

Article

Using REDD+ Policy to Facilitate Climate Adaptation at the Local Level: Synergies and Challenges in Vietnam

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Abstract: Attention has recently been paid to how REDD+ mitigation policies are integrated into other sectoral policies, particularly those dealing with climate adaptation at the national level. But there is less understanding of how subnational policy and local projects are able to incorporate attention to adaptation; therefore, we use a case study in Vietnam to discuss how REDD+ projects and policies address both concerns of mitigation and adaptation together at subnational levels. Through stakeholder interviews, focus groups, and household surveys in three provinces of Vietnam with REDD+ activities, our research sought to understand if REDD+ policies and projects on the ground acknowledge that climate change is likely to impact forests and forest users; if this knowledge is built into REDD+ policy and activities; how households in forested areas subject to REDD+ policy are vulnerable to climate change; and how REDD+ activities can help or hinder needed adaptations. Our findings indicate that there continues to be a lack of coordination between mitigation and adaptation policies in Vietnam, particularly with regard to REDD+. Policies for forest-based climate mitigation at the national and subnational level, as well as site-based projects, have paid little attention to the adaptation needs of local communities, many of whom are already suffering from noticeable weather changes in their localities, and there is insufficient discussion of how REDD+ activities could facilitate increased resilience. While there were some implicit and coincidental adaptation benefits of some REDD+ activities, most studied projects and policies did not explicitly target their activities to focus on adaptation or resilience, and in at least one case, negative livelihood impacts that have increased household vulnerability to climate change were documented. Key barriers to integration were identified, such as sectoral specialization; a lack of attention in REDD+ projects to livelihoods; and inadequate support for ecosystem-based adaptation.

Keywords: REDD+; household livelihoods; climate adaptation; vulnerability; forest policy; land

1. Introduction

There has been increasing concern in recent years for the need to link climate mitigation and adaptation policies together, particularly with regard to forests [1,2]. Forest policies to respond to climate change often involve either mitigation actions, such as biological carbon sequestration,

or adaptation actions, such as promoting resilience of ecosystems, but rarely are both considered together. Although the Intergovernmental Panel on Climate Change (IPCC) since 2007 has called for combined approaches, little has happened to facilitate mitigation and adaptation policies within the UN Framework Convention on Climate Change (UNFCCC), and individual country policies vary considerably in how much they integrate both approaches [3,4]. The IPCC defines adaptation as “adjustments in practices, processes, or structures” that can “moderate or offset the potential for damage or take advantage of opportunities created by a given change in climate” [4], and thus can encompass a wide range of potential policies for both forests and forest-using peoples.

Reducing Emissions from Deforestation and Degradation (REDD+) is the most well-known forest mitigation strategy to lower land-use generated greenhouse gas (GHG) emissions; the fundamental premise of REDD+ is that if households and governments are given payments and other types of rewards that equal or exceed what is earned from deforestation, then forests will be better protected, carbon emissions will be reduced, and these areas can serve as greater sinks for future GHG mitigation [5]. The rollout and implementation of REDD+ policies in various countries over the past decade has received much scholarly attention [6–10], although there has been less attention to how adaptation policies have been integrated into REDD+. Most existing studies of REDD+ and adaptation have been at the national level and have assessed how different ministries and sectors have coordinated through REDD+ projects to incorporate adaptation and mitigation concerns [11–17], while a smaller number of studies have looked at how voluntary forest carbon projects include adaptation measures [18–20]. However, we know less about how sub-national policymakers are treating adaptation in the development of forest carbon policies, and how households in areas with REDD+ projects, particularly those already vulnerable to climate impacts, are affected in terms of their adaptation options by REDD+ activities.

This article uses a case study in Vietnam to explore how REDD+ projects and policies link both concerns of mitigation and adaptation together at subnational levels in both policy and household impacts, and if not, what the barriers to doing so are. We build off a previous assessment for Vietnam that determined there was potential to address adaptation in REDD+ at national levels, as many stakeholders recognized the importance of integration of this sector [13]. Our project follows up at local levels to see if these potentials have been realized by exploring two main questions:

- (1) To what degree do REDD+ policies and projects on the ground at subnational levels acknowledge that climate change is likely to impact forests and forest users, and how is this built into REDD+ policy and activities?
- (2) How are households in forested areas subject to REDD+ policy also vulnerable to climate change, and how can REDD+ activities help or hinder needed adaptations?

Overall, we find that there continues to be a lack of coordination between mitigation and adaptation policies for forests in Vietnam, particularly with regard to REDD+. Policies at both the national and provincial level, and site-based projects, have paid little attention to the adaptation needs of local communities, and how REDD+ activities could facilitate increased resilience in livelihoods. While there were some implicit and coincidental adaptation benefits of REDD+ activities, most of the projects and local policies that we examine did not explicitly consider their activities to touch on adaptation or resilience, and in at least one case, negative livelihood impacts that have increased household vulnerability to climate change were documented. We conclude the article with insights into the barriers that continue to exist that keep REDD+ and adaptation from being considered more holistically.

2. Background: Intersections between REDD+ and Climate Adaptation in International and National Policy and Practice

REDD+ policies have been discussed as part of the UN Framework Convention on Climate Change (UNFCCC) since 2005, and has been on the agenda of all subsequent Conference of the Party

(COP) meetings, as technical subcommittees have worked out elements of how REDD+ might be implemented [21]. COP 19 in Warsaw in 2013 adopted a number of important technical decisions on REDD+, including on results-based finance, coordination of support, forest monitoring systems, safeguards, reference levels, measuring, reporting and verifying (MRV), and addressing the drivers of deforestation [22]. Pilot programs to prepare countries for “REDD+ readiness” have been underway in many nations, funded by bilateral and multilateral donors, and involving new institutions like the United Nations’ UN-REDD+ program and the Forest Carbon Partnership Facility (FCPF) of the World Bank [23].

Very few of the decisions taken at various COPs have explicitly linked REDD+ and adaptation approaches. For example, the 2015 Paris Agreement that was negotiated at COP 21 entered into force in November 2016, following ratification by at least 55 parties accounting for 55% of total global emissions (Vietnam ratified the agreement in November 2016). REDD+ is explicitly mentioned in article 5 of the agreement, but it does not state how countries are to implement forest sinks, or how results-based payments will be made, and leaves such decisions up to individual countries. These actions will be clarified by states in their submissions of “nationally determined contributions” (NDCs) that the Paris Agreement regularly requires. Article 7 notes that adaptation actions are similarly to be decided at the country level, through National Adaptation Plans (NAPs) also to be regularly filed with the UNFCCC, and such actions should *“follow a country-driven, gender responsive, participatory and fully transparent approach, taking into consideration vulnerable groups, communities and ecosystems, and should be based on and guided by the best available science and, as appropriate, traditional knowledge, knowledge of indigenous peoples and local knowledge systems, with a view to integrating adaptation into relevant socioeconomic and environmental policies and actions, where appropriate”* [24].

