

**Payment for Forest Environmental Services:
Its Contribution to the Livelihood and Motivational
Factors for Local People from A Case Study in Central
Vietnam**

LE THI THU HA

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Abstract

Deforestation and forest degradation continue to threaten ecological stability and rural livelihoods, highlighting the need for innovative market-based mechanisms to mobilize financial resources for conservation. Vietnam's Payment for Forest Environmental Services (PFES) policy, implemented nationwide since 2011, represents a mandatory form of payment for ecosystem services (PES) that differs from many voluntary PES schemes globally. Despite more than a decade of implementation, evidence on PFES effectiveness remains inconclusive, particularly regarding benefit distribution, livelihood improvement, and the motivations that encourage community participation in forest protection. This study aims to (i) evaluate PFES implementation and its contributions to community-based forest management and the livelihoods of ethnic minority households, and (ii) examine the motivational factors influencing household participation in forest protection under PFES, taking into account differences among household groups and key sociodemographic and experiential determinants. Thua Thien Hue Province and three buffer-zone communes of the Phong Dien Nature Reserve in central Vietnam were selected as the study area. A mixed-methods approach was employed. At the provincial level, PFES implementation was assessed using secondary data from 2011 to 2020 combined with analyses of administrative records, payment flows, and forest monitoring reports. At the community level, household surveys, Likert-scale motivational assessments, in-depth interviews, focus group discussions, and participatory forest walks were conducted to measure socioeconomic impacts and identify intrinsic and extrinsic drivers of forest protection. Quantitative data were analyzed using descriptive statistics, logistic regression, multiple linear regression, and non-parametric tests, while qualitative data provided contextual insights into cultural and institutional dynamics.

The results show that successful negotiation and expansion of service users increased the PFES-supported forest area from 37% to 53% of the province's total forest area over seven years. PFES revenue has become an important supplementary financial source for forest protection; however, it remains highly variable due to dependence on two primary service users: hydropower plants and water supply companies. This dependence reduces income stability and weakens forest protection incentives. Although PFES has strengthened monitoring capacity and reduced forest violations in some areas, it has not adequately addressed forest quality decline or the restoration of degraded forests. At the household level, PFES contributes approximately 2% of total annual income in Hong Kim Commune, insufficient to improve livelihoods or offset opportunity costs. Regression analysis shows that education level, dependency ratio, paddy land,

and forest land significantly influence household income, whereas participation in forest protection groups shows no effect. Livelihood transformations resulting from forestry market reforms and declining natural resources have driven many young people to migrate for wage labor, raising concerns about the future sustainability of community-based forest protection. Motivational analysis reveals that intrinsic motivations, including environmental concern, cultural identity, spiritual values, and social responsibility, are the most influential factors driving participation. Extrinsic motivations, particularly financial incentives, play a supportive role, especially for households not participating in forest protection groups, but they do not replace intrinsic values. Legal and regulatory motivations are the weakest, reflecting limited enforcement and low perceived penalties. Education, ethnicity, income, dependency ratio, and institutional trust significantly predict motivational domains and willingness to participate. The findings provide evidence of a crowding-in effect in which PFES financial incentives reinforce rather than undermine intrinsic motivations when program implementation is perceived as legitimate, transparent, and culturally aligned.

Key policy implications include the need to diversify PFES service users to stabilize revenue and ensure transparent and equitable benefit sharing. Payment levels should better reflect the contributions of forest protection group members, and ecological monitoring should be strengthened through remote sensing and enhanced patroller capacity. PFES contracts should address forest quality in addition to forest area, and culturally rooted motivations should be supported through environmental education and the integration of indigenous knowledge.

Overall, the study demonstrates that PFES can support conservation and community engagement when financial incentives, cultural identity, and institutional trust are aligned. However, without improvements in equity, sustainable financing, and ecological monitoring, PFES may fall short of its long-term conservation and livelihood objectives. The findings provide valuable insights for refining PFES in Vietnam and for other countries developing community-based PES schemes in culturally diverse landscapes.

Keywords: *community participation, ethnic minorities, forest protection, intrinsic and extrinsic motivation, mountainous livelihood, motivational indicators, PFES, Thua Thien Hue, Vietnam.*

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List of Abbreviations

ALDPC	A Luoi District's People Committee
ALFPDO	Forest Protection Department Office of A Luoi District
AW3D30	ALOS World 3D - 30m
EI	Economic Incentives
ER	Environmental Recognition
ES	Ecosystem Services
FGDs	Focus Group Discussions
FPGs	Forest Protection Groups
GSO	General Statistics Office of Vietnam
HKCO	Hong Kim Commune Office
HKCPC	Hong Kim Commune People's Committee
LRC	Legal and Regulatory Compliance
MARD	Ministry of Agriculture and Rural Development
MONRE	Ministry of Natural Resources and Environment
N-FPGs	Non-Forest Protection Groups
NTFPs	Non-Timber Forest Products
NR	Nature Reserve
PES	Payment for Environmental Service
PFES	Payment for Forest Environmental Service
SFEs	State Forest Enterprises
SI	Social Incentives
SPSS	Statistical Package for the Social Science
Std. D	Standard Deviation
TTH-FPD	Forest Protection and Department of Thua Thien Hue Province
TTH-FPDF	Forest Protection and Development Fund of Thua Thien Hue Province
TTHPPC	Thua Thien Hue Provincial People's Committee
TTHSO	Thua Thien Hue Statistical Office
UNDP	United Nations Development Program
USAID	United States Agency for International Development

USD	United States Dollar
VAT	Value Added Tax
VND	Vietnam Dong, 1 USD Approx. 26,000 VND in 2025
VNFF	Vietnam Forest Protection and Development Fund
WB	World Bank

Chapter 1

General Introduction

1.1. PES over the world

In the 20th century, the expansion of agricultural land and the exploitation of wood energy greatly accelerated the rate of global deforestation. This situation was particularly severe in tropical regions of Asia and Latin America (Hannah, 2021). Between 1990 and 2000, forest loss amounted to approximately 309 million hectares; even during the 2010s, when deforestation rates were believed to have “improved”, the area lost remained high at 102 million hectares (Hannah, 2021). Large-scale forest loss not only reduced forest cover but also severely degraded essential ecosystem services provided by forests to humankind (FAO, 2020). As natural ecosystems shrink, services that were once freely available from nature become increasingly scarce and unstable (Wunder, 2005; Wunder, 2007). In this context, ecological values that were previously unrecognized by markets began to be “commodified”. They were measured, quantified, and linked to financial mechanisms designed to promote conservation (Gómez-Baggethun et al., 2010). This trend reflects the expansion of economic instruments in environmental governance, where nature is viewed as a form of “asset” that requires investment to be maintained (Sullivan, 2013). Quantifying the value of ecosystem services, therefore, provides the foundation for designing incentive-based mechanisms that create financial motivations for conservation, especially in countries where public environmental spending is limited and unstable. Market-based instruments are expected to supplement public budgets by mobilizing financial contributions from the direct beneficiaries of ecosystem services. This approach reframes forest protection not merely as a cost, but as an activity that can be encouraged through economic signals and financial incentives.

However, “charging” for environmental services raises critical questions: which natural components can be priced, who is entitled to benefit, and under what conditions these transactions can be fair and sustainable. The discourse on Payment for Environmental Services (PES) emerged as an attempt to address these issues. The central idea of PES is that external beneficiaries of ecosystem services make reciprocal, contractual payments to landowners and land users in exchange for land-use practices that maintain or restore ecological functions (Wunder, 2005; Wunder, 2007). According to Wunder (2005)’s influential definition, PES consists of (1) a voluntary transaction in which (2) a well-defined environmental service (or a land use likely to secure that service) (3) is “bought” by a (minimum of one) buyer (4) from a (minimum of one) provider (5) if and only if the provider continuously secures the provision of

the service (conditionality). Four service groups are typically identified: carbon sequestration and storage, biodiversity protection, watershed services, and landscape beauty (Wunder, 2005).

PES programs have expanded globally (Le et al., 2024; Nelson et al., 2014), increasing from 287 programs in 2001 (Natasha Landell-Mills, 2002) to more than 550 by 2016 (Salzman et al., 2018). Costa Rica pioneered the first national PES program, Pago por Servicios Ambientales (PSA), in 1997 to reverse severe deforestation (Pagiola, 2008). In the following decade, both formal and semi-formal PES schemes spread across Central and South America (Corbera et al., 2007; Kosoy et al., 2008; Pagiola, 2008; Wunder and Albán, 2008). In Mexico, PES combines market principles with government regulation and subsidies (McAfee and Shapiro, 2010). In Ecuador, PES mechanisms are designed to conserve native vegetation to maintain water quality and dry-season flow (Wunder and Albán, 2008). In Brazil, PES has become an important tool for reducing deforestation and distributing REDD⁺ benefits (Börner et al., 2010). A well-known European example is Vittel in France, where the mineral water company pays farmers to adopt sustainable practices that ensure water quality (Perrot-Maître, 2006). In most of these programs, buyers are public agencies or communities, while local households serve as service providers (Vatn, 2010).

These cases show that PES functions not only as a payment mechanism but also as a governance approach that integrates economic incentives into conservation objectives. While many programs demonstrate positive outcomes, such as increased household income, reduced deforestation, and improved forest cover (Snilsveit et al., 2019), the effectiveness of PES for conservation and sustainable livelihoods remains debated (Gómez-Baggethun et al., 2010). Implementation challenges include difficulties in identifying service providers and beneficiaries, disagreements over payment levels, high transaction costs (Song et al., 2018), and negative social impacts such as increased inequality (Jones et al., 2020) or exclusion of non-participants from resource access (Wang et al., 2017). These challenges suggest that poorly designed or poorly implemented PES can undermine equity, effectiveness, and long-term sustainability, highlighting the need for close attention to institutional context and local conditions.

1.2. PFES in Vietnam

Compared with many countries, Vietnam entered PES policymaking relatively late, but it became the first country in Asia to establish a national PES program (McElwee, 2012a; Pham et al., 2013). To emphasize the role of forest ecosystem services, Vietnam refers to its program as Payment for Forest Environmental Services (PFES). PFES is widely recognized as one of

the country's most successful forestry policies of the past decade (Trieu et al., 2020). After a pilot program in 2008 in Son La and Lam Dong provinces under Decision 380/QD-TTg, the Government issued Decree 99/2010/ND-CP, implementing PFES nationwide beginning 1 January 2011.

The policy clearly identifies ecosystem service users, including hydropower plants, water supply facilities, tourism companies, and selected industrial enterprises, and service providers, including individuals, households, communities, and organizations with forest land rights who are responsible for forest protection and service maintenance. The Forestry Law (2017) and Decree No. 99 define five categories of forest environmental services: (i) soil protection, erosion reduction, and sedimentation control in reservoirs, rivers, and streams; (ii) regulation and maintenance of water sources for production and daily life; (iii) carbon sequestration and storage, and the reduction of greenhouse gas emissions through preventing forest degradation, avoiding deforestation, and promoting sustainable forest development; (iv) protection of natural landscapes and conservation of ecosystem biodiversity for tourism; and (v) provision of spawning grounds, sources of feed and natural seeds, and the use of forest water for aquaculture (Decree No. 99, 2010).

PFES payments follow two modalities: (i) direct payments between service users and providers, and (ii) indirect payments in which users pay through the Forest Protection and Development Fund (FPDF), which then transfers payments to forest owners (Decree No. 99, 2010). In practice, PFES in Vietnam does not fully follow the original “voluntary” definition of PES but is a government-regulated program where service beneficiaries pay fixed fees, often charged through monthly electricity and water bills.

Over more than a decade, PFES has generated a substantial supplementary financial source for forest protection and development and has promoted community-based forest management (Trieu et al., 2020). It has mobilized additional social resources for the forestry sector and improved household income, especially among poor and ethnic minority households, thus reducing pressure on forests (Trieu et al., 2020). However, significant gaps remain between policy design and implementation at the provincial level. Challenges include limited monitoring capacity, unclear enforcement of conditionality (McElwee et al., 2019; Suhardiman et al., 2013; Truong, 2022a), incomplete violation-handling regulations (Hoang et al., 2021a), and a lack of transparency in benefit sharing (Truong, 2022a).

Eligibility for PFES payments depends heavily on forest area, topography, or slope rather than actual evidence of service provision. This is largely due to the limited technical capacity

of provinces and service users to monitor indicators such as soil erosion, water flow, or water quality (McElwee et al., 2019). Collective PES agreements are widely used to reduce transaction costs, yet in many cases do not provide meaningful benefits or decision-making authority to communities (Nguyen et al., 2022). Moreover, very few PFES contracts include genuinely conditional clauses based on performance or outcomes (Nguyen et al., 2022).

The livelihood impacts of PFES remain debated, particularly among ethnic minority communities whose livelihoods rely heavily on forest resources. A national PFES review indicated that payments account for approximately 20 percent of annual cash income for around 540,000 forest-protecting households, but the distribution is highly uneven (Forest and Deltas program, 2021). Some households receive very small payments, while others earn substantial amounts that form their primary income source (Forest and Deltas program, 2021). Studies acknowledge that PFES provides supplementary income and strengthens community participation, but payments are often low, unstable, and insufficient to offset the opportunity costs of conservation (Do and NaRanong, 2019; Hoang et al., 2021b; Truong, 2022a). Benefits vary depending on land rights, forest location and quality, and the organizational capacity of forest protection groups.

These inconsistent findings indicate that evidence of PFES livelihood impacts at the household level remains limited. This gap demonstrates the need for a detailed analysis of the determinants shaping benefit differences among households.

1.3. Motivational factors for PES/PFES

Another important but understudied gap concerns the motivational mechanisms through which PFES influences household forest protection behavior. Although PFES is based on financial incentives, international research shows that payments can influence human motivation in complex ways (Vatn, 2010). Some studies warn of crowding-out effects, in which financial incentives weaken intrinsic motivations rooted in cultural values, community responsibility, or local identity (Muradian et al., 2013). In other contexts, crowding-in effects occur when payments reinforce intrinsic motivations by improving fairness, awareness, or institutional trust (Bowles, 2008). Motivational responses vary across households: economic incentives may be sufficient for some but not for others (Polomé, 2016). Rico García-Amado et al. (2013) found that PES recipients increasingly relied on monetary justifications as participation lengthened. Similarly, Oniki et al. (2023) indicated that economic incentives, including rewards and sanctions, can shift intrinsic motivations for community activities toward extrinsic ones, reducing long-term commitment to social benefits. Conversely, other studies

show that participants perceive both economic and broader socio-ecological benefits, such as improved well-being or contributions to conservation (Bremer et al., 2014; Perevochtchikova and Rojo Negrete, 2015).

This issue is particularly relevant in Vietnam, where many ethnic minority communities have long-standing traditions of forest stewardship grounded in customs, spiritual beliefs and community regulations (Hoang, 2006). Yet few studies systematically examine how PFES interacts with these socio-cultural values or determine whether PFES reinforces or diminishes households' intrinsic motivations. This lack of evidence indicates that PFES effectiveness cannot be assessed solely based on financial flows but requires understanding the actual level of commitment of households and the factors shaping such motivation. Therefore, analyzing forest protection motivation under PFES is essential for explaining variations in household participation, assessing policy sustainability, and understanding how PFES influences conservation values and behaviors.

Taken together, these institutional, livelihood, and motivational gaps highlight the need for a comprehensive assessment of PFES implementation at both provincial and household levels.

1.4. Research objectives

Building on these identified gaps, this dissertation aims to provide an integrated assessment of both the institutional performance and the behavioural dimensions of PFES implementation in Thua Thien Hue Province, where ethnic minority communities play a critical role in forest management. Thua Thien Hue province was selected as a study site to evaluate PFES implementation in Vietnam for several reasons. Thua Thien Hue is one of the provinces with the largest forest cover in the country (57.38%) in 2020 (MARD, 2021). The province is also a pioneer province to implement the Payment for Forest Environmental Services since 2011. In Thua Thien Hue province, PFES is not heavily reliant on foreign donors, which enables a closer evaluation of its implementation and effects of a domestically-funded PFES program (Hoang et al., 2021a). The Forest Protection and Development Fund of Thua Thien Hue province (TTH-FPDF) is the only intermediary organization and has pushed a number of initiatives, such as the use of remote sensing technology and various policies to ensure the efficient, transparent, and equitable implementation of PFES (Hoang et al., 2021b). According to a report from the TTH-FPDF, PFES is considered a breathtaking policy for the provincial forestry sector. It supports the protection of 156,000 ha/283,000 ha of forest area in the region, contributes to maintaining the province's forest cover, creating more jobs, and providing

additional income for 4,682 households, with 65% being ethnic minorities in mountainous areas (Tran, 2019). From the lens of the state, the PFES in Thua Thien Hue seems to be very successful and attains its purpose. Thus, our study focused on re-evaluating the implementation of PFES within a decade to verify whether or not the PFES implementation process has been successful as expected. From the lens of the state, PFES in Thua Thien Hue seems to be very successful and attains PFES's purpose. However, existing studies have paid limited attention to the actual functioning of PFES at the provincial level, the ways in which PFES interacts with community-based forest management arrangements, and how household-level motivations and participation are shaped under the policy, particularly among ethnic minority groups. As a result, there remains insufficient empirical evidence linking institutional implementation processes with behavioural responses at the household level. The specific objectives of the study are to:

- (i) evaluate the implementation of the PFES policy and its contributions to community-based forest management and the livelihoods of ethnic minority households, and
- (ii) examine the motivational factors that influence household participation in forest protection under PFES, with attention to differences across household groups and key sociodemographic and experiential determinants.

1.5. Structure of dissertation

The dissertation is organized into five chapters (Figure 1.1). Chapter 1 outlines the background and rationale of the study, identifies the knowledge gaps that motivate the research, and presents the objectives and overall structure of the dissertation. Chapter 2 introduces the study area by describing its key natural and socio-economic characteristics. Chapter 3 examines the implementation of PFES at the provincial level, focusing on the operational mechanisms of the PFES fund, the payment procedures for service providers, and the current status of community-based forest management under PFES support. This chapter also evaluates the contribution of PFES to the livelihoods of households engaged in forest protection, offering insights into the effectiveness of the policy in practice. Chapter 4 presents the empirical approach used to analyze household motivations for participating in PFES. It introduces the motivational indicator framework developed for the study, compares motivation and perceptions between forest protection group (FPG) households and non-FPG households, and assesses the influence of socio-demographic characteristics and PFES-related experiences on households' willingness to participate in forest protection. This analytical approach provides a deeper understanding of the factors shaping sustained community participation. Chapter 5 synthesizes and discusses the main findings of the dissertation, draws the overall conclusions,

and proposes recommendations to enhance PFES implementation in the study area. The chapter also highlights the limitations of the research and outlines directions for future work.

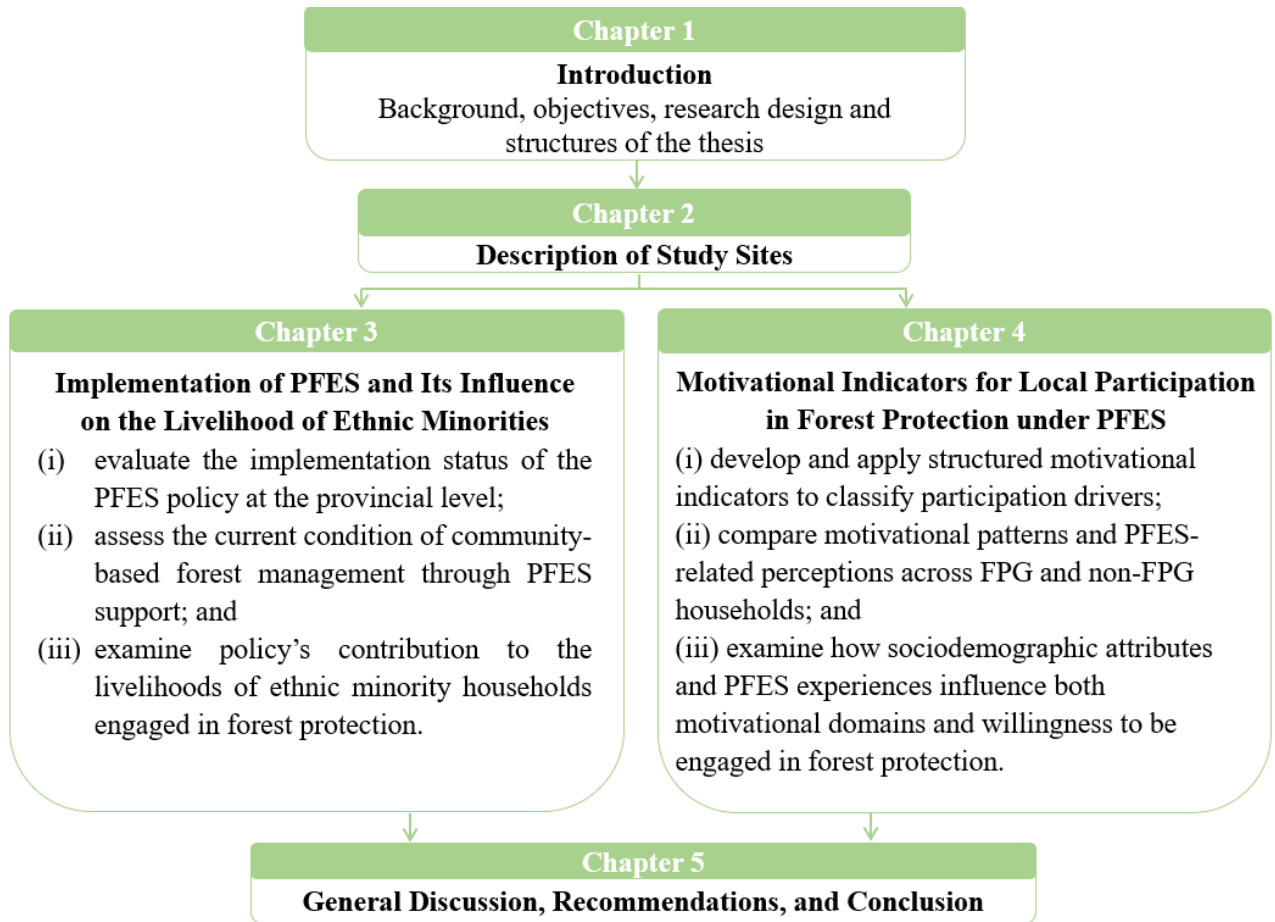


Fig. 1.1. Structure of the dissertation

References

- Börner, J., Wunder, S., Wertz-Kanounnikoff, S., Tito, M.R., Pereira, L., Nascimento, N., 2010. Direct conservation payments in the Brazilian Amazon: Scope and equity implications. *Ecological Economics*, Special Section - Payments for Environmental Services: Reconciling Theory and Practice 69, 1272–1282. <https://doi.org/10.1016/j.ecolecon.2009.11.003>
- Bowles, S., 2008. Policies designed for self-interested citizens may undermine “the moral sentiments”: evidence from economic experiments - PubMed. *Science* 320, 1605–1609. <https://doi.org/10.1126/science.1152110>
- Bremer, L., Farley, K., Lopez-Carr, D., Romero, J., 2014. Conservation and livelihood outcomes of payment for ecosystem services in the Ecuadorian Andes: What is the potential for ‘win-win’? *Ecosystem Services* 8. <https://doi.org/10.1016/j.ecoser.2014.03.007>
- Corbera, E., Kosoy, N., Martínez Tuna, M., 2007. Marketing ecosystem services through protected areas and rural communities in Meso-America: Implications for economic efficiency, equity and political legitimacy
- Decree No. 99/2010/ND-CP, dated September 24, 2010, of the Government, on the policy on payment for forest environment services, 2010
- Do, D.T., NaRanong, A., 2019. Livelihood and Environmental Impacts of Payments for Forest Environmental Services: A Case Study in Vietnam. *Sustainability* 11, 4165. <https://doi.org/10.3390/su11154165>
- FAO, 2020. Global Forest Resources Assessment 2020. Rome
- Forest and Deltas program, 2021. Summary of 10 years implementation of the policy on payment for forest environment services for the period 2011-2020 and development orientation for the period of 2021-2030
- Gómez-Baggethun, E., de Groot, R., Lomas, P.L., Montes, C., 2010. The history of ecosystem services in economic theory and practice: From early notions to markets and payment schemes. *Ecological Economics*, Special Section - Payments for Environmental Services: Reconciling Theory and Practice 69, 1209–1218. <https://doi.org/10.1016/j.ecolecon.2009.11.007>
- Hannah, R., 2021. Deforestation and Forest Loss. Our World in Data

- Hoang, H.T., 2006. Decentralization and local politics of forest management in Vietnam: a case study of Cờ Tu ethnic community. *The Journal of Legal Pluralism and Unofficial Law* 38, 169–206
- Hoang, P.B.N., Fujiwara, T., Iwanaga, S., Sato, N., 2021a. Challenges of the Payment for Forest Environmental Services (PFES) program in forest conservation: a case study in Central Vietnam. *Journal of Forest Research* 26, 400–409
- Hoang, P.B.N., Fujiwara, T., Iwanaga, S., Sato, N., 2021b. Participation of local people in the payment for forest environmental services program: A case study in central Vietnam. *Sustainability* 13, 12731
- Jones, K.W., Powlen, K., Roberts, R., Shinbrot, X., 2020. Participation in payments for ecosystem services programs in the Global South: A systematic review. *Ecosystem Services* 45, 101159. <https://doi.org/10.1016/j.ecoser.2020.101159>
- Kosoy, N., Corbera, E., Brown, K., 2008. Participation in payments for ecosystem services: Case studies from the Lacandon rainforest, Mexico. *Geoforum, Placing Splintering Urbanism* 39, 2073–2083. <https://doi.org/10.1016/j.geoforum.2008.08.007>
- Le, T.-A.T., Vodden, K., Wu, J., Bullock, R., Sabau, G., 2024. Payments for ecosystem services programs: A global review of contributions towards sustainability. *Heliyon* 10, e22361. <https://doi.org/10.1016/j.heliyon.2023.e22361>
- McAfee, K., Shapiro, E.N., 2010. Payments for Ecosystem Services in Mexico: Nature, Neoliberalism, Social Movements, and the State. *Annals of the Association of American Geographers* 100, 579–599. <https://doi.org/10.1080/00045601003794833>
- McElwee, P., Bernhard, H., Nguyen, T.H.V., 2019. Hybrid outcomes of payments for ecosystem services policies in Vietnam: Between theory and practice. *Development and Change* 51, 253–280
- McElwee, P.D., 2012. Payments for environmental services as neoliberal market-based forest conservation in Vietnam: Panacea or problem? *Geoforum, The Global Rise and Local Implications of Market-Oriented Conservation Governance* 43, 412–426. <https://doi.org/10.1016/j.geoforum.2011.04.010>
- Ministry of Agriculture and Rural Development (MARD), 2021. Decision No. 1558 / QĐ-BNN-TCLN dated April 13, 2021, of the Ministry of Agriculture and Rural Development on Declaration of forest status of the whole country until 2020 Ministry of Agriculture and Rural Development.

- Muradian, R., Arsel, M., Pellegrini, L., Adaman, F., Aguilar, B., Agarwal, B., Corbera, E., Ezzine de Blas, D., Farley, J., Froger, G., Garcia-Frapolli, E., Gómez-Baggethun, E., Gowdy, J., Kosoy, N., Le Coq, J.F., Leroy, P., May, P., Méral, P., Mibielli, P., Norgaard, R., Ozkaynak, B., Pascual, U., Pengue, W., Perez, M., Pesche, D., Pirard, R., Ramos-Martin, J., Rival, L., Saenz, F., Van Hecken, G., Vatn, A., Vira, B., Urama, K., 2013. Payments for ecosystem services and the fatal attraction of win-win solutions: PES & fatal attraction of win-win solutions. *Conservation Letters* 6, 274–279. <https://doi.org/10.1111/j.1755-263X.2012.00309.x>
- Natasha Landell-Mills, I.T.P., 2002. Silver bullet or fools’ gold: a global review of markets for forest environmental services and their impact on the poor, *Instruments for Sustainable Private Sector Forestry*
- Nelson, J., Yahya, H., Chowdhury, M.S.H., Muhammed, N., 2014. Indigenous community awareness and rights to forest in Kawang Forest Reserve, Sabah, Malaysia. *International Journal of Sustainable Development & World Ecology* 21, 127–137. <https://doi.org/10.1080/13504509.2014.880959>
- Nguyen, T.H.V., McElwee, P., Le, T.V.H., Nghiem, T., Vu, T.D.H., 2022. The challenges of collective PES: Insights from three community-based models in Vietnam. *Ecosystem Services* 56. <https://doi.org/10.1016/j.ecoser.2022.101438>
- Oniki, S., Berhe, M., Negash, T., Etsay, H., 2023. Do economic incentives crowd out motivation for communal land conservation in Ethiopia? *Forest Policy and Economics* 150, 102948. <https://doi.org/10.1016/j.forpol.2023.102948>
- Pagiola, S., 2008. Payments for environmental services in Costa Rica. *Ecological Economics, Payments for Environmental Services in Developing and Developed Countries* 65, 712–724. <https://doi.org/10.1016/j.ecolecon.2007.07.033>
- Perevochtchikova, M., Rojo Negrete, I.A., 2015. The perceptions about payment schemes for ecosystem services: Study case of the San Miguel and Santo Tomás Ajusco community, Mexico. *Ecosystem Services* 14, 27–36. <https://doi.org/10.1016/j.ecoser.2015.04.002>
- Perrot-Maître, D., 2006. The Vittel payments for ecosystem services: A “Perfect” PES case? *BES Net*
- Pham, T.T., Bennett, K., Vu, T.P., Brunner, J., Le Ngoc, D., Nguyen, V.D., 2013. Payments for forest environmental services in Vietnam from policy to practice. *CIFOR Occasional Paper*, Bogor

- Polomé, P., 2016. Private forest owners motivations for adopting biodiversity-related protection programs. *Journal of Environmental Management* 183, 212–219. <https://doi.org/10.1016/j.jenvman.2016.07.097>
- Rico García-Amado, L., Ruiz Pérez, M., Barrasa García, S., 2013. Motivation for conservation: Assessing integrated conservation and development projects and payments for environmental services in La Sepultura Biosphere Reserve, Chiapas, Mexico. *Ecological Economics* 89, 92–100. <https://doi.org/10.1016/j.ecolecon.2013.02.002>
- Salzman, J., Bennett, G., Carroll, N., Goldstein, A., Jenkins, M., 2018. The global status and trends of Payments for Ecosystem Services. *Nat Sustain* 1, 136–144. <https://doi.org/10.1038/s41893-018-0033-0>
- Snilsveit, B., Stevenson, J., Langer, L., Tannous, N., Ravat, Z., Nduku, P., Polanin, J., Shemilt, I., Evers, J., Ferraro, P.J., 2019. Incentives for climate mitigation in the land use sector—the effects of payment for environmental services on environmental and socioeconomic outcomes in low- and middle-income countries: A mixed-methods systematic review. *Campbell Systematic Reviews* 15, e1045. <https://doi.org/10.1002/cl2.1045>
- Song, B., Zhang, Y., Zhang, L., Zhang, F., 2018. A top-down framework for cross-regional payments for ecosystem services. *Journal of Cleaner Production* 182, 238–245. <https://doi.org/10.1016/j.jclepro.2018.01.203>
- Suhardiman, D., Wichelns, D., Lestrelín, G., Hoanh, C.T., 2013. Payments for ecosystem services in Vietnam: Market-based incentives or state control of resources? *Ecosystem Services* 5, 94–101
- Sullivan, S., 2013. Banking Nature? The Spectacular Financialisation of Environmental Conservation. *Antipode* 45, 198–217. <https://doi.org/10.1111/j.1467-8330.2012.00989.x>
- Tran, Q.C., 2019. Thua Thien Hue: Impact of the policy of payment for forest environmental services. *Protect the forest and the environment (Bao ve rung va moi truong)*
- Trieu, V.H., Pham, T.T., Dao, T.L.C., 2020. Vietnam Forestry Development Strategy: Implementation results for 2006–2020 and recommendations for the 2021–2030 strategy
- Truong, D.D., 2022. Impacts of payment for forest environmental service policy in Vietnam: A case study of Muong Nhe protected area. *Trees, Forests and People* 7, 100198. <https://doi.org/10.1016/j.tfp.2022.100198>

- Vatn, A., 2010. An institutional analysis of payments for environmental services. *Ecological Economics*, Special Section - Payments for Environmental Services: Reconciling Theory and Practice 69, 1245–1252. <https://doi.org/10.1016/j.ecolecon.2009.11.018>
- Wang, C., Pang, W., Hong, J., 2017. Impact of a regional payment for ecosystem service program on the livelihoods of different rural households. *Journal of Cleaner Production* 164, 1058–1067. <https://doi.org/10.1016/j.jclepro.2017.07.002>
- Wunder, S., 2005. Payments for environmental services: some nuts and bolts. CIFOR Occasional Paper No. 42.
- Wunder, S., 2007. The efficiency of payments for environmental services in tropical conservation. *Conserv Biol* 21, 48–58. <https://doi.org/10.1111/j.1523-1739.2006.00559.x>
- Wunder, S., Albán, M., 2008. Decentralized payments for environmental services: The cases of Pimampiro and PROFAFOR in Ecuador. *Ecological Economics*, Payments for Environmental Services in Developing and Developed Countries 65, 685–698. <https://doi.org/10.1016/j.ecolecon.2007.11.004>

Chapter 2

Description of Study Sites

2.1. Thua Thien Hue province

Thua Thien Hue province is located in Vietnam's North Central Coast region, lying approximately 654 km south of Hanoi and 1,071 km north of Ho Chi Minh City. It is one of the five provinces in the Central Key Economic Region, with geographical coordinates ranging from N 15°59'30'' to 16°44'30'' and from E 107°00'56'' to 108°15'7''. Thua Thien Hue borders Quang Tri province to the north; Da Nang City and Quang Nam province to the south; Laos to the west; and the East Sea to the east (TTHPPC, 2014) (Fig. 2.2).

