REDD through the lens of resilience: *Navigating the trade-offs*

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**Abstract**

Forested landscapes play a critical role in climate change dynamics by sequestering carbon and supporting adaption in social-ecological systems. It has been suggested, therefore, that the conservation of forested landscapes may provide a potential win-win in the fight against global environmental change. Despite the potential synergies between mitigation and adaptation efforts, however, studies in recent years have raised concerns about trade-offs between the two as well as potential discontinuities in the principles and practices. Our research explores the intersection between mitigation and adaptation in a forested landscape in Lao PDR through the analytic lens of social-ecological resilience - an approach, we suggest, that provides a more robust framework for systems-level analyses of trade-offs in climate change interventions. Drawing on ecosystem studies and interviews with policy makers, practitioners and resource-dependent communities, we suggest three specific limitations of REDD for achieving climate synergies. First, by disrupting existing disturbance regimes, REDD interventions run the risk of reducing social-ecological diversity and structural heterogeneity at the landscape level. Second, REDD-as-practiced selects local, rather than structural, drivers of deforestation and thus focuses disproportionately on curtailing local livelihood practices. Third, REDD risks redirecting ecosystem service benefits away from local communities toward state agencies, potentially undermining local governance by incentivizing recentralization. We argue that REDD’s potential for delivering synergies between climate change mitigation and adaptation in Laos is currently attenuated by structural factors rooted in development policies and broader political-economic trajectories in ways that may not be legible to, or adequately addressed by, current programmes and policy.

**Keywords:** social-ecological resilience, REDD, mitigation, adaptation, trade-offs

**Introduction**

There is a growing consensus that climate interventions must seek not only to mitigate the extent and severity of climate change, but also support adaptation within social and ecological systems. While both mitigation and adaptation are about reducing the risks of climate change and thus share common long-term goals, they are seldom brought together explicitly within policy frameworks (Dang *et al.* 2003). The conservation of forested landscapes in the Global South has been promoted as a way to bring together mitigation and adaptation for a win-win; mitigating climate change through carbon sequestration as well as ensuring the provision of ecosystem services which underlie the adaptive capacities of forest-dependent communities. There are, however, some obstacles. In forest systems important trade-offs may exist between carbon sequestration and biodiversity values (Gilroy
et al. 2014), local livelihoods (Bluffstone et al. 2013) and tenure security for forest-dwelling communities (Awono et al. 2014), problematizing the notion of a simple win-win.

In this paper, we analyse synergies and trade-offs under Reducing Emissions from Deforestation and Degradation (REDD) within a forested landscape in the Lao People’s Democratic Republic (or Laos) through the lens of the resilience framework. By interrogating the complex interactions between climate mitigation interventions and the adaptive functions of forested social-ecological systems, a systems-level resilience approach elucidates not only trade-offs between individual system components (such as biodiversity and carbon values) but also those deriving from macro-scalar, interactive and dynamic processes. Our analysis suggests that while REDD-as-practiced within this case study may achieve some synergies for climate resilience, its conservative and regressive application may also undermine a number of complex processes that foster climate resilience at the local level. By neglecting structural drivers of forest change rooted in the broader political economy and focusing unhelpfully on restricting local forest uses, REDD programming may not achieve synergies for adaptation.

Research Setting and Approach

Our research focuses on a case study in Xe Sap National Protected Area (NPA) in the Annamite Mountain range along the border between Laos and Vietnam (figure 1) comprising of 1,498 km² located within Sekong and Salavanh Provinces in southern Laos, both of which were identified by Laos’ National Adaptation Programmes of Action (GoL 2009) as priority provinces due to high risks of climate change impacts such as increased mean annual temperatures and flood risks (GFDRR 2011). The NPA is largely forested, with significant conservation and livelihoods values due to its unique forest ecosystems, high degree of biodiversity including a number of large mammal species of global and regional conservation significance (Timmins and Vongkhamheng 1996, Timmins and Duckworth 2013), and its substantial resources that support more than 15,000 local ethnic minority people.