Within the international literature, there is increasing reference to how forest mitigation and adaptation activities might intersect [1]. In some countries, the same actors are in charge of both REDD+ and adaptation plans [11]. (However, this is not the case in Vietnam where REDD+ activities and actors are centered in the Ministry of Agriculture and Rural Development (MARD), and adaptation activities are mainly driven by the Ministry of Natural Resources and Environment (MONRE)). Some privately financed forest carbon projects, such as those certified by the Climate, Community and Biodiversity Alliance (CCBA) standard, have required attention to social adaptation as part of their certifications [19]. Other REDD+ policies, at national and local levels, have had little to say about adaptation. Some authors have assumed that attention to safeguards under REDD+ (a requirement from the Warsaw COP in 2013) demonstrates a sufficient approach to livelihoods, which will result in adaptation benefits [11], while other authors are more skeptical that safeguards and local participation (which might lead to adaptation benefits) are actually happening in REDD+ projects on the ground [25,26]. Of the existing reports on combined mitigation and adaptation policy, very few assess the complicated relationships between livelihoods, climate impacts, and REDD+ through on-the-ground surveys or interviews, leaving most discussions at higher levels of policy. One of the few papers to tackle this problem did find that while many forest mitigation projects in a case study in Belize did not have specific adaptation actions embedded in them, nearly half did have adaptation-related outcomes, such as improved livelihoods, and 90% of adaptation-explicit projects also reported mitigation-related outcomes, such as enhanced carbon stocks [18].

This topic deserves further study, as a lack of integration of REDD+ and adaptation into subnational and local policy could have serious consequences. Several authors have noted that activities taken to increase mitigation of land-based GHGs under REDD+ might have unintended impacts on the livelihoods of forest-dependent people [27,28], and therefore also have impacts on the ability of these households to adapt to climate change. A hypothetical example might be a forest plantation created for carbon sequestration that reduced water availability for nearby households, who then might become more vulnerable to climate-change induced droughts [18]. Overall, communities’ and individuals’ ability to cope with many forecasted climate changes, like localized changes in rainfall timing and amounts, among other impacts, are likely to be strongly conditioned on their ability

to access and mobilize resources like land, trees, water, fish and other means of livelihood [29,30]. If access rights to forest change under REDD+ projects, this could render communities and households more vulnerable to the effects of climate change at local levels if traditional assets like forests that are used for adaptation responses (e.g., as a source of quick cash or as food) become inaccessible [25,31]. Alternatively, REDD+ could potentially strengthen local access rights to forests through increased financing to ensure their protection from outside deforestation pressures, thus possibly increasing communities' resilience to climate change [32,33]. The aforementioned assessment of forest carbon mitigation projects in Belize show the positive benefits of attention to adaptation which resulted in diversified livelihoods, strengthened land tenure, and more robust local forest management [19].

Other reasons to combine mitigation and adaptation approaches include the need to maximize limited climate financing [11,18,34]; to harmonize sectoral policy and avoid institutional duplication and overlap in approaches [35]; and to potentially "climate-proof" mitigation and other development projects [36,37]. For example, the planting of biofuels (a mitigation policy) might be impacted by climate-induced changes in the future and would need to be planned for, otherwise projects' contributions to overall mitigation might decrease without adaptation measures [38].

However, numerous challenges face any attempt to integrate adaptation and mitigation together in policy and projects, at both national and local levels. For example, examination of existing REDD+ development at national scales has revealed major challenges in coordination across sectors already, with both duplications and gaps in how REDD+ works with other development policies [39–41]. Additionally, there are often mismatches between time scales for projects, with mitigation usually being more immediate and adaptation more longer term [19]. In cases where adaptation has explicitly been linked into a REDD+ mitigation project, there are often difficulties in financing and extended time spans for projects [42]. Further, future climate change impacts on both households and forests are variable and often depend on localized context, making generalizations about adaptation difficult to put into policy [43–46]. For example, one study that assessed climate change forecasts for the provisioning of ecosystem services from forests in Finland found a series of complicated impacts, some positive, some negative, with no clear direction for policy actions to increase adaptation [44].

On the positive side, one potentially promising new approach has been the concept of ecosystem-based adaptation (EBA), promoted for "the use of natural capital by people to adapt to climate change impacts, which can also have multiple co-benefits for mitigation, protection of livelihoods and poverty alleviation" [47]. EBA is often presented as a win-win for both mitigation and adaptation [48], and activities under this label include such activities as restoration or protection of coastal mangroves, which sequester carbon as well as helping coastal communities withstand the impacts of storms [49]. A recent review of EBA noted that forests can support human climate adaptation through: (1) provision of goods to vulnerable communities; (2) regulation of microclimates, especially for agriculture; (3) regulation of soil and water to buffer climate impacts; (4) coastal forest protection against storms; and (5) urban trees that regulate temperature and water [50,51]. However, there have been few assessments of the degree to which EBA approaches are integrated into either national or subnational REDD+ or other policies [52,53], and country experience shows that many challenges remain in operationalizing EBA [54].

Vietnam is a particularly appropriate country in which to look at both climate adaptation and forest-based mitigation, as it has been an early adopter of REDD+ activities, through the UN-REDD+ programme and the FCPF, as well as a number of voluntary projects. Slightly more than half of Vietnam's 2010 greenhouse gas emissions were from the agriculture, forestry, or land use sectors, indicating a high priority for investments in emissions reductions in this category [55]. Vietnam has also been identified as one of the top fifteen countries in the world vulnerable to natural hazards like drought and storms in terms of the number of people and scale of exposure [56], and forecasted temperature increases will exacerbate this condition to levels previously not experienced. The forecasted climate impacts to 2100 will likely be an increase in rainfall in wet seasons and decrease in dry of around 10% or more, increased intensity and frequency of storms and floods, and a likely sea

level rise of at minimum one meter [57]. In order to minimize climate change impacts on Vietnam, adaptation projects to reduce vulnerability have been increasing in scale and importance in recent years, including in water management, health care provisioning, and land use planning, such as resettlement away from vulnerable zones [58–60]. Many of these actions have been combined with disaster-risk reduction strategies and aimed at increasing resilience of households to a multitude of climate related effects [61–64]. However, there have been relatively fewer adaptation actions directed at forest-dwelling and using communities, which tend to be located in mountainous areas of the country, while more adaptation attention and financing focuses on coastal and delta areas [57,65].

3. Materials and Methods

3.1. Fieldsites

This study was carried out in 3 provinces of Dien Bien, Kon Tum, and Kien Giang (see Figure 1a). These sites were selected as representative of the North, Center and South of the country and were sites in which preliminary REDD+ readiness projects were on-going, all sponsored by different donors, which gave us a range of project types to explore. In each study province, local communes were selected for in-depth study based on where existing projects for REDD+ or other forestry-focused projects have been operating (see Figure 1b–d).

Dien Bien is a mountainous area located in the Northwest along the border with Laos. The total natural area of this province is 956,290 ha, with 41.1% of the total area classified as forest. The total population is 547,785, and 47% of the province's households were considered under the government poverty line in 2016, the highest rate in the entire country. Livelihoods primarily consist of agricultural production, livestock husbandry, and forestry exploitation and development activities. Around 50,000 households, mostly consisting of ethnic minorities like Hmong, Thai, Dao, Kho Mu, and others, have participated in government payments for environmental services (PES) programs since 2011. A Japan International Cooperation Agency (JICA) REDD+ project was piloted in two districts from 2012 to 2013 and included activities such as raising awareness of REDD+, FPIC (Free, Prior and Informed Consent) agreements, agro-forestry extension, and development of the province's overall REDD+ policy.

Kon Tum is a mountainous area located in the Central Highlands, with a total forest area of 603,814 ha, 58.5% of the province. There is a large and vulnerable ethnic minority population (54% of total), dependent on both cash crop and subsistence agriculture, and 26% of the province's households were considered under the government poverty line in 2016. The major crops grown in this area are primarily cassava for subsistence, with only a little rice, corn and rubber for supplemental income. Households located in areas of the province with basalt soils have been able to transition into cash crop agriculture, particularly rubber but also coffee, tea, cashew and litsea in the past 10 years, but these activities have been faulted for deforestation and forest degradation. A REDD+ project has been piloted in Kon Plong district of Kon Tum in 11 villages of Hieu commune by Fauna and Flora International (FFI), Kon Tum Provincial People Committee's, Kon Tum's Agriculture & Rural Development Department (DARD), and PanNature (an NGO) in the period 2011–2014. Hieu commune has around 20,500 ha that is nearly 90% forest, and 660 households, mostly of the M'nam ethnicity, have participated in project activities, such as building capacity for local authorities and communities in order to directly implement REDD+ activities (including setting up a new local community-based institution which would have locally derived and implemented rules), with the hopes of providing financial benefits to forest-dependent local and indigenous people from selling carbon credits in the voluntary carbon market.