The province covers a natural land area of 4,947.1 km² and had an average population of 1,178.6 thousand people in 2024 (GSO, 2024). In 2024, the population density was 238 people/km², lower than the national average (306 people/km²) but above the average for provinces in the North Central and Central Coastal regions (140 people/km²) (GSO, 2024). Thua Thien Hue is home to six major ethnic groups. Besides the Kinh, the Co Tu and Ta Oi account for a large proportion, followed by Pa Hy, Pa Co, Van Kieu, and several smaller groups. Administratively, the province previously had six districts (Phong Dien, Quang Dien, Phu Loc, Phu Vang, A Luoi, and Nam Dong), two towns (Huong Tra and Huong Thuy), and Hue City, with a total of 152 communes and wards (TTHPPC, 2014). A major administrative restructuring took place when Thua Thien Hue province became a centrally governed city and was renamed Hue City on January 1, 2025 (Resolution No. 175/2014/QH15). Additionally, following Vietnam's nationwide administrative reorganization effective July 1, 2025 (Resolution No. 1675/NQ-UBTVQH15), the new Hue City includes 40 commune-level administrative units, 21 wards, and 19 communes. In this study, to maintain consistency with the research period, the former names of Thua Thien Hue province and commune-level units are retained. In 2024, the province's average monthly income per capita was 5,128,000 VND, which is lower than the national average (5,415,000 VND) but higher than the regional average for the North Central and Central Coastal areas (4,648,000 VND) (GSO, 2024).

Similar to other areas in central Vietnam with a tropical monsoon climate, Thua Thien Hue province experiences distinct rainy and dry seasons. The rainy season typically lasts from September to December, with the heaviest rainfall occurring between September and November, peaking at 960 mm in October. The dry season extends from January to August, with minimal rainfall from February to June (only 7 mm in April). The annual average humidity is around 84%, reaching 91% in December and dropping to about 76% in August. The mean annual

temperature is 26.3°C, rising above 29°C from April to August and falling to around 20°C in December and January (GSO, 2024) (Fig. 2.3).

Thua Thien Hue features diverse natural conditions and topography, comprising four major terrain types: midland mountainous areas, hills, plains, and lagoons separated from the sea by sand dunes. Mountainous terrain accounts for roughly 25% of the province, concentrated in the western, southwestern, and southern areas, with elevations ranging from 750 m to over 1,800 m. Hills and low mountains cover about 50% of the territory. Plains occupy 16%, extending over 100 km from northwest to southeast. Lagoon and coastal systems follow the deltaic zones, notably the Tam Giang Lagoon, the largest in Southeast Asia, stretching 68 km with an area of 22,000 ha (TTHPPC, 2014).

About three-quarters of the province consists of hilly and mountainous terrain, with a forest cover of 57.18%, significantly higher than the national average (42.03%) (MAE, 2025). Forest land accounts for most of the province's land use, totaling 306,190 ha (MAE, 2025). According to Circular No. 34/2009/TT-BNNPTNT (2009), forests are classified by use purposes into protection, special-use, and production forests; by origin into natural and plantation forests; and by timber volume into poor (10–100 m³/ha), medium (101–200 m³/ha), rich (201–300 m³/ha), and very rich (>300 m³/ha) forests. Of the total forest area, 205,582 ha are natural forests, and 100,608 ha are plantations (GSO, 2024). By function, the province has 93,153.88 ha of special-use forests, 77,011.24 ha of protection forests, and 118,236.70 ha of production forests (TTHPPC, 2021) (Fig. 2.4).

Historically, forests and forestland were fully state-owned and managed. Since 1991, several policies have facilitated the decentralization of forest management to different forest owners. In 2000, Thua Thien Hue was among the first provinces to allocate forest land and forests to communities and household groups (Hoang, 2006; Tran et al., 2010). In 2010, the province issued Decision 430 on “Forest allocation and lease for the period 2010–2014” to further promote socialization in the forestry sector. By 2020, approximately 103,856.24 ha of natural forests had been allocated to non-state owners, including households, household groups, communities, and Commune People's Committees (TTH-FPD). Thua Thien Hue was also a pioneer in implementing the PFES policy in 2011 under Decree 99/2010. By 2020, about 620 state and non-state forest owners were participating in PFES, managing a total area of 153,202.42 ha (TTH FPDF, 2021).

2.2. Phong Dien Nature Reserve and its buffer zone communes

Phong Dien Nature Reserve is one of the largest nature reserves in Thua Thien Hue province, central Vietnam, with a total area of 40,814.31 ha (Phong Dien NR office, 2020). The reserve is located between 107°03' and 107°20' E longitude and 16°17' and 16°35' N latitude. The reserve borders Quang Tri province to the north and west (Fig. 2.1, Fig. 2.2). The reserve itself has no settlements, but the buffer zone spans seven communes across Phong Dien and A Luoi districts, home to approximately 32,973 people in 8,789 households (Phong Dien NR office, 2020). Most residents live east of the reserve, where agricultural land is more accessible.

Phong Dien Nature Reserve is a key area within the Central Truong Son Priority Landscape, known for its high biodiversity and lowland evergreen forests, which is one of the region's most threatened ecosystems (Nguyen and Hardcastle, 2003). This area is one of the last remaining habitats of the critically endangered Edwards's pheasant (*Lophura edwardsi*), which was thought to be extinct in the wild until its rediscovery in 1996. The reserve also offers a haven for threatened mammalian species such as the saola (*Pseudoryx nghetinhensis*), tigers, and gibbons (Le et al., 2001). Nevertheless, rising pressures from agricultural expansion, illegal hunting and logging, as well as illegal mineral extraction (Tuan et al., 2017) create major obstacles to its conservation, highlighting the importance of conservation support measures such as PFES.

Phong Dien Nature Reserve experiences a tropical monsoon climate, with a rainy season extending from September to late November. As the reserve spans two administrative districts, climatic conditions differ between Phong Dien and A Luoi. Areas located closer to A Luoi district receive higher annual rainfall compared to those in Phong Dien district. Over the period of 2015–2021, the average annual rainfall in A Luoi reached approximately 4,193 mm, whereas the Hue area (including Phong Dien) recorded an average of 3,273 mm. In terms of air temperature, the mean annual temperature in the Hue area during the same period was 25.6°C, which is around 3°C higher than that observed in A Luoi. Similarly, the average annual relative humidity was higher in A Luoi (88.3%) compared to Hue (86.4%) (TTHSO, 2022).

The topography of Phong Dien Nature Reserve is dominated by a series of low mountain ridges located in the southern part of the North Annamite Range, with elevations exceeding 1,000 m and extending in a northwest–southeast direction. The highest peaks within the reserve include Dong Ngai (1,825 m) and Mount A No (1,550 m). The eastern and northern parts of the reserve are situated in downstream river basins with marked elevation fluctuations, whereas the western and southern areas lie in the upstream catchments of the My Chanh, O Lau, and Bo

rivers, characterized by highly dissected terrain. Forest cover in Phong Dien Nature Reserve accounts for approximately 36,863 ha, representing about 89% of the total area. The reserve contains a substantial proportion of relatively intact forest (43%), alongside areas of degraded forest (21%) and regenerating forest (22%) (USAID, 2018). In 2021, the PFES-eligible forest area within the reserve reached 13,961.21 ha, accounting for approximately 34% of the total natural area, representing the largest PFES coverage among state forest owners.

Among the buffer zone communes, Phong My in Phong Dien district is predominantly inhabited by Kinh households, whereas Trung Son and Hong Kim communes in A Luoi district have a higher proportion of ethnic minority populations, mainly the Paco, alongside the Kotu, Ta-Oi, and Van Kieu communities.

The Kinh population in Phong My largely consists of migrants from the lowland areas of Thua Thien Hue province who relocated under the New Economic Zone program following 1975. During the initial settlement period, these households received food support for the first six months and were allocated agricultural land for cultivation. They were also able to access forest resources for subsistence purposes, including timber for housing, collection of non-timber forest products (NTFPs), and hunting. Following the implementation of forest protection policies that restricted forest exploitation, households gradually transitioned toward more stable agricultural production systems and engaged in off-farm employment opportunities at the local level.

In contrast, the Paco communities residing in Trung Son and Hong Kim communes have a long-standing history of settlement in the mountainous areas of western Thua Thien Hue province within the Truong Son range. Their traditional livelihoods have been closely linked to forest resources through shifting cultivation, hunting, and gathering, alongside reliance on forest products for housing materials, fuelwood, medicinal plants, and food. Beyond its material functions, the forest also holds cultural and spiritual significance for the Paco communities through customary beliefs such as sacred forests and ritual practices associated with forest deities. Following the implementation of state-led forest protection policies, traditional shifting cultivation practices have gradually been replaced by more sedentary farming systems, including wet rice cultivation and other crop-based production.

Currently, forest use practices in the buffer zone communes primarily involve the collection of NTFPs such as bamboo shoots, mushrooms, honey, fuelwood, and medicinal plants for subsistence use and supplementary household income. However, timber extraction and wildlife hunting in natural forests are prohibited under national regulations. Consequently,

access to forest resources is now more strictly regulated, leading to adjustments in traditional forest use practices among local communities.

Under the PFES scheme, Phong My commune currently manages approximately 2,000 ha of community forest. In 2021, the Phong Dien Nature Reserve Management Board allocated over 4,000 ha of forest to local communities in Phong Xuan and Phong My communes for management and benefit-sharing through PFES contracts. Trung Son commune has the largest PFES-supported forest area in the buffer zone (over 3,721 ha), managed through a combination of community-based, household group, and individual household arrangements. In contrast, Hong Kim commune has a relatively smaller PFES-supported forest area (approximately 400 ha), which is primarily managed by community forest protection groups (Table 2.1). These differences in socio-economic conditions and forest governance arrangements create distinct livelihood contexts across the study sites.

In this study, Hong Kim commune was selected as the primary site for livelihood impact assessment due to its relatively high poverty rate (31.31%), predominantly seasonal labor force (67%), and low average per capita income (18.4 million VND per year) (HKCO, 2020) (HKCO, 2020). Despite a high forest cover (89.8%) (ALFPDO, 2019), most forest areas remain under state management, while the area allocated directly to local communities is limited. Hong Kim was also among the early communes where PFES was piloted in 2014, providing an appropriate context for examining the livelihood implications of PFES within existing household livelihood systems.

Conversely, the analysis of motivational factors influencing household participation in forest protection under PFES in Chapter 4 was conducted across three buffer zone communes, Phong My, Trung Son, and Hong Kim (Fig. 2.1), in order to reflect variations in ethnic composition, historical forest use practices, and PFES-related forest governance arrangements within the buffer zone of Phong Dien Nature Reserve. The inclusion of these three communes enables the study to examine household participation in forest protection across differing socio-economic and institutional contexts.

Table 2.1. Characteristics of the study sites (buffer zone communes)

No.	Categories	Phong My commune	Trung Son commune	Hong Kim commune
1	Total area (ha)	39,361.06	7,822.81	4,089
2	Total population (people)	5472	3295	2127
3	Total household	1671	919	600
4	Ethnicity	Kinh (90%), others: Pahy, Van Kieu, Paco, Kotu,...	Paco (95%), Others: Kotu, Taoi, Kinh, Pahy, Van Kieu, Muong,...	Paco (85%), Others: Kotu, Taoi, Kinh, Van Kieu, Muong,...
5	Natural forest area (ha)	27,811.47	5,116.4	3,442.5
6	PFES area (ha)	1,920.64	3,721.04	403.51
7	Sub-contract to protect the forest of Phong Dien NR (ha)	2,612.26		

Source: Phong Dien NR office, 2020

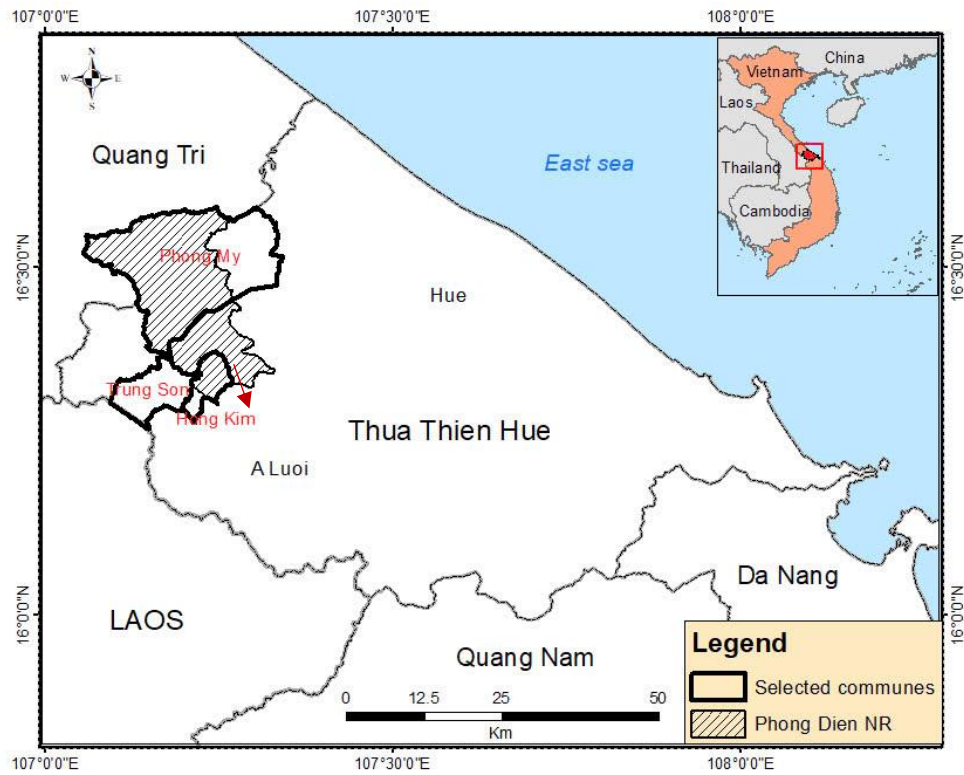
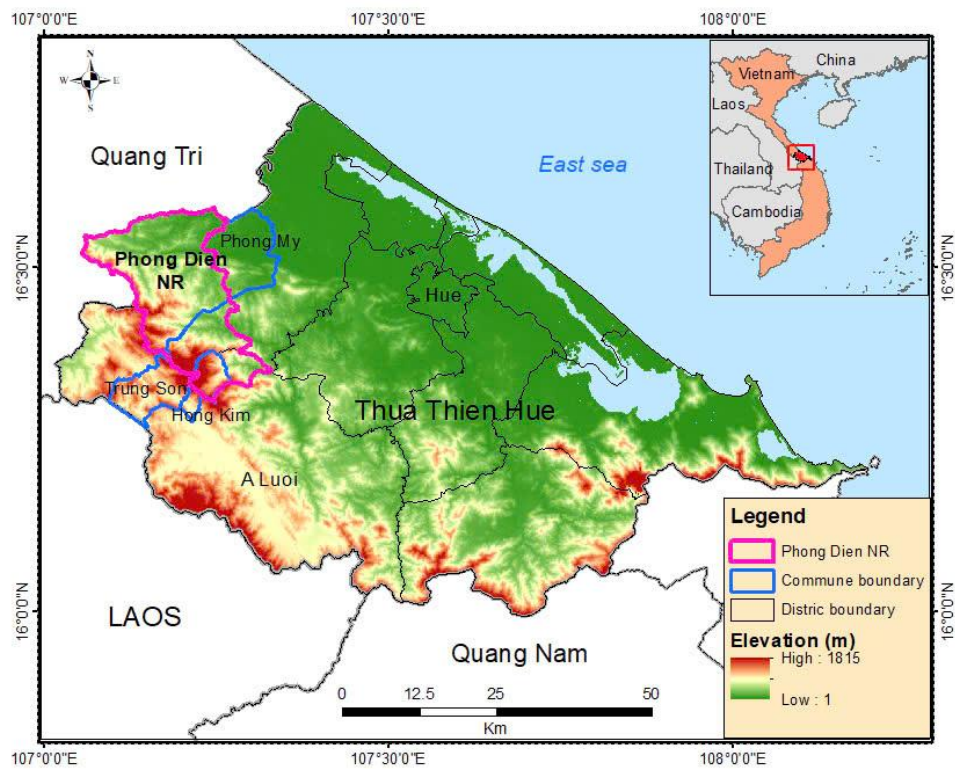


Fig. 2.1. Location of study sites and Phong Dien NR



Source: AW3D30, 2025

Fig. 2.2. Topography of Thua Thien Hue province, Phong Dien NR, and selected communes

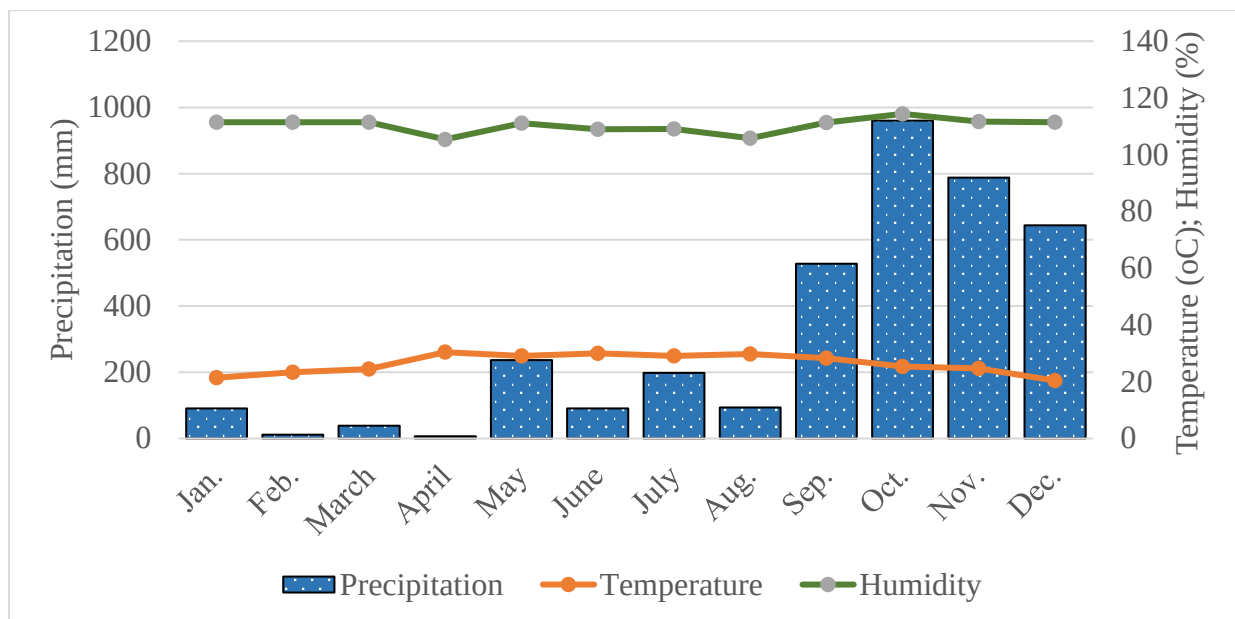


Fig. 2.3. Mean monthly precipitation, mean monthly air temperature, and relative humidity in Hue city in 2024

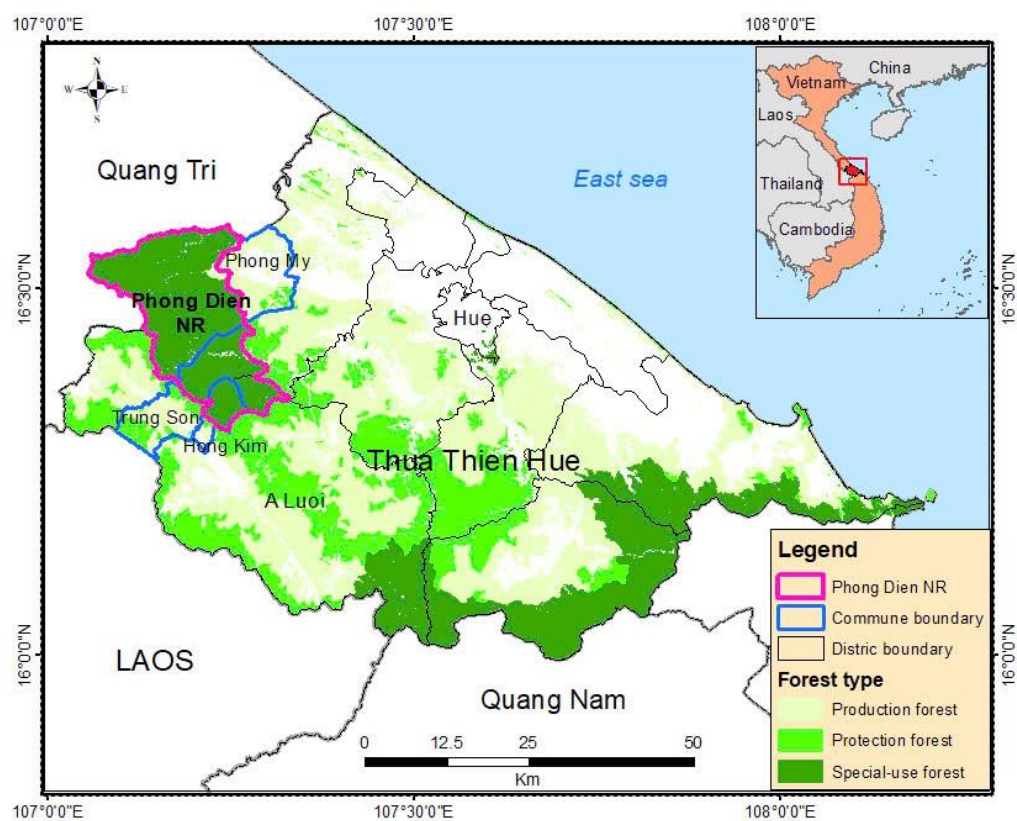


Fig. 2.4. Map of three main forest types in Thua Thien Hue province in 2020

References

- A Luoi district Forest Protection Department office (ALFPDO), 2019. Summary report of forest cover in the whole district.
- AW3D30. (2025). *ALOS Global Digital Surface Model "ALOS World 3D - 30m (AW3D30)*.
<https://www.eorc.jaxa.jp/ALOS/en/aw3d30/data/index.htm>
- Forest Protection and Development Fund of Thua Thien Hue Province (TTH FPDF), 2021. Results of implementing tasks in 2020 and implementation plan for 2021 of Thua Thien Hue Provincial Forest Protection and Development Fund
- General Statistics Office (GSO), 2024. Statistical Yearbook of Viet Nam 2024. Statistical Publishing House
- Hoang, H.T., 2006. Decentralization and local politics of forest management in Vietnam: a case study of Cờ Tu ethnic community. *The Journal of Legal Pluralism and Unofficial Law* 38, 169–206
- Hong Kim Commune Office (HKCO), 2020. Statistic of Hong Kim People’s Committee office.
- Le, T.T., Tran, H.M., Tran, Q.N., Tran, Q.D., Hughes, R., 2001. An Investment Plan for the Establishment of Phong Dien Nature Reserve, Thua Thien Hue Province, Vietnam. BirdLife International Vietnam Programme and the Forest Inventory and Planning Institute, Hanoi, Vietnam
- Ministry of Agriculture and Environment (MAE), 2025. Decision No. 561/ QD-BNNMT dated March 31, 2021, of the Ministry of Agriculture and Rural Development on Declaration of forest status of the whole country until 2024. Ministry of Agriculture and Rural Development
- Nguyen, C., Hardcastle, J., 2003. Phong Dien Nature Reserve. An Operational Management Plan 2004 to 2008. Thua-Thien Hue Provincial Forest Protection Department
- Phong Dien NR office, 2020. Sustainable forest management plan for Phong Dien Nature Reserve in the period of 2021-2030. Phong Dien Nature Reserve Management Board
- Resolution No. 175/2014/QH15, dated 30 November 2024, of the National Assembly, on the Establishment of Hue City as a Centrally Governed Municipality, 2024
- Resolution No. 1675/NQ-UBTVQH15 dated June 16, 2025, of the Standing Committee of the National Assembly, on the arrangement of commune-level administrative units of Hue City in 2025

- Thua Thien Hue Province People's Committee (TTHPPC), 2021. Decision No. 439 / QD-UBND dated February 27, 2021, of the People's Committee of Thua Thien Hue province on announcing the current forest status of Thua Thien Hue province in 2020
- Thua Thien Hue Province People's Committee (TTHPPC), 2014. Decision No. 2730 / QD-UBND dated December 26, 2014, of the People's Committee of Thua Thien Hue Province on Documentation of current socio-economic situation, natural conditions, environment, climate, hydrology of Thua Thien Hue Province to the year 2013
- Thua Thien Hue Statistical Office (TTHSO), 2022. Thua Thien Hue statistical yearbook 2021. Thuan Hoa Publishing House
- Tran, N.T., Ganesh, P.S., Makuto, I., 2010. Changes in property rights, forest use, and forest dependency of Katu communities in Nam Dong District, Thua Thien Hue Province, Vietnam. *International Forestry Review* 12, 307–319. <https://doi.org/10.1505/ifor.12.4.307>
- Tuan, N.D.A., Ngo, D., Sharma, S., 2017. Comanagement Approach for Conflict Management. pp. 179–188. <https://doi.org/10.1016/B978-0-12-805452-9.00012-6>
- USAID, 2018. PA Fact Sheet Phong Dien Nature Reserve. United States Agency for International Development (USAID)

Chapter 3

Implementation of Payment for Forest Environmental Services and Its Influence on the Livelihood of Ethnic Minorities

3.1. Introduction

Vietnam's PES programme (hereafter PFES) focuses on mobilising new financial resources to support forest co-management between the state and local communities, while contributing to supplementary livelihood benefits for participating households. The development of PFES reflects the interaction of two key forces that are sometimes contradictory: Vietnam's distinctive socialist development trajectory and the active involvement of multiple stakeholders in forest governance (McElwee, 2019). In practice, PFES aims to operationalize the state's forestry laws and policies, promote the socialization of forestry activities, and strengthen the sense of responsibility and obligation of organizations and individuals toward forest protection and development (Nguyen, 2008). PFES has been widely promoted as an important policy instrument for improving rural livelihoods, particularly among forest-dependent communities. The program is estimated to contribute to income improvements for approximately 500,000 households living in and near forest areas, most of whom are ethnic minority households (Pham, 2018; VNFF & MONRE, 2017). The initiative on PFES is seen as a reciprocation for people participating in community forest management and being motivated by those who participate in forest protection and management (Nguyen and Nguyen, 2019).

Although this policy is considered to contribute to the reduction of the state budget invested in the forestry sector and poverty reduction (Pham, 2018; VNFF & MONRE, 2017), the implementation of this policy still has many shortcomings. To et al. (2012) highlighted that payments acquired from PFES services may administer a strong incentive for state entities to seize on to the land, catching the benefit streams allied with PES, while poor households find it difficult to approach such benefits when faced with stronger constraints on resource access. In many cases, income from PES programs does not grasp the poor because of economic and political constraints. Suhardiman et al. (2013) also emphasized that the PES program implemented in Vietnam does not resemble the basic principles of PES program design following Wunder's definition in 2005. This is mainly because the government outlines the payment mechanisms and valuation. There was no negotiation between the fund providers and service providers regarding the amount of payments, and the state coerces participation from both sides (Suhardiman et al., 2013). The benefit-sharing mechanism of PFES is still unclear;

local inhabitants have little voice in making benefit-sharing decisions and monitoring the distribution of funds from the PFES (Truong, 2022). The government discourse on the 'success' of PES has served as an effective tool of diverting consideration to the weakness of the forestry sector, creating new capital for the pre-existing sector in the context of prolonged budget shortage, and expanding of state power concerning forest resources (To and Dressler, 2019). A few recent studies (Pham et al., 2021, 2020a) have attempted to better understand the impact of the PFES on the livelihoods of households participating in the PFES. PFES payments contribute 16% to 18% of the total household income in villages with PFES in Cat Tien National Park (Pham et al., 2021). Income in places where PFES is implemented is significantly higher than that in places where PFES has not been introduced (Pham et al., 2021). The contribution of PFES income in Son La is controversial and depends on who collects the data and what data are used to assess PFES impacts (Pham et al., 2020b). In addition, there are many existing weaknesses in the current monitoring and evaluation system, and the lack of reliable data to measure the impact of PFES (Pham et al., 2021). PFES in Vietnam has evolved into 'something else' for different participants. For households, PES has become a form of livelihood subsidy provided by the state, while for local officials, it has become a new source of locally controlled monies that they can manage with minimal interference from higher-ups (McElwee et al., 2019). The adoption of PFES in Vietnam has been affected by both rural history and forest institutions (McElwee et al., 2019). Although collective PES models in Vietnam were designed to suit local contexts, none have exceeded expectations in promoting positive collective action, and each model faces unique challenges that undermine the group's efforts, exacerbate underlying issues, or even lead to new conflicts (Nguyen et al., 2022).

Taken together, these debates highlight the need to re-evaluate PFES performance to determine whether the policy is functioning as intended and whether it adequately addresses community needs. While PFES in Vietnam primarily focuses on mobilizing new financial resources for state and local forest co-management and supporting household livelihoods (McElwee et al., 2019), empirical evidence remains limited regarding how the policy is implemented across governance levels and how it reshapes livelihood structures, particularly among ethnic minority households.

