more, the cows will calve. The mothers exist, the youngs exist, then, the dairy milk can be used to make food, to help make food.***
00:52:03	CD	Tetapi kalau sapi itu juga Ini ya, Bu...kata orang-orang sapi itu halus perasaannya..mereka juga kenal sama pemiliknya..benar itu Bu? ***But the cows, Mam, according to some people, are gentle in their feeling. They do recognize their owners, is it true, mam?***
00:52:09	R2	Iya benar, terus diperhatikan gitu kan ? ***Yes, it is. Then, paying attention to them, right?***
00:52:22	CD	Iya..terus ada ini Bu..istilahnya apa ya Bu.. ikatan batinnya dengan pemiliknya begitu ya..itu benar, Bu? ***Yes, then, there is, what is it called, Mam, an emotional connection with the owners. Is it true, Mam?***
00:52:35	R2	Kalau misalnya yang punya pulang dari cari rumput saja masih jauh sudah ini..….sapinya sudah bengong gitu (laughing) ***If the owner returns from collecting grass, even from a long distance, the cow would be bengong* (laughing)***
00:52:37	CD	Maksudnya mengeluarkan suara begitu, Bu? ***Do you mean that the cows would release sound, Mam?***
00:52:38	R2	Kalau..sok neteni motor…neteni opo…karo bendaharanya ***If (discontinued), sometimes watching over the motorcycle, watching over anything belonging to the owner***
00:52:52	CD	Kalau Ibu meras sapi sampai jam berapa Bu di kandang tadi? ***What time do you usually go to the cattle shed, Mam?***
00:52:56	R2	kalau pagi apa siang? ***In the morning or at noon?***
00:53:01	CD	Kalau siang ini? ***At noon?***
00:53:03	R2	Ya kalau siang teman-teman antara jam 1 sampai dengan jam 3..itu kan ngurusin nggak meras tok…bersih-bersih kasi makan…satu setengah jam sudah cukup ***Yeah, at noon, my friends would work between 1 and 3 but they only take care of the cows and do not milk them. They will clean the cattle shed, feed the cows. It will only take one and a half hours.***
00:53:07	CD	Ibu juga sampai jam 3 siang tadi, Bu, ya?

		Do you also do that until 3 PM today, Mam?
00:53:13	R2	Kalau saya kan nggak meras jadi cuma kasi makan sama bersih-bersih gitu ***In my case, I do not milk cows and only feed and clean them***
00:53:15	CD	Lebih cepat ya Bu ***It is relatively faster, right, Mam?***
00:53:26	R2	Iya sampai jam 3 kalau yang meras kan storenya jam 3 sampai sore… ***Yes, until 3 PM. Those who milk the cows will need to store the milk from 3 PM to the afternoon.***
00:53:43	CD	Kalau besok ibu mencari rumput juga ya berarti? ***Will you collect grass tomorrow, Mam?***
00:53:49	R2	Ya kalau suami saya…di atas nggak terlalu ramai yo yang cari rumput suami saya.. ***Yes, if my husband (discontinued). If there is no crowd in the upper land (tourism site), it is my husband who will collect the grass.***
00:54:02	CD	Gantian ya Bu? ***Do you do this with a shift system, Mam?***
00:54:32	R2	Suami saya kalau di atas kan sepi terus cari rumput..terus aku di rumah gitu (laughing) ***My husband, if the upper land is quiet, will look for grass so I will be just at home (laughing)***
00:55:01	CD	Bu, kalau di dalam ternak sapi itu ada tidak Bu….kan Pelemsari juga dikenal sebagai daerah yang sarat budaya ritual..kegiatan-kegiatan kultur seperti labuhan gunung yang masih dilakukan.. Kira-kira ada tidak Bu pengaruh budaya Jawa terhadap tradisi ternak sapi? ***Mam, in dairy farming, since Pelemsari is rich in cultural rites, the cultural activities like the Merapi spiritual rite which is still performed nowadays, are there any effects of Javanese culture on dairy farming?***