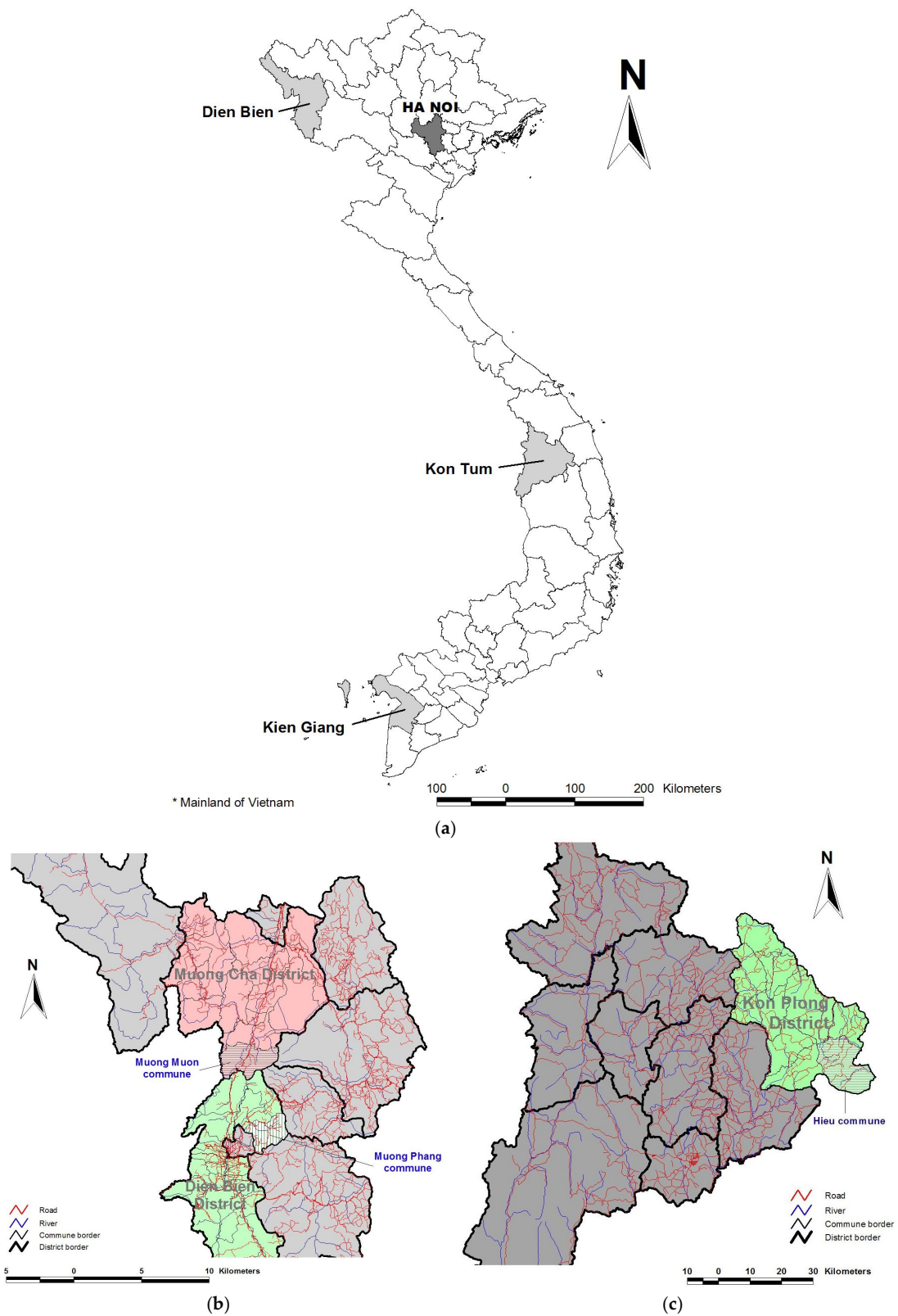


Figure 1. Cont.

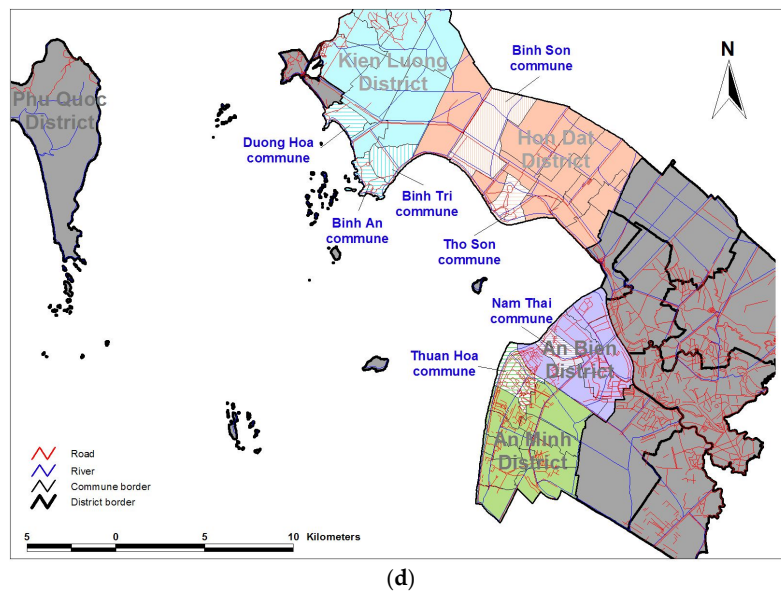


Figure 1. (a) Map of Vietnam showing provinces where research took place; (b) Dien Bien Province; (c) Kon Tum Province; (d) Kien Giang Province. Communes labelled in blue were sites of REDD+ projects and our research.

Kien Giang is located in the Mekong Delta area in the South. The total area of the province is 634,853 ha, in which forestry land is only 13.6% of the total area, mostly coastal mangroves. The total population is about 1.7 million people, of which ethnic minorities (primarily Khmer) are about 16% of the total, and the provincial poverty rate is 9.7%. Two-thirds of the population live in rural areas and have activities related to agriculture and aquaculture near mangrove forests. In 2008, with support from AUSAID and GTZ, Kien Giang began to implement a Conservation and Development of the Kien Giang Biosphere Reserve project. Within this project, activities have included surveys of mangrove species diversity; mangrove and coastline mapping via remote sensing and satellite image interpretation; studying biomass, carbon stocks, and biological diversity, including an assessment of forest regeneration needs and potential; and developing a REDD+ feasibility study. Local people have been involved in training courses and awareness raising activities held by the project and the local government agencies on the topic of PES and reducing emissions due to deforestation and agriculture production in the province.

3.2. Data Collection

Within each province, we carried out a mixed methods approach to collecting social and environmental data, making several field trips to each province throughout 2012, 2013 and 2014, spending from two to three weeks collecting data in each site. In each province a standard questionnaire was administered to a sample of households (selected at random from a village census by choosing every k th household on list) proportionately spread across villages to generate 100 households per province, for a total sample size of 300 households. Households are usually the main units making land-use and livelihood decisions, and this project has used the standard Vietnamese government definition of households. The survey asked questions about livelihoods, income, assets, participation in forest projects, climate vulnerability and adaptation measures. The data from the surveys was entered into SPSS for analysis.