In response to these gaps, this chapter empirically examines the implementation of the PFES policy and its contribution to the livelihoods of ethnic minority households. Specifically, the objectives of this chapter are to:

- (i) evaluate the implementation status of the PFES policy at the provincial level;

(ii) assess the current condition of community-based forest management under PFES support; and

(iii) examine the policy's contribution to the livelihoods of ethnic minority households engaged in forest protection.

3.2. Materials and methods

3.2.1. Study sites

The study area for this chapter is Thua Thien Hue Province, with data analyzed at both provincial and community levels. A detailed description of the physical, socio-economic, and institutional characteristics of the study area is provided in Chapter 2; therefore, this section outlines only the analytical scope and data coverage relevant to this chapter.

At the provincial level, Thua Thien Hue Province serves as the unit of analysis for describing PFES implementation, including payment arrangements, and revenue distribution among forest owners, based on administrative and secondary data sources.

At the community and household levels, data were collected in Hong Kim commune, a buffer-zone commune of the Phong Dien Nature Reserve, where PFES-supported forest protection is organized through local forest protection groups. This site provides a community-level context for examining how PFES implementation is reflected in forest management practices and household livelihood structures.

Together, these levels of analysis allow the chapter to link provincial PFES implementation patterns with community-level and household-level observations.

3.2.2. Data collection

3.2.2.1. Secondary data collection

Secondary data were collected from Thua Thien Hue Forest Protection and Development Fund (TTH-FPDF), and Thua Thien Hue Forest Protection Department (TTH-FPD) (annual reports, project reports, provincial statistical data, etc.) related to the PFES and forestry sector at the provincial level. Basic information and data on the natural and socio-economic conditions of research sites were collected from local authorities of the Hong Kim commune, A Luoi district, and Thua Thien Hue province.

3.2.2.2. Primary data collection

Primary data collection in this study combined several methods, such as key informant interviews, focus group discussions, semi-structured interviews, and participatory observations.

For key informant interviews, respondents were officials of the TTH-FPDF, TTH-FPD other officer groups (comprising staff of Forest Protection Department Office of A Luoi District (ALFPDO), A Luoi District's People Committee (ALDPC), and village leader groups (comprising Village Head, Women's Union Head, Farmer Association, Youth Union, and Elderly with Sanding Peerage, FPG Head) to collect information on the situation, progress, and results of PFES implementation at the research site.

Focus group discussions (FGDs) were implemented through unstructured interviews to acquire fundamental issues to identify relevant factors, and design a questionnaire for the household survey. Ten participants were selected and categorized into two groups: forest protection groups (FPGs) and non-forest protection groups (N-FPGs).

Semi-structured interviews were conducted for the household surveys. The questionnaire was built to obtain information related to the profile of households, the livelihood activities of households, rights of withdrawal of forest resources between forest protection groups and non-forest protection groups, reasons for participating and non-participating in forest protection management activities among interviewed households, expectations of people regarding policies to improve their livelihoods, and attitudes towards sustainable forest management. Two villages were selected for the survey in four villages of Hong Kim commune, namely A Tia 2 and Dut 1, with a total of 185 households and 212 households, respectively. The survey sample size was defined based on the formula of Slovin (1960) (Maina et al., 2018):

$$n = N / (1 + Ne^2),$$
 where N is the total population, n is the number of survey samples, and e is the margin of error (usually taken as 10%).

Then, a simple random sampling technique was used to select household interviewees based on the list of households provided by the local government.

A Tia 2 should be 65 interviewees and Dut 1 should be 68 interviewees, divided into two different groups: forest protection group (FPGs, n=67) and non-forest protection group (N-FPGs, n=66) (Table 3.1). The total number of household interviewees was 133 households. Interview surveys were conducted between February and March 2020 (a total of 30 days). The household surveys focused on collecting information relating to the socio-demographic characteristics of respondents, their livelihood activities from agriculture, forestry, and other fields, the impact of PFES on livelihoods, and the local perception of the role of the forest in their lives.

Table 3.1. Basic information of interviewees in Hong Kim commune

Current village name	Previous village name	Group name	The number of households
A Tia 2 (N = 185; n = 65)	Village 2	Forest protection groups (N = 22; n = 18)	18
		Non-forest protection groups	18
	Village 3	Forest protection groups (N = 16; n = 14)	14
		Non-forest protection groups	15
Dut 1 (N = 212; n = 68)	Village 4	Forest protection groups (N = 21; n = 17)	17
		Non-forest protection groups	17
	Village 5	Forest protection groups (N = 22; n = 18)	18
		Non-forest protection groups	16
Total			133

Participatory observations are used to gain insights into the daily activities of forest protection patrols, thereby verifying and comparing it with the initial information gathered through the interview process.



Fig. 3.1. Household surveys in Hong Kim



Fig. 3.2. Participatory observation during a forest patrol with FPG members

3.2.3. Data analysis

Quantitative analysis was conducted using SPSS 20 and Excel software. Descriptive statistics were used to introduce the demographic data of the interviewees. The Mann-Whitney U test was used to compare differences between two independent groups (FPGs and N-FPGs) when the dependent variable was either ordinal or continuous, but not normally distributed. The chi-squared test was used for independent variables in a contingency table to determine whether they were related or not. Multiple regression analysis was applied to identify the relationship between the dependent variable (total income) and other independent variables.

3.3. Results

3.3.1. Evolution of PFES in Thua Thien Hue province

After the reunification of Vietnam in 1975, forests and agricultural lands throughout the country were nationalized, and State Forest Enterprises (SFEs) were established to manage the nationalized forests (McElwee, 2012). However, those who have been living in the vicinity of the forests for generations have been marginalized and deprived of any benefits from the SFEs (McElwee, 2012), leading to disputes over land rights and exploitation areas between villages and SFEs (Hoang, 2006; McElwee, 2004).

Thua Thien Hue province was a pioneer in establishing community-based forest management, which shares resource management between the government and locals. Numerous forestry policies have been implemented since 1991 to decentralize forest management to various forest owners. In 2000, Thua Thien Hue province was among the first localities to allocate forest land and forests to communities and groups of households (Hoang, 2006; Tran et al., 2010). To further promote the socialization of the forestry sector, Thua Thien Hue province issued Decision 430 in 2010, which focused on forest allocation and leasing from 2010 to 2014. According to the TTH-FDPF, in 2020, non-state forest owners, including households, household groups, communities, and the Commune People's Committee, were allotted roughly 103,856.24 hectares of natural forest areas. Despite many efforts, Thua Thien Hue province's forestry sector still has many challenges in managing forest resources and combating illegal logging due to the vast forest cover, distribution of resources in various regions with complex terrain, and limited budget. Although forestry is one of the sectors that Thua Thien Hue province is extremely interested in, the state budget for forest protection and development is still inadequate. These financing sources are modest in size, and are primarily focused on the improvement of social welfare and education (roads, schools, hospitals, etc.) [Interview staff of TTH - FPDF and TTH - FPD, 2023].

As a result, following the successful implementation of the PFES pilot program in Son La and Lam Dong provinces from 2008-2010, with substantial international donor funding from the US Agency for International Development (USAID) and the German development agency, and the national PFES policy issuance in 2010, the People's Committee of Thua Thien Hue province established the provincial-level FPDF under Decision No. 1632/QD-UBND on August 10, 2011. The foundation of PFES is socialized revenue, particularly consumers of clean water and electricity who pay for environmental services through their electricity and water bills, which are collected by water supply companies and hydroelectric plants (referred to as intermediaries or ES buyers). The TTH-FPDF, a newly established state agency, is in charge of distributing the funds to forest owners or those who participated in forest patrolling in order to ensure that forested areas continue the potential to provide environmental services. Moreover, Thua Thien Hue province has been piloting various environmental services from other service users. Revenue from environmental services provided by tourism activities has been piloted at Bach Ma National Park, with an amount of over 100 million VND per year directly paid. The TTH - FPDF also planned to collect the environmental service payments from aquaculture activities, but it had to halt due to the Formosa Marine incident's impact on the locals' livelihoods. The COVID-19 pandemic has delayed the plan of collecting environmental service payments from large industrial power plants, including cement mills, with an estimated sum of about 6 billion VND. Additionally, Thua Thien Hue is one of six provinces piloting carbon sequestration payments in the period 2023-2025.

The provincial government has created a PFES management system by utilizing existing state forest management mechanisms, outlining regulations and compliance based on a national PFES policy. The PFES aimed to lessen reliance on governmental financial sources while assisting forest rangers in managing and safeguarding forests. They assist the provincial FPD in identifying violations and enhancing forest management, but they lack the authority to deal with transgressions on their own. The TTH-FPDF initially received cooperation from forestry organizations, including the province and district forest ranger offices in conducting surveys to identify forest areas qualified to offer forest environmental services. Then, in several watersheds, they mapped up the eligible forest areas. Thua Thien Hue is one of the few provinces in the country where PFES recipients are clearly identified from state forest owners to the communities, group households, and individual houses. Service users (water and hydropower firms) are thus able to precisely determine who should be paid, how much should be paid, and for how many regions. Additionally, the TTH-FPDF has implemented various initiatives utilizing remote sensing technology and policies to monitor and ensure effective,

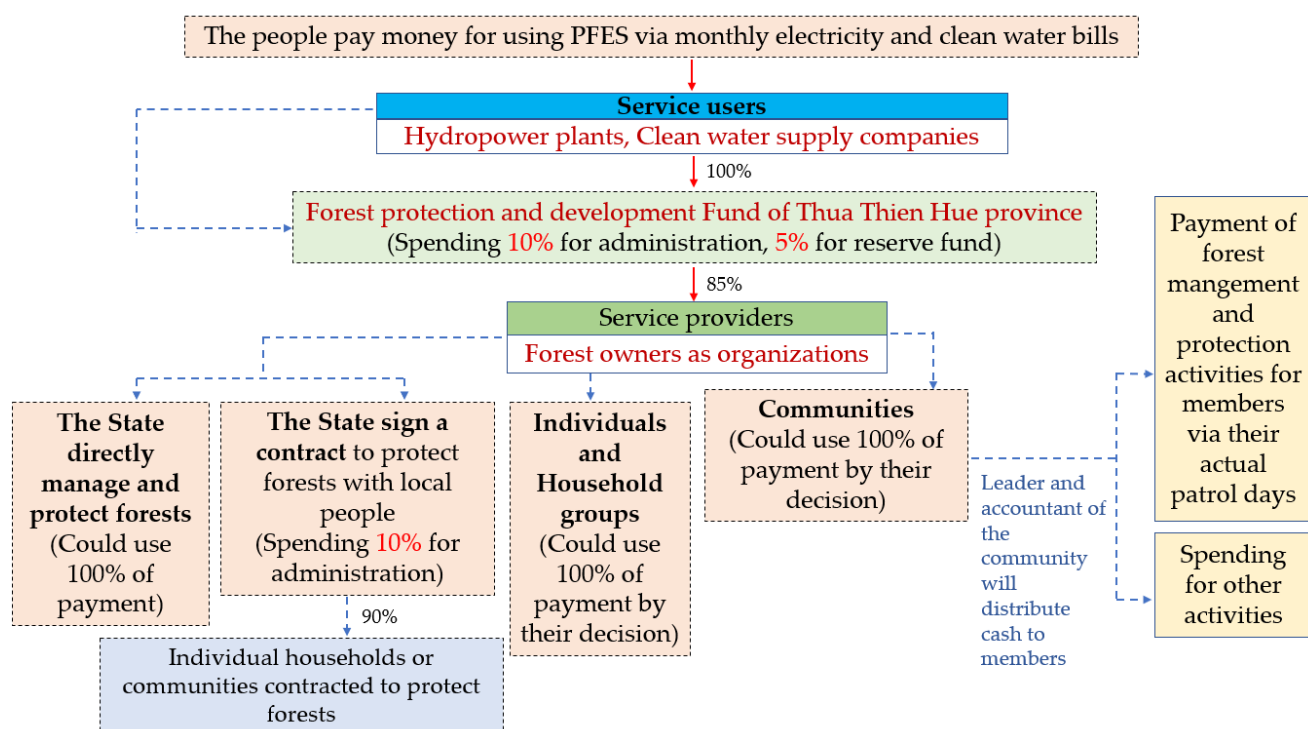
transparent, and fair PFES implementation. Using satellite imagery, the TTH-FPDF will give forest owners and rangers information on locations where forests have been lost or encroached upon. They can cooperate to look into the root reasons and take prompt action to address the issue. In addition, the TTH-FPDF supports local people in using GIS technology in forest patrol activities to monitor and evaluate the efficiency of their work.

Despite being one of the first provinces to pilot community-based forest management, Thua Thien Hue has been under a lot of pressure from small families encroaching on forest land for acacia plantations (Nguyen et al., 2022). The establishment of PFES intends to offer financial help for maintaining and protecting forests in accordance with traditional collective forest management models from previous policies. In the traditional society of ethnic minorities living near forests, the land and forests are either common property (ghost forests, spiritual forests, watershed areas, etc.) or private property (land for shifting cultivation and gardens, and resident land). They managed them according to customary laws with open access for their villagers. Village patriarchs establish strict guidelines for the management and usage of natural resources within and between villages. Ownership conflicts are rare because ownership is clearly defined (Hoang, 2006). TTH-FPDF is trying to help these communities rebuild their traditional customary laws to align with current state forest laws, facilitating strong relations among the community. Besides, they support them in monitoring, patrolling, and building forest protection agreements among local and forest rangers. Communities are allowed to access non-timber forest products and commit to protecting large timber resources in their natural forest areas. Additionally, PFES supports local inhabitants in planting non-timber forest products (medicinal plants) under forest canopies to develop livelihoods. To more quickly identify instances of encroachment on natural forests for the planting of acacia trees, PFES in Hue also employs remote sensing methods. By mandating families encroaching on forests to replant with native species to prevent forest loss and restore forests, they will work in conjunction with forest rangers and local authorities to address infractions.

3.3.2. How to distribute the fund to the service providers in Thua Thien Hue province

The mechanism for allocating payments from PFES in Thua Thien Hue province is basically under the General Regulations on Payment for Forest Environmental Services Nationwide (Decree No. 99/2010/ND-CP; Decree No.147/2016/ND-CP). Service users (hydropower plants, clean water supply companies) collect monthly bills from people using electricity and clean water, including the PFES fee (GSO, 2020). The average selling price of clean water in 2018 was 10,155 VND/m³ (excluding 10% of VAT, 5% of environmental

protection fee for domestic wastewater, and PFES fee with 52 VND/m³ for commercial water use) (Decision No. 54/2016/QD-UBND, 2016). The average retail price of electricity was 1,864.44 VND/kWh in 2019 (including a PFES fee of 36 VND/kWh for commercial electricity, excluding 10% of VAT) (Decision No. 648/QD-BCT, 2019). This means that both electricity and water users have to pay their monthly bills based on their actual use and retail price, including VAT, environmental fees, and PFES fees. One hundred percent of the revenue is directly transferred to the TTH-FPDF every three months. FPDF spends 10% of the total revenue from service users for administration and 5% for contingency funds. The remaining 85% is distributed to service providers, who are forest owners or those who sign a contract in forest protection and management. Forest owners and forest protectors receive a payment amount based on the forest area they are assigned to manage and protect. In terms of the state forest owners, the payment is directly transferred into their organization's bank account. They can use 100% of the money received from the FPDF for the forest area directly managed and protected. If the state forest owners assign their forest area to local communities to support management and protection activities, 90% of the money received from provincial FPDF will be transferred directly to those who participate in forest patrolling activities. Virtually, households or household groups of forest owners are ethnic minorities, most of whom do not have bank accounts. Hence, it is difficult to pay through bank accounts, and direct payment in cash to these forest owners is still preferred. Community forest owners receive money via the community's bank account under the representation of the leader and accountant. The community will use 100% of the money they receive from the FPDF according to the agreement of the entire community. Most of the money received from the PFES will be distributed to those who are directly involved in forest protection according to their patrol days (Fig. 3.3).



Source: The percent and the flow of payment are based on Decree 99 and Decree 147

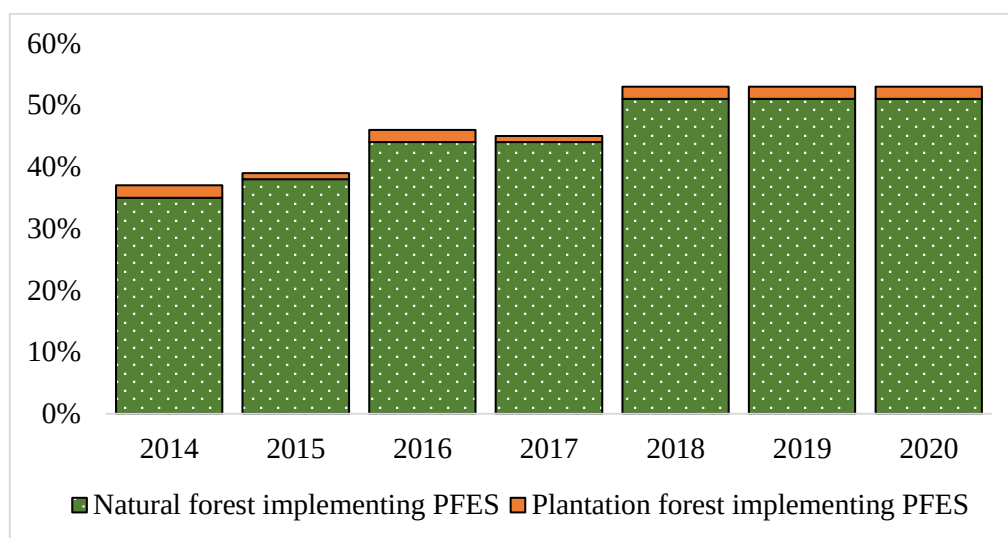
Fig. 3.3. How forest owners and forest protectors receive the payment from service users in Thua Thien Hue province

3.3.3. PFES implementation in Thua Thien Hue province over 10 years

3.3.3.1. Total area receiving payment from PFES

In Thua Thien Hue province, the total area of forested land in 2014 was 297,802.4 ha, of which the natural forest area for PFES was 103,963.38 ha (accounting for 35% of total forest area) and those for the plantation forest area was 5,285.39 ha (accounting for 2% of total forest area) (Fig. 3.4). Since 2016, the area of natural forests receiving PFES has increased to 44% (125,774.86 ha), whereas the corresponding figures for plantation forest area have remained unchanged. From 2018 to 2020, the area of natural forests eligible to provide PFES has increased to 51%, while only 2% of plantation forest areas provide forest environmental services. In general, within seven years of implementing the PFES, the total forest area eligible for service provision increased from 37% to 53% of the total forest area. This is because, in the early years, negotiations with environmental service users faced many difficulties, and only four organizations agreed to sign a commitment to pay for forest environmental services. The forest area to be paid must be within the basins of these hydropower plants. Only forest areas located in three basins, A Luoi, Binh Dien, and Huong Dien, implemented PFES in 2014. In 2016, after the issuance of Decree No. 147/2016/ND-CP on amendments and supplements to

the PFES, the provincial FPDF signed with seven additional organizations using forest environmental services. By 2020, 13 service users were defined, which contributed to an increase in the forest area eligible for the provision of PFES.



Source: TTH-FPDF, 2020

Fig. 3.4. Percentage of the forest area implementing PFES in Thua Thien Hue province

The payments to forest owners (or service providers) shall be calculated by multiplying the forest area providing services, the average payment for one hectare of forest, and the K coefficient (the K coefficient is determined based on forest status, forest type, forest origin, location, etc.) (Decree No. 99/2010/ND-CP, 2010). For the Thua Thien Hue province, the K coefficients of each eligible area were determined in the early years of the PFES implementation. Unit price converted for 1 ha of forest area received payment from PFES is calculated depending on the production capacity of hydropower plants and clean water supply companies located in each basin. There was a significant difference in the amount converted to pay for one hectare between hydropower basins. Specifically, in 2014, the payment per 1 ha in the A Luoi Hydropower basin was the highest at 574,722 VND, while the remaining basins, such as the Huong Dien Hydropower basin and Binh Dien Hydropower basin, received only 86,336 VND and 53,000 VND, respectively. From 2017 to 2020, the unit price converted for 1 ha was balanced to reduce the disparity between the hydropower basins. The converted amount in the A Luoi hydropower basin in 2020 was 400,000 VND, which was lower than in previous years, but still the highest compared to the remaining basins at 230,000 VND and 180,000 VND (Table 3.2). In general, the unit price converted for 1 ha paid for forest environmental services in the basins varied from year to year because it depends on the productivity and revenue of service providers (hydroelectricity and clean water plants) (Table 3.2).

Table 3.2. Unit price converted for 1 ha received from PFES in different Hydropower basins
in Thua Thien Hue province

VND	2014	2015	2016	2017	2018	2019	2020
A Luoi Hydropower basin	574,722	646,165	738,543	450,000	600,000	600,000	400,000
Huong Dien Hydropower basin	86,336	44,615	122,632	297,728	400,000	400,000	230,000
Binh Dien Hydropower basin	53,000	55,680	60,038	297,728	400,000	400,000	230,000
Water source basin	100,000	158,800	165,132	297,728	400,000	400,000	230,000
Thuong Lo Hydropower basin	-	-	7,842	297,278	235,000	235,000	180,000

Source: TTH-FPDF, 2020

3.3.3.2. Total revenue and distribution payment from PFES over 10 years (2011-2020)

Although PFES has been officially implemented in Thua Thien Hue since 2011, it began to receive payment from service providers in 2012. The total revenues and distribution payments from the PFES between 2012 and 2020 are listed in Table 3.3. From 2011 to 2020, the total revenue from the PFES payment was 239,436 billion VND, of which 92% was from hydropower production plants, only 7.5% was from clean water companies, and 0.5 % was obtained from bank interest. The revenue from PFES still fluctuates from year to year due to its heavy dependence on two service users, namely hydroelectricity and clean water companies. According to a report from the Fund, the dynamic debt ratio and slow capital recovery from these service users greatly affected the allocation of funds to service providers. Other users of forest environment services, such as tourism businesses and industrial and aquaculture production establishments (mentioned in Decree 99/2010), have not been identified in Thua Thien Hue. Ten years after implementing the PFES, 87% of the total revenue from the PFES was transmitted to service providers (207.308 billion VND). State forest owners received 77% of the amount from the PFES, while non-state forest owners received only 23% (Fig 3.5).

Table 3.3. PFES revenues and distribution to the service providers in Thua Thien Hue province over 10 years

Billion VND	Hydropower plants	Clean water supply facilities	Interest from the bank	Total revenue from PFES	PFES payment distributes	PFES payment distributed to the	PFES payment distributed to Non-
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					to service providers	State service providers	State service providers
2011	-	-	-	-	-	-	-
2012	-	0.791	0.003	0.795	-	-	-
2013	7.096	2.720	0.090	9.905	-	-	-
2014	22.932	1.620	0.124	24.676	11.283	7.163	4.119
2015	34.054	1.727	0.374	36.155	14.637	8.478	6.159
2016	17.891	1.821	0.397	20.109	19.694	12.583	7.111
2017	36.156	2.276	0.183	38.615	34.030	27.150	6.880
2018	28.763	2.494	0.108	31.366	48.712	40.100	8.612
2019	41.128	2.717	0.071	43.915	48.762	40.174	8.588
2020	31.994	1.856	0.050	33.900	30.190	24.841	5.349
Total	220.014	18.022	1.401	239.436	207.308	160.490	46.818

Source: TTH-FPDF, 2020

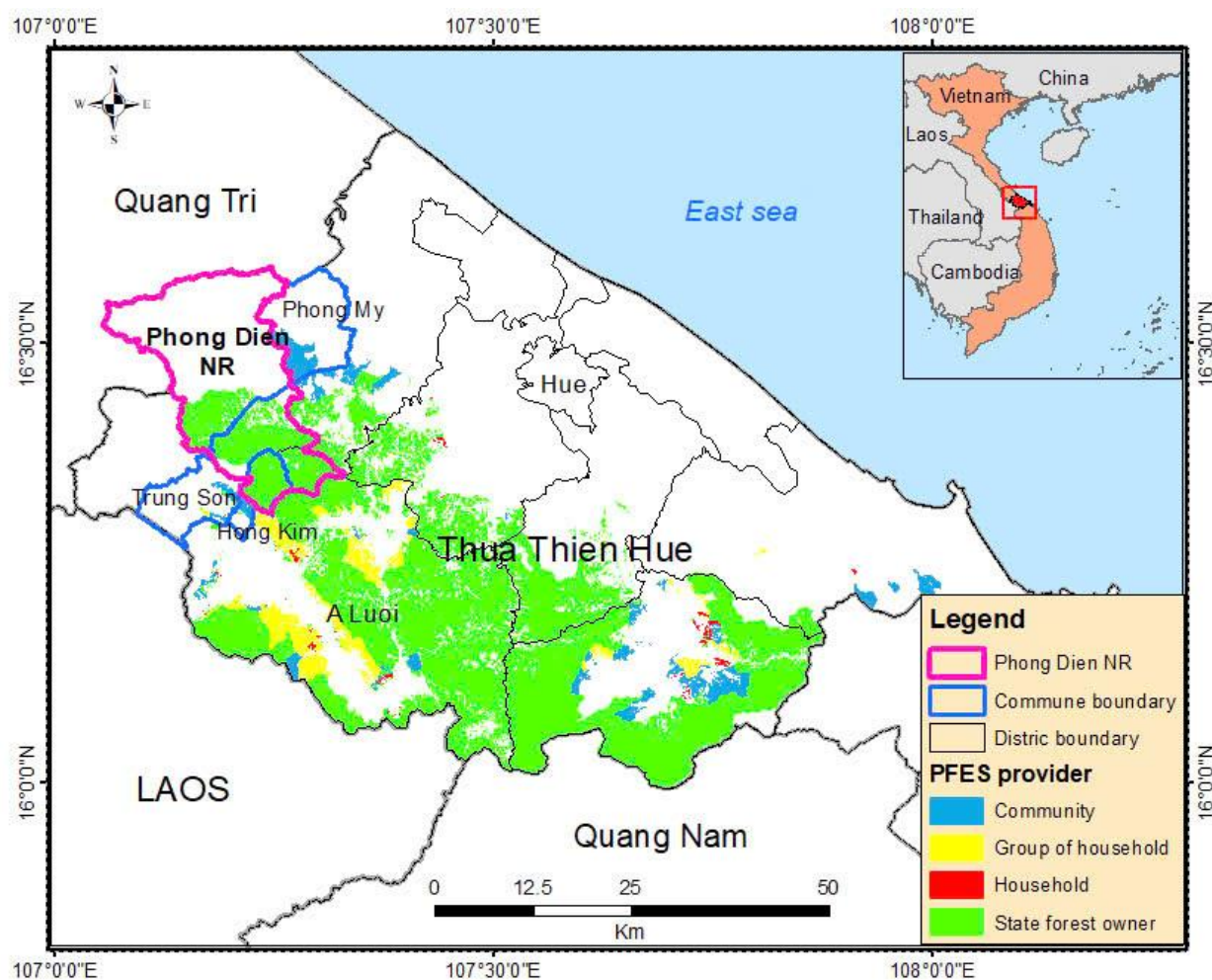


Fig. 3.5. Map of forest owners receiving payment from PFES in TTH province in 2020

3.3.4. PFES in Hong Kim commune

3.3.4.1. History of forest protection groups

In 2005, although forest resources were strictly managed by the state, illegal hunting and logging still occurred frequently. The policy of allocating forests to the community for management according to Decision No. 430/QD-UBND of the TTHPPC in 2010 is considered a fundamental policy for community forestry development in Hong Kim commune. In 2013, six forest management and protection groups were established to manage more than 400 ha of forest allocated to communities. Initially, the selection of FPG members was done by local authorities in collaboration with village heads to call for voluntary participation from households, and the people involved in forest protection had not received any benefits from patrolling activities. Members of the FPG organized patrols with the support of local forest rangers and commune forestry officers, but lacked financial support. Hence, although forest patrols have been put into operation, they have not been effective in limiting illegal logging and

encroachment on forest land. In 2014, PFES began to be piloted in the Hong Kim commune, with the goal of supporting forest protection and management activities. The former FPG groups have been kept and maintained with more methodical patrol activities under the support of PFES. Compared with N-FPGs, those who are not involved in forest protection, FPG members were trained and guided in forest patrolling methods, had the opportunity to have access to many forestry projects and programs, and received payment from PFES.



Fig. 3.6. Community forest receiving PFES payments



Fig. 3.7. One FPG member using supporting equipment for forest patrolling

3.3.4.2. The reasons why respondents join and do not join the forest protection group

Through group discussions, we asked interviewees of both FPGs and N-FPGs to list the reasons why they participated and did not participate in the forest protection groups. Subsequently, household survey questionnaires were built based on the information gathered from group discussions. Interviewees find it free to choose the reason from a list of multiple choices (Fig. 3.8 and 3.9). The interview results (Fig. 3.8) show that 70% of the interviewees participated in FPGs because they gained benefits from PFES and other projects. Since Hong Kim is a mountainous commune with a high poverty rate in the A Luoi district, there are many forestry-related livelihood development projects, such as the afforestation program named 147 in 2013, the Greater Mekong Subregion Biodiversity Conservation Corridors Project (BCC project) for the period 2014-2019, and the United States Agency for International Development Green Annamites Project (USAID Green Annamites) to support the development of community-based tourism in 2019. Through household surveys, most of the interviewees at N-FPGs and FPGs said that the criteria for selecting participants in these projects were considered by local authorities. Members of the FPGs were also given priority in forestry development

programs in the area than N-FPGs because they were contributors to the management and protection of local forests. Specifically, all members of the FPGs agreed to take part in the project to enrich the forest by planting native trees and planting rattan under the forest canopy, funded by the BBC project. They gain not only cash benefits but also training to enhance capacity. In addition, Hong Kim started to develop community-based tourism since 2017, and the local authorities defined that members of the FPGs were also members of community-based tourism groups. Thus, from respondent aspects, compared to N-FPGs, participating in FPGs will give them more opportunities to gain monetary and non-monetary benefits (Fig. 3.8). More than half of the interviewees said that they love nature and forests; therefore, they applied to become members. Approximately 12% of respondents believed that if they have an opportunity to act as forest patrols, their offspring can inherit the forest protection outcomes in the future (Fig. 3.8). During an interview, a member of the FPGs said that *"Initially, when the community was assigned forest by the state, local residents did not gain any benefits because the allocated forest was poor, and the government firmly forbade the use of timber and wildlife. I nevertheless offered to take part since I believe that the establishment of FPGs will forge close ties among community members, and I also hope that by doing this, my offspring would be able to see the dense forests as I used to see when I was a child"*.

On the other hand, after conducting household interviews with the N-FPGs to find out why they did not join the group, 35% of respondents said that the number of members to join FPGs was limited, and there was a consideration among the members. Since the forest area allocated to communities in the Hong Kim commune was very limited, only about 400 ha, the number of people selected to be FPG members was more than 120 out of 553 households. During the household interviews, the study found that members wishing to join the FPGs must apply for and be approved by the management board and local authorities. Others thought that they did not know information about recruiting members (9%). More than a third of the interviewees had to spend time doing other jobs to improve their poverty (Fig. 3.9). When asked, "If you are agreed to become a new member of the forest protection and management group, do you want to participate in?", 62% of respondents also wanted to participate in forest patrolling because they would not only profit from PFES cash, but also help protect the future for their next generation.