00:55:46	R2	Nggak..nggak ini koq nggak pengaruh..kan waktunya kan diatur..di sini kan termasuk budaya...tradisi budaya itu kan..yang jelas kan setiap tahun ada acara labuhan dari kration itu...hajatan kraton labuhan di atas..jadi kalau situasi tidak seperti covid kemarin setiap tahun itu dimeriahkan... itu dari pihak pariwisata ikut memeriahkan.... dari warga ikut memeriahkan..gitu... ***No, there are no effects. The time schedule can be managed. Here, including cultures, those traditions are annually performed like the court's rite of Labuhan Merapi. The court's occasion in the upper land, unlike the situation during the COVID_19 last year, was consistently performed. the order came from the tourism (governmental) agency. From the side of the local communities, they will participate.***
00:55:48	CD	Maksud ibu sebelum erupsi? ***Do you mean before the eruption?***
00:56:27	R2	Ya sesudah erupsi sudah kembali lagi seperti dulu tetapi pas..pas…selama ada covid ini kan kegiatan yang menimbulkan berkerumun kan dihentikan...jadi selama ada hajatan cuma ya itu... orangnya bisa dihitung dikurangin nggak seperti kemarin-kemarin… ***Well, after the eruption the condition has once returned to before but when the COVID-19 occurred, activities that create gatherings stopped. So during this occasion, only, you know. We can count the number of people which is very few, unlike the previous years.***
00:56:36	CD	Tetapi tidak ada ritual-ritual budaya ya misalnya ada kenduri hubungannya dengan sapi ***But there are no cultural rites like kenduri* that relate to dairy cows?***

	R2	Oh ada..ada..di sini ritual selalu ada..seperti kemarin waktu dikabarkan statusnya naik…ya kita sebisa-bisanya berdoa sama-sama di atas ada yang mimpin gitu..ngundangi kyai aopo ngundang ustad gitu....di atas sama-sama..gitu…di sini kan..ya itu…tempat apa itu wisata..terus budaya-budaya kan selalu ada itu.. Ada
00:57:32		jatilan..ada krawitan..ada macam-macam...
		Oh, there are. Here, rites always exist. Similar to the past, that is when the status of the volcano is announced to have increased. Well, we try to pray together and there is a spiritual leader up there. We invited kyai* or ustad, like that. In the upper land, we were together. Here, you know, the tourism site, then the cultural rites always exist. There were jatilan*, krawitan, many of them.
00:57:49	CD	Kalau sapinya sendiri Bu? Di sini saya dengar, kalau di sini kan ada sapi yang di sini yang melahirkan betina ada slametan tidak Bu?
		How about the cow itself, Mam? I heard that if the cow gives birth to a female cow, there will be slametan*, Mam?
00:58:20	R2	Oh..di sini kalau melahirkan 1 kali 2 ada acara kenduri..dikendurenin gitu…tapi kalau ngggak ya nggak… kalau cuma satu satu ya nggak..kalau beranaknya cuma satu satu ya nggak…tapi ada yang begitu beranak dua gitu lho jadi katanya harus dikendurenin
		Oh, here, if the cow gives birth to one or two cows, there will be kenduri. But if not, there will be no occasion. If only one cow is delivered, then no occasion will be held. But sometimes once the dairy cow gives birth to two cows, there should be kenduren*
00:58:22	CD	Tetapi jarang ya Bu?
		But, is it rare, Mam?
00:58:30	R2	Iya, jarang itu..sekali bernaka dua ya jarang
		Yes, it is rare. Giving birth to two cows is a rare event, right.
00:58:34	CD	Selain itu tidak ada ya Bu?
		Besides that, there are no other occasions, Mam?
00:59:09	R2	Slametan ya kalau mulutan yo degan kan.. Tiap degan ya harus degan gitu...Mentri deso…mentri deso itu acaranya dandan kali opo..ben to-tok dikirim sajen ngono kae to
		Slametan, if with mulutan, there should be degan. Every degan should be with degan. The village's medical officer. The officer's occasion of dandan kali*, so it will look like sending sajen*, you know.