In addition, focus groups were carried out with small numbers of local residents in each study area to help us to build histories of resource use, determine how residents learned from one another and set up institutions for managing forests and reducing climate risk and vulnerability, how these institutions functioned in different situations, and how such institutions interacted with official forest policies like

REDD+. In each research site, four focus groups (of approximately ten people per group) were run. A general focus group consisting of representatives of local civil society and government groups (such as the women's union, youth union, veteran's union, Communist Party, etc.) were asked to discuss the general issues of village such as main livelihoods, household economic status ranking, and seasonal calendars of the village, among other topics. A forest user focus group including families who were allocated forest land and who joined village forest patrolling groups discussed forest issues, changes of land and forest during the past ten to fifteen years, and participatory land-mapping exercises. For women's focus groups, representative women from different household types (poor, average, rich), and woman-headed households were selected to join for discussion. Finally, one focus group of officially designated "poor" households was run as well, and focused on risk-mapping, climate impacts on the poor, and other topics. In each case invitations were issued to attendees with the advisement of the village head and snowball sampling (e.g., asking invitees to bring along neighbors with related knowledge). We also targeted knowledgeable people in each community for lengthier, unstructured key informant interviews to collect life histories aimed at understanding social and climate vulnerability, as well as changes in resource-use patterns and access over time, among other topics.

Finally, we used stakeholder interviews with government officials and policymakers in each field site to gather information on the development of local forest policies. We asked how they were responsible for designing a forest policy incorporating social considerations; types of social data that policy makers use; and local input and participation to forest policy to their locality. We interviewed 15 policymakers at district and provincial levels in each fieldsite, and several national level stakeholders involved with REDD+ as well, for 60 policy interviews total.

4. Results

In the first part of this results section we discuss the national policy frameworks that have developed for REDD+ and for climate adaptation, and the degree to which they are integrated at subnational levels, while later we present data from a household survey undertaken in REDD+ project areas that aimed to understand forest-based livelihoods, climate vulnerabilities and adaptation, and the impacts of REDD+ projects on these.

4.1. National Policy Development for REDD+ and Adaptation

Vietnam developed a National Strategy on Climate Change in late 2011, which addresses both adaptation and mitigation, and REDD+ activities are a key element of the strategy [66]. It is estimated that through REDD+, 88.2 million tCO₂ emissions per year could be reduced [67]. Vietnam has recently submitted an intended "nationally determined contribution" (NDC) outlining plans to carry out the Paris Agreement, and the submission calls for an 8% reduction in greenhouse gas emissions by 2030 as compared to the business-as-usual scenario, which could be increased to a 25% reduction depending on international support. Specific activities in Vietnam's NDC related to forests and REDD+ include actions to:

- "Review and identify the areas and objects to apply sustainable forest management, afforestation and reforestation, biodiversity conservation, including special priority for regions with large forests that are important for forestry production and livelihoods of local communities of people;
- Develop and improve policies to promote sustainable forest management; mechanisms and policies to attract private sector investment for sustainable forest management, afforestation, reforestation, biodiversity conservation and livelihood development;
- Integrate and effectively use domestic and international resources for implementation of programmes and projects related to forest management and development, livelihoods and biodiversity conservation such as REDD+, the policy of payment for forest environmental services, etc.

- Strengthen and expand international cooperation for investment, technical assistance and capacity building, information and experience sharing on the sustainable forest management and development, biodiversity conservation and livelihood development" [68].

The development and governance structures for REDD+ in Vietnam have been reviewed by others, to which we refer readers for additional details [69–71]. We primarily focus on the adaptation linkages at national level in this paper. Most of the REDD+ activities in Vietnam have been carried out by various department of MARD, and have focused on traditional forestry activities like inventories and forest land use planning. However, one potential institutional linkage exists to facilitate adaptation into REDD+; a national steering network was set up in 2009 to coordinate REDD+ activities, and the Department of Meteorology and Climate Change of the Ministry of Natural Resources and Environment (MONRE) sits as a member the network, one of three non-MARD government departments (the other two are the Agro-economic Department of the Ministry of Planning and Investment and the Government Office, a prime-ministerial level coordinating office).

The steering network was charged with developing a National REDD+ Action Plan (NRAP), which was first completed in 2012 (and which is now under revision). The goals of the original 2012 NRAP were to (1) Build a national REDD+ Program and provincial REDD+ plans; (2) Enhance institutional capacity and coordination between ministries; (3) Raise awareness to stakeholders in forestry; (4) Improve technical capacity in reference levels, and monitoring; and (5) Develop benefit sharing systems and an information system on safeguards [72]. However, this initial NRAP made no mention of adaptation in any systematic way [13], although there are implied adaptation benefits from some of the REDD+ activities. For example, MARD is currently focused on a revision of forest criteria and classification for Vietnam to help clarify forest tenure agreements, which will likely have impacts on both REDD+ and adaptation projects in the future. The NRAP also affirms that by 2016–2020, there should be attention to “diversification and improvement of livelihoods of the forest owners and the people at large” [72], which would likely have positive adaptation benefits for households. Although previous researchers found limited policy support for adaptation in the forestry field at the national level in their analysis in 2014 [13], there has been some progress since then, particularly in research activities. For example, current climate adaptation focused activities in the forest sector include forest breeding of trees resistant to climate change; developing a national plan for adaptation to climate change in the forestry sector; and coordinating with the World Bank to conduct research on climate change adaptation in forestry [73].

Vietnam’s NDC clearly states that adaptation will also be an important part of the country response. However, Vietnam has not yet filed a National Adaptation Plan (NAP) with the UNFCCC, though it intends to do so in the future. The NDC has a lack of specificity with regard to funding and priorities for adaptation beyond stressing its importance. Although the NDC states that costs of adaptation in Vietnam are estimated to exceed 3%–5% of GDP by 2030, how funding will be mobilized and for what specific activities is not yet clear, beyond a few priorities of: (1) responding pro-actively to disasters and improving climate monitoring; (2) ensuring social security, including EBA and community-based adaptation; and (3) responding to sea level rise and urban inundation [68].

While the ways adaptation may be carried out in the forest sector are not explicitly referenced in the NDC, the National Strategy on Climate Change refers more specifically to the ways that forestry can contribute to “preventing and coping with natural disasters, flash floods and landslides in mountain areas”, and that policy will be needed to “improve quality of forests and afforestation, to turn bare lands and hills green, to effectively exploit different kinds of forest to secure and improve resistance against natural disasters, preventing desertification, land erosion and degradation; to enhance protection, management and development of mangrove forests and flooded ecosystems; to raise the forest coverage to 45% by 2020”. There is also a stated goal to “preserve biodiversity, protect and develop ecosystems and species which can well resist climatic changes; to protect and preserve genes and species endangered by impacts of climate change”. In addition, the National Strategy explicitly refers to “managing forest in a sustainable way, preserving and improving forests’ absorption

of carbon, and maintaining and diversifying local people's livelihood as well as helping them to adapt to climate change" [66].