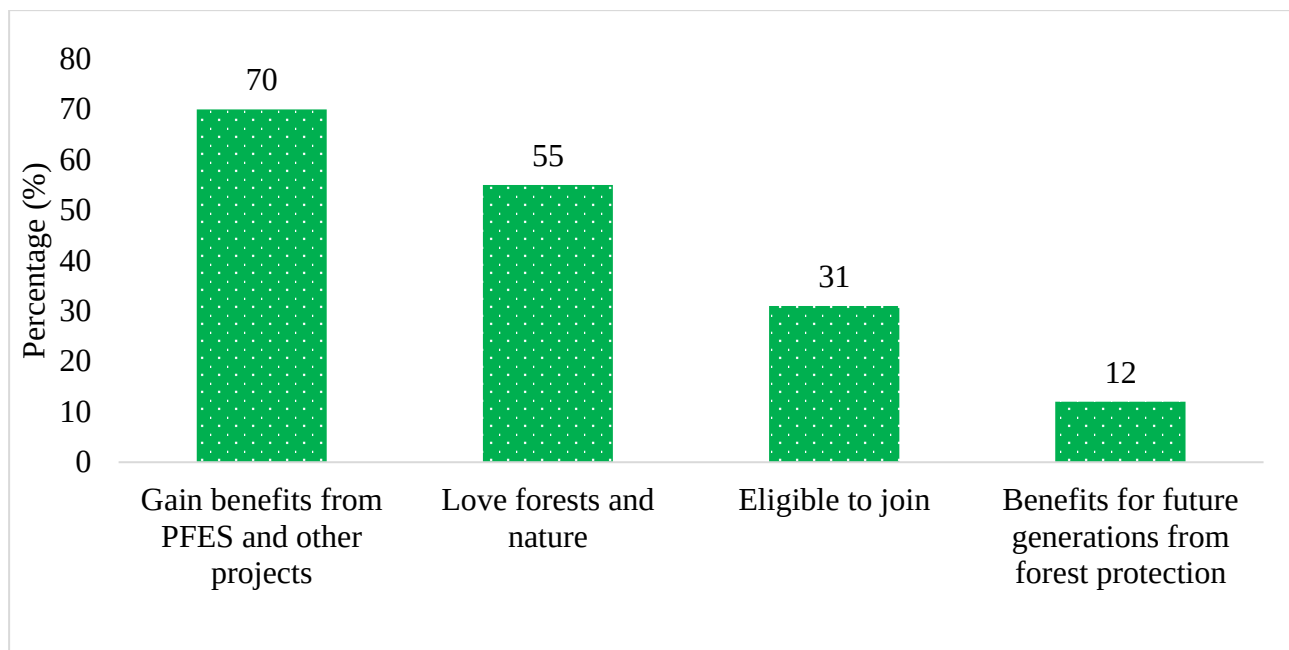


Fig. 3.8. Reason for becoming a member of FPGs (Multiple choices) (n=67)

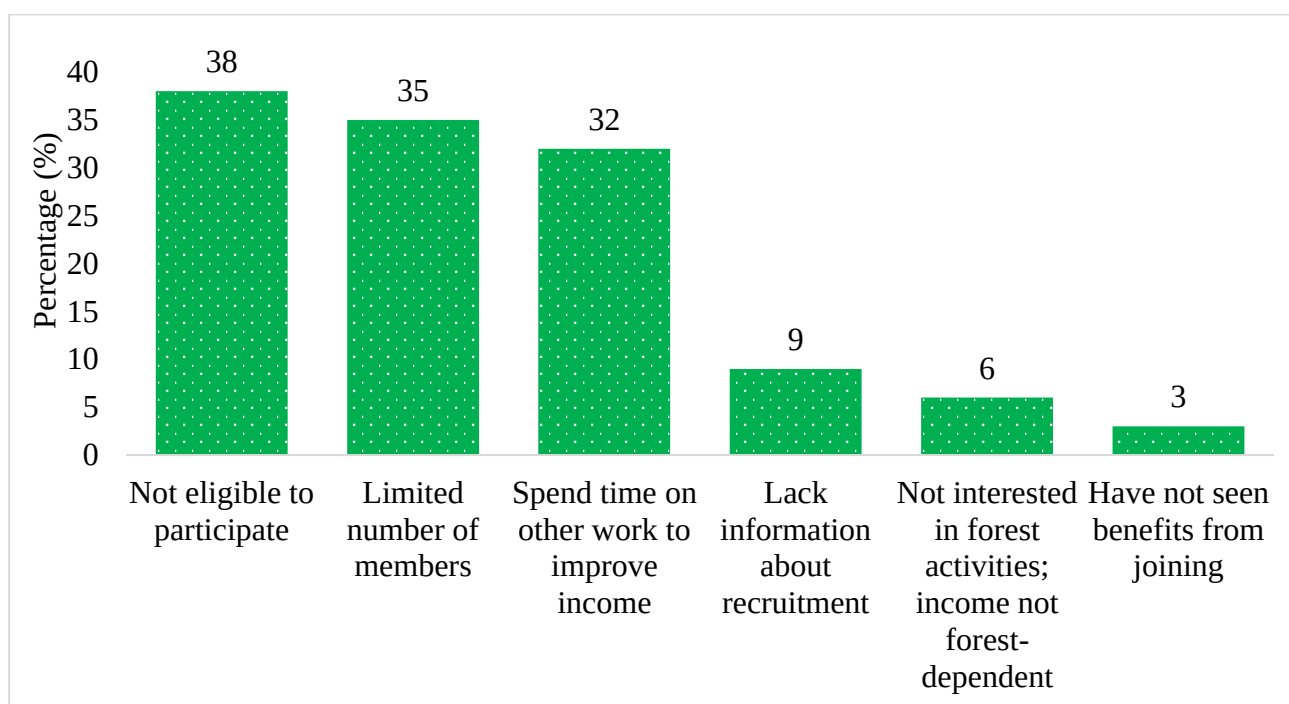


Fig. 3.9. Reason why interviewees did not join FPGs (Multiple choices) (n=66)

3.3.4.3. Characteristic of households interviewed

Table 3.4. Characteristic of the interviewees in 2020

Categories	Socio-demographic characteristic					
	N-FPGs		FPGs		Total	
	n = 66		n = 67		n = 133	
	n	%	n	%	n	%
1. Gender						
- Men	36	55	44	66	80	60
- Women	30	45	23	34	53	40
2. Age group						
- Under 25 years old	4	6	0	0	4	3
- From 25 to 35	20	30	14	21	34	26
- From 36 to 45	20	30	31	46	51	38
- From 46 to 60	12	18	17	25	29	22
- Over 60 years old	10	15	5	8	15	11
3. Occupation						
- Farmer	50	76	49	73	99	74
- Builder/mason	1	2	1	2	2	2
- Hired worker	9	14	2	3	11	8
- Business	2	3	0	0	2	2
- Government officials	3	5	13	19	16	12
- Teacher	1	2	2	3	3	2
4. Ethnicity						
- Paco	61	92	64	96	125	94
- Kotu	0	0	1	2	1	1
- Kinh	5	8	2	3	7	5
5. Education level						
- Illiterate	9	14	8	12	17	13
- Literate	14	21	5	8	19	14
- Primary school	4	6	14	21	18	14

Categories	Socio-demographic characteristic					
	N-FPGs		FPGs		Total	
	n = 66		n = 67		n = 133	
- Secondary school	17	26	20	30	37	28
- High school	17	26	12	18	29	22
- University	5	8	8	12	13	10
6. Type of household						
- Poor	27	41	19	28	46	35
- Near poor	10	15	10	15	20	15
- Average	29	44	38	57	67	51
7. Households whose members work away from home	23	32	28	42	51	38

Table 3.4 demonstrates that the gender of respondents was moderately balanced in the N-FPGs. Men (66%) were dominant among the interviewees in FPGs. The age of respondents in N-FPGs from 25 to 45 years old had the highest percentage (60%), while the middle-aged demographic from 36 to 45 years old (46%) was overwhelmingly large in FPGs. Young people prefer to do other jobs and are not interested in FPGs, and the elderly are not healthy enough to participate in this activity. The occupations of the interviewees in both N-FPGs and FPGs were mainly farmers at 76% and 73%, respectively. Only 3% of interviewees in FPGs were hired workers, whereas the number of N-FPGs was four times higher. Additionally, approximately a fifth of respondents in FPGs had a job as government officials, while only 5% of N-FPGs had the same occupation. Paco was the dominant ethnic group in both groups, while Kinh and Kotu were minor. Regarding the education level of respondents, almost a tenth of the interviewees experienced illiteracy in both groups. Most of them were elderly individuals. The number of respondents with a university level in FPGs made 12% which was 4% higher than that of N-FPGs. At the high school level, N-FPGs (26%) was higher than that in FPGs (18%). Forty-one percent of respondents in N-FPGs experienced poor conditions while more than a quarter of FPGs lived under the poor. In contrast, average households in FPGs accounted for 57%, which was 13% higher than that of N-FPGs. This household classification was based on government standards (Decision No. 59/2015/QĐ-TTg, 2015). High poverty incidence might have a great influence on the management of natural resources because the dependence of the poor on the sources of goods and services from natural forests is enormous (Sunderlin and Huynh, 2005).

Currently, job opportunities in this mountainous area are unstable. The households with family members working far from home in both groups were relatively high at 32% and 42%, respectively. Most of them moved to Da Nang City or the South of Vietnam (Binh Duong City, Ho Chi Minh City) to find a job at garment, leather, and wood processing companies to send the money back to support their families. This money was used to pay off previous loans to the bank to build a brick house, buy a motorbike, or invest in agriculture.

3.3.4.4. Contribution of PFES to livelihood income of FPGs

Table 3.5. Cash income sources per household per year in Hong Kim commune

Categories		N-FPGs (n = 66)			FPGs (n=67)			Mann-Whitney U test
Cash income (million VND)		n	Mean	Std. D	n	Mean	Std. D	p-value
On-farm income	- Crops	21	2.238	4.277	45	1.884	1.884	0.593
	- Animal husbandry	35	6.560	7.541	46	7.880	7.598	0.176
	- Acacia plantation	24	1.738	1.932	38	3.195	9.996	0.856
	- NTFPs	9	5.811	9.349	9	10.689	9.996	0.145
Off-farm income	- Hired agricultural labor	38	27.134	15.691	26	28.331	12.186	0.424
Non-farm income	- Officers, freelance business, hired non-agriculture	59	48.586	48.773	62	53.984	43.324	0.269
	-PFES	0	0	0	67	1.152	0.303	
Total income per year		66	64.671	41.580	67	72.025	40.847	0.215

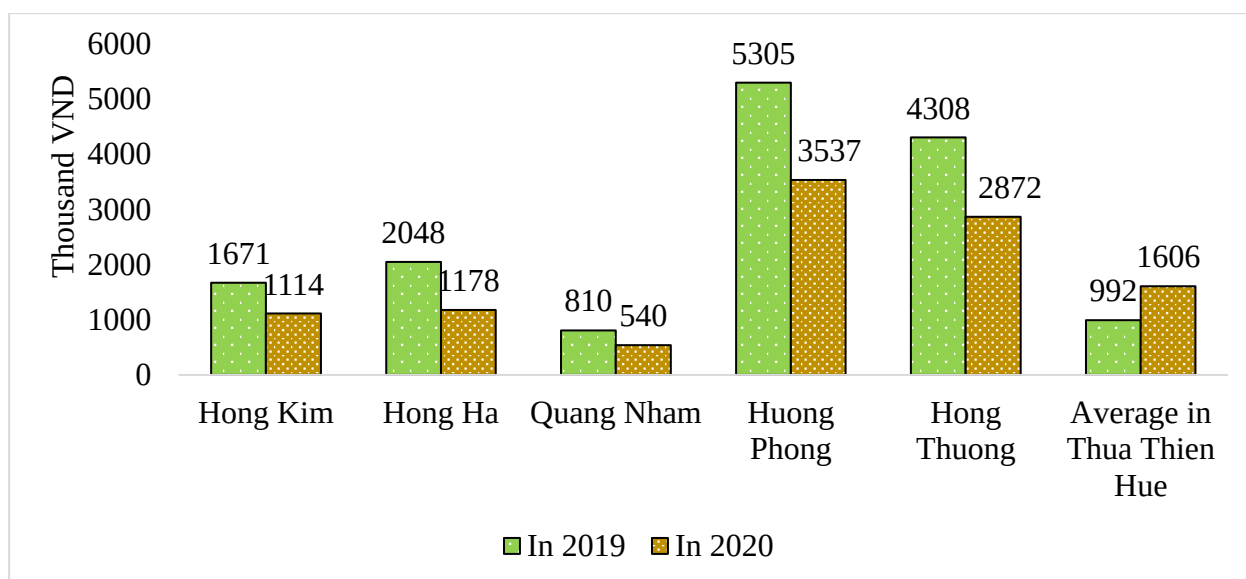
Table 3.5 shows that total income of N-FPGs was 64.671 ± 41.580 million VND, whereas the corresponding number for FPGs was 72.025 ± 40.847 million VND. The on-farm income from crops, livestock, acacia plantations, and collecting non-timber forest products, made up a small part to the total income structure of both FPGs and NPGs. Income from nonfarm and hired labor activities contributes remarkable high amounts to total income of both FPGs and N-FPGs. These findings are consistent with (Nguyen et al., 2020) on income structure of households in Hong Kim commune in 2018. Mann-Whitney U test revealed that there were no

significant differences in the total income and each income sources between the two groups. The primary livelihood activities of the local communities are presented in Fig. 3.10.



Fig. 3.10. Livelihood activities of interviewees

The average income from PFES per capita per year in Thua Thien Hue province was calculated by dividing the total PFES revenue by the total number of members of FPGs in each commune (Fig. 3.11). Figure 3.11 indicates some variation in the income per capita per year from PFES between 2019 and 2020. Specifically, in 2020, each member joining FPGs in Hong Kim commune received 1,114,000 VND from PFES, which was lower than the average amount from PFES per person at the whole province level (1,606,000 VND). FPGs in Huong Phong and Hong Thuong commune received amounts that were two to three times higher, respectively, than those in Hong Kim commune.



Source: TTH-FPDF

Fig. 3.11. Average income from PFES per capita per year in Hong Kim commune and the other communes in Thua Thien Hue province

3.3.4.5. Identification of factors related to household income in Hong Kim commune

A multiple linear regression model was employed to examine the relationship between household income and a set of independent variables in Hong Kim commune. The dependent variable was total annual household income (hereafter referred to as total income per year), while the independent variables comprised (1) age; (2) education (dummy variable: 0 = below high school level, 1 = high school education or higher); (3) dependence ratio (calculated as the proportion of household members who do not earn income, such as children, the elderly, or other non-working members, relative to the total household size, multiplied by 100); (4) total number of main laborers; (5) having household members working far from home (dummy variable: 0 = no, 1 = yes); (6) wet rice area (log); (7) home garden area (log); (8) annual crop area (log); (9) perennial crop area (log); (10) plantation area (log); (11) fish pond area (log); (12) access to loans and credit (dummy variable: 0 = no, 1 = yes); (13) participation in forest protection groups (dummy variable: 0 = no, 1 = yes); and (14) harvesting NTFPs in community forests (dummy variable: 0 = no, 1 = yes).

Table 3.6. Factors associated with total household income in Hong Kim

Explanatory variables	Total income per year of both groups	
	Coefficients Beta	VIF
Age	0.058	1.471
Education level	0.232**	1.184
Dependency ratio	-0.221**	1.685
Main labor in the household	0.100	1.650
People working far from home	0.054	1.343
Wet rice land area (log)	-0.323***	1.236
Home garden area (log)	-0.073	1.130
Annual crop area (log)	0.134	1.176
Perennial crop area (log)	-0.081	1.121
Plantation land area (log)	0.170*	1.300
Fish pond area (log)	0.080	1.244
Access to the credit	-0.034	1.205
Access to the natural forest	-0.131	1.264
Participate in forest protection group	0.132	1.225
R squared	0.319	
Observations	133	

*, $p < 0.10$; **, $p < 0.05$; ***, $p < 0.01$

Table 3.6, which shows explanatory variables based on their contribution (irrespective of positive or negative signs) in elucidating the outcome, indicates that the model explained 31.9% of the variation in total annual household income. Table 3.6 reveals that multicollinearity did not exist in the model because the VIF for all variables was < 5 (Jim, 2020). Some coefficients were statistically significant ($p < 0.01$, $p < 0.05$, and $p < 0.1$) with the expected signs. The beta weight (coefficients beta) measures how much the outcome variable increases (in standard deviations) when the explanatory variable is raised by one standard deviation, assuming that other variables in the model are kept constant. It is a useful measure variable (Dhakal, 2018). Notably, the value of beta coefficients (Table 3.6) shows that the education level of the household head (0.232) plays a larger role in the total household income compared to the remaining associated factors.

3.4. Discussion

3.4.1. PFES implementation at the provincial level

The area of forest receiving payments from forest environmental services has increased over the past seven years (Fig. 3.4), which opens up opportunities for communities living near forests, especially those involved in forest management and protection activities benefit from this policy (Clements and Milner-Gulland, 2015; Suhardiman et al., 2013). In reality, the difference in unit price converted per 1 ha receiving payment among hydropower basins in the whole province (Table 3.2) rose comparisons related to PFES payments among forest protectors. This is because the amount of money that forest protectors receive depends on the allocated forest area and the unit price paid for one hectare. Fig. 3.11 shows that there is a difference in the average income from PFES per year per capita in each commune. Although they perform forest protection patrols with the same roles and responsibilities, their incomes are very different. This might create conflicts among people living in the same area but located in different hydropower basins or neighboring areas, especially minor ethnic minorities. Notably, income disparity from forest patrols might greatly affect people's awareness and effectiveness of forest protection and management, such as the number of times to patrol the forest, the number of people participating in a patrol, and the work done during the patrol. Therefore, it is necessary to adjust and balance the source of money from the PFES so that it can contribute to the income structure of forest protectors. In addition, revenue from PFES is not stable over the years owing to the limitations of service users. Hence, to create motivation and incentives for forest patrolling activities, other service users who benefit from PFES should be identified (according to Decree 99) (tourism business, industrial, and aquaculture production establishments). The provincial government and TTH-FPDF should review and negotiate to expand the beneficiaries of forest environmental services to create a stable source of income, and reduce dependence on the two current beneficiaries (hydropower plants and clean water supply companies). In addition, it is essential to properly balance the unit cost and the source of payment, so that the income from PFES for people participating in forest protection is increased commensurate with their efforts and responsibilities. It is vital to develop stricter legal provisions on the responsibilities of the parties involved. Although FPGs are in charge of making sure that their allotted forest area is kept in good condition, any loss of forest cover just reduces their PFES payment without subjecting them to additional duty (Nguyen et al., 2022). Additionally, there has been a lack of attention given to maintaining forest quality in the event of forest degradation during the province's adoption of PFES. While remote sensing technology

has effectively monitored forest patrols, there is a need to establish additional commitments between forest owners or those involve in forest patrols and TTH-FPDF to restore degraded forests increase responsibility in forest patrols. For service users, payment regulations and reasonable payment deadlines should be introduced to limit late payments and outstanding debt. This will solidly bind the participation of stakeholders.

3.4.2. PFES contribution at the community level

Although this study could not clearly indicate that FPG members were selected by social relationships, more members of the FPGs were government officials (Table 3.4). This might marginalize vulnerable households (low education, poor households, weak social ties, etc.) in competition to become members of the FPGs due to limited membership. It is better to openly and transparently select members to ensure fairness and promote the effectiveness of the PFES to involve the entire commune. FPGs were dominated by men (Table 3.4). Revelo et al. (2011) also indicated that forestry is widely identified in men and that the design of formal forestry policies and management is mostly dominated by men. A prerequisite for members in FPGs in the Hong Kim commune was to have good health, experience in walking through the forest, a high sense of responsibility, and stable work in the locality. Through a forest transect walk with FPG members, we found that the road to conduct forest patrols is quite far and inaccessible by means of transport. Forest patrollers have to walk on foot through small, narrow, and dangerous roads in the natural forest. Usually, an entire day is required to complete this job. Besides, this is a sensitive job; it is quite tough if the patrol process encounters aggressive illegal logging and hunting. Thus, men are likely to be more suited to this job than women in the Hong Kim commune. In fact, local people carry out group forest patrolling (four or five members joining per one-time patrol) to manage the forest and reduce risks, so that women with good health and experience could still participate in this work.

Based on the great dependence on forest resources for livelihood development, many changes in livelihood resources were detected in this study, and wet rice cultivation and extraction of resources from natural forests (such as collecting NTFPs) are no longer the core cash income for households (Table 3.5). Nguyen et al. (2020) also indicated that the impact of a series of forestry policies has changed the land-use history and traditional farming practices of local citizens in the Hong Kim commune. In fact, hired labor in the forestry sector, such as peeling and transporting acacia timber, and working far away was a new trend to adapt to the difficulties in limiting natural resources and scarcity of job opportunities in remote areas. In particular, the tendency to leave their motherlands to seek jobs in the city is becoming popular

(Table 3.4). Although this transformation helps households improve income, household standards, or even tackle their debt, there is also a need to look at the future of the community. There may be a shortage of young, healthy, and dynamic people who inherit forest patrol activities. Hence, to maintain the sustainability of PFES implementation in the future, more attention should be paid to raising awareness among young people and encouraging them to participate in forest protection patrols so that the next generations are responsible for continuing this work.

One of the aims of the government to implement the PFES policy is to engage crucial stakeholders in protecting forests, improving local livelihoods, and contributing to poverty alleviation (To et al., 2012). Nonetheless, our findings (Table 3.5) indicate that PFES payment (accounting for 2% of total household income) does not contribute significantly to the income of households engaged in forest management and protection in the Hong Kim commune, and it seems that the reflection of this fact contradicts the PFES program's purpose. This finding is consistent with (Diswandi, 2017; Pham et al., 2020b, 2018; To and Dressler, 2019). Specifically, in Thai Hung village, Moc Chau district, Son La province, the average income from PFES is 509,436 VND/household/year, accounting for only 1% of the total average income (35,000,000 VND/household/year). Similarly, the proportion of income collected from PFES to total household income in other villages such as Ban Lun, Ban Ang I, Ban Bua, and Ban Cang Ty is also very low (2-5%) (Diswandi, 2017; Pham et al., 2020b). A study in West Lombok, Indonesia, applying an econometric model, also indicated that the PES program did not derive the peasants' welfare (Diswandi, 2017). In contrast, the PES contribution for Ban Tong was quite high, accounting for 15% of the total household income. This was because the total household income per year was as low as approximately 15,000,000 VND, and the PFES's income was 2,276,661 VND higher than in other villages (Pham et al., 2020b). Another study in Cat Tien National Park, Dong Nai province in 2019 (Pham et al., 2020a) found that PFES play a key role in household income. Each household received approximately 28 million VND/year from the PFES. Because households belonging to the category with good income in the village earn from PFES about 50-70 million/year, PFES contributed up to 50% of the income of better-off households in the village. Tran et al. (2019) estimated the results of multiple log-linear models on factors influencing income, and also found that PFES significantly contributed to the household's income of farmers in the Da River basin. Do and NaRanong, (2019) conducted research in Thua Thien Hue and Quang Nam provinces and pointed out that the PFES policy has a positive impact on household income, and there was a significant difference in total income between poor households with and without PFES. As

discussed here, the contribution of PFES to household income varies depending on the amount of PFES and household income. However, considering that the PFES income in our study was comparable to its average in Thua Thien Hue province (Fig. 3.11) and the household income was not as high as the values reported, we could conclude that the contribution of PFES to household income is generally low.

Notably, even though the PFES scheme did not drastically improve the livelihoods of participants, the nexus with external stakeholders began to generate options for participants to diversify or seize greater value from their income sources (Leimona et al., 2010). Similarly, the results of household interviews have revealed that non-monetary benefits are a significant motivator for local inhabitants to be involved in PFES in the Hong Kim commune. Nonetheless, it is the fact that PES schemes may not work effectively if poor communities, which are most dependent on land for their livelihoods, are excluded from the systems. Endeavors must therefore be built to integrate these populations and broaden the benefits of PES schemes (Mayrand and Paquin, 2004).

In line with previous studies (Tran, 2015; Vu, 2020), I found that education has a positive effect on household income (Table 3.6). People with a higher level of education earn more money than those with minimal education. As shown in Table 3.6, the dependence ratio is negatively associated with total income per year. The same finding was also reported in previous studies (Nguyen and Nguyen, 2019a; Tran, 2015; Tran and Nguyen, 2018; Vu, 2020). They found that having more dependent members and more family members, in general, is likely to reduce per capita income. Regarding the role of land assets in total household income, while only forest land had a positive effect on total household income, the remaining types of land were not associated with total household income. Tran and Nguyen (2018) and Tran et al. (2019) also revealed that forest land plays an integral part in the livelihood of local households. Although wet rice land was correlated with total income, the results showed a negative effect. This coincides with the actual survey results in the locality, suggesting that farmers with large paddy fields do not need to earn much cash income because their rice production could meet the demand of their consumption. Notably, there was no significant contribution of participation in forest protection groups to total household income (Table 3.6).

3.5. Conclusion

The study was set out to elucidate the PFES framework in Thua Thien Hue province and its influence on forest management activities and household income in the Hong Kim commune. The research results revealed that the success in negotiating and expanding the number of

service beneficiaries increased the forest area receiving PFES from 37% to 53% of the total forest area over seven years. This revenue contributes a very important part in supporting the state budget to invest in forest protection and development in the province. In addition, this revenue also contributes to opening the door to benefit from PFES for forest owners and people participating in forest protection patrols. However, the study also found that revenue from PFES still fluctuates from year to year due to their great dependence on the limited number of service users. This greatly affects the stability of income and the motivation to protect the forest of service providers. In fact, the PFES fund distributed to state-forest owners was dominant, while a smaller amount was transferred to non-state forest owners because the state holds the majority of the nation's forest area. Thanks to the use of remote sensing technology, the implementation of PFES in Thua Thien Hue has substantially improved when compared to other areas in supporting community forest patrols. However, PFES implementation in the province has not paid enough attention to sustaining forest quality during forest deterioration, highlighting the need for additional commitments between forest owners and TTH-FPDF to restore degraded forests and raise accountability in forest protection activities.

At the community level, total income was correlated with education level, dependence ratio, wet rice land, and forest land. Notably, participation in forest protection groups did not affect the total income. The study concluded that PFES payment (2%) does not contribute significantly to the income of households engaged in forest patrols in the Hong Kim commune. The study also found that although many reasons led to the decision of local residents to join the FPGs, both monetary and non-monetary benefits from PFES and other projects seem to incentivize for local people to become members of FPGs. However, the impact of forestry policies and changes in market mechanisms has affected Paco people to change their livelihoods to adapt to the limitations of natural resources and scarcity of job opportunities in remote areas. PFES's promise seems unclear in the Hong Kim commune, and an increasing number of local inhabitants decided to leave their motherland to seek a job in the city to improve their livelihood income.

References

- Aguilar Revelo, L., Quesada-Aguilar, A., Shaw, D.D.M.P., International Union for Conservation of Nature, Women's Environment & Development Organization, 2011. Forests and gender. IUCN ; WEDO, Gland, Switzerland; New York.
- Clements, T., Milner-Gulland, E.J., 2015. Impact of payments for environmental services and protected areas on local livelihoods and forest conservation in northern Cambodia. *Conserv Biol* 29, 78–87. <https://doi.org/10.1111/cobi.12423>
- Decision No. 54/2016/QĐ-UBND, dated August 19, 2016, on Approving the clean water pricing plan and promulgating the tariff for domestic clean water in TTH province, 2016.
- Decision No. 59/2015 / QĐ-TTg, issued on November 19, 2015, promulgating the multi-dimensional approach poverty lines applicable to the period 2016-2020., 2015.
- Decision No. 430/QĐ-UBND, dated March 2, 2010, of the People's Committee of Thua Thien Hue province, on approving the project of forest allocation and forest leasing in Thua Thien Hue province for the period 2010-2014, 2010.
- Decision No. 648/QĐ-BCT, dated March 20, 2019, of the Ministry of Industry and Trade, on adjustment of average retail electricity price and regulation of electricity selling price, 2019.
- Decree No. 99/2010/ND-CP, dated September 24, 2010, of the Government, on the policy on payment for forest environment services, 2010.
- Decree No.147/2016/ND-CP dated November 2, 2016, of the Government, on amending and supplementing a number of articles of the Government's Decree No. 99/2010/ND-CP of September 24, 2010, on the policy on payment of forest environment service charge, 2016.
- Dhakal, C.P., 2018. Interpreting the Basic Outputs (SPSS) of Multiple Linear Regression 8, 6.
- Diswandi, D., 2017. A hybrid Coasean and Pigouvian approach to Payment for Ecosystem Services Program in West Lombok: Does it contribute to poverty alleviation? *Ecosystem Services* 23, 138–145. <https://doi.org/10.1016/j.ecoser.2016.12.005>
- Do, D.T., NaRanong, A., 2019. Livelihood and Environmental Impacts of Payments for Forest Environmental Services: A Case Study in Vietnam. *Sustainability* 11, 4165. <https://doi.org/10.3390/su11154165>
- General Statistics Office (GSO), 2020. Statistical Yearbook of Viet Nam 2019. Statistical Publishing House.

- Hoang, H.T., 2006. Decentralization and local politics of forest management in Vietnam: a case study of Cờ Tu ethnic community. *The Journal of Legal Pluralism and Unofficial Law* 38, 169–206.
- Jim, F., 2020. *Multicollinearity in Regression Analysis: Problems, Detection, and Solutions*.
- Leimona, B., Pasha, R., Rahadian, N.P., 2010. The livelihood impacts of incentive payments for watershed management in Cidanau watershed, West Java, Indonesia. Payments for environmental services, forest conservation and climate change: livelihoods in the REDD? 106–129. <https://doi.org/10.4337/9781849806015.00011>
- Maina, E.W., Mugambi, F., Waiganjo, E., 2018. Effect of Strategic Product Development Practices on Competitiveness of Kenyan Tea in the Global Market. *Bus Eco J* 09. <https://doi.org/10.4172/2151-6219.1000340>
- Mayrand, K., Paquin, M., 2004. Payments for Environmental Services: A Survey and Assessment of Current Schemes 60.
- McElwee, P., 2004. You Say Illegal, I Say Legal: The Relationship Between ‘Illegal’ Logging and Land Tenure, Poverty, and Forest Use Rights in Vietnam. *Journal of Sustainable Forestry* 19, 97–135. https://doi.org/10.1300/J091v19n01_06
- McElwee, P., Bernhard, H., Nguyen, T.H.V., 2019a. Hybrid outcomes of payments for ecosystem services policies in Vietnam: Between theory and practice. *Development and Change* 51, 253–280.
- McElwee, P., Huber, B., Nguyễn, T., 2019b. Hybrid Outcomes of Payments for Ecosystem Services Policies in Vietnam: Between Theory and Practice. *Development and Change* 51. <https://doi.org/10.1111/dech.12548>
- McElwee, P.D., 2012. Payments for environmental services as neoliberal market-based forest conservation in Vietnam: Panacea or problem? *Geoforum, The Global Rise and Local Implications of Market-Oriented Conservation Governance* 43, 412–426. <https://doi.org/10.1016/j.geoforum.2011.04.010>
- Nguyen, H.M., Nguyen, T.A., 2019. Investigating the determinants of household welfare in the Central Highland, Vietnam. *Cogent Economics & Finance* 7.
- Nguyen, T.H.M., Nguyen, V.M., 2019. Impact of Payment for Forest Environmental Service policy on community forest management in A Luoi district, Thua Thien Hue province. *Science and Technologi Journal of Agriculture & Rural Development* 19, 107–114.