00:59:10	CD	Sampai sekarang masih ada ya Bu?
		Do they still exist today, Mam?
00:59:12	R2	Masih ada. Beleh wedus, dandan kali beleh wedus.
		Yes, they do. They butcher goats, during the dandan kali, they butcher goats.
00:59:27	CD	Untuk sapi perah…selain pupuk tadi ada hal lain yang Ibu butuhkan? Misalnya sentrat?
		In terms of dairy cows, besides fertilizers, are there any factors that you need, Mam? Such as centrate?
00:59:41	R2	Oh, maksudnya?
		Oh, what do you mean?
00:59:43	CD	Supaya bisa meningkatkan produksi susu sapi selain apa...
		To increase the dairy milk besides (discontinued)
00:59:46	R2	Dikasi makannya?….Oh banyak, ya..ada..itu ada rumput kan terus masih ada polar, sentrat, mineral, makanan tambahan gitu...kalau nggak ya produksinya nggak bagus..
		Feeding the cow? Oh, many of them. Grass, polar, centrate, mineral, additional food. If these are not given, the milk production will not be good.
01:00:09	CD	Kalau hanya rumput nggak bisa ya Bu?
		If only giving them grass, it won't be enough, right, Mam?

01:00:10	R2	Kalau cuma dikasi rumput tok ya nggak keluar susunya..susunya nggak ini nggak bagus cuma sedikit gitu...itu harus...kasi makannya harus banyak..ada mineral, polar, sentrat.. ada sendiri-sendiri...campuran gitu lho dikasi rumput
		If only given grass, the dairy milk will not come out. The milk will not be good and only a little of it will come out. The food must be abundant. There should be mineral, polar, centrate. Each type exists. The mixture is added to the grass.
01:00:40	CD	Kalau rumputnya juga khusus ya?
		Is there special grass too, Mam?
01:00:43	R2	Iya, kalau sudah diputus digombor dulu namanya..sudah dignombor terus dikasi rumput
		Yes, if the grass has been cut, the grass should be gombor* after gombor then give the grass
01:00:53	CD	Digombor itu apa, Bu?
		What do you mean with gombor, Mam?
01:00:57	R2	Dikasi makanan tambahan itu lho baru dikasi rumput
		By giving the additional food then the grass.
01:00:58	CD	Oh, seperti konsentrat tadi?
		Oh, similar to the centrate, Mam?
01:01:12	R2	Tempatnya itu harus sering dibersihkan..
		The container must be kept clean.
01:01:15	CD	Kalau tidak dibersihkan, marah Bu sapinya?
		How if it is not clean, Mam, will the cow get mad?
01:01:18	R2	Misalnya nggak marah, kalau susunya diminum disetorkan...sepertinya kan kurang nyaman gitu kalau nggak selalu bersih
		Despite it is not mad, if the milk will be stored. It feels inconvenient if the container is not always clean.
01:01:40	CD	Kalau jenis rumputnya jenis khusus, Bu, misalnya jenis rumput apa yang bagus gitu…
		Is there a specific type of grass, Mam? For example, the high-quality grass.
01:01:46	R2	Oh, kalau rumputnya nggak…nggak milih-milih rumput..diperas atau nggak, rumputnya sama
		Oh, in terms of grass, no. No specific type of grass is selected. Whether it is milked or not, the grass is the same.
		We ended the interview that day and made another schedule for an appointment on Wednesday, October 20, 2021. She, however, had an occasion on that day in which she must prepare food for an Islamic event in the sub-village. After the interview, we exchanged personal stories beyond the research topic. She mentioned that she cut the woods from her home yard/field to boil the water as that served to me and to compensate her memory of using a wood stove before the 2010 eruption. We agreed to visit her former home in the upper land where I would ride a motorcycle to accompany her and observe her cutting the sengon wood, foraging, cleaning in her property and the remains of the house and biogas system in the upper land/ former house.