The primary approach for livelihood improvements under REDD+ will likely be household payments, and it has been calculated that there will likely be a national-level payment rate from REDD+ of around 265,000 (12\$US) VND/ha/year in the future. Together with the general financial support from the state budget for forest protection measures (100,000–400,000 VND (5–20\$US) /ha/year), as well as the average payment for environmental services (PES) available for forest protection in some upland forests (on average 250,000 VND (11\$US)/ha/year) [74], participation in forest protection and management under a combination of REDD+ and other programs can contribute to incomes of local people, especially for poor and vulnerable groups in remote areas. Existing PES payments to households in forested areas of Vietnam account for on average 6%–7% (and up to 30%) of household income in participating areas, and are often used to enable school fees and healthcare bills to be paid, to help ensure food security through purchases of rice or seedlings, and other forms of investment [75,76]. When payments can be made to community funds (done in some areas but not others), they can be used to build community infrastructure (e.g., roads, bridges, community houses, etc.); upgrading and buying common assets for the community (e.g., school supplies); paying for a village forest protection group; or even can setting up micro-loans for diversifying livelihood activities and other activities [77,78]. Through these ways, households and communities could be helped via REDD+ payments to adapt and recover following climatic shocks or disasters, although more research will need to be carried out once these payments begin to follow how these monies are actually being used (no areas of Vietnam have received national REDD+ payments as of 2016).

4.2. Subnational Policy on REDD+ and Adaptation and Interlinkages

The primary purpose of the NRAP is to set out key legal and institutional roles as well as priority interventions in REDD+ for the period 2011–2020 [72]. However, the document is mainly an enabling document rather than one providing detailed guidance to develop REDD+ interventions on the ground. Thus, the NRAP is to be supplemented by Provincial REDD+ Action Plans (PRAPs) and Site-based REDD+ Action Plans (SiRAPs). Depending on the particular context of sub-national levels, the PRAPs will help to develop mechanisms and set out suggested REDD+ prioritized interventions that are suitable for the local political, social and environmental conditions in order to support local actors to participate in REDD+ implementation more effectively and sustainability. Currently, fifteen provinces are developing PRAPs; ten are completed while five others are in the development process. (They include: Ca Mau, Lam Dong, Binh Thuan, Ha Tinh, Bac Kan and Lao Cai (supported by the UN-REDD+ program); Thanh Hoa, Ha Tinh, Nghe An, Quang Binh, Quang Tri and Thua Thien Hue (supported by the World Bank Forest Carbon Partnership Facility and the USAID-funded Vietnam Forests and Delta Program) and Dien Bien, Son La, and Hoa Binh provinces (supported under the aforementioned JICA project)). Of our three study provinces, only Dien Bien has an approved PRAP (finalized in May of 2014). In addition to the development of subnational PRAPs, pilot REDD+ activities for REDD+ readiness or voluntary carbon market accession have been implemented in many of Vietnam's provinces, funded by multilateral or bilateral donors or NGOs.

Many provinces have used these donor pilot projects to build off of for development of PRAPs. Because all provinces already were required to create Forest Protection and Development Master Plans to 2020 as required by MARD, REDD+ programs have piggybacked onto this process. This means that the PRAPs usually include both general forest protection and development activities, as well as specific activities for REDD+ pilot areas, divided into 5 different approaches: reducing deforestation, reducing degradation, sustainable forest management, conserving and enhancing forest carbon stocks. In addition, depending on the characteristic of the activities, PRAP activities also can be broken down into direct investment interventions (type I) and the supporting interventions (type II). Type I are defined as direct investment or activities for forest protection, management and development. Type II are supporting activities, which are mainly focused on providing incentives to forest owners, local

communities and other relevant actors to carry out the type I activities. The supporting activities include, depending on the local demands, provision of community development funds, financial and technical support for sustainable local livelihoods, or capacity building on various aspects of forest or livelihoods activities. All these activities have been required to be considered in the development of PRAPs, as per government decision 5414/QĐ-BNN-TCLN dated on 25 December 2015. Although many of these activities likely have adaptation benefits, throughout the national guidance issued for PRAP development, the words “climate change”, “mitigation” and “adaptation” are rarely used or not mentioned directly. Part of this inattention is likely due to the fact that PRAPs are primarily being developed by forestry departments at local levels, with less of the sector integration and multi-stakeholder engagement that has characterized the NRAP process at the national level.

We analysed the Dien Bien PRAP in some detail to understand the potential for synergies and linkages with climate adaptation policy. In addition, team members attended several workshops during the process of the development of the Dien Bien PRAP. Dien Bien was the first province in Vietnam to have completed and launched a PRAP with the support from JICA under the project “Sustainable Forest Management in the Northwest Watershed Areas (SUSFORM-NOW)”. The PRAP was designed to cover the period 2013–2020 and was approved by the Dien Bien Provincial People’s Committee in early 2014. Because the Dien Bien PRAP was developed and approved even before the national guidelines for PRAP development were issued, there are some now required activities that are not mentioned in this specific PRAP (see Table 1; the left hand column are activities now required to be addressed in most PRAPs). In particular, some interviewees noted that in fact Dien Bien’s PRAP is more similar to a general Forest Protection and Development Plan rather than a specific REDD+ plan focused on forest carbon mitigation.

Key activities to be implemented in the future under the Dien Bien PRAP include forest patrolling and monitoring; forest land allocation; livelihood support; and forest plantations, but there are few details on how these will be accomplished yet. Similar to the NRAP, the Dien Bien PRAP does not mention adaptation directly, and is only implied indirectly through the livelihood development activities to support forest protection in implementing REDD+. For example, the Dien Bien PRAP has highlighted that forestland allocation to organizations, households, individuals and communities should be completed, as one of the supporting activities to reduce deforestation and forest degradation drivers at the local level. Such activities are considered to have the potential to indirectly improve the adaptive capacity of local people to tackle other climate impacts by providing more secure access rights to forests (see Table 1, far right column), although how this will play out in reality will need further research. Additionally, the PRAP does place emphasis on the need to incorporate climate-resilient forest species in future forest plantations, and has several other foci of potential adaptation benefits to forests themselves (Table 1, second column from right).

In addition to helping support the creation and implementation of PRAP for Dien Bien, JICA developed a guidebook for other provinces carrying out PRAP development as well [79]; however, the handbook makes no explicit mention of adaptation support or activities. The handbook outlines a 13-step process that is necessary to develop a PRAP, of which some of the key activities are forest and socio-economic surveys; calculations of reference emission levels; searches for potential funding of emissions reductions; surveys on forest monitoring; and policies on safeguards. The handbook does identify the global Adaptation Fund as a source of REDD+ financing, but does not identify what adaptation activities related to REDD+ should be incorporated into PRAPs. Additionally, the socio-economic surveys only indirectly touch on climate vulnerabilities, as primarily these surveys are to “identify forest status such as forest distribution & stock at present and past forest change, the driver of forest decrease and increase, socio-economic conditions such as demography and agriculture & forestry production, and to assess past programs & policies relating forest protection and development” [79]. Thus, there appears to be much more room for PRAPs and PRAP development guidance to focus explicitly on adaptation.

Table 1. Key sectors and activities in subnational Provincial REDD Action Plan (PRAP) in Dien Bien Province.