- Nguyen, T.H.M., Tran, N.T., Le, T.T.H., 2020. Study on changes in forest land use of the ethnic people in Hong Kim commune of A Luoi district, Thua Thien Hue province. *HUAF Journal of Agriculture Science & Technology* 4, 2048–2057. <https://doi.org/10.46826/huaf-jasat.v4n3y2020.347>
- Nguyen, T.H.V., McElwee, P., Le, T.V.H., Nghiem, T., Vu, T.D.H., 2022. The challenges of collective PES: Insights from three community-based models in Vietnam. *Ecosystem Services* 56. <https://doi.org/10.1016/j.ecoser.2022.101438>
- Nguyen, T.P., 2008. Necessary needs for Payment for Forest Environmental Services in Vietnam.
- Pham, H.L., 2018. Payments for forest environmental services in Vietnam: Situation and solution. *Journal of Forestry Science and Technology* 198–202.
- Pham, T.T., Dao, T.L.C., Hoang, T.L., Nguyen, D.T., Le, M.T., Nong, H.H., Dang, T.N., 2018. Impact of Payments for Forest Environmental Services (PFES) in Son La, Vietnam. CIFOR. <https://doi.org/10.17528/cifor/006955>
- Pham T.T., Dao T.L.C., Nguyen T.L., Hoang T.L., Nguyen D.T., Pham H.L., 2020. Economic and social impacts of payments for forest environmental services in Cat Tien National Park. Center for International Forestry Research (CIFOR). <https://doi.org/10.17528/cifor/007892>
- Pham, T.T., Ngo, H.C., Dao, T.L.C., Hoang, T. long, Fisher, M.R., 2020. The politics of numbers and additionality governing the national Payment for Forest Environmental Services scheme in Vietnam: A case study from Son La province. *Forest and Society* 379–404. <https://doi.org/10.24259/fs.v4i2.10891>
- Pham, T.T., Nguyen, T.D., Dao, C.T.L., Hoang, L.T., Pham, L.H., Nguyen, L.T., Tran, B.K., 2021. Impacts of Payment for Forest Environmental Services in Cat Tien National Park. *Forests* 12, 921. <https://doi.org/10.3390/f12070921>
- Suhardiman, D., Wichelns, D., Lestrelin, G., Hoanh, C.T., 2013. Payments for ecosystem services in Vietnam: Market-based incentives or state control of resources? *Ecosystem Services* 5, 94–101.
- Sunderlin, W.D., Huynh Thu Ba, 2005. Poverty alleviation and forests in Vietnam. CIFOR, Jakarta.

- To, P., Dressler, W., 2019. Rethinking ‘Success’: The politics of payment for forest ecosystem services in Vietnam. *Land Use Policy* 81, 582–593. <https://doi.org/10.1016/j.landusepol.2018.11.010>
- To, X.P., Dressler, W.H., Mahanty, S., Pham, T.T., Zingerli, C., 2012. The prospects for payment for ecosystem services (PES) in Vietnam: a look at three payment schemes. *Human Ecology* 40, 237–249. <https://doi.org/10.1007/s10745-012-9480-9>
- Tran, N.T., Ganesh, P.S., Makuto, I., 2010. Changes in property rights, forest use and forest dependency of Katu communities in Nam Dong District, Thua Thien Hue Province, Vietnam. *International Forestry Review* 12, 307–319. <https://doi.org/10.1505/ifor.12.4.307>
- Tran, Q.T., 2015. Socio-Economic Determinants of Household Income among Ethnic Minorities in the North-West Mountains, Vietnam. *Croatian Economic Survey* 17, 139–159. <https://doi.org/10.15179/ces.17.1.5>
- Tran, Q.T., Nguyen, V.T., 2018. Forestland and household welfares in North Central Provinces, Vietnam. *MPRA (Munich Personal RePEc Archive)* 10–19.
- Tran, V.C., Trinh, Q.T., Cao, Q.A., Pham, M.T., Camacho, L.D., Hoang, V.S., 2019. Contribution of forest to rural households’ livelihood: evidences from Da river basin in the northwest mountainous region of Vietnam. *Forest and Society* 235–247. <https://doi.org/10.24259/fs.v3i2.7050>
- Truong, D.D., 2022. Impacts of payment for forest environmental service policy in Vietnam: A case study of Muong Nhe protected area. *Trees, Forests and People* 7, 100198. <https://doi.org/10.1016/j.tfp.2022.100198>
- VNFF & MONRE, 2017. Report on Activities of Forest protection and development Fund (2008-2016) and 5 years of implementation of Payment for Forest Environmental Services policy (2011-2016).
- Vu, V.H., 2020. The Impact of Education on Household Income in Rural Vietnam. *International Journal of Financial Studies* 8.

Chapter 4

Motivational Indicators for Local Participation in Forest Protection under Payment for Forest Environmental Services

4.1. Introduction

Losses and degradation of natural habitats have motivated biodiversity conservation efforts in agricultural landscapes (Pagiola et al., 2004). Payments for Ecosystem Services (PES) programs have been implemented globally to preserve and restore ecosystems while balancing conservation outcomes with equitable benefit distribution for local communities (Chu et al., 2019; Mayrand and Paquin, 2004; Seven Wunder, 2005).

In Vietnam, the Payment for Forest Environmental Services (PFES) was initiated in 2008 and rolled out nationwide in 2011 (McElwee et al., 2014). Unlike some PES models emphasizing voluntary participation and conditional payments based on environmental outcomes (Seven Wunder, 2005), PFES is legally mandated (Loft et al., 2019; McElwee et al., 2019; Suhardiman et al., 2013). Ecosystem service users, such as hydropower plants, water utilities, industrial facilities, and tourism companies, are required to pay financial contributions, functioning as a levy on water and hydropower consumption borne by end-users (Chu et al., 2019).

Payments through PFES are allocated to villagers or community groups responsible for forest protection and are treated as income (Pham et al., 2013). In essence, these payments compensate local people for their labor, while land and forest remain under state ownership (Chu et al., 2019). Villagers may collect non-timber forest products or grow shade-tolerant crops under the canopy (Decision 178/2001/QĐ-TTg), but are prohibited from timber harvesting or converting forestland (Decree 99/2010/NĐ-CP, Article 20). Violations such as illegal logging may incur fines up to 200 million VND per cubic meter (Decree 157/2013/NĐ-CP, Article 12) and be subject to criminal prosecution (Article 7). Failure to fulfill forest protection responsibilities is also punishable (Decree 15/2013/CP, Article 15) (Chu et al., 2019).

Vietnam's forest policies have evolved from centralized management by state forestry enterprises in the 1970s, to household land allocation in the 1990s, and adoption of community forestry in the 2000s (Bayrak, 2019; Suhardiman et al., 2013). The government integrated compensation schemes into natural resource management, leading to the development of PFES, which supports both household-level and collective forest protection (Nguyen et al., 2022). PFES was inherited from previous community forest management models (Nguyen et al., 2022),

including communities with forest land titles using customary management; household groups (kin, clan, or neighborhood-based) with shared titles; individual households with land use rights; and sub-contracts for forest protection on behalf of state forest owners. Previously, forest protection policies were constrained by the absence of financial mechanisms to support local actors (Suhardiman et al., 2013). Although local authorities managed forests, policies lacked funds or tools to establish income-generating forest institutions (FOMIS, 2010). Prior to PFES, forest patrol groups operated with limited and unstable financial support (Duong and De Groot, 2020). PFES has strengthened these groups, attracting more participants and improving selection procedures, notably in Dien Bien province (Duong and De Groot, 2020).

Recently, community participation in forest management has gained recognition as more effective than top-down conservation (Coulibaly-Lingani et al., 2011). PFES not only improves governance but also enhances social cohesion and brings economic benefits to communities (Nguyen et al., 2022). However, factors such as assets, economic returns, culture, trust, and social capital influence involvement (Nguyen et al., 2022).

In addition to financial incentives (Fisher, 2012; Suhardiman et al., 2013; Wunder, 2008), non-monetary drivers also play key roles in participation decisions (Bottazzi et al., 2018; Bremer et al., 2014; Fisher, 2012; Hayes, 2012; Kosoy et al., 2008; Le et al., 2023; Van Hecken et al., 2012). These motivations often stem from individuals' desire to conserve natural resources and uphold cultural or spiritual values. In Mexico, participation in PES has been associated with the protection of forests, water sources, and sacred or culturally significant sites, with some communities even maintaining forest areas without any external financial support (Figueroa et al., 2016). In Nepal, intergenerational responsibility and respect for the efforts of ancestors have served as important foundations for sustaining long-term conservation commitments (Kimengsi et al., 2019). Similarly, a study by Maleknia (2025) on urban forests in Iran revealed that individuals who perceive forests as essential for air purification, mental well-being, and social cohesion are more likely to support forest conservation initiatives. These non-monetary motivations can interact with financial incentives, sometimes reinforcing (crowding-in) or undermining (crowding-out) them, depending on the social and institutional context (Kaczan et al., 2019). Understanding these drivers is essential for designing effective, context-appropriate management strategies (Coulibaly-Lingani et al., 2011; Dolisca et al., 2006; Soe and Yeo-Chang, 2019).

While several studies assessed PFES impacts on livelihoods in Vietnam (Do and NaRanong, 2019; Le et al., 2023; Nguyen et al., 2021; Pham et al., 2020; Tran et al., 2019), few

have examined the underlying motivations behind local participation. Nguyen et al. (2024) highlighted social networks under PFES in enhancing forest value awareness and shaping conservation behavior in Northwest Vietnam; however, these findings are context-specific and not readily generalizable. Likewise, Chapter 3 highlighted social responsibility and appreciation for nature as key motivations for community participation in a mountainous commune of Thua Thien Hue. However, their conclusions were derived from a small, single-site sample, and the identified non-material drivers were not subject to quantitative testing or cross-domain analysis. Therefore, a comprehensive understanding of the motivations underlying participation across diverse community groups remains limited.

Building on this gap, this study hypothesizes that both intrinsic and extrinsic factors influence household decisions to engage in forest protection, and that perceptions of PFES impacts differ between members of Forest Protection Groups (FPGs) and non-Forest Protection Groups (N-FPGs) due to differences in roles, access to information, and benefit-sharing mechanisms.

To empirically examine these hypotheses, the study investigates motivational drivers of participation under the PFES scheme, with particular attention to variations between FPG and N-FPG households across communities. The specific objectives are to:

- (i) develop and apply structured motivational indicators to classify participation drivers;
- (ii) compare motivational patterns and PFES-related perceptions across FPG and N-FPG households; and
- (iii) examine how sociodemographic attributes and PFES experiences influence both motivational domains and willingness to be engaged in forest protection.

By conceptualizing motivations as measurable indicators, the study introduces an indicator-based analytical framework for quantifying behavioral drivers. This approach contributes to the development of evidence-informed, context-sensitive PFES interventions that promote sustained community engagement and the long-term sustainability of forest ecosystem management.

4.2. Conceptual framework

Motivation plays a critical role in shaping human behavior (Thirupathy and Kannan, 2020), including participation in forest conservation. While definitions vary, it is generally viewed as a psychological process that initiates and sustains goal-directed actions (Kamaraj et al., 2019; Schunk et al., 2014; Weiner, 2013). Sudakov (2006) further emphasizes its influence

on decision-making and cognition. This study adopts Self-Determination Theory (SDT) to classify motivation into two domains: intrinsic motivation, which arises from internal values and personal satisfaction, and extrinsic motivation, which is driven by external rewards or social and institutional pressures (Ryan and Deci, 2000).

Intrinsic motivation is fostered when basic psychological needs for autonomy, competence, and relatedness are fulfilled, leading to voluntary and sustained behavior. In the context of forest conservation, intrinsic motivation is nurtured by deep emotional connections with nature, cultural and spiritual attachments to forests (Kosoy et al., 2008; Sood and Dhyani, 2024), and the recognition of the long-term benefits and values of forests (Lovrić et al., 2025; Nunez Godoy et al., 2022). By contrast, extrinsic motivation stems from incentives such as financial payments (De Martino et al., 2017; Figueroa et al., 2016; Isyaku, 2021; Sommerville et al., 2010), legal regulations, or social expectations. PES schemes, including PFES in Vietnam, aim to strengthen this motivation through compensation for conservation efforts. Legal instruments such as logging bans and land-use restrictions further reinforce compliance (McElwee et al., 2014; To, 2015).

To capture broader institutional influences, the study integrates Ostrom's Institutional Analysis and Development (IAD) framework, which emphasizes the role of individual attributes, institutional rules, and external conditions in shaping collective behavior (Ostrom, 1990). Accordingly, the conceptual framework links motivational domains with socio-demographic and contextual variables such as gender, income, landholding, group participation, and satisfaction with PFES (Basu, 2021; Coulibaly-Lingani et al., 2011; Dolisca et al., 2006; Maskey et al., 2006; Soe and Yeo-Chang, 2019).

Figure 4.1 presents the conceptual framework employed in this study. It illustrates the hypothesized relationships between socio-demographic and institutional factors, types of motivation (economic, social, environmental, and legal), and household willingness to participate in forest protection. These motivational domains were transformed into measurable indicators, allowing for their empirical evaluation through household survey data. The conceptual model not only informed questionnaire design but also provided an analytical basis for identifying key motivational levers for strengthening community-based forest governance under PFES.

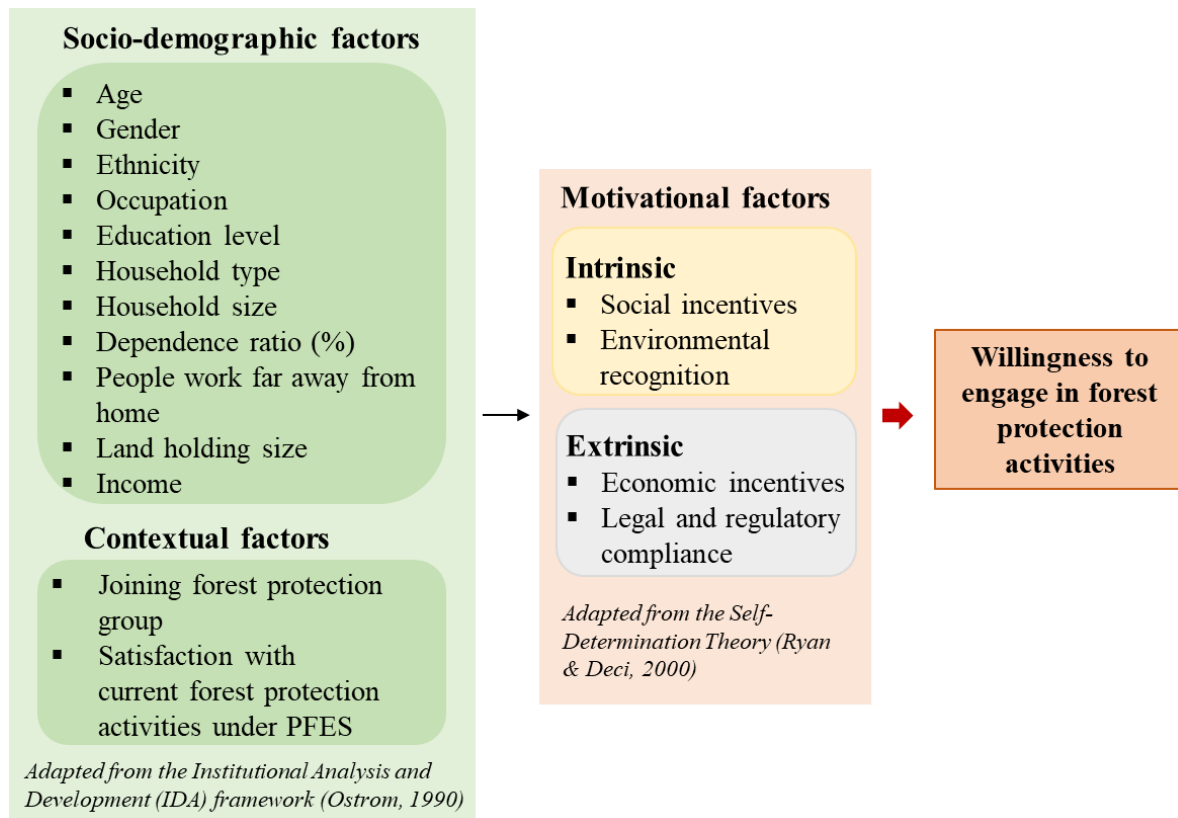


Fig. 4.1. Conceptual framework for examining households' willingness to engage in forest protection activities.

4.3. Materials and methods

4.3.1. Study sites

This chapter draws on empirical data collected from three buffer-zone communes of the Phong Dien Nature Reserve: Phong My, Trung Son, and Hong Kim communes. The geographical setting, socio-economic conditions, and forest management characteristics of these communes are described in detail in Chapter 2. Accordingly, this section highlights only those site characteristics that are directly relevant to the analysis of household motivation and participation in forest protection under the PFES program.

The three communes were selected to reflect variation in ethnic composition, forest tenure arrangements, and modes of participation in PFES-supported forest protection. Phong My commune is characterized by a predominance of Kinh households and community-based forest management under PFES. Trung Son commune consists mainly of ethnic minority households and exhibits a more diverse set of PFES participation arrangements, including community-based, group-based, and household-level forest protection. Hong Kim commune represents a context in which the forest area supported by PFES is relatively limited, while community

participation in forest protection is shaped by a combination of economic and non-economic motivations, as indicated by the analysis presented in Chapter 3.

These differences provide a comparative context for exploring variation in household motivation and participation across study sites under a shared PFES policy framework.

4.3.2. Data collection

Both primary and secondary data were used to investigate drivers of community engagement in forest protection. A literature review was conducted using the keyword “motivation in forest management” to identify key incentives. Findings were categorized into economic, social, environmental, and legal motivations.

Based on the conceptual framework, an initial list of internal and external motivations was developed, followed by the design of a questionnaire. A preliminary study was conducted in August 2023 with ten individuals (five FPGs and five N-FPGs) from Ha Long village, Phong My commune, who also served as key informants for the main survey.

The preliminary survey focused on two main questions: Which factors from the predefined list do households agree influence community motivation for forest protection? Are there any additional motivations not listed in the questionnaire? This step aimed to confirm agreement with predefined motivations and identify others. A Likert scale was used to assess levels of agreement. Results informed revisions to improve the questionnaire’s clarity and relevance.

The main survey employed a semi-structured questionnaire and was conducted in three buffer-zone communes of Phong Dien Nature Reserve: Phong My, Trung Son, and Hong Kim. Six villages were selected: Ha Long and Tan My (Phong My), Ta Ay Ta and Dut Le Trieng II (Trung Son), and A Tia 2 and Dut 1 (Hong Kim), with a total of 243 households surveyed (83 in Phong My, and 80 each in the other two). The sample size was calculated using Slovin’s formula (Ellen, 2020):

$$n = N / (1 + Ne^2),$$
 where N is the population, n is the required sample size, and e is the margin of error (generally set at 10%).

A simple random sampling method was applied using household lists provided by local authorities, ensuring equal selection probability and minimizing selection bias (Thirupathy and Kannan, 2020).

Households were classified into two groups based on self-reported forest protection participation: FPGs (n = 144) and N-FPGs (n = 99). Participation included activities such as

patrolling, attending meetings, or other conservation-related tasks. These groups were proportionally drawn from the total sample (Table 4.1; Fig. 4.2).

The field survey was conducted over 50 days, from August to September 2023.

Table 4.1. Basic information of interviewees in study sites

Village	Commune	The number of household interviewees by groups
Ha Long (N=120)	Phong My (N=498; n=83)	FPGs (n = 60)
Tan My (N=378)		N-FPGs (n = 23)
TaAy Ta (N=225)	Trung Son (N=411; n=80)	FPGs (n = 42)
Dut Le Trieng II (N=186)		N-FPGs (n = 38)
A Tia 2 (N=185)	Hong Kim (N= 397; n=80)	FPGs (n= 42)
Dut 1 (N=212)		N-FPGs (n = 38)
Total of interviewee	n = 243	FPGs (n = 144); N-FPGs (n=99)



Fig. 4.2. Household surveys in Phong My commune (left), and Trung Son commune (right)

4.3.3. Measuring motivational indicators for forest protection

Based on the literature review and preliminary surveys, a set of motivational indicators was developed to represent both intrinsic and extrinsic drivers of forest protection. Each indicator was operationalized as a single-item measure, capturing a distinct motivational perception across four domains: social incentives (SI), environmental recognition (ER), economic incentives (EI), and legal and regulatory compliance (LRC). All indicators were measured using a five-point Likert scale (1 = strongly disagree to 5 = strongly agree) (Table 4.2).

In Table 3, SI1 and SI5 are intermediate motivations that can be seen as intrinsic or extrinsic depending on interpretation. This study treats both as intrinsic social motivations, as they are internally regulated and grounded in cultural and personal values. SI1 (the right to access forest and forest land) is viewed not as a legal right but as a belief rooted in tradition, subsistence needs, and emotional ties to place. It reflects behavior shaped by identity and cultural meaning, not external rules. SI5 (passing on land tenure to children or heirs) reflects intergenerational responsibility and a desire to preserve family legacy. Rather than stemming from legal obligation, this motivation arises from moral commitment, emotional bonds, and internalized values, aligning with intrinsic motivation as defined by self-determination theory. Both SI1 and SI5 are guided by internal drivers such as social identity and perceived responsibility, not external rewards or sanctions.

Table 4.2. Name, abbreviations, and scales of motivational domains and indicators

No	Dependent variable	Abbreviations	Likert scale	Findings from
I	Intrinsic motivation: Social incentives	SI		
I.1	Rights to access forest and forest land	SI1	[1-5]	Added by locals from preliminary surveys
I.2	Protect the cultural, traditional, and spiritual values of the community associated with forests	SI2	[1-5]	Hoang et al., 2021a; Ihemezie et al., 2021; Isyaku, 2021; Mook et al., 2022
I.3	Concern for the future of next generation	SI3	[1-5]	Fisher, 2012; Ihemezie et al., 2021; Kimengsi et al., 2019; Le et al., 2023
I.4	Good relationship among forest patrolling members	SI4	[1-5]	Bremer et al., 2014; Hoang et al., 2021a; Isyaku, 2021
I.5	Pass land tenure to their children or other heirs	SI5	[1-5]	Mook et al., 2022; Tian and Pelkki, 2021
II	Intrinsic motivation: Environmental recognition	ER		
II.1	Protect forest to supply food and habitat for wildlife	ER1	[1-5]	Ihemezie et al., 2021; Isyaku, 2021; Mook et al., 2022; Tian and Pelkki, 2021
II.2	Protect forest to preserve nature and biodiversity conservation	ER2	[1-5]	Tian and Pelkki, 2021; Truong, 2022
II.3	Protect forest to maintain a good living environment for human lives	ER3	[1-5]	Isyaku, 2021; Kimengsi et al., 2019
II.4	Forest's role in water supply and water regulation	ER4	[1-5]	Bremer et al., 2014; Hoang et al., 2021a; Nguyen et al., 2024; Thoker et al., 2024; Truong, 2022
II.5	Forest's role in climate regulation	ER5	[1-5]	Fisher, 2012; Ihemezie et al., 2021; Thoker et al., 2024
II.6	Forest's role in limiting soil erosion and landslides	ER6	[1-5]	Fisher, 2012; Hoang et al., 2021a; Nguyen et al., 2024; Thoker et al., 2024; Truong, 2022
III	Extrinsic motivation: Economic incentives	EI		

III.1	Receive remuneration for joining forest patrols to create additional household income	EI1	[1-5]	Coulibaly-Lingani et al., 2011; Hoang et al., 2021a, 2021b
III.2	Get a higher income from the PFES payment compared to other livelihood sources	EI2	[1-5]	Added by locals from preliminary surveys
III.3	The PFES payment satisfies our household expense	EI3	[1-5]	Added by locals from preliminary surveys
III.4	To harvest NTFPs within permitted levels	EI4	[1-5]	Coulibaly-Lingani et al., 2011; Dolisca et al., 2006; Hoang et al., 2021b
III.5	Logging is allowed with the approval of local authorities and forest ranger	EI5	[1-5]	Added by locals from preliminary surveys
III.6	Access to loans for other livelihood activities	EI6	[1-5]	Added by locals from preliminary surveys
III.7	Opportunity to earn extra income from other Livelihood activities such as community-based eco-tourism	EI7	[1-5]	Added by locals from preliminary surveys
III.8	Participate in projects and training courses on local community forestry development	EI8	[1-5]	Le et al., 2023
IV	Extrinsic motivation: Legal and regulatory compliance	LRC		
IV.1	We have to fulfill mandatory work as agreed by local authorities and forest rangers	LRC1	[1-5]	Added by locals from preliminary surveys
IV.2	Because forest land cannot be converted to other land use under government law	LRC2	[1-5]	McElwee, 2004
IV.3	Involvement in the decision on forest monitoring and evaluation	LRC3	[1-5]	Coulibaly-Lingani et al., 2011

4.3.4. Statistical analysis

All statistical analyses were conducted using SPSS version 20. Descriptive statistics were used to summarize household characteristics and participation status in forest protection activities. As the motivational indicators and their aggregated domain scores did not meet the assumption of normality, non-parametric tests were applied. The Kruskal-Wallis H test was used to examine differences in socioeconomic characteristics among communes. The Mann-Whitney U test was used to examine differences in motivation scores between the two groups.

Within each group, differences among the four motivational domains were examined using the Friedman test for related samples. When significant overall differences were detected, post-hoc pairwise comparisons were performed using the Wilcoxon signed-rank test with Bonferroni correction to identify which domains differed (Field, 2024).

To analyze factors influencing households' willingness to participate in forest protection, a binary logistic regression was applied (Hosmer Jr et al., 2013). The dependent variable was binary (1 = willing; 0 = not willing), with independent variables including demographic, socio-economic, and institutional characteristics described in Table 4.3. Among these, satisfaction with forest protection activities under PFES was measured using a five-point Likert scale (1 = strongly dissatisfied, 5 = strongly satisfied). The model is specified as follows:

$$\text{Logit}(P) = \ln\left(\frac{P}{1-P}\right) = \beta_0 + \beta_1AG + \beta_2GE + \beta_3ETH + \beta_4OC + \beta_5EDU + \beta_6HT + \beta_7HS + \beta_8DR + \beta_9PWFAFH + \beta_{10}TLA + \beta_{11}AI + \beta_{12}SWF$$

Where P is the probability of willingness to participate, and β_i are regression coefficients. Model fit was assessed using the Hosmer-Lemeshow test, and multicollinearity was evaluated via Variance Inflation Factors (VIF).

Multiple linear regression was also used to examine how socio-demographic and contextual variables influence motivational domains (SI, ER, EI, and LRC). Each domain served as a dependent variable in separate models:

$$\text{Factor}_i = \text{Constant} + \beta_1AG + \beta_2GE + \beta_3ETH + \beta_4OC + \beta_5EDU + \beta_6HT + \beta_7HS + \beta_8DR + \beta_9PWFAFH + \beta_{10}TLA + \beta_{11}AI + \beta_{12}JFPG + \beta_{13}SWF + \varepsilon$$

Where Factor_i represents the dependent variable corresponding to a specific motivational domain, and ε is the error term. Diagnostic tests confirmed that the assumptions of ordinary least squares (OLS), including normality, linearity, homoscedasticity, and the absence of multicollinearity, were not violated (Porter and Gujarati, 2008).

Table 4.3. Explanatory variables used in logistic and multiple regression analyses

<i>Sociodemographic</i>	<i>Abbreviation</i>	<i>Description</i>
Age	AG	Continuous
Gender	GE	Binary: 1 (male); 0 (female)
Ethnicity	ETH	Binary: 1 (Ethnic minority); 0 (Kinh)
Occupation	OC	Binary: 1 (Farmer); 0 (Others)
Education level	EDU	Ordinal: 1 (Illiterate); 2 (Literate); 3 (Primary school); 4 (High school); 5 (Vocational school/technical institute); 6 (University)
Household type	HT	Binary: 1 (Poor/near poor); 0 (Non-poor)
Household size	HS	Continuous
Dependence ratio (%)	DR	Continuous
People work far away from home	PWFAFH	Binary: 1 (Yes); 0 (No)
Total land area (m ²) (log)	TLA	Continuous
Average income per person per month (million VND)	AI	Continuous
Joining forest protection groups	JFPG	Binary: 1 (Yes); 0 (No)
Satisfaction with forest protection activities under PFES support	SWF	Ordinal: 1 (Extremely dissatisfied); 2 (Dissatisfied); 3 (Neutral); 4 (Satisfied); 5 (Extremely satisfied)

4.4. Results

4.4.1. Historical development of community forest protection groups in the buffer zone of Phong Dien Nature Reserve

Following the Doi Moi policy (1986), forests in Phong Dien were managed by state-owned enterprises. The rediscovery of the endangered Edwards's pheasant (*Lophura edwardsi*) in 1996 highlighted the area's ecological value, leading to the establishment of Phong Dien NR in 2003 (Phong Dien NR office, 2020).

Logging was banned in the core zone, but restricted forest access in the buffer zone created tensions with local residents who depended on forest resources (N. D. A. Tuan et al., 2017). Excluding locals also increased risks of outside encroachment and weakened community

monitoring (Boissie`re et al., 2009). To ease conflicts, Thua Thien Hue province pioneered forest land allocation to community groups and households from the early 2000s (Huy Tuan, 2006). In 2010, the provincial government issued Decision No. 430/QĐ-UBND, titled "Forest Allocation and Lease in TTH Province for the Period 2010–2014", to expand forest land allocation to eligible communities.

In practice, community forest allocation began earlier in some areas. In 2005, Phong My commune piloted a voluntary forest protection group of 30 households, though it lacked precise benefit-sharing mechanisms and external supervision. That same year, approximately 45 Paco households in Trung Son commune received forest land under the Biodiversity Conservation Corridor Project, with technical support to plant native tree species and non-timber forest products (NTFPs). In Hong Kim commune, forest allocation took place during 2006–2007 through donor-funded programs; however, formal FPGs were not officially established until 2013.

Initially, these FPGs were mobilized by village leaders and commune authorities. Participation was voluntary and unpaid, with limited technical support from local forestry officers. Due to constrained resources, group effectiveness remained low, with no formal patrol plans or operational procedures.

A significant turning point occurred in 2014 with PFES implementation across the three communes. PFES funding enabled communities to develop local regulations, internal spending mechanisms, and regular patrol routines. Members received training, payments, and forestry extension support. Participation motivation increased, attracting interest from non-members. However, limited community forest areas restricted group expansion, and new members had to meet health, commitment, and availability criteria for patrols.

These institutional changes provided an appropriate context for examining how individual motivations, both intrinsic and extrinsic, shape participation in forest protection under PFES.

4.4.2. Socio-demographic characteristics of household interviewees

Household survey results (Table 4.4) show that the average respondent age was 47.7 years, with Phong My significantly older than Trung Son and Hong Kim. Gender distribution varied, with males predominating in Phong My (74.7%) and Hong Kim (61.3%), while females were majority in Trung Son (55%) (Table 4.5). Ethnic composition differed: Trung Son and Hong Kim were mainly Paco (93.8% and 98.8%), while Phong My included Kinh (55.4%), Pahi (27.7%), and Van Kieu (14.5%). The Kinh are the majority ethnic group in Vietnam (approximately 85% of the national population) (CIA factbook, 2025), while the others are

recognized as ethnic minorities. Most Kinh households in Phong My migrated from lowland areas of Thua Thien Hue province to the upland region after 1975 under the government's New Economic Zones program (Chandola, 1977), which promoted resettlement to support agricultural and economic development. Agriculture was the main occupation (65.8%), especially in Hong Kim (71.3%), while non-agricultural work was more common in Phong My. Education levels were generally low, with illiteracy rates of 20% and 25% in Trung Son and Hong Kim respectively, in contrast to 62.7% of respondents in Phong My who had completed at least lower secondary school. Households were categorized based on Vietnam's multidimensional poverty criteria (Decision No. 59/2015 / QD-TTg, 2015). In rural areas, a household is poor if monthly per capita income $\leq$ 700,000 VND or between 700,000 and 1,000,000 VND with deprivation in at least three of ten social indicators (e.g., education, health, housing). Near-poor households fall within the same income range but have fewer than three indicators. Poor and near-poor households were grouped and coded as 1, non-poor as 0 (Table 4.3). This binary coding enabled the calculation of a poverty index as the mean within each commune. Poverty rates varied significantly (Table 4.4), with Phong My lowest (0.1), lower than Trung Son (0.6) and Hong Kim (0.7). Average household sizes were 4.2 ± 1.2 in Phong My, 4.0 ± 1.3 in Trung Son, and 4.6 ± 1.4 in Hong Kim. Monthly per capita income differed significantly: Phong My was the highest (2.0 ± 1.4 million VND), then Hong Kim (1.5 ± 1.1 million), and Trung Son (1.1 ± 1.0 million) (Table 4.4). The highest proportion of households with members working away was in Hong Kim (32.5%). Land ownership was most significant in Phong My (1.8 ± 2.8 ha) and smallest in Hong Kim (0.4 ± 0.5 ha). Participation in forest protection groups was highest in Phong My (72.3%), versus 52.5% in the other communes (Table 4.5).

Table 4.4. Comparison of socio-demographic and economic characteristics across communes

	Phong My (n = 83)	Trung Son (n = 80)	Hong Kim (n = 80)	Total (n = 243)
<i>Sociodemographic</i>	Mean (Std.Dev.)	Mean (Std.Dev.)	Mean (Std.Dev.)	Mean (Std.Dev.)
Age	47.7 ± 14.2 ^b	40.5 ± 12.0 ^a	44.1 ± 12.9 ^{ab}	44.2 ± 13.3
Household type	0.1 ± 0.3 ^a	0.6 ± 0.5 ^b	0.7 ± 0.5 ^b	0.5 ± 0.5
Household size	4.2 ± 1.2 ^a	4.0 ± 1.3 ^a	4.6 ± 1.4 ^a	4.3 ± 1.3
Average income per person per month (million VND)	2.0 ± 1.4 ^c	1.1 ± 1.0 ^a	1.5 ± 1.1 ^b	1.6 ± 1.2
Total land area (ha)	1.8 ± 2.8 ^b	1.2 ± 1.6 ^b	0.4 ± 0.5 ^a	1.1 ± 2.0

Refer to Table 4.4 for the description of variables



Fig. 4.3. Examples of household types in the study sites

Table 4.5. Characteristic of household interviewees

Categories	Socio-demographic characteristic							
	Phong My		Trung Son		Hong Kim		Total	
	(n = 83)		(n = 80)		(n = 80)		(n = 243)	
	n	%	n	%	n	%	n	%
Gender								
- Men	62	74.7	36	45.0	49	61.3	147	60.5
- Women	21	25.3	44	55.0	31	38.8	96	39.5
Ethnicity								
- Paco	2	2.4	75	93.8	79	98.8	156	64.2
- Kotu	0	0.0	2	2.5	0	0.0	2	0.8
- Van Kieu	12	14.5	0	0.0	0	0.0	12	4.9
- Pahi	23	27.7	1	1.3	0	0.0	24	9.9
- Kinh	46	55.4	2	2.5	1	1.3	49	20.2
Occupation								
- Farmer	49	59.0	54	67.5	57	71.3	160	65.8
- Builder/mason	1	1.2	0	0.0	2	2.5	3	1.2
- Hired worker	12	14.5	12	15.0	11	13.8	35	14.4
- Business	5	6.0	5	6.3	0	0.0	10	4.1
- Government officials	2	2.4	3	3.8	7	8.8	12	4.9
- Others	14	16.9	6	7.5	3	3.8	23	9.5
Education level								
- Illiterate	1	1.2	16	20.0	20	25.0	37	15.2
- Literate	14	16.9	13	16.3	7	8.8	34	14.0
- Primary school	16	19.3	7	8.8	16	20.0	39	16.0
- Secondary school	34	41.0	17	21.3	24	30.0	75	30.9
- High school	12	14.5	18	22.5	8	10.0	38	15.6
- Vocational school/technical institute	3	3.6	0	0.0	0	0.0	3	1.2
- University	3	3.6	9	11.3	5	6.3	17	7.0
Households have members working away from home	16	19.3	21	26.3	26	32.5	63	25.9
Joining forest patrolling activities								
- N-FPGs	23	27.7	38	47.5	38	47.5	99	40.7

Categories	Socio-demographic characteristic							
	Phong My		Trung Son		Hong Kim		Total	
	(n = 83)		(n = 80)		(n = 80)		(n = 243)	
	n	%	n	%	n	%	n	%
- FPGs	60	72.3	42	52.5	42	52.5	144	59.3



Fig. 4.4. Paco people in the study sites (Hong Kim commune)

4.4.3. Differences in motivational domains within and between FPG and willing N-FPG households

Among the 243 surveyed households, 40 respondents who explicitly stated that they did not wish to participate in forest protection activities (due to age, health conditions, or livelihood constraints) were excluded from the motivation analysis. Consequently, motivational domains were analyzed for 203 respondents, comprising 144 members of FPGs and 59 N-FPGs who expressed willingness to participate (Table 4.6).

Table 4.6 presents the mean Likert scores of motivational domains among FPGs and willing N-FPGs. For both FPGs and N-FPGs, intrinsic motivations (SI, ER) scored significantly higher than extrinsic motivations (EI, LRC) ($p < 0.05$). The Mann-Whitney U test results showed that FPG members were more motivated by environmental recognition (ER), while N-FPGs were more influenced by external economic incentives (EI). No significant differences were found in SI and LRC between the two groups.

Table 4.6. Mean Likert scores of the motivation domains within and between FPGs and willing N-FPGs

No	Abbreviation	Motivation	FPGs (n=144)	N-FPGs (n=59)
I	SI	Intrinsic	4.1 ± 0.4 ^{bA}	4.1 ± 0.4 ^{aA}
II	ER	Intrinsic	4.4 ± 0.5 ^{aA}	4.2 ± 0.5 ^{aB}
III	EI	Extrinsic	3.5 ± 0.3 ^{cB}	3.7 ± 0.5 ^{bA}
IV	LRC	Extrinsic	3.5 ± 0.6 ^{cA}	3.6 ± 0.7 ^{cA}

Different lowercase letters (a, b, c) indicate significant differences among motivational domains within each group ($p < 0.05$). Different uppercase letters (A, B) indicate significant differences between FPGs and N-FPGs ($p < 0.05$). Each motivational domain represents the average score of multiple single-item indicators (see Table 4.2 and Appendices A).

4.4.4. Factors related to motivational dimensions

Regression results (Table 4.7) indicated that ten out of thirteen sociodemographic and institutional factors influenced the four motivational domains for forest protection. Multicollinearity diagnostics, examined through variance inflation factors, confirmed that no multicollinearity was present (all VIF < 10) (O'brien, 2007). The models explained 16.8%, 29.4%, 18.2%, and 12.1% of the variance in SI, ER, EI, and LRC, respectively. The standardized Beta coefficients (β) indicate the relative strength and direction of each factor's influence. Among the significant predictors, education emerged as the strongest and most consistent factor, being positively associated with SI ($\beta = 0.215$), ER ($\beta = 0.444$), and LRC ($\beta = 0.156$), indicating that higher levels of education foster stronger conservation motivation among local respondents. Age was also positively related to social incentives ($\beta = 0.186$), suggesting that older respondents tended to be more socially engaged in forest protection activities. By contrast, household type ($\beta = -0.166$) and dependence ratio ($\beta = -0.183$) were negatively associated with LRC, implying that poorer households with more dependents were less responsive to legal compliance motivations. Income showed a negative relationship with economic incentives ($\beta = -0.225$), indicating that financial rewards less drove higher-income households. Membership in forest protection groups was positively associated with environmental recognition ($\beta = 0.232$) but negatively with economic incentives ($\beta = -0.280$). This finding corroborates the Mann–Whitney U test results (Table 4.6), indicating that FPG members were more environmentally motivated but less driven by economic incentives.

Table 4.7. Sociodemographic variables associated with social incentives (SI), environmental recognition (ER), economic incentives (EI), and compliance with legal regulations (LRC) that motivate local people to protect forests in three communes

Motivation	SI		ER		EI		LRC		VIF
<i>Explanatory variables</i>	<i>Coef. Beta</i>	<i>t</i>	<i>Coef. Beta</i>	<i>t</i>	<i>Coef. Beta</i>	<i>t</i>	<i>Coef. Beta</i>	<i>t</i>	
Age	0.186**	2.403	0.087	1.215	0.127	1.655	0.033	0.418	1.360
Gender	-0.086	-1.139	0.101	1.452	0.044	0.592	0.105	1.361	1.288
Ethnicity	0.124	1.545	0.082	1.109	0.093	1.167	0.104	1.270	1.455
Occupation	-0.031	-0.422	0.005	0.074	0.178**	2.412	0.051	0.666	1.252
Education	0.215***	2.769	0.444***	6.205	0.108	1.406	0.156*	1.957	1.373
Household type	-0.034	-0.423	0.017	0.227	-0.063	-0.783	-0.166**	-1.991	1.491
Family size	-0.064	-0.793	0.061	0.816	-0.057	-0.714	0.156*	1.870	1.492
Dependence ratio	0.084	0.996	0.053	0.680	0.029	0.353	-0.183**	-2.127	1.597
People working far from home	0.039	0.511	0.028	0.406	0.060	0.791	-0.115	-1.467	1.315
Total land area (log)	0.293***	3.915	0.034	0.498	0.031	0.421	-0.187**	-2.426	1.274
Average income per person per month	-0.154*	-1.740	-0.036	-0.442	-0.225**	-2.562	0.023	0.256	1.788
Joining forest protection group	-0.001	-0.015	0.232***	3.408	-0.280***	-3.814	-0.079	-1.038	1.245
Satisfaction with forest protection activities under PFES	0.055	0.740	0.122*	1.777	-0.050	-0.678	-0.080	-1.041	1.257
R-square	0.168		0.294		0.182		0.121		
Observations	203		203		203		203		

*, $p < 0.10$; **, $p < 0.05$; ***, $p < 0.01$

Refer to Table 4 for the description of the explanatory variables

4.4.5. Determinants of willingness to participate in forest protection activities of non-forest protection groups

Among the 99 individuals who had never participated in FPGs, the logistic regression model was statistically significant ($\chi^2 = 36.64$, $p < 0.001$), with a Nagelkerke R^2 of 0.418 and a correct classification accuracy of 75.8% (Table 4.8). As variables were not standardized, the interpretation focused on statistical significance and the direction of effects rather than the effect size.

Three variables significantly predicted willingness to participate: ethnicity ($p < 0.05$), education level ($p < 0.05$), and satisfaction with forest protection activities under the PFES program ($p < 0.01$). A positive coefficient for ethnicity indicates that minority ethnic individuals were more likely to express willingness to participate than Kinh counterparts. Education level also showed a positive association, suggesting that those with higher educational attainment were more likely to engage in forest protection activities. Satisfaction with PFES was another strong predictor of participation. Participants who reported higher satisfaction, reflecting perceived improvements in forest conditions, reductions in illegal logging and land encroachment, stronger community responsibility, and fairer compensation, were more likely to express willingness to participate in forest protection activities. This suggests that perceptions of fairness and effectiveness in PFES implementation are essential for fostering long-term community engagement.

Table 4.8. Binary logistic regression results identifying significant predictors of households' willingness to participate in forest protection activities

Variables	B	S.E.	Wald	Exp (B)
Age	-0.030	0.020	2.304	0.971
Gender	-1.109	0.676	2.689	0.330
Ethnicity	2.305**	0.977	5.571	10.024
Occupation	-0.508	0.683	0.552	0.602
Education level	0.415**	0.196	4.485	1.514
Household type	0.560	0.595	0.888	1.751
Household size	-0.071	0.238	0.089	0.932
Dependence ratio	0.002	0.017	0.018	1.002
People work far away from home	0.247	0.690	0.128	1.280
Total land area (log)	0.092	0.431	0.045	1.096
Average income per person per month	-0.157	0.270	0.336	0.855
Satisfaction with forest protection activities under PFES	1.981**	0.622	10.137	7.249
Constant	-8.279	2.841	8.491	0.000
Chi-square	36.64***			
Nagelkerke	41.80%			
No. of correct predictions	75.80%			
No. of observations	99			

*, $p < 0.10$; **, $p < 0.05$; ***, $p < 0.01$

(Refer to Table 4.3 for coding variables)

Note: B: Unstandardized regression coefficient; S.E: Standard Error of the coefficient estimate; Wald: Wald chi-square test statistic; Exp(B): Odds ratio.

4.5. Discussion

4.5.1. Intrinsic and extrinsic motivations in forest protection

The results show that intrinsic motivations, particularly environmental concern and social responsibility, were central in driving participation among both FPG and N-FPG households (Table 4.6). Respondents emphasized key ecological functions of forests such as water protection, climate regulation, and soil fertility, values directly linked to livelihoods and long-

term community security (Table 4.2, Appendix A). This reflects the perception that forests in Vietnam's uplands are life-supporting systems rather than mere economic resources (Martín-López et al., 2019; Price, 1998). The findings reinforce international evidence that environmental motivations often represent the most sustainable foundation for conservation behavior. For instance, in Bunyaruguru, Uganda, people participated primarily for ecological rather than financial benefits (Fisher, 2012). Likewise, in Ecuador, some communities had already been engaged in conservation before the introduction of PES, motivated by previous degradation and viewing the program merely as support for existing efforts: "I conserve to conserve, not only for water, but for biodiversity, for everything" (Bremer et al., 2014). Similarly, Isyaku (2021) found that the Ekuri people of Nigeria valued forests as essential for survival and global climate regulation. Social motivations rooted in cultural, traditional, and spiritual values were also prominent. Among ethnic minority groups such as the Pa Co in Trung Son and Hong Kim in this study, rituals of forest worship before patrols embody both local ecological knowledge and intergenerational responsibility. This exemplifies the concept of place attachment, the emotional, behavioral, and cognitive bond between people and landscapes (Brown et al., 2012), which has been linked to pro-environmental behavior (Agarwal et al., 2017; Isyaku, 2021; Lin and Lockwood, 2014). In this context, forests are not only economic assets but also cultural-spiritual spaces that strengthen long-term conservation commitments.

Although intrinsic motivations dominated, extrinsic drivers, particularly financial incentives, still played a complementary role, especially among N-FPG households. This difference likely stems from the historical context of forest protection efforts. Initially, FPG members participated voluntarily without any financial compensation, motivated primarily by a sense of communal responsibility. Similarly, a study in Sri Lanka found that many individuals engaged in conservation out of social obligation rather than direct material gain (Nuggehalli and Prokopy, 2009). Once PFES was introduced, external rewards became a major incentive attracting the participation of N-FPGs. This aligns with Nguyen et al. (2022), who observed that PES in Vietnam increasingly functions as a financial incentive mechanism, and with international studies highlighting the role of monetary or in-kind payments in promoting participation in PES (Authélet et al., 2021; Waruingi et al., 2021). By contrast, legal and regulatory compliance motivations exerted the weakest influence across both groups. This reflects the weak institutionalization of local rules and limited enforcement capacity. As Nguyen et al. (2022) noted, PES participants in Vietnam face few legal consequences beyond payment reductions when forest cover declines. Similar results have been reported in other developing contexts, where weak law enforcement reduces deterrence effects (McElwee, 2004;

Tacconi, 2012). In this context, PFES has become a critical institutional mechanism to compensate for enforcement gaps.

A distinctive feature of Vietnam is that PFES is implemented as a nationwide mandatory policy, unlike voluntary PES schemes in many other countries. The persistence of intrinsic motivation within this compulsory framework suggests that legal obligations do not necessarily erode intrinsic values when programs are perceived as transparent and culturally appropriate. While several studies warn that financial rewards may weaken intrinsic motivation if they fail to offset opportunity costs or align with local values (De Martino et al., 2017; Rode et al., 2015), sometimes even producing backlash effects when land-use restrictions cause income loss (Luck et al., 2012), our results indicated the opposite. PFES payments acted as complementary incentives, stimulating initial participation while environmental, cultural, and social values sustained long-term commitment. This dynamics reflects a “crowding-in” rather than “crowding-out” effect, where intrinsic and extrinsic motivations can reinforce one another when embedded in legitimate and culturally resonant institutions, an outcome also observed in southern Mexico, where community-based conservation persisted through intrinsic commitments even after the introduction of financial incentives (Méndez-López et al., 2015).

Overall, these findings reinforce the conceptual expectation that both intrinsic and extrinsic motivations jointly shape household engagement in forest protection. The complementary interaction between internal values and external incentives supports the theoretical premise that sustainable conservation behavior emerges when financial, social, and cultural drivers are aligned within legitimate and locally meaningful institutions.

4.5.2. Determinants of motivational domains and willingness to participate

Regression analysis revealed that sociodemographic and institutional factors significantly shaped motivational domains (Table 4.7). Among the factors examined, education emerged as the most consistent and influential predictor, positively associated with social incentives, environmental recognition, and legal compliance. This finding aligns with previous studies showing that individuals with higher educational attainment tend to demonstrate greater environmental awareness, civic engagement, and understanding of institutional mechanisms (Jumbe and Angelsen, 2007; Lise, 2000; Obua and Turyahabwe, 1998; Ratsimbazafy et al., 2012). Education fosters both agency and knowledge about the ecological and regulatory dimensions of PFES, thereby strengthening intrinsic and rule-based motivations. Although some studies have shown no statistically significant relationship between education and participation (Apipoonyanon et al., 2019; Soe and Yeo-Chang, 2019), the effect of education

in this context was evident. This underscores the importance of integrating environmental education and capacity-building initiatives into PFES implementation to strengthen local people's long-term commitment to forest conservation. Age also had a positive effect on social motivation, reflecting the stronger sense of responsibility among older individuals possibly due to experience and long-standing engagement in community forest management (Ratsimbazafy et al., 2012; Soe and Yeo-Chang, 2019). These intergenerational differences indicate that conservation values are often rooted in lived experiences and community identity (Boafo et al., 2016; Sinthumule and Mashau, 2020), while modernization (Kandari et al., 2014) and migration (Le et al., 2023) may gradually weaken place attachment among younger generations. Economic characteristics further shaped motivation. Household type had a significant adverse effect on legal-regulatory compliance motivation, indicating that poor and near-poor households were less responsive to legal obligations. As To (2015) observed in Ban Yen village, Vietnam, some households continued illegal logging despite official bans, suggesting that vulnerable groups may prioritize livelihood security over legal compliance. This underscores the need for governance approaches that address livelihood constraints rather than relying solely on enforcement. Similarly, the dependence ratio was negatively associated with legal-regulatory compliance. This may be because a higher proportion of non-working members (e.g., children or the elderly) increases economic pressure on the working population, thereby limiting their ability or willingness to comply with forest protection rules. Such households tend to prioritize immediate livelihood needs, particularly in contexts of weak enforcement and minimal sanctions. Income levels also influenced economic motivation. Lower-income households regarded PFES payments as essential, whereas wealthier ones were less dependent on financial incentives. As illustrated by a N-FPG respondent in Trung Son, *"For a low-income family like mine, earning money is very difficult, so the income from forest protection means a lot"*. This finding is consistent with international evidence that low-income households are more likely to participate in PES schemes (Kosoy et al., 2008). Ensuring equity and maintaining sufficiently attractive payments for vulnerable groups is therefore vital to sustain participation.

Institutional factors also played a decisive role. Membership in forest protection groups was positively associated with environmental recognition but negatively with economic incentives, corroborating the group-level differences identified by the Mann-Whitney U test (Table 4.7). This pattern suggests that repeated institutional participation fosters ecological awareness while reducing dependence on financial rewards. One explanation is that PFES payments are relatively small, accounting for less than 2% of household income, and are often perceived as insufficient compared with the effort required for forest protection (Le et al., 2023;

Nguyen et al., 2024). Over time, however, long-term FPG members tend to internalize conservation values through regular patrols and collective activities that promote peer learning, information sharing, and ecological understanding. Taken together, these findings highlight the importance of institutional design in strengthening intrinsic motivations and promoting lasting behavioral change beyond economic incentives. The observed interlinkages between individual and institutional factors also validate the theoretical consistency of the study framework combining STD (Ryan and Deci, 2000) and IAD (Ostrom, 1990), thereby confirming that both personal values and rule-based structures jointly sustain participation in PFES.

For N-FPG households, willingness to participate was strongly influenced by ethnicity, education, and satisfaction with PFES (Table 4.8). Ethnic minority households expressed higher willingness than Kinh households, reflecting greater dependence on forests for livelihoods and deep cultural–spiritual attachments to sacred landscapes (Hoang, 2006; Sunderlin and Huynh Thu Ba, 2005). These cultural values underpin intergenerational responsibility, consistent with recent studies on cultural identity and local knowledge (Nghie and Thu, 2023). Education again emerged as a robust predictor, confirming its cross-cutting role not only in shaping motivational domains but also in translating motivation into behavioral intentions. This suggests that education enhances the capacity to act on pro-environmental values, reinforcing findings from other PES contexts (Kimengsi et al., 2019; Masha et al., 2024; Tadesse et al., 2017). Satisfaction with PFES was another decisive factor shaping willingness to participate. Respondents who perceived PFES as fair, transparent, and effective were significantly more likely to engage in forest protection. This finding highlights the central role of institutional trust, which develops through perceptions of fairness, transparency, and legitimacy, in sustaining voluntary participation (Corbera et al., 2007; Sommerville et al., 2010).

These results indicate that motivations for forest protection are shaped by the interaction between intrinsic and extrinsic drivers, which are in turn influenced by underlying sociodemographic characteristics, livelihood dependence, and institutional experiences. Accordingly, the design and implementation of PFES should be tailored to account for socio-cultural diversity and varying levels of institutional trust to enhance equity and sustain long-term participation. Moreover, the observed differences between FPG and N-FPG households substantiate the study’s conceptual premise that motivational structures and perceptions of PFES vary according to institutional roles, access to information, and benefit-sharing mechanisms. This finding highlights the heterogeneous nature of community participation and

demonstrates the internal consistency between the empirical results and the theoretical framework.

4.5.3. Theoretical implications

This study contributes to the theoretical literature on PES and environmental governance by expanding the understanding of motivation in community-based conservation programs. First, conceptually, it distinguishes four motivational domains: financial incentives, social motivation, recognition of environmental values, and legal compliance, thereby applying and extending Self-Determination Theory (SDT) (Ryan and Deci, 2000) to a mandatory institutional context such as PFES. Findings show that motivation is not only shaped by individual autonomy but also by cultural identity, community responsibility, and institutional trust, which are often overlooked in conventional applications of SDT.

Second, the study refines debates on the “crowding-out” hypothesis. Rather than assuming that extrinsic motivations undermine intrinsic ones, the results reveal a form of sequential complementarity, in which financial incentives and legal rules attract initial participation, while cultural and environmental values sustain long-term commitment. This “motivation sequencing” perspective extends PES theory beyond the substitution logic commonly assumed.

Third, methodologically, the study introduces a structured set of motivational indicators, translating abstract concepts such as cultural identity, intergenerational responsibility, and institutional legitimacy into measurable domains. This approach not only facilitates comparison across communities within a country but also opens possibilities for cross-national studies, contributing to the development of a comparative framework of motivation in PES.

By operationalizing SDT in a mandatory PES context, this study advances theoretical understanding of how intrinsic and extrinsic motivations interact under institutional constraints, particularly in state-led conservation programs.

Overall, these contributions bridge the gap between individual-level psychological theories and institutional analyses of environmental governance, offering an integrated framework for understanding participation in PES.

4.6. Conclusion

This study investigated the motivations driving household participation in forest protection under Vietnam’s Payment for Forest Environmental Services (PFES), focusing on both intrinsic and extrinsic factors across three buffer-zone communes of the Phong Dien

Nature Reserve. The findings have important implications for the design and implementation of PFES in Vietnam, while also offering insights for other countries adopting or considering similar payment schemes.

Results showed that intrinsic motivations remained the most enduring drivers of participation, while financial and legal–regulatory incentives played supporting roles, attracting initial engagement but not sustaining long-term commitment. Education, age, ethnicity, dependence ratio, household type, income, and institutional trust (e.g., participation in Forest Protection Groups and satisfaction with PFES) significantly shaped both motivational domains and willingness to participate, underscoring the interlinkages between livelihood conditions, institutional experiences, and cultural identity.

These results confirm the multidimensional nature of motivations and contribute to ongoing debates on motivational crowding, institutional trust, and cultural identity in environmental governance. They also highlight the importance of adopting a motivation-based approach to explain conservation behavior and to inform community forest governance strategies.

References

- Agarwal, S., Marathe, A., Ghate, R., Krishnaswamy, J., Nagendra, H., 2017. Forest protection in Central India: do differences in monitoring by state and local institutions result in diverse social and ecological impacts? *Biodivers Conserv* 26, 2047–2066. <https://doi.org/10.1007/s10531-017-1344-6>
- Apipoonyanon, C., Kuwornu, J., Szabo, S., Shrestha, R., 2019. Factors influencing household participation in community forest management: evidence from Udon Thani Province, Thailand. *Journal of Sustainable Forestry* 39. <https://doi.org/10.1080/10549811.2019.1632211>
- Authélet, M., Subervie, J., Meyfroidt, P., Asquith, N., Ezzine-de-Blas, D., 2021. Economic, pro-social and pro-environmental factors influencing participation in an incentive-based conservation program in Bolivia. *World Development* 145, 105487. <https://doi.org/10.1016/j.worlddev.2021.105487>
- Basu, J.P., 2021. Forest participation of local communities: a study of a tribal dominated region in India. *J. Soc. Econ. Dev.* 23, 180–201. <https://doi.org/10.1007/s40847-020-00142-w>
- Bayrak, M.M., 2019. State of Forest Governance in Vietnam: Where Are the Local Communities?, in: *Population, Development, and the Environment*. Palgrave Macmillan, Singapore, pp. 273–295. https://doi.org/10.1007/978-981-13-2101-6_16
- Boafo, Y.A., Saito, O., Kato, S., Kamiyama, C., Takeuchi, K., Nakahara, M., 2016. The role of traditional ecological knowledge in ecosystem services management: the case of four rural communities in Northern Ghana. *International Journal of Biodiversity Science, Ecosystem Services & Management* 12, 24–38. <https://doi.org/10.1080/21513732.2015.1124454>
- Boissie`re, M., Sheil, D., Basuki, I., Wan, M., Hien Le, 2009. Can engaging local people’s interests reduce forest degradation in Central Vietnam? *Biodiversity and Conservation* 18, 2743–2757. <https://doi.org/10.1007/s10531-009-9627-1>
- Bottazzi, P., Wiik, E., Crespo, D., Jones, J.P.G., 2018. Payment for Environmental “Self-Service”: Exploring the Links Between Farmers’ Motivation and Additionality in a Conservation Incentive Programme in the Bolivian Andes. *Ecological Economics* 150, 11–23. <https://doi.org/10.1016/j.ecolecon.2018.03.032>
- Bremer, L., Farley, K., Lopez-Carr, D., Romero, J., 2014. Conservation and livelihood outcomes of payment for ecosystem services in the Ecuadorian Andes: What is the potential for ‘win-win’? *Ecosystem Services* 8. <https://doi.org/10.1016/j.ecoser.2014.03.007>
- Brown, B.B., Altman, I., Werner, C.M., 2012. Place Attachment, in: Smith, S.J. (Ed.), *International Encyclopedia of Housing and Home*. Elsevier, San Diego, pp. 183–188. <https://doi.org/10.1016/B978-0-08-047163-1.00543-9>
- Chandola, H., 1977. New Economic Zones. *Economic and Political Weekly* 12, 83–85.