I. General Forest Sectors and Plans	In Dien Bien PRAP?	Potential Adaptation Benefit to Forests?	Potential Adaptation Benefit to Households?
1.1. Forest protection and natural forest regeneration and enrichment	x	Y	Y
1.2. Forest plantation	x	Unclear	Unclear
1.3. Forest rehabilitation and reforestation	x	Y	Y
1.4. Silvicultural-related construction projects			
II. Prioritized Activities carried out at the potential REDD+ areas			
<i>2.1. Activities to reduce deforestation</i>			
a. Reviewing and analyzing overall land-use planning and forest/ forestland planning			
b. Reviewing and analyzing the overlap between forest/forestland planning and socio-economic development planning			
c. Strictly control the conversion of natural forests into other purposes	x	Y	Unclear
d. Supporting the forestland allocation, contracts and lease to households, individuals and local communities	x	Unclear	Y
e. Livelihood improvements			
f. Establishing small-scale local livelihood credit development funds			
g. Enhancing the forest protection and development law enforcement			
<i>2.2. Activities to reduce forest degradation</i>			
a. Reducing/ preventing illegal timber logging and utilization			
b. Establishing the administrative and technical monitoring system on timber legality assurance			
c. Promoting sustainable non-timber forest product (NTFP) models			
d. Market orientation to agro-forest products	x		Y
e. Developing village forest protection and development conventions	x		Y
f. Encouraging job creation in the REDD+ implementation sites	x		Y
<i>2.3. Sustainable forest management</i>			
a. Support to develop and implement the sustainable forest management plan and SFM certificates			
b. Improving the forest governance ability for forest owners	x		Y
<i>2.4. Conserving carbon stocks</i>			
a. Improving the quality of forests: forest enrichment, or diversification of crops to adapt impacts of climate change			
b. Biodiversity conservation in special-use forests and protection forest and payments for forest environmental services	x	Y	Y
<i>2.5. Enhancing carbon stocks</i>			
a. Technical support for forest plantation: climate change resilient seedlings, etc.	x	Y	Unclear
b. Forest enrichment in exhausted forest areas			
c. Afforestation by land-use conversion projects			

4.3. Project Based Interlinkages with Adaptation

The REDD+ projects in our three study sites differ from the three projects analysed previously by other reports on adaptation and REDD+ in Vietnam [13]. The REDD+ Community Carbon Pool Program (REDD+ CCP) is the first and only REDD+ project to be implemented in Kon Tum province and is focused at a site-based level in Hieu commune, Kon Plong District; a 3-year SiRAP had been developed and approved by the Kon Tum Provincial People's Committee. Under the REDD+ CCP project, 18,700 ha forests have been re-allocated with community land use rights, which is intended to lead to local access and control over forestland and forest resources. The development of local community forest management institutions that comprised equitable, easy to understand, locally devised and implemented rules was seen as a way to effectively reduce emissions and provide benefits to forest-dependent local people, and the project was hopeful to meet the requirements for CCBA certification, which explicitly includes projects that generate benefits for climate change adaptation.

In Dien Bien, the JICA SUSFORM-NOW project aimed to test REDD+ activities in two pilot communes; develop capacity for forest rangers and commune level field officers; and prepare the PRAP and related technical guidance documents as noted previously. Overall, the project aimed to build efficient models and develop capacity for provincial cadres to implement REDD+ themselves so that those models would be replicated to other areas. As such, the project was aimed to contribute to better forest management at the local level and respond to climate change in the forestry sector, although adaptation was not explicitly mentioned in project documents.

In Kien Giang, the GIZ/AusAid Conservation and Development program was originally designed as a climate change adaptation, mitigation and integrated coastal zone management project. In recent years it has also supported research into mangrove forests, awareness raising of forest protection, and training on REDD+ readiness in Kien Giang and Ca Mau provinces. One of the major activities funded by the project has supported local communities to develop "green fences" along the coastal area through mangrove plantations to protect against landslides and coastal erosion due to strong waves from the seas and future sea level rise. Local people were also supported by the project to establish mangrove nurseries. The project provided training courses for local people, especially women, on primary health care services and rural sanitation, for example building toilets and using clean water, among others, which have adaptation benefits. Kien Giang province also has had since 2005 an initiative of benefit sharing in mangrove forest protection that enables local people to combine forest protection and aquaculture development to secure local livelihoods. People are allocated two to three ha of protection mangrove forest, and they are allowed to use 30% of this area to raise shrimp, as long as they maintain 70% mangrove forest. By 2013, there were 1076 households participating who were allocated mangrove forest with "green books" (a long-term contract for forest protection) along 200 km of the coast of Kien Giang province. The program aims to give local people incentive to protect mangrove forest while developing shrimp production for their livelihood; however, according to GIZ/AusAid project officers' assessments, the expectation from local people is for a higher percentage of land devoted to shrimp production due to low profits and higher costs of maintaining mangrove forest as compared to non-participating shrimp farms.

4.4. Household Level Impacts from Climate Changes and REDD+ Projects

Our household survey provided a general summary of the characteristics of households in the three sites: around 31% of surveyed households were classified as poor by the government (based on guidelines of the Ministry of Labor, Invalids, and Social Affairs, as every household in Vietnam receives regular assessments of their economic status to determine some social benefits); 49% as average; and 11% better off (the rest did not know or did not answer). The average household generated 78 million (around 3580\$US) per HH per year in subsistence and cash income (see Table 2), with great variation between the three sites, as Kien Giang households had over four times the income as those in Kon Tum. In each site, a different income source was the primary contributor to local livelihoods: business and trading in Dien Bien; livestock in Kon Tum; and aquaculture in Kien Giang.

The primary uses of forests by households were for fuelwood and forest product collection; as sites for aquaculture in the case of mangroves in Kien Giang (where households generated on average 4758\$US per household from aquaculture); as sources of lands for fields in swidden cultivation systems in Dien Bien and Kon Tum; and as supplies of wood for house building, particularly for poorer or ethnic minority households. Forest-based subsistence and cash income was highest in Dien Bien, while it was surprisingly low in Kon Tum, despite having the most extensive forest cover of all three sites (and which we explain below was a result of restrictions on forest use instituted by the CCP project).

The living conditions of the populations in the research sites were generally low with poor infrastructure, making areas difficult to access in the rainy season, leading to limited access to information regarding markets and services. Local communities were all sensitive to changes in weather and had been very much impacted by natural disasters that appeared with higher frequency and more intensity in recent years. In general, local people at all fieldsites had concerns about climate changes and risk, although the specific type of impacts varied (see Table 3). In the Northwest mountainous area of Dien Bien, people were concerned about droughts, with 59% of surveyed households noting decreases in rainfall, and 53% noting longer dry seasons. In Kon Tum, people were more concerned with increases in storms and rainfall, leading to localized flooding. Households in the Mekong Delta area of Kien Giang were particularly concerned about salinity intrusions farther from the coast in the dry season. During group meetings, communities often linked these climate changes explicitly to forest policy and activities; for example, in Kon Tum, local people explained that the higher impacts of storms and flooding were due to deforestation in the last few decades in the area. In Dien Bien, local people noted that higher temperature and severe droughts had caused forest fires to increase as well (focus group data).

When asked to rank the most serious climate-related risk to their property and livelihoods, households choose a variety of answers (Figure 2a). Typhoons and storms were ranked as the most serious risk by nearly 30% of survey respondents, with landslides and drought chosen as the most serious risk by fewer than 15% and 10% of households respectively. Although households overall understood climate risks to be important and in most cases increasing, these risks were put in the context of other challenges that households had to face (Figure 1b). Health problems were considered the most serious and frequently encountered risk, with natural disasters and pests ranked second and third. Problems with access and quality and outcomes of education of their children were also considered risks, as people were worried they could not afford for their children go to school; these concerns are reflected as “children’s schooling” in the Figure 2b. Other risks included labour shortages due to health and other problems (such as alcoholism or drug use). Poor infrastructure in the study areas, especially in health care, education, and public services, increased households’ feeling of risky livelihoods. This findings confirmed that vulnerability to shocks, be it climate or health or unemployment, have long been one of the major challenges for the poor in Vietnam [57]. In particular, while these climate risks have the potential to impact all income groups, the poor tend to have less resilience, such as less access to insurance and less ability to rebuild or move away from affected areas [80,81].

Table 2. Average household livelihood sources and values in VND.

Province	Agriculture	Livestock	Aquaculture/Fishing	Forestry	Business	Total Average HH Subsistence and Cash Income
Dien Bien	14,493,982	24,124,279	4,464,852	12,008,551	30,811,538	79,772,542 (3626\$US)
Kon Tum	5,352,315	20,136,242	0	3,754,609	10,415,938	30,078,040 (1367\$US)
Kien Giang	55,395,454	19,965,853	104,679,297	5,951,666	35,293,787	126,419,650 (5746\$US)
Average across all households	18,390,243	21,955,750	53,053,674	7,594,240	25,113,156	78,756,744 (3580\$US)

* At the time of the survey, 1 USD = approximately 22,000 Vietnam Dong (VND).

Table 3. Household perceptions of weather and climate changes in recent years (% of households citing each reason).

Province	Increase in Rainfall	Decrease in Rainfall	Longer Rainy Season	Longer Dry Season	Increase in Number of Storms	Increase in Storm Strength	Salinity Intrusion	Higher Temperatures
Dien Bien	14%	59%	5%	53%	3%	24%	n/a	30%
Kon Tum	37%	3%	26%	17%	74%	43%	n/a	9%
Kien Giang	48%	38%	70%	30%	23%	33%	100%	61%

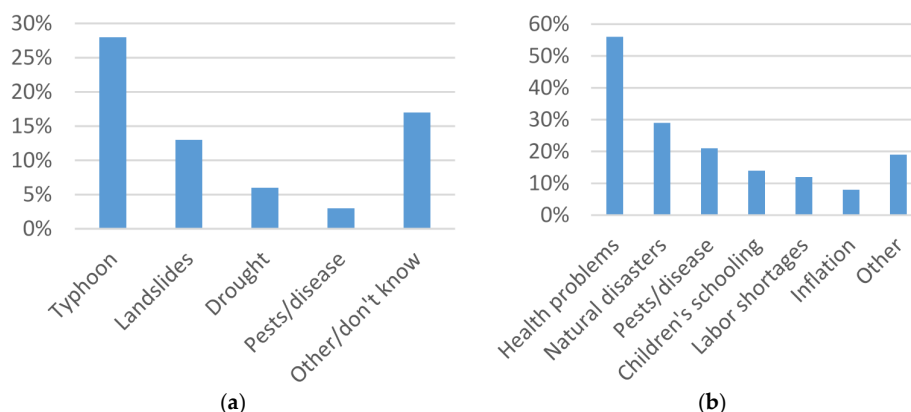


Figure 2. (a) The most serious climate/weather risk as identified by households; (b) The most serious of all risks as identified by households.

4.4.1. Impacts of REDD+ on Livelihoods and Vulnerability

In one of our studied projects, household level REDD+ activities had been confined to awareness raising of REDD+ and there were no significant livelihood or other activities directed at the household (Dien Bien). In Kon Tum however household activities had been taking place, and showed the potential negative impacts of REDD+ on both livelihoods and climate vulnerability. The commune where REDD+ activities were taking place is one of the 300 poorest communes in Vietnam [82]. Most of the local people are of the M'Nam ethnic group and have long directly depended on forestland and forest resources for livelihoods, such as rice or cassava cultivation on shifting cultivation plots in designated forestlands, firewood collection, and gathering and commercialization of diverse NTFPs. These forest activities are important because the local climate is highly variable, with rainy and cold weather affecting agricultural production. As a result, the growing season in Hieu commune is very short, around 6 months per year, from February until the end of September. Due to this weather, if households want to increase their rice or cassava production, they can only expand their cultivation areas (as they cannot diversify out of season), but this conflicts with REDD+ project priorities of conserving forest lands for emissions reductions [83].

In 2011 the initial stage of the REDD+ CCP project began, and the message that households could “protect forest for selling carbon” that the project delivered to local people through FPIC awareness-raising activities raised their hopes and expectation of gaining benefits and improving their livelihoods. The household survey and interviews conducted showed that the local people in Hieu commune perceived REDD+ as a new type of income source that would be used to replace existing practices. Therefore, the local people accepted the need to stop expanding their traditional swidden plots as well as restricting NTFP extraction of “*la kim cuong*” (*Anoectochilus setaceus*), a medicinal plant found in forests, as trade-offs in order to get income from forest carbon in the future. The project drew a lucrative picture about the benefits of REDD+ and forest carbon, but in reality, difficulties have already emerged from the project, which include scarcity of cultivable land as swiddening has stopped or been discouraged, and the loss of income from NTFP extraction. Data from the survey and interviews show that most people already changed their household livelihood strategies several years ago (household surveys showed lower forest income in Kon Tum than the other two sites, at only 170\$US worth of timber, fuelwood and NTFPs extracted per household), but are still waiting for forest carbon benefits, which have not yet been paid. While the project finished at the end of 2014, it could not get carbon certificates to sell in the market as per the initial objective, and the project designer, FFI, has been trying to obtain further funding and access some carbon market to get emissions reductions certificates.

In the meantime, however, households with differences in cultivable land sources, capital and labor, have had to adjust their livelihood strategies in different ways. The poor and landless households are the most vulnerable group in this situation, and their way to adapt to the new context varies within

this group. Some households have returned to make use of their old swidden plots or tried to find some small pieces of land near their paddy fields, or even have planted field crops like cassava in the garden surrounding their houses. Some other households, particularly those who do not have cultivable land, cannot open new swidden plots, and who also cannot wait two to three years for carbon credits, have decided to give up their rights to participate and get benefits from REDD+ in the future by leaving the villages or continuing to do restricted activities. For example, some husbands in these families have decided go to other communes or cities to find new jobs to compensate for the loss of income due to participating in REDD+, which has increased their families' overall vulnerability to risk and shocks. Further, "leakage" has been an on-going issue. Statistics by the local authority shows there has been no more forest clearance since the middle of 2013 in Hieu commune. However, there were some households who decided to leave and clear some forest of Bo E commune (a commune nearby but not in the REDD+ project) in order to establish new swidden plots illegally.

4.4.2. Household Adaptation Actions

At the household level in all research sites, some spontaneous adaptation actions are being taken to cope with climate risks that are already being felt. Households were most proactive in the agriculture sector, using adaptation strategies to adjust cropping patterns, harvesting time, selecting salt-resistant varieties, and so on, as to reduce damages to livelihoods. For example, 13% of households in Dien Bien and 12% of households in Kien Giang stated they had changed a crop variety, while only 3% of households in Kon Tum had done so. Changing crop calendars and harvesting crops early to avoid flood and disaster losses was another strategy, one that had been taken by 100% of households in Kien Giang, 90% of households in Kon Tum, and 60% of households in Dien Bien at least once. However, most households felt they were not doing enough to adapt to climate change, and needed more policy support. In particular, households rarely mentioned adaptation actions they were taking with regard to forestry, indicating that households felt less knowledge about this sector and needed guidance as to steps to take.

In group discussions, those residents who stated that they had not taken any adaptation actions explained that they knew that adaptation was necessary but they had a lack of resources. Poor households in particular stated they did not have enough human, physical or financial resources to protect their fields and homes from climate hazards, therefore they tended to lose relatively more when hit by floods and storms than wealthier households, and had a lower capacity to cope with and adapt to shocks due to lower access to savings. While acknowledging these challenges, local government officials interviewed stated that they lacked budgets to support households to carry out climate change strategies, plans and adaptation actions at community levels. These stakeholders at district and commune levels noted that national adaptation strategies and action plans were normally very ambitious but often not feasible due to lack of funding and low participation from local people, since there was very little funding to distribute.