- Chu, L., Quentin Grafton, R., Keenan, R., 2019. Increasing Conservation Efficiency While Maintaining Distributive Goals With the Payment for Environmental Services. *Ecological Economics* 156, 202–210. <https://doi.org/10.1016/j.ecolecon.2018.10.003>
- CIA factbook, 2025. The world factbook. Explore all countries - Vietnam [WWW Document]. URL <https://www.cia.gov/the-world-factbook/countries/vietnam/> (accessed 10.13.25).
- Corbera, E., Kosoy, N., Martínez Tuna, M., 2007. Marketing ecosystem services through protected areas and rural communities in Meso-America: Implications for economic efficiency, equity and political legitimacy.
- Coulibaly-Lingani, P., Savadogo, P., Tigabu, M., Oden, P.-C., 2011. Factors influencing people's participation in the forest management program in Burkina Faso, West Africa. *Forest Policy and Economics* 13, 292–302. <https://doi.org/10.1016/j.forpol.2011.02.005>
- De Martino, S., Kondylis, F., Zwager, A., 2017. Protecting the Environment: For Love or Money? The Role of Motivation and Incentives in Shaping Demand for Payments for Environmental Services Programs. *Public Finance Review* 45, 68–96. <https://doi.org/10.1177/1091142115604352>
- Decision No. 59/2015 / QD-TTg, issued on November 19, 2015, promulgating the multi-dimensional approach poverty lines applicable to the period 2016-2020., 2015.
- Decision No. 430/QD-UBND, dated March 2, 2010, of the People's Committee of Thua Thien Hue province, on approving the project of forest allocation and forest leasing in Thua Thien Hue province for the period 2010-2014, 2010.
- Do, D.T., NaRanong, A., 2019. Livelihood and Environmental Impacts of Payments for Forest Environmental Services: A Case Study in Vietnam. *Sustainability* 11, 4165. <https://doi.org/10.3390/su11154165>
- Dolisca, F., Carter, D.R., McDaniel, J.M., Shannon, D.A., Jolly, C.M., 2006. Factors influencing farmers' participation in forestry management programs: A case study from Haiti. *Forest Ecology and Management* 236, 324–331. <https://doi.org/10.1016/j.foreco.2006.09.017>
- Duong, N.T.B., De Groot, W.T., 2020. The impact of payment for forest environmental services (PFES) on community-level forest management in Vietnam. *Forest Policy and Economics* 113, 102135. <https://doi.org/10.1016/j.forpol.2020.102135>
- Ellen, S., 2020. Slovin's Formula Sampling Techniques [WWW Document]. Sciencing. URL <https://www.sciencing.com/slovins-formula-sampling-techniques-5475547/> (accessed 4.18.25).
- Field, A., 2024. *Discovering statistics using IBM SPSS statistics*, 6th edition. ed. Sage publications limited.
- Figueroa, F., Caro-Borrero, Á., Revollo-Fernández, D., Merino, L., Almeida-Leñero, L., Paré, L., Espinosa, D., Mazari-Hiriart, M., 2016. "I like to conserve the forest, but I also like the cash". Socioeconomic factors influencing the motivation to be engaged in the Mexican Payment for Environmental Services Programme. *Journal of Forest Economics* 22, 36–51. <https://doi.org/10.1016/j.jfe.2015.11.002>

- Fisher J., 2012. No pay, no care? A case study exploring motivations for participation in payments for ecosystem services in Uganda. *Oryx* 46, 45–54. <https://doi.org/10.1017/S0030605311001384>
- Forest Sector Monitoring Information System (FOMIS), 2010. Vietnam Forest Sector Progress Report 2006–2010.
- Hayes T.M., 2012. Payment for ecosystem services, sustained behavioural change, and adaptive management: peasant perspectives in the Colombian Andes. *Environmental Conservation* 39, 144–153. <https://doi.org/10.1017/S0376892912000045>
- Hoang, H.T., 2006. Decentralization and local politics of forest management in Vietnam: a case study of Cờ Tu ethnic community. *The Journal of Legal Pluralism and Unofficial Law* 38, 169–206.
- Hoang, P.B.N., Fujiwara, T., Iwanaga, S., Sato, N., 2021a. Challenges of the Payment for Forest Environmental Services (PFES) program in forest conservation: a case study in Central Vietnam. *Journal of Forest Research* 26, 400–409.
- Hoang, P.B.N., Fujiwara, T., Iwanaga, S., Sato, N., 2021b. Participation of local people in the payment for forest environmental services program: A case study in central Vietnam. *Sustainability* 13, 12731.
- Hosmer Jr, D.W., Lemeshow, S., Sturdivant, R.X., 2013. Applied Logistic Regression. Hosmer Jr, D. W., Lemeshow, S., & Sturdivant, R. X. (2013). Applied logistic regression. John Wiley & Sons., 3rd edition. ed. John Wiley & Sons.
- Huy Tuan, H., 2006. Decentralization and Local Politics of Forest Management in Vietnam: A Case Study of Cờ Tu Ethnic Community. *The Journal of Legal Pluralism and Unofficial Law* 38, 169–206. <https://doi.org/10.1080/07329113.2006.10756595>
- Ihemezie, E.J., Nawrath, M., Strauß, L., Stringer, L.C., Dallimer, M., 2021. The influence of human values on attitudes and behaviours towards forest conservation. *Journal of Environmental Management* 292, 112857. <https://doi.org/10.1016/j.jenvman.2021.112857>
- Isyaku, U., 2021. What motivates communities to participate in forest conservation? A study of REDD+ pilot sites in Cross River, Nigeria. *Forest Policy and Economics* 133, 102598. <https://doi.org/10.1016/j.forpol.2021.102598>
- Jumbe, C.B.L., Angelsen, A., 2007. Forest dependence and participation in CPR management: Empirical evidence from forest co-management in Malawi. *Ecological Economics* 62, 661–672. <https://doi.org/10.1016/j.ecolecon.2006.08.008>
- Kaczan, D.J., Swallow, B.M., Adamowicz, W.L. (Vic), 2019. Forest conservation policy and motivational crowding: Experimental evidence from Tanzania. *Ecological Economics* 156, 444–453. <https://doi.org/10.1016/j.ecolecon.2016.07.002>
- Kamaraij, S., Raju, D.V., Kannan, J., 2019. A study on employees motivation in B & B developers and builders private ltd., Vellore. *Journal of Advanced Research in Dynamical and Control Systems* 11, 211–216. <https://doi.org/10.5373/JARDCS/V11/20192557>

- Kandari, L.S., Bisht, V.K., Bhardwaj, M., Thakur, A.K., 2014. Conservation and management of sacred groves, myths and beliefs of tribal communities: a case study from north-India. *Environ Syst Res* 3, 16. <https://doi.org/10.1186/s40068-014-0016-8>
- Kimengsi, J.N., Bhusal, P., Aryal, A., Fernandez, M.V.B.C., Owusu, R., Chaudhary, A., Nielsen, W., 2019. What (De)Motivates Forest Users' Participation in Co-Management? Evidence from Nepal. *Forests* 10, 512. <https://doi.org/10.3390/f10060512>
- Kosoy, N., Corbera, E., Brown, K., 2008. Participation in payments for ecosystem services: Case studies from the Lacandon rainforest, Mexico. *Geoforum, Placing Splintering Urbanism* 39, 2073–2083. <https://doi.org/10.1016/j.geoforum.2008.08.007>
- Le, H.T.T., Nguyen, M.T.H., Le, H.T., Shinjo, H., 2023. Implementation of payment for forest environmental services and its influence on the livelihood of ethnic minorities in Thua Thien Hue Province, Vietnam. *Trees, Forests and People* 13, 100404. <https://doi.org/10.1016/j.tfp.2023.100404>
- Lin, C.-C., Lockwood, M., 2014. Forms and sources of place attachment: Evidence from two protected areas. *Geoforum* 53, 74–81. <https://doi.org/10.1016/j.geoforum.2014.02.008>
- Lise, W., 2000. Factors influencing people's participation in forest management in India. *Ecological Economics* 34, 379–392. [https://doi.org/10.1016/S0921-8009\(00\)00182-8](https://doi.org/10.1016/S0921-8009(00)00182-8)
- Loft, L., Gehrig, S., Le, D.N., Rommel, J., 2019. Effectiveness and equity of Payments for Ecosystem Services: Real-effort experiments with Vietnamese land users. *Land Use Policy* 86, 218–228. <https://doi.org/10.1016/j.landusepol.2019.05.010>
- Lovrić, M., Torralba, M., Orsi, F., Pettenella, D., Mann, C., Geneletti, D., Plieninger, T., Primmer, E., Hernandez-Morcillo, M., Thorsen, B.J., Lundhede, T., Loft, L., Wunder, S., Winkel, G., 2025. Mind the income gap: Income from wood production exceed income from providing diverse ecosystem services from Europe's forests. *Ecosystem Services* 71, 101689. <https://doi.org/10.1016/j.ecoser.2024.101689>
- Luck, G.W., Chan, K.M.A., Eser, U., Gómez-Baggethun, E., Matzdorf, B., Norton, B., Potschin, M.B., 2012. Ethical Considerations in On-Ground Applications of the Ecosystem Services Concept. *BioScience* 62, 1020–1029. <https://doi.org/10.1525/bio.2012.62.12.4>
- Maleknia, R., 2025. Roots of urban forest conservation behaviors: Discovering determinants of citizens' attitudes. *Environmental and Sustainability Indicators* 26, 100671. <https://doi.org/10.1016/j.indic.2025.100671>
- Martín-López, B., Leister, I., Lorenzo Cruz, P., Palomo, I., Grêt-Regamey, A., Harrison, P.A., Lavorel, S., Locatelli, B., Luque, S., Walz, A., 2019. Nature's contributions to people in mountains: A review. *PLoS One* 14, e0217847. <https://doi.org/10.1371/journal.pone.0217847>
- Masha, M., Bojago, E., Tadila, G., Belayneh, M., 2024. Effects of participatory forest management programs on Land use/land cover change and its Determinants in Alle District, southwest Ethiopia. *Heliyon* 10, e35179. <https://doi.org/10.1016/j.heliyon.2024.e35179>

- Maskey, V., Gebremedhin, T.G., Dalton, T.J., 2006. Social and cultural determinants of collective management of community forest in Nepal. *Journal of Forest Economics* 11, 261–274. <https://doi.org/10.1016/j.jfe.2005.10.004>
- Mayrand, K., Paquin, M., 2004. Payments for Environmental Services: A Survey and Assessment of Current Schemes 60.
- McElwee, P., 2004. You Say Illegal, I Say Legal: The Relationship Between ‘Illegal’ Logging and Land Tenure, Poverty, and Forest Use Rights in Vietnam. *Journal of Sustainable Forestry* 19, 97–135. https://doi.org/10.1300/J091v19n01_06
- McElwee, P., Bernhard, H., Nguyen, T.H.V., 2019. Hybrid outcomes of payments for ecosystem services policies in Vietnam: Between theory and practice. *Development and Change* 51, 253–280.
- McElwee, P., Nghiem, T., Le, H., Vu, H., Tran, N., 2014. Payments for environmental services and contested neoliberalisation in developing countries: A case study from Vietnam. *Journal of Rural Studies* 36, 423–440.
- Méndez-López, M.E., García-Frapolli, E., Ruiz-Mallén, I., Porter-Bolland, L., Reyes-Garcia, V., 2015. From Paper to Forest: Local Motives for Participation in Different Conservation Initiatives. Case Studies in Southeastern Mexico. *Environmental Management* 56, 695–708. <https://doi.org/10.1007/s00267-015-0522-0>
- Mook, A., Goyke, N., Dwivedi, P., 2022. Conservation Intentions and Place Attachment among Male and Female Forest Landowners. *Rural Sociology* 87, 817–846. <https://doi.org/10.1111/ruso.12434>
- Nghi, T.H., Thu, N.Q., 2023. Spiritual Forests—A Nature Conservation Model of Ethnic Minority Communities in Central Viet Nam. *Open Journal of Forestry* 14, 74–86. <https://doi.org/10.4236/ojf.2024.141005>
- Nguyen, D., Do, T., Huyen, D., Tran, N.T., Thi, D., To-The, N., 2024. Effect of payment for forest ecosystem services on forest conservation practices in Vietnam. *Journal of Infrastructure Policy and Development* 8. <https://doi.org/10.24294/jipd.v8i5.5254>
- Nguyen, T.H.V., McElwee, P., Le, T.V.H., Nghiem, T., Vu, T.D.H., 2022. The challenges of collective PES: Insights from three community-based models in Vietnam. *Ecosystem Services* 56. <https://doi.org/10.1016/j.ecoser.2022.101438>
- Nguyen, T.Q., Huynh, N.T., Hsu, W.-K.K., 2021. Estimate the Impact of Payments for Environmental Services on Local Livelihoods and Environment: An Application of Propensity Scores. *Sage Open* 11, 21582440211040774. <https://doi.org/10.1177/21582440211040774>
- Nuggehalli, R.K., Prokopy, L.S., 2009. Motivating factors and facilitating conditions explaining women’s participation in co-management of Sri Lankan forests. *Forest Policy and Economics* 11, 288–293. <https://doi.org/10.1016/j.forpol.2009.05.002>
- Nunez Godoy, C.C., Pienaar, E.F., Branch, L.C., 2022. Willingness of private landowners to participate in forest conservation in the Chaco region of Argentina. *Forest Policy and Economics* 138, 102708. <https://doi.org/10.1016/j.forpol.2022.102708>

- O'brien, R.M., 2007. A Caution Regarding Rules of Thumb for Variance Inflation Factors. *Qual Quant* 41, 673–690. <https://doi.org/10.1007/s11135-006-9018-6>
- Obua, J., Turyahabwe, N., 1998. Attitudes of local communities towards forest management practices in Uganda: The case of Budongo forest reserve. *Commonwealth Forest/*' Review 77(2), 1998.
- Ostrom, E., 1990. *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge University Press.
- Pagiola, S., Paola, A., José, G., Cees de, H., Muhammad, I., Enrique, M., Elías, R., Mauricio, R., Juan, P.R., 2004. Paying for biodiversity conservation services in agricultural landscapes. The World Bank Environment Department.
- Pham, T.T., Bennett, K., Vu, T.P., Brunner, J., Le Ngoc, D., Nguyen, V.D., 2013. Payments for forest environmental services in Vietnam from policy to practice. CIFOR Occasional paper, Bogor.
- Pham, T.T., Ngo, H.C., Dao, T.L.C., Hoang, T. long, Fisher, M.R., 2020. The politics of numbers and additionality governing the national Payment for Forest Environmental Services scheme in Vietnam: A case study from Son La province. *Forest and Society* 379–404. <https://doi.org/10.24259/fs.v4i2.10891>
- Phong Dien NR office, 2020. Sustainable forest management plan for Phong Dien Nature Reserve in the period of 2021-2030. Phong Dien Nature Reserve Management Board.
- Porter, D.C., Gujarati, D.N., 2008. *Basic Econometrics*. McGraw-Hill Education.
- Price, M.F., 1998. Forests in Sustainable Mountain Development, in: Sassa, K. (Ed.), *Environmental Forest Science: Proceedings of the IUFRO Division 8 Conference Environmental Forest Science, Held 19–23 October 1998, Kyoto University, Japan*. Springer Netherlands, Dordrecht, pp. 39–49. https://doi.org/10.1007/978-94-011-5324-9_5
- Ratsimbazafy, C.L., Harada, K., Yamamura, M., 2012. Forest resources use, attitude, and perception of local residents towards community based forest management: Case of the Makira Reducing Emissions from Deforestation and Forest Degradation (REDD) Project, Madagascar. *JENE* 4, 321–332. <https://doi.org/10.5897/JENE11.123>
- Rode, J., Gómez-Baggethun, E., Krause, T., 2015. Motivation crowding by economic incentives in conservation policy: A review of the empirical evidence. *Ecological Economics* 117, 270–282. <https://doi.org/10.1016/j.ecolecon.2014.11.019>
- Ryan, R.M., Deci, E.L., 2000. Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist* 55, 68–78. <https://doi.org/10.1037/0003-066X.55.1.68>
- Schunk, D.H., Pintrich, P.R., Meece, J.L., 2014. *Motivation in education : Theory, research, and applications*, 3rd ed., international ed. ed. Pearson Education.
- Sinthumule, N.I., Mashau, M.L., 2020. Traditional ecological knowledge and practices for forest conservation in Thathe Vondo in Limpopo Province, South Africa. *Global Ecology and Conservation* 22, e00910. <https://doi.org/10.1016/j.gecco.2020.e00910>

- Soe, K.T., Yeo-Chang, Y., 2019. Perceptions of forest-dependent communities toward participation in forest conservation: A case study in Bago Yoma, South-Central Myanmar. *Forest Policy and Economics* 100, 129–141. <https://doi.org/10.1016/j.forpol.2018.11.009>
- Sommerville, M., Milner-Gulland, E.J., Rahajaharison, M., Jones, J.P.G., 2010. Impact of a community-based payment for environmental services intervention on forest use in Menabe, Madagascar. *Conserv Biol* 24, 1488–1498. <https://doi.org/10.1111/j.1523-1739.2010.01526.x>
- Sood, R., Dhyani, S., 2024. Spiritual Commons: An Indigenous Narration for Sacred High-Conservation Value Landscapes of Himachal Pradesh, India, in: *Sacred Landscapes, Indigenous Knowledge, and Ethno-Culture in Natural Resource Management*. Springer, Singapore, pp. 471–484. https://doi.org/10.1007/978-981-97-4206-6_24
- Sudakov, K.V., 2006. Motivation as a basis of mental activity. *Zh Nevrol Psikhiatr Im S S Korsakova* 106, 4–11.
- Suhardiman, D., Wichelns, D., Lestrelin, G., Hoanh, C.T., 2013. Payments for ecosystem services in Vietnam: Market-based incentives or state control of resources? *Ecosystem Services* 5, 94–101.
- Sunderlin, W.D., Huynh Thu Ba, 2005. Poverty alleviation and forests in Vietnam. CIFOR, Jakarta.
- Tacconi, L., 2012. Redefining payments for environmental services. *Ecological Economics* 73, 29–36. <https://doi.org/10.1016/j.ecolecon.2011.09.028>
- Tadesse, S., Woldetsadik, Muluneh, and Senbeta, F., 2017. Forest users' level of participation in a participatory forest management program in southwestern Ethiopia. *Forest Science and Technology* 13, 164–173. <https://doi.org/10.1080/21580103.2017.1387613>
- Thirupathy, B., Kannan, J., 2020. A study on rural employees motivation in B & B Developers and Builders Private Ltd, Vellore. *Malaya Journal of Matematik*.
- Thoker, I.A., Bhat, M.S., Shah, S.A., Lone, F.A., Mir, S., Parrey, H.A., Akbar, M., 2024. Towards sustainable forest management: an examination of environmental knowledge among forest dwellers in the Kashmir Himalayas. *Environ Dev Sustain*. <https://doi.org/10.1007/s10668-024-04823-y>
- Tian, N., Pelkki, M., 2021. Nonindustrial private forest landowner perspectives on forest certification: A look at awareness and barriers. *Forest Policy and Economics* 131, 102552. <https://doi.org/10.1016/j.forpol.2021.102552>
- To, P.X., 2015. State Territorialization and Illegal Logging: The Dynamic Relationships between Practices and Images of the State in Vietnam. *Critical Asian Studies* 47, 229–252. <https://doi.org/10.1080/14672715.2015.1041278>
- Tran, V.C., Trinh, Q.T., Cao, Q.A., Pham, M.T., Camacho, L.D., Hoang, V.S., 2019. Contribution of forest to rural households' livelihood: evidences from Da river basin in the northwest mountainous region of Vietnam. *Forest and Society* 235–247. <https://doi.org/10.24259/fs.v3i2.7050>

- Truong, D.D., 2022. Impacts of payment for forest environmental service policy in Vietnam: A case study of Muong Nhe protected area. *Trees, Forests and People* 7, 100198. <https://doi.org/10.1016/j.tfp.2022.100198>
- Tuan, N.D.A., Dung, N. T., Sharma, S., 2017. Chapter 12 - Comanagement Approach for Conflict Management: A Case Study of the Phong Dien Nature Reserve, in: Thang, T.N., Dung, Ngo Tri, Hulse, D., Sharma, Shubhechchha, Shivakoti, G.P. (Eds.), *Redefining Diversity & Dynamics of Natural Resources Management in Asia*, Volume 3. Elsevier, pp. 179–188. <https://doi.org/10.1016/B978-0-12-805452-9.00012-6>
- Van Hecken, G., Bastiaensen, J., Vásquez, W.F., 2012. The viability of local payments for watershed services: Empirical evidence from Matiguás, Nicaragua. *Ecological Economics* 74, 169–176. <https://doi.org/10.1016/j.ecolecon.2011.12.016>
- Waruingi, E., Mbeche, R., Ateka, J., 2021. Determinants of forest dependent household's participation in payment for ecosystem services: Evidence from Plantation Establishment Livelihood Improvement Scheme (PELIS) in Kenya. *Global Ecology and Conservation* 26, e01514. <https://doi.org/10.1016/j.gecco.2021.e01514>
- Weiner, B., 2013. *Human motivation: Metaphors, theories, and research*. Psychology Press.
- Wunder, S., 2008. Payments for environmental services and the poor: concepts and preliminary evidence. *Envir. Dev. Econ.* 13, 279–297. <https://doi.org/10.1017/S1355770X08004282>
- Wunder, S., 2005. *Payments for environmental services: some nuts and bolts*. CIFOR, Bogor, Indonesia.

Chapter 5

General Discussion, Policy Recommendations, and Conclusion

5.1. General discussion

This dissertation examines Vietnam's Payment for Forest Environmental Services (PFES) policy from two complementary perspectives: (1) institutional performance and livelihood impacts at the household level (Chapter 3), and (2) the motivational foundations of household participation in forest protection (Chapter 4). Combining these two perspectives provides a more comprehensive understanding of how PFES operates in practice and how local communities perceive and respond to this policy.

From an institutional perspective, the results from Chapter 3 show that PFES in Thua Thien Hue has achieved notable progress, with the area of forest receiving payments increasing from 37% to 53% over seven years, thanks to negotiation efforts with environmental service users. However, PFES revenue still depends heavily on two main groups of service users, hydropower plants and water supply companies. This dependence causes significant fluctuations in annual PFES revenue, creating financial risks for the fund and reducing income stability for households participating in forest protection. Although this issue has not been examined in detail in much of the international PES literature, it is consistent with broader concerns about financial risks in PES, where programs may be delayed or discontinued if funding sources are constrained or interrupted (Engel, 2016; Pattanayak et al., 2010; Wunder, 2008). In the Vietnamese context, such financial instability may undermine the long-term motivation of community patrol teams, especially in buffer communes where livelihoods are strongly dependent on forest resources.

The study also reveals substantial variation in per-hectare payment rates across hydropower catchments. Although these differences can be technically justified based on the volume of electricity generated and the financial contributions of each catchment, their social implications are concerning. Households performing similar forest patrol tasks receive very different levels of income depending on the catchment in which they are located. This reflects equity challenges that have been widely reported in PES programs worldwide (Corbera et al., 2007; McDermott et al., 2013). Pascual et al. (2014) warn that designs that overlook distributional fairness can generate "equity risks," weakening the legitimacy of the program and reducing participation incentives. Lliso et al. (2021) further shows that PES schemes perceived as more equitable tend to achieve better social and environmental outcomes. Therefore, in addition to the transparency that is already ensured, adjusting the benefit-sharing

mechanism towards a more balanced distribution among catchments could strengthen community cohesion and enhance the long-term effectiveness of community-based forest management under PFES.

On the ecological side, PFES has contributed to improving forest monitoring capacity through the use of remote sensing technologies. However, explicit commitments related to forest quality remain limited. This finding is consistent with other PFES studies in Vietnam, which indicate that current policy primarily focuses on maintaining forest area rather than enhancing ecological functions (Pham et al., 2013; Truong, 2022a). Incorporating ecological indicators, such as the restoration of degraded forests and carbon sequestration, into PFES contracts is therefore necessary.

At the household level, PFES contributes only about 2% of average annual household income in Hong Kim commune. While this payment provides some financial support to patrol members, it is far too small to improve livelihoods or compensate for the opportunity costs of reduced forest exploitation. Regression results show that socio-economic factors such as education level, dependency ratio, and agricultural land area have a much stronger influence on household income than participation in forest protection groups. These findings are consistent with international evidence: Grima et al. (2016) report that most PES programs in Latin America have limited livelihood impacts, and Lliso et al. (2021), drawing on data from 12 countries in the region, concludes that PES can modestly improve the situation of the poorest households but does not resolve structural poverty or disadvantage. In addition, low PFES income and scarce local employment opportunities are contributing to a trend of labor migration among Pa Co youth, reducing the size of community patrol teams and raising concerns about the future sustainability of community-based forest management.

While the findings from Chapter 3 highlight the financial and livelihood constraints of PFES, Chapter 4 provides deeper insights into the motivational foundations of household participation. A key finding is that intrinsic motivations, such as environmental concern, cultural identity, and a sense of community responsibility, are the strongest drivers of engagement in forest protection. This is consistent with international evidence that pro-social and pro-environmental values constitute important non-monetary drivers of participation in PES (Costedoat et al., 2016; Grillos, 2017; Moros et al., 2019). In contrast, extrinsic motivations such as financial incentives and legal requirements play mainly a supporting role. PFES may attract initial participation among non-FPG households, but sustained engagement over time depends more strongly on program transparency, local satisfaction, and the coordinating role

of forest protection groups. The relatively weak legal motivation reflects gaps in sanctioning mechanisms and enforcement capacity, which is in line with findings by Pham et al. (2021), who observed ongoing deforestation in Dak Lak, Viet Nam despite the presence of PFES.

The coexistence of intrinsic and extrinsic motivations in this context also aligns with Self-Determination Theory (Deci and Ryan, 2000). While Muradian et al. (2013) caution that monetary payments may “crowd out” intrinsic motivations for conservation, the results from Thua Thien Hue suggest the opposite: PFES appears to reinforce intrinsic motivations (“crowding in”), particularly when the program is perceived as legitimate, transparent, and culturally appropriate. This implies that in indigenous communities such as the Pa Co, intrinsic motivations and financial incentives can be mutually reinforcing, a crucial insight for PES design in culturally specific settings.

The results further show that household socio-demographic characteristics, including education level, age, ethnicity, dependency ratio, household type, income, and trust in local organizations (for example, membership in Forest Protection Groups and satisfaction with PFES), play an important role in shaping differences in motivations and willingness to participate in PFES. This indicates that participation behavior is not determined solely by the design of the policy itself, but is also conditioned by livelihood circumstances, organizational experience and the cultural backgrounds of different household groups.

Overall, this study contributes to the international understanding of PFES by demonstrating that conservation effectiveness cannot be separated from behavioral motivations and socio-cultural context. The case of Thua Thien Hue provides empirical evidence of how PFES can simultaneously mobilize financial resources for conservation and activate intrinsic community values, thereby fostering more sustained participation. However, without improvements in equity, transparency and financial sustainability, PFES may fall short of its long-term conservation and livelihood objectives, a challenge that many countries implementing PES are currently facing.

5.2. Research limitations and perspectives on future studies

Although this study offers several important contributions, several limitations should be acknowledged. First, the analysis of PFES implementation and livelihood impacts in Chapter 3 focused exclusively on community forest owners in a single commune (Hong Kim). This narrow scope limits the ability to comprehensively assess how PFES benefits are distributed across different beneficiary groups. Future research should therefore include non-forest owners, such as individuals, households, and communities who receive PFES indirectly through forest

protection contracts with state forest owners, to provide a more complete understanding of the overall impacts of the policy.

Second, the study relied primarily on secondary data from 2011–2020, which provide important information on payment flows and administrative arrangements but do not reflect actual forest conditions or the quality of PFES implementation at the local level. As a result, the author was unable to assess ecological outcomes of PFES-supported forest protection activities, such as forest regeneration, biomass dynamics, or carbon storage. Future studies should incorporate remote sensing data, field-based ecological monitoring, or integrated socio-ecological indicators to more comprehensively evaluate PFES effectiveness in sustaining ecosystem services.

Third, limitations related to the analysis of motivations in Chapter 4 must also be acknowledged. The survey was conducted only in three buffer-zone communes of the Phong Dien Nature Reserve, which restricts the generalizability of our findings to areas with different institutional conditions, ethnic compositions, or PFES enforcement contexts. Future research should expand to diverse ecological regions to assess the consistency of these findings.

Fourth, the cross-sectional design allowed identification of associations but not causal relationships, leaving unanswered how motivations change over time or under policy shocks. Longitudinal designs or natural experiments would provide stronger insights into the dynamics and long-term impacts of PFES.

Fifth, the use of self-reported Likert-scale measures may introduce social desirability bias, even though anonymity and standardized procedures were applied during data collection. Future studies should therefore complement quantitative surveys with qualitative methods such as in-depth interviews, focus group discussions, or participant observation to more fully capture the cultural, institutional, and relational factors shaping forest protection motivations.

Finally, the analysis did not explicitly examine the ongoing erosion of intrinsic motivation due to social change, modernization, or youth migration. These trends may gradually weaken cultural and spiritual attachments that historically sustained conservation. Future research should therefore explore how generational transitions, value shifts, and changes in rural livelihoods influence the long-term transmission of intrinsic motivations in PFES communities.

5.3. Policy recommendation

Based on the findings of Chapter 3 regarding the implementation of PFES at the provincial level and its impacts on local livelihoods, together with the insights on forest

protection motivation from Chapter 4, this study proposes several policy recommendations to enhance the effectiveness, equity, and long-term sustainability of PFES in Thua Thien Hue province.

First, the range of environmental service users should be expanded in accordance with Decree 99, particularly to include tourism enterprises, industrial producers, and aquaculture facilities. Broadening the PFES revenue base will reduce dependence on hydropower plants and water supply companies, stabilize annual payment flows, and increase financial resources for forest protection and restoration.

Second, benefit-sharing mechanisms need to be strengthened to improve fairness and transparency. Simplifying administrative procedures, increasing community monitoring, and enhancing the connection between service users and providers would help reduce transaction costs and reinforce public trust in the PFES mechanism.

Third, PFES payment levels should be reconsidered to better reflect the workload and responsibilities of forest patrol teams. Ensuring adequate and stable income is essential not only for supporting household livelihoods but also for maintaining participation and reducing out-migration among young labourers.

Fourth, ecological monitoring should be strengthened through the application of remote sensing and GIS technologies to track forest changes and detect degradation early. A portion of the PFES fund could be allocated to equipment procurement and capacity building for patrol teams to enhance transparency and accountability in forest management.

Fifth, PFES contracts between forest owners and the provincial Forest Protection and Development Fund (FPDF) should incorporate explicit commitments related to forest quality, degraded-forest restoration, and ecological performance indicators. Integrating ecological criteria into PFES evaluation will help orient forest protection efforts toward improving forest quality rather than merely maintaining forest area.

Sixth, PFES should be integrated with livelihood support programs, particularly agroforestry models, non-timber forest products, and community-based tourism. Such integration would reduce pressure on natural forests, diversify household income sources, and foster longer-term participation in forest protection.

Beyond these institutional and financial considerations, findings from Chapter 4 highlight the importance of addressing social and cultural dimensions to sustain community engagement in forest conservation. Maintaining participation requires moving beyond short-term financial

incentives toward embedding forest stewardship within local cultural identity, ecological knowledge, and intergenerational responsibility.

Moreover, fairness and transparency in benefit distribution remain fundamental to strengthening institutional trust and social cohesion—two factors that strongly shape community motivation to participate in PFES.

PFES design should also recognize the heterogeneity of motivations across different social groups and pay particular attention to vulnerable households. Poorer families tend to respond more strongly to monetary incentives, while ethnic minority communities are often guided by cultural and spiritual values. These differences call for context-specific engagement strategies tailored to the needs and motivations of each group.

Implementing this principle requires integrating indigenous knowledge and traditional practices into environmental education, community activities, and PFES design. Such integration can enhance local ownership and strengthen cultural pride in forest conservation.

Finally, PFES should not be communicated merely as “wages for patrol work” but rather as recognition of community stewardship over forest resources. This framing can reinforce existing social and cultural motivations for forest protection and support the long-term sustainability of community participation.

5.4. Conclusion

This study provides a comprehensive assessment of PFES implementation and the motivational dynamics underlying community participation in forest protection in Thua Thien Hue province, central Vietnam. By integrating institutional analysis with behavioral perspectives, the research constructs a multidimensional understanding of how PFES operates in practice and how local communities perceive and engage with the policy.

The findings indicate that PFES has made meaningful contributions to forest governance by expanding the area under payment, mobilizing financial resources, and improving monitoring capacity. However, its impact on household livelihoods remains limited due to unstable payment flows and low benefit levels. These results underscore the need to diversify service users, improve benefit-sharing mechanisms, and strengthen contractual requirements related to forest quality and restoration.

At the household level, intrinsic motivations, including environmental awareness, cultural identity, and community responsibility, play a central role in sustaining long-term participation, whereas extrinsic motivations such as PFES payments primarily serve as initial

triggers. Factors such as educational attainment, age, ethnicity, dependence ratio, income level, and institutional trust significantly influence motivational domains and willingness to participate in forest protection.

The study also contributes theoretically by clarifying how intrinsic and extrinsic motivations interact within a mandatory PFES framework. It demonstrates that well-designed institutional arrangements can reinforce rather than diminish intrinsic motivations. The integration of Self-Determination Theory and the Institutional Analysis and Development framework provides deeper explanatory power for understanding variations in conservation behavior among different community groups.

From a policy perspective, the dissertation highlights the importance of combining financial incentives with socio-cultural motivations; ensuring fair and transparent benefit-sharing; strengthening ecological monitoring; and integrating PFES with livelihood support programs. Ultimately, sustainable forest management in upland Vietnam requires governance systems that harmonize economic, cultural, and institutional dimensions.

By illuminating both the institutional and behavioral dimensions of PFES, this dissertation offers a robust foundation for improving policy design and enhancing community participation in forest protection in Thua Thien Hue and comparable regions.

References

- Corbera, E., Kosoy, N., Martínez Tuna, M., 2007. Marketing ecosystem services through protected areas and rural communities in Meso-America: Implications for economic efficiency, equity, and political legitimacy.
- Costedoat, S., Koetse, M., Corbera, E., Ezzine-de-Blas, D., 2016. Cash only? Unveiling preferences for a PES contract through a choice experiment in Chiapas, Mexico. *Land Use Policy* 58, 302–317. <https://doi.org/10.1016/j.landusepol.2016.07.023>
- Deci, E.L., Ryan, R.M., 2000. The “What” and “Why” of Goal Pursuits: Human Needs and the Self-Determination of Behavior. *Psychological Inquiry* 11, 227–268.
- Engel, S., 2016. The Devil in the Detail: A Practical Guide on Designing Payments for Environmental Services. *International Review of Environmental and Resource Economics* /9, 131–177. <https://doi.org/10.1561/101.000000076>
- Grillos, T., 2017. Economic vs non-material incentives for participation in an in-kind payments for ecosystem services program in Bolivia. *Ecological Economics* 131, 178–190. <https://doi.org/10.1016/j.ecolecon.2016.08.010>
- Grima, N., Singh, S.J., Smetschka, B., Ringhofer, L., 2016. Payment for Ecosystem Services (PES) in Latin America: Analysing the performance of 40 case studies. *Ecosystem Services* 17, 24–32. <https://doi.org/10.1016/j.ecoser.2015.11.010>
- Lliso, B., Pascual, U., Engel, S., 2021. On the role of social equity in payments for ecosystem services in Latin America: A practitioner perspective. *Ecological Economics* 182, 106928. <https://doi.org/10.1016/j.ecolecon.2020.106928>
- McDermott, M., Mahanty, S., Schreckenberg, K., 2013. Examining equity: A multidimensional framework for assessing equity in payments for ecosystem services. *Environmental Science & Policy* 33, 416–427. <https://doi.org/10.1016/j.envsci.2012.10.006>
- Moros, L., Vélez, M.A., Corbera, E., 2019. Payments for Ecosystem Services and Motivational Crowding in Colombia’s Amazon Piedmont. *Ecological Economics* 156, 468–488. <https://doi.org/10.1016/j.ecolecon.2017.11.032>
- Muradian, R., Arsel, M., Pellegrini, L., Adaman, F., Aguilar, B., Agarwal, B., Corbera, E., Ezzine de Blas, D., Farley, J., Froger, G., Garcia-Frapolli, E., Gómez-Baggethun, E., Gowdy, J., Kosoy, N., Le Coq, J.F., Leroy, P., May, P., Méral, P., Mibielli, P., Norgaard, R., Ozkaynak, B., Pascual, U., Pengue, W., Perez, M., Pesche, D., Pirard, R., Ramos-Martin, J., Rival, L., Saenz, F., Van Hecken, G., Vatn, A., Vira, B., Urama, K., 2013.

- Payments for ecosystem services and the fatal attraction of win-win solutions: PES & fatal attraction of win-win solutions. *Conservation Letters* 6, 274–279. <https://doi.org/10.1111/j.1755-263X.2012.00309.x>
- Pascual, U., Phelps, J., Garmendia, E., Brown, K., Corbera, E., Martin, A., Gomez-Baggethun, E., Muradian, R., 2014. Social Equity Matters in Payments for Ecosystem Services. *BioScience* 64, 1027–1036. <https://doi.org/10.1093/biosci/biu146>
- Pattanayak, S.K., Wunder, S., Ferraro, P.J., 2010. Show Me the Money: Do Payments Supply Environmental Services in Developing Countries? *Review of Environmental Economics and Policy* 4, 254–274. <https://doi.org/10.1093/reep/req006>
- Pham, T.T., Bennett, K., Vu, T.P., Brunner, J., Le Ngoc, D., Nguyen, V.D., 2013. Payments for forest environmental services in Vietnam from policy to practice. CIFOR Occasional Paper, Bogor.
- Pham, T.T., Nguyen, T.D., Dao, C.T.L., Hoang, L.T., Pham, L.H., Nguyen, L.T., Tran, B.K., 2021. Impacts of Payment for Forest Environmental Services in Cat Tien National Park. *Forests* 12, 921. <https://doi.org/10.3390/f12070921>
- Truong, D.D., 2022. Impacts of payment for forest environmental service policy in Vietnam: A case study of Muong Nhe protected area. *Trees, Forests and People* 7, 100198. <https://doi.org/10.1016/j.tfp.2022.100198>
- Wunder, S., 2008. Payments for environmental services and the poor: concepts and preliminary evidence. *Envir. Dev. Econ.* 13, 279–297. <https://doi.org/10.1017/S1355770X08004282>

Appendices

Appendix A. Mean Likert scores of individual motivational indicators between FPGs and willing N-FPGs

No	Abbreviation	FPGs (n=144)	N-FPGs (n=59)	Mann-Whitney U test
I.1	SI1	4.4 ± 0.6	4.5 ± 0.6	ns
I.2	SI2	4.4 ± 0.6	4.4 ± 0.6	ns
I.3	SI3	4.6 ± 0.5	4.7 ± 0.5	ns
I.4	SI4	4.3 ± 0.6	4.2 ± 0.6	ns
I.5	SI5	2.9 ± 1.1	2.8 ± 1.2	*
II.1	ER1	4.2 ± 0.7	4.0 ± 0.9	*
II.2	ER2	4.2 ± 0.7	4.0 ± 0.7	ns
II.3	ER3	4.5 ± 0.5	4.0 ± 0.7	*
II.4	ER4	4.6 ± 0.5	4.3 ± 0.5	*
II.5	ER5	4.6 ± 0.5	4.3 ± 0.5	*
II.6	ER6	4.6 ± 0.6	4.2 ± 0.6	*
III.1	EI1	4.4 ± 0.6	4.2 ± 0.6	ns
III.2	EI2	2.8 ± 0.6	4.5 ± 0.5	*
III.3	EI3	3.0 ± 0.7	3.3 ± 0.6	*
III.4	EI4	4.3 ± 0.7	3.6 ± 0.7	ns
III.5	EI5	2.6 ± 1.0	4.3 ± 0.7	*
III.6	EI6	3.4 ± 0.8	3.3 ± 1.2	ns
III.7	EI7	3.5 ± 0.8	3.5 ± 0.9	ns
III.8	EI8	4.3 ± 0.5	3.6 ± 0.9	ns
IV.1	LRC1	2.9 ± 1.1	2.9 ± 1.0	ns
IV.2	LRC2	3.9 ± 0.6	4.0 ± 0.5	*
IV.3	LRC3	3.6 ± 0.8	3.7 ± 1.0	ns

Significance levels are indicated as follows: ns = not significant ($p \geq 0.05$); * $p < 0.05$

Appendix B. Questionnaire for household interview (Chapter 3)

Interviewer:

Date of the interview: (year/month/day) |_|_|/|_|_|/|_|_|_|_|

Time of the interview: (hour: minute) |_|_|:|_|_|

Place of the interview: District: Commune: Village (Old/New name):

Geographic location by GPS:

A. General information

1. Interviewee's Name:

2. Age:

3. Gender: ☐ Male ☐ Female

4. Ethnicity: ☐ Paco ☐ Taoi ☐ Kotu ☐ Van Kieu ☐ Others.....

5. Occupation:

(Note: Did you work at the local institution?)

6. Education level:

☐ Illiterate ☐ Literate ☐ Primary school ☐ Secondary school

☐ High school ☐ University

7. Type of household:

☐ Poor ☐ Near Poor ☐ Average

8. Are you a household head? ☐ Yes ☐ No

9. Basic information on household members

Household member No.	Gender 0= male 1=Female	Age	Education level 0=Illiterate; 1=Literate; 2=Primary school; 3=Secondary school; 4=High school; 5=University	Current occupation (for those 16 and older) 0= child below 6 years; 1=student; 2=self-employed; 3=temporary labour; 4= permanent labour; 5= non-employed; 6=household tasks; 7=retired; 8=working away from home; 9=others (specify)	Sector 1= agriculture cultivation; 2= animal husbandry; 3=aquaculture; 4= Forest harvesting 5= construction; 6=commercial/business 7=government/public sector; 8=transport services; 9=community tourism; 10=others
1.					

2.					
3.					
4.					
5.					

Note: In case your family has a member working far from home:

Why did they decide to work far away from home? (Place and types of work)

.....

Do they send money home? ☐ No ☐ Yes (If yes, how did they send money back home?)

.....

How is their money used?

.....

13. Did you join the Forest protection group?

☐ No (Go to Part D)

☐ Yes (Go to Part E)

B. Household background

B1. Area of the household land asset by land-use categories

Land cover type	Land use category and security	Land Tenure		
		Area of land used by the household (ha)	Land use certificate 0= No papers 1= Red book 2= Green Book 3= In the process of getting land certificates 4= Others (specific)	Location of your land (distance from your house to these locations)
1.Agriculture	Rice land			
	Industrial crops			
	Vegetable gardens close to the house			
	Pasture			
	Others			
2.Forest	Plantation (Piece 1)			
	Plantation (Piece 2)			
	Plantation (Piece 3)			
	Shifting cultivation			

	Natural forests (Forest protection contracts)			
3.Others (residential areas, infrastructure, shrubs, grasslands, wetland, lakes, rivers)				

C. Financial capital

C1. Livelihood sources and household income

1. In the last 12 months, what were the main sources of production and cash income for this household?

No.	Source income	Estimated income from these activities (VND/year)	Household use (Eat, gift, donation)	Sold for cash	Rank the top 3 most important sources of income (1 is the most important)
1	Rice				
2	Other agriculture crops...				
3	Other agriculture crops...				
4	Industrial crops (rubber tree, pepper or others)				
5	Animal husbandry (pig, cow, chicken...)				
6	Aquaculture				
7	Acacia plantation (<i>Ask about the last harvest and calculate annual income</i>)				
8	Collecting/Selling NTFPs from natural forest				
9	Harvesting timber from natural forest				

10.	Payment from PFES policy				
11	Business (shops, other services)				
12	Support from Government (in cash)				
13	Support from States forest enterprises (in cash)				
14	Support from family/relatives not living in the village				
15	Pensions				
16	Other wage labor (specify)				

C2. Saving and Credits

During the last 12 months, did you have any loans or savings?

	0=No; 1=Yes	Amount	Rate/Conditions	Source	Purpose of Loans
Loans/Credits					
Savings					
Total					

C3. Supporting from government and Non-government organizations

1. Did you receive any supports related to developing agriculture activities or increasing the livelihood of local people?

☐ Do not remember

☐ No. Please explain the reason.....

☐ Yes. Please fill the name of organizations, activities, year as a table below.

Name of project or organizations	Activities	Beginning year	Criteria to choose household

D. Questions for those who do not participate in Forest Protection Groups (FPGs)

1. Why have you not joined the forest protection groups?

☐ Have not enough eligible to participate in. Please list specific reasons.

.....

☐ Have not seen any benefits from participation in this group

☐ Not interested in joining the FPGs because our family income do not depend on harvesting products from the forest

☐ Spending time to do other work to improve income due to the poverty

☐ Limiting the number of members to join

☐ Other reasons (specify).....

2. If someone now quit managing and protecting forests, would you like to join that group?
Please explain the reason why you pick up this answer.

☐ No

☐ Yes

.....

3. Do you have any ideas or recommendations for better forest management and protection activities in your community?

☐ No

☐ Yes (If yes, please explain specific)

.....

E. Questions for those who participate in Forest protection groups (FPGs)

1. When you join the forest protection group? (year)

.....

2. Why did you or member of your family join FPGs?

☐ Have enough eligible to participate in. Please list specific reasons.

.....

☐ Love nature and forest

☐ Gaining benefit from PFES and other projects

☐ Other reasons (specify).....

3. What group of community forest management are you belong to?

☐ Community Forest Group I

☐ Community Forest Group II

☐ Community Forest Group III

- ☐ Community Forest Group IV
- ☐ Community Forest Group V
- ☐ Community Forest Group VI

4. Do you know when did your community is allocated the forest land to management and protection, and how many hectares?

- ☐ No ☐ Yes (If yes, please answer the table below)

Subject assigned	Area (ha)	Year	Forest types (Rich, medium, Poor...)	Forest origin (Nature/Plantation)
A household				
Group household				
Community Forest Group.....				

5. Does your family receive money from the payment for forest environmental services?

- ☐ No ☐ Yes

If No, Why.....

If Yes, When did you receive the payment from PFES (start from which year)? How much per each year?

.....

6. How many times did you receive the payment from PFES per year?

- ☐ Once per year ☐ Every three months ☐ Every month ☐ Twice per year
- ☐ Advance if needed ☐ Others (specific).....

7. How did you receive the payment from the fund of FFES? (Which method?)

.....

8. How did you use the money from PFES in your family?

- ☐ Buying food ☐ Buying rice ☐ Tuition fee ☐ Health care/Medicine
- ☐ Buying equipment for agriculture activities ☐ Others.....

9. Assess the importance of revenue from PFES to household livelihoods?

- ☐ Do not know ☐ None important ☐ Relatively important

☐Neutral ☐ Important ☐Completely important

Please explain why you choose the answer like this?

.....

10. How often do you do forest patrolling?

☐ Once per month ☐ Twice per month ☐ Depends on the peak season of illegal exploitation

☐ Others.....

11. When did you see the illegal hunting and logging in your community forest what did you do?

☐ Arrest them ☐ Warn and remind them ☐ Taking the photo of crime evidence to report Aluoi forest ranger ☐ Report to the leader of FPGs ☐ Expel them from forest

☐ Do nothing ☐ Others.....

12. Do you have any difficulties in doing forest patrolling?

☐ No ☐ Yes (If yes, please tell more specific)

.....

13. Do you have any ideas or recommendations for better forest management and protection activities in your community?

☐ No ☐ Yes (If yes, please explain specific)

.....

Thank you so much for your answer!

Appendix C. Questionnaire for household interview (Chapter 4)

(To look into the motivating factors that drive different types of forest ownership titles to participate in forest management and protection)

Interviewer:

Time of the interview: (year/month/day) |_|_|/|_|_|/|_|_|_|_|

Date of the interview: (hour: minute) |_|_|:|_|_|

Place of the interview: District Commune Village

Geographic location by GPS:

A. General information

1. Interviewee's Name:

2. Age:

3. Gender: ☐ 1. Male ☐ 2. Female

4. Ethnicity: ☐ 1. Paco ☐ 2. Taoi ☐ 3. Kotu ☐ 4. Van Kieu

☐ 5. Others.....

5. Occupation: ☐ 1. Farmer ☐ 2. Builder ☐ 3. Hired labor/ Freelancer

☐ 4. Business ☐ 5. Government Officers ☐ 6. Others.....

6. Education level:

☐ 1. Illiterate ☐ 2. Literate ☐ 3. Primary school ☐ 4. Secondary school

☐ 5. High school ☐ 6. Vocational school/technical institute ☐ 7. University

7. Type of household: ☐ 1. Poor ☐ 2. Near Poor ☐ 3. Average ☐ 4. Better off

8. How many people are there in your family?

☐ 1. 1-3 people ☐ 2. 4-6 people ☐ 3. 7-10 people ☐ 4. ≥ 11 people

9. Are you a household head? ☐ Yes ☐ No

10. How long have you been living in this village?

.....

11. Basic information on household members

Household member No.	Relationship with household head 1 = Father; 2 = Mother; 3 = Wife; 4 = Husband; 5 = Son; 6 = Daughter; 7 = Others	Gender 0= male 1=Female	Age	Education level 0= Illiterate; 1= Literate; 2= Primary school; 3= Secondary school; 4= High school; 5= Vocational school/technical institute; 6= University	Current occupation (for those 16 and older) 0= child below 6 years; 1=student; 2=self-employed; 3= temporary labour; 4= permanent labour; 5= non-employed; 6=household tasks; 7=retired; 8=working away from home; 9=others (specify)	Sector 1= agriculture cultivation; 2= animal husbandry; 3=aquaculture; 4= Forest harvesting; 5= construction; 6=commercial/business; 7=government/public sector; 8=transport services; 9=community tourism; 10=others
1.						
2.						
3.						
4.						
5.						

Note: In case your family has a member working far from home:

Who work far away from home? When did he/she start to do it? Where is he/she working now?

What kinds of job is he/she doing now?

.....

Do they send money home? ☐ No ☐ Yes (If yes, how did they send money back home?)

.....

How is their money used?

.....

13. What is your current forest ownership titles?

☐ 1. Community land title (Go to Part D)

☐ 2. None of forest ownership (Go to Part E)

B. Household background

B1. Area of the household land asset by land-use categories

Land cover type	Land category use and security	Land Tenure		
		Area of land used by the household (ha)	Land use certificate 0= No papers 1= Red book 2= Green Book 3= In the process of getting land certificates 4= Others (specific)	Location of your land (distance from your house to these locations)
4. Agriculture	Rice land			
	Industrial crops			
	Vegetable gardens close to the house			
	Pasture			
	Others			
5. Forest	Plantation (Piece 1)			
	Plantation (Piece 2)			
	Plantation (Piece 3)			
	Shifting cultivation			
	Natural forests (Forest protection contracts)			
6. Others (residential areas, infrastructure, shrubs, grasslands, wetland, lakes, rivers)				

C. Financial capital

C1. Livelihood sources and household income

1. In the last 12 months, what were the main sources of production and cash income for this household?

No.	Source Income	Estimated income from these activities (VND/year)	Household use (Eat, gift, donation)	Sold for cash	Rank the top 3 most important sources of income (1 is the most important)
1	Rice				
2	Other agriculture crops.....				
3	Other agriculture crops.....				
4	Industrial crops (rubber tree, pepper, or others)				
5	Animal husbandry (pig, cow, chicken...)				
6	Aquaculture				
7	Acacia plantation (<i>Ask about the last harvest and calculate annual income</i>)				
8	Collecting/Selling NTFPs from natural forest				
9	Harvesting timber from natural forest				
10.	Income from forest protection activities under PFES payment				
11	Business (shops, other services)				
12	Support from Government (in cash)				
13	Support from States forest enterprises (in cash)				

14	Support from family/relatives not living in the village				
15	Pensions				
16	Hired labor (Acacia plantation)				
17	Other wage labor (specify)				

2. Please estimate the average income of your household per month

- ☐ 1. < 1 million VND ☐ 2. 1-2 million VND ☐ 3. 2-3 million VND
☐ 4. 3-5 million VND ☐ 5. > 5 million VND ☐ 6. No answer

3. Is there any change in your income after holding land title to protect the forest under the PFES support? (Note: PFES was implemented in this area in 2014)

- ☐ 1. Worse (please answer question 3.1) ☐ 2. Neutral ☐ 3. Better (please answer question 3.2)

3.1.The reasons for worse income

- ☐ 1. There is no arable land
☐ 2. Scaring of forest resource
☐ 3. No freedom to exploit forest product
☐ 4. Spending money for the education of offsprings
☐ 5. Unhealthy
☐ 6.Others (Specify).....

3.2.The reasons for better income

- ☐ 1. Doing other business
☐ 2. Subsidy from Government
☐ 3. Gaining more income from PFES
☐ 4. Harvesting acacia plantation
☐ 5. Others (Specify).....

C3. SAVINGS AND CREDIT

During the last 12 months, did you have any loans or savings?

	0=No; 1=Yes	Amount	Rate/Conditions	Source	Purpose of Loans
Loans/Credits					
Savings					
Total					

C4. SUPPORTING FROM GOVERNMENT AND NON-ORGANIZATIONAL GOVERNMENT

1. Did you receive any supports related to developing agriculture activities or increasing the livelihood of local people?

- ☐ 1. Do not remember
- ☐ 2. No. Please explain the reason.....
- ☐ 3. Yes. Please fill the name of organizations, activities, year as a table below

Name of project or organizations	Activities	Beginning year	Criteria to choose household

D. Questions for community forest protection groups

1. Do you know when did your community/households is allocated the forest land and how many hectares?

- ☐ 1. No ☐ 2. Yes (If yes, please answer the table below)

Subject assigned	Year	Area (ha)	PFES area (ha)	Forest types (Rich, medium, Poor...)	Forest origin (Nature/Plantation)

Community Forest					
------------------	--	--	--	--	--

2. When did your community/household groups start to do forest patrolling?

.....

3. How do you get information about recruiting members for the forest protection group?

.....

4. What kinds of forest management activities did you do at that time?

.....

5. When did your community/household groups receive the support for your forest protection activities?

.....

6. What kind of forest activities did you and other members do related to forest management under PFES support?

- ☐ 1. Forest patrolling ☐ 2. Restore and regenerate forests with native species
- ☐ 3. Build forest patrol plan ☐ 4. Plant NTFPs under the forest
- ☐ 5. Participating in the decision-making process related to forest protection
- ☐ 6. Report violations to local authority and forest rangers
- ☐ 7. Handle on-site violations ☐ 8. Do nothing
- ☐ 9. Others

7. Do you think these forest protection activity changed since PFES implementation?

- ☐ 1. No ☐ 2. Yes ☐ 3. Do not know

If Yes please answer the question below.

What change took place after PFES implementation?

- ☐ 1. Positive ☐ 2. No change ☐ 3. Negative ☐ 4. Do not know

Please choose the reasons for positive change.

- ☐ 1. Frequently patrolling ☐ 2. Reduce illegal encroachment on forest land
- ☐ 3. Reduce illegal hunting and logging ☐ 4. Control forest fires
- ☐ 5. More willing to join forest patrol due to a diverse training program
- ☐ 6. Raise local awareness about forest's role
- ☐ 7. Provide alternate forms of livelihood (such as planting NTFPs under the forest canopy)

☐ 8. Others.....

8. How often are you participate in forest patrolling activities?

☐ 1. Never ☐ 2. Seldom ☐ 3. Frequent ☐ 4. Very frequent

Please explain more detail about your answer.

.....

9. How frequently do you attend meetings relating to forest management activities in comparison with others?

☐ 1. Never ☐ 2. Seldom ☐ 3. Frequent ☐ 4. Very frequent

Please explain more detail about your answer.

.....

10. How often are you involved in forest management decision-making compared to others?

☐ 1. Never ☐ 2. Seldom ☐ 3. Neutral ☐ 4. Frequent ☐ 5. Very frequent

Please explain more detail about your answer.

.....

11. Are there any specific mechanisms or practices in place to ensure that every member shares the responsibility and contributes to forest protection efforts?

☐ 1. No ☐ 2. Yes ☐ 3. Do not know

If yes, what is it?

.....

12. How is the level of cooperation and collective action among members in forest protection activities?

☐ 1. Very low level ☐ 2. Low level ☐ 3. Neutral ☐ 4. High level
☐ 5. Very high level

Please explain more detail about your answer.

.....

12. During the forest patrols, do the members agree on the route, patrol methods, and response strategy when violations are found?

☐ 1. Yes ☐ 2. No ☐ 3. Do not know

If yes, please choose the reasons.

- ☐ 1. We build a patrolling plan with the unity of all team members
- ☐ 2. The members help each other and are highly collective in patrol activities
- ☐ 3. Always patrol in groups to promote collective strength and take appropriate handling measures when violations occur
- ☐ 4. The leader always listens to the member's opinions to improve the patrol work better
- ☐ 5. Others.....

13. When you suppose to do patrolling and find it too difficult due to the sickness, did anyone take over or not?

- ☐ 1. Yes ☐ 2. No ☐ 3. Do not know

Please explain your answer.

.....

14. How do you rank your involvement in forest management activities compared to others?

- ☐ 1. Very little participation ☐ 2. Little participation ☐ 3. Satisfactory
- ☐ 4. Good ☐ 5. High level of participation

Please explain more detail about your answer.

.....

15. Are you satisfied with the current benefit-sharing mechanism from PFES among members of the forest protection group?

- ☐ 1. Extremely dissatisfied ☐ 2. Dissatisfied ☐ 3. Neutral
- ☐ 4. Satisfied ☐ 5. Extremely satisfied

Please explain more detail about your answer.

.....

16. How is the money used after receiving from the fund to the community/ household groups? (Plural answers)

- ☐ 1. Buying new equipment ☐ 2. Paying for those joint forest patrolling
- ☐ 3. Using for community activities (repair community houses, festivals)
- ☐ 4. Expenses for emergencies situation (unexpected patrol, forest fire)
- ☐ 5. Management and executive fees ☐ 6. Others

17. How did you use the money from PFES in your family?

- ☐ 1. Buying food ☐ 2. Buying rice ☐ 3. Tuition fee ☐ 4. Health care/Medicine

☐ 5. Buying equipment for agriculture activities ☐ 6. Others.....

18. Assess the importance of revenue from PFES to household livelihoods?

☐ 1. None important ☐ 2. Relatively important ☐ 3. Neutral
☐ 4. Important ☐ 5. Completely important

Please explain why you choose the answer like this.

.....

19. How has the implementation of PFES changed the access to land and forests of local people?

☐ 1. Extremely difficult to access ☐ 2. Difficult to access ☐ 3. Neutral
☐ 4. Easy to access ☐ 5. Extremely easy to access

Please explain why you choose the answer like this.

.....

20. What is the motivating factors that drive you and people in your community participate in forest protections activities?

1. Totally disagree; 2. Disagree; 3. Neutral; 4. Agree; 5. Totally agree

Motivating factors	Level of agreement				
	1	2	3	4	5
Economic incentives					
Be remunerated by joining forest patrols to create additional household income					
Get higher income from PFES payment compared to other livelihood sources					
The PFES payment is satisfy our household expense					
To harvest NTFPs within permitted levels					
Logging is allowed with the approval of local authorities and Forest ranger					
Loans for other livelihood activities					
Opportunity to earn extra income from other livelihood activities such as community-based eco-tourism					
Social incentives					

Rights to access forest and forest land					
Protect the culture, traditional and spiritual values of the community associated with forests					
Concern for future of next generation					
Good relationship among forest patrolling members					
To pass on land tenure to their children or other heirs					
Opportunity to participate in projects and training course related to local community forestry development					
Environmental recognition					
Protect forest to supply food and habitat for wildlife					
Protect forest to preserve nature and biodiversity conservation					
Protect forest to maintain good living environment for human's lives					
Forest role in water supply and water regulation					
Forest role in climate regulation					
Forest role in limiting soil erosion and landslide					
Legal and regulatory compliance					
We have to fulfill obligatory work as agreed by local authorities and forest rangers					
Because forest land can not change to other land use activities by government law					
Involvement in decision on forest monitoring and evaluation					

21. What are the main challenges or obstacles you are facing when implementing forest protection activities? How do you address these challenges or who can support you to overcome them?

.....

22. Are there any specific regulations or guidelines related to forest protection under PFES support that you must comply with under your ownership?

- ☐ 1. No ☐ 2. Yes ☐ 3. Do not know

If yes, what is it?

.....

23. How are these regulations or guidelines enforced, and what are the consequences of not complying with the general regulations?

.....

24. How would you describe your satisfaction with forest protection activities under your ownership title via the support of PFES?

- ☐ 1. Extremely dissatisfied ☐ 2. Dissatisfied ☐ 3. Neutral
☐ 4. Satisfied ☐ 5. Extremely satisfied

Please explain more detail about your answer.

.....

25. What improvements or changes would you recommend to improve the effectiveness of your forest protection activities?

.....

E. Questions for those did not join forest protection groups

1. Do you know that the government allocates land and forests to communities, groups of households and individuals in your village?

- ☐ 1. No ☐ 2. Yes

2. Do you know when did people in your village start to do forest patrolling?

- ☐ 1. No ☐ 2. Yes

If yes, please choose the answer.

- ☐ 1. I don't remember exactly, but I know they conducted patrols many years ago
☐ 2. They start patrolling when they receive forest land from the government
☐ 3. They start patrolling when they receive PFES payments
☐ 4. Others.....

3. Do you know what kind of activities did forest protection group members do?

- ☐ 1. No ☐ 2. Yes

If yes, please choose the activities.

- ☐ 1. Forest patrolling
 ☐ 2. Restore and regenerate forests with native species
☐ 3. Build forest patrol plan
 ☐ 3. Plant NTFPs under the forest
☐ 4. Participating in the decision-making process related to forest protection
☐ 5. Report violations to local authority and forest rangers
☐ 6. Handle on-site violations
 ☐ 7. Do nothing
☐ 8. Others

4. Do you want to join forest protection group (FPGs)?

- ☐ 1. No
 ☐ 2. Yes

If yes, what motivated you to become a member of FPGs?

1. Totally disagree; 2. Disagree; 3. Neutral; 4. Agree; 5. Totally agree

Motivating factors	Level of agreement				
	1	2	3	4	5
Economic incentives					
Be remunerated by joining forest patrols to create additional household income					
Get higher income from PFES payment compared to other livelihood sources					
The PFES payment is satisfy our household expense					
To harvest NTFPs within permitted levels					
Logging is allowed with the approval of local authorities and Forest ranger					
Loans for other livelihood activities					
Opportunity to earn extra income from other livelihood activities, such as community-based eco-tourism					
Social incentives					

Rights to access forest and forest land					
Protect the culture, traditional, and spiritual values of the community associated with forests					
Concern for future of next generation					
Good relationship among forest patrolling members					
To pass on land tenure to their children or other heirs					
Opportunity to participate in projects and training course related to local community forestry development					
Environmental recognition					
Protect forest to supply food and habitat for wildlife					
Protect forest to preserve nature and biodiversity conservation					
Protect forest to maintain good living environment for human's lives					
Forest role in water supply and water regulation					
Forest role in climate regulation					
Forest role in limiting soil erosion and landslide					
Legal and regulatory compliance					
We have to fulfill obligatory work as agreed by local authorities and forest rangers					
Because forest land can not change to other land use activities by government law					
Involvement in decision on forest monitoring and evaluation					

5. Do you think these forest protection activity changed since PFES implementation?

- ☐ 1. No ☐ 2. Yes ☐ 3. Do not know

If Yes please answer the question below.

What change took place after PFES implementation?

- ☐ 1. Positive ☐ 2. No change ☐ 3. Negative ☐ 4. Do not know

Please choose the reasons for positive change.

- ☐ 1. Frequently patrolling ☐ 2. Reduce illegal encroachment on forest land
☐ 3. Reduce illegal hunting and logging ☐ 4. Control forest fires
☐ 5. More willing to join forest patrol due to a diverse training program
☐ 6. Raise local awareness about forest's role
☐ 7. Provide alternate forms of livelihood (such as planting NTFPs under the forest canopy)
☐ 8. Others.....

6 . How frequently do you attend meetings in your village?

- ☐ 1. Never ☐ 2. Seldom ☐ 3. Frequent ☐ 4. Very frequent

Please explain more detail about your answer.

.....

Have you ever attended meetings or training programs related to forest management and development in your village?

- ☐ 1. No ☐ 2. Yes

Please give the detail reasons for that answer.

.....

7. If you have the opportunity to receive payment from PFES, is that payment important for your household's livelihood?

- ☐ 1. None important ☐ 2. Relatively important ☐ 3. Neutral
☐ 4. Important ☐ 5. Completely important

Please explain why you choose the answer like this.

.....

8. How has the implementation of PFES changed the access to land and forests of local people?

- ☐ 1. Extremely difficult to access ☐ 2. Difficult to access ☐ 3. Neutral

☐ 4. Easy to access ☐ 5. Extremely easy to access

Please explain why you choose the answer like this.

.....

9. How would you describe your satisfaction with current forest protection activities via the support of PFES?

☐ 1. Extremely dissatisfied ☐ 2. Dissatisfied ☐ 3. Neutral

☐ 4. Satisfied ☐ 5. Extremely satisfied

Please explain more detail about your answer.

.....

10. What improvements or changes would you recommend to improve the effectiveness of your forest protection activities?

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Thank you so much for your answer!

Publications

Chapter 3

Le, H.T.T., Nguyen, M.T.H., Le, H.T., Shinjo, H., 2023. Implementation of payment for forest environmental services and its influence on the livelihood of ethnic minorities in Thua Thien Hue Province, Vietnam. *Trees, Forests and People* 13, 100404. <https://doi.org/10.1016/j.tfp.2023.100404>

Chapter 4

Le, H.T.T., Shinjo, H., 2025. Motivational indicators for local participation in forest protection under Vietnam's payment for forest environmental services. *Environmental and Sustainability Indicators* 28, 101038. <https://doi.org/10.1016/j.indic.2025.101038>