5. Discussion and Conclusions

This study has confirmed that there continues to be a lack of coordination between mitigation and adaptation policies in Vietnam, particularly with regard to REDD+. While much lip service has been paid to combining approaches, in reality, policies at the national and provincial level, and site-based projects, have paid little attention to the adaptation needs of local communities, and how REDD+ activities could facilitate increased resilience in livelihoods. While there were some potential implicit adaptation benefits of REDD+ projected activities (such as promises of future activities to improve livelihoods, or to increase forest tenure security which might help local communities have better access to forest resources), local REDD+ planning through development of PRAPs has not systematically considered activities that focus on adaptation or resilience. This is despite the fact that many national policymakers, donors, and NGOs interviewed a few years ago expressed strong support for integrated attention to adaptation [13]. There was also little discussion in either PRAPs or site-specific REDD+

projects regarding EBA (with the exception of Kien Giang), again despite the fact that the idea has been enthusiastically discussed with regard to Vietnam [84,85].

These are missed opportunities, as our household data shows a great deal of need for assistance in reducing climate vulnerability (particularly in coping with drought and floods) and increasing adaptive capacity in many REDD+ project sites. There are potentials for integration with agricultural adaptation in particular. REDD+ activities in agroforestry or financial support for climate-smart agriculture could help households deal with the increasing climate risks they are facing, particularly those areas that are experiencing either drought or flooding as noted in household surveys. Tree shelterbelts that could be planted to enhance carbon stocks could help to reduce wind and drought pressures on nearby agricultural fields. Similarly, using trees to secure landslide and flood prone areas near fields can help reduce impacts on agricultural livelihoods from flooding [50]. Other examples of adaptation needs might include: a stronger focus on useful multipurpose tree species for reforestation and carbon stock enhancement that could provide for both carbon and increased livelihoods (e.g., food or products for sale); policies to increase value and marketing of forest goods that can be harvested sustainably (such as NTFPs); and policies to reduce woodfuel use but increase energy access (e.g., improved cookstoves or small-scale hydro-powered electrification projects), among others [19,86,87]. Poor households in particular showed needs for financial support to undertake adaptation actions in agriculture, which REDD+ payments could potentially be useful for, but households stated these needed to be coupled with training, education, and other forms of support so they would know what to invest in to increase resilience. Payments alone will not be sufficient.

Further, within both national and subnational REDD+ policy approaches, our analysis notes a lack of attention to the potential consequences of climate change on forest structure and composition, and the implications of this for REDD+ activities into the future. Several of the most serious climate impacts from the literature on forest vulnerability in Asia include forest fires; pest outbreaks; shifts in species distributions; higher tree mortality; changes in forest composition; or loss of wood volume [51,88–90]. Very few of these possible climate vulnerabilities of forests are discussed in the National Strategy on Climate Change (which only mentions the need to “increase capacity and efficiency of systems for evaluating, forecasting, preventing, monitoring, supervising and urgently responding to forest fires” [66]); in the NRAP; or the in the PRAP for Dien Bien. Future REDD+ projects to address forests’ climate vulnerabilities might focus on reducing fire hazard and risk (e.g., community supported fire watches) or reforestation projects that prioritize drought and fire resistant native species (e.g., rather than introduced eucalyptus or acacia, which have been primary species in reforestation in the past but which are both drought and windfall-prone) [51].

Several pilot REDD+ projects examined also did not explicitly acknowledge how climate-induced changes might impact household livelihoods, and what role these vulnerabilities may play in REDD+ participation. In the one project we examined that did specifically have a focus on adaptation (Kien Giang), livelihood activities were developed that extended beyond typical REDD+ activities, such as addressing water scarcity and shoreline erosion, adaptation responses that were considered useful by households facing water and land erosion risks, and which may increase positive feelings and household participation in other parts of the project (e.g., tree planting). However, in another project site (Kon Tum), restrictions on livelihood activities had taken place under REDD+ and had caused negative consequences, particularly for the poorer households, due to restrictions on swidden agriculture and NTFP collection, the lack of suitable alternative livelihood plans, and delays in seeking carbon financing. Other studies in Vietnam have shown the importance of NTFPs as “insurance” for poor households, particularly for buffering unpredictable shocks like disasters or health problems [91]. Yet the Kon Tum project did not consider these roles of NTFPs, and how loss of access to these forests might create unforeseen negative impacts. Indeed, it appears that the project has made households more vulnerable to the risks of poverty and climate change impacts than before, particularly in the cases where REDD+ participation seems to have triggered male outmigration in some families.

Despite the negative outcomes of one of the examined projects, there appear to be opportunities to promote synergies with adaptation, where REDD+ could improve local actors' adaptive capacity. For example, in Kien Giang, the approach to forest management which allows some limited production activities in mangrove areas has proven moderately successful, and shows that co-management that allows for some livelihood activities, rather than complete abandonment of forest use as was the case in Kon Tum, can provide benefits for both people and forests. The fact that livelihoods are supported, and that mangroves provide useful protection against storms, landslides and river erosion, makes for a double adaptation benefit. Kien Giang could address concerns from households about low profitability by expanding the area of mangroves allowed under the 70/30 model from the current small pilot area to allow for each participating household to manage a larger area. Despite these successes, however, there have been shortfalls in incorporating mangroves into other REDD+ and PES policies. Although many reports within Vietnam have noted that mangroves are important for both mitigation and adaptation [92–94], there have been limited on-the-ground mangrove projects linked to REDD+, and there are currently no mangrove areas receiving national PES money due to an inability to determine who the buyers of mangrove ecosystem services are [95]. These are challenges that should be immediately prioritized in future REDD+ development.

All of these potential synergies rest on removing barriers to integration between REDD+ and adaptation. Key barriers to integration can be seen in both the PRAP development process and in individual site projects. These include:

- (1) Sectoral specialization: the PRAP process, as seen in Dien Bien, was led by forestry officials and primarily focused on narrow interpretations of forests, and did not involve much input from agricultural or climate adaptation offices. The minimal inputs of the Ministry of Environment and Natural Resources, the key climate adaptation ministry, in REDD+ policy development below the national level is further evidence of this disengagement.
- (2) A primary focus of REDD+ policy on technical measures rather than livelihoods: in the PRAP for Dien Bien and in national PRAP development guidance, there was far more attention devoted to reference levels of deforestation and carbon emissions equations than to outlining ways to involve local people in participatory forestry projects with livelihood benefits. The Kon Tum CCP project similarly spent time focused on meeting technical requirements for selling emissions reductions on the market, without interim livelihood activities.
- (3) A focus primarily on emissions rather than co-benefits or multipurpose trees: in the NRAP and in Dien Bien's PRAP, more attention was paid to maintaining large intact forest areas or plantations rather than support for small scattered tree plantings, such as in agroforestry or shelterbelts that would benefit farmers. A focus on maximizing emissions levels in REDD+ through extensive forestry thus might create a disincentive for more adaptive measures in local household-based forestry.

As we have shown, the potentials for integration of adaptation activities into REDD+ in Vietnam are there. Climate vulnerable households in our study sites, like many place in Vietnam, are already feeling the effects of some climate and weather changes now [57], and see natural disasters as serious risks threatening their families' wellbeing. REDD+ activities that provide ways to strengthen the adaptive capacity of these households would therefore be extremely useful and welcome. Future PRAP development in the remaining forested provinces of Vietnam would do well to consider better integration of adaptation considerations in future planning, and site-specific projects clearly need to learn from previous lessons with regard to the necessity of considering both livelihoods and forest outcomes simultaneously to avoid increasing the climate vulnerability of participating households.

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