In order to conserve Xe Sap and the forested landscapes which adjoin this area in Vietnam, the World Wide Fund for Nature (WWF) and the Government of Laos initiated the US$9 million transboundary Carbon and Biodiversity (CarBi) Project in 2011. As one component of this project, WWF commissioned the consultancy company Forest Carbon to undertake a REDD Feasibility Study using Voluntary Carbon Standards’ (VCS) methodology for avoided unplanned deforestation. Remotely-sensed imagery was obtained from 2001 and 2011 in order to develop the baseline emissions rate for the 10 year period leading up to the initiation of the study, supplemented by driver analyses and field visits with government officials.

Our research draws on WWF’s (2013) Feasibility Study as well as other studies carried out under the CarBi Project, ecological and social research in the NPA between the mid-1990s and the present, and key person interviews with government authorities, conservation practitioners and local communities in the NPA which were carried out by the first author, WWF and affiliated individuals and organizations (notably Village Focus International, VFI) between 2012 and 2015.

Results

Local communities adjacent to and within the NPA exhibit a high degree of reliance on local natural resources. Rice, the staple dietary input, is largely procured through shifting-cultivation on low and medium-elevation slopes, supplemented through the management and collection of Non-Timber Forest Products (NTPFs). Communities utilize 120 animal species and more than 50 species of wild plants, distributed diffusely across portions of the NPA but primarily within swidden1 fallows

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1 In this paper we use ‘shifting cultivation’ and ‘swiddening’ interchangeably.
and secondary forest mosaics. Remittances from economic migrations and the sale of NTFPs, poultry, small livestock and scrap metal remaining from the Indochinese Wars constitute the primary sources of household income, supplementing insufficient rice harvests and providing resources for expenses such as clothes, medicines and school fees. According to local participants, historic settlement patterns and the spatial dimensions of agricultural activities have been highly fluid. Village establishment, abandonment and relocation have been prompted by exogenous factors such as armed conflict and government resettlement programmes aimed at eradicating shifting cultivation, as well as endogenous factors such as movements toward resource-rich forest areas. Shifting cultivation takes place on a rotational basis in old fallows and secondary forests within village territories, often several kilometres distant from the village centres, intercropped with vegetables, herbs and other crops, with fallow areas providing NTFPs and wildlife for consumption and sale (VFI unpublished reports 2012).

In 2011, mature forests constituted 81.4% of land area within the NPA, while fallow vegetation comprised an additional 16.6%. Analysis of RapidEye imagery indicated that while the amount of forest has decreased at an average rate of 0.28% per year since 2001, there has been a general increase in the rate of deforestation in recent years. During the period from 2010-2011 alone, the rate was closer to 0.43% (Bender 2013). While hydropower development, agricultural and mining concessions, and the expansion of road networks within and adjacent to the NPA were determined to constitute significant threats to forest conditions (WWF 2014) and causal factors displacing shifting cultivation into the NPA (WWF 2013), these were authorized by government authorities and thus did not constitute ‘unplanned’ drivers of deforestation under the selected VCS methodology. Consequently, the Feasibility Study identified shifting cultivation as the primary driver of unplanned deforestation to be addressed through REDD interventions. With a view toward curtailing shifting cultivation as the project’s key driver of unplanned deforestation, the Feasibility Study recommended Land Use Planning (LUP), boundary demarcation, patrolling and law enforcement as the most efficient mechanisms to curb emissions and enhance carbon stocks by reducing the amount of forested areas used for shifting cultivation in favour of short-fallow swiddening and intensified, settled agricultural activities.
While no project proponent was specified, carbon resources within NPAs in Laos are managed by the state under DFRM, to whom revenues from the sale of carbon credits would accrue. Due to low financial estimates of potential carbon credits, the REDD project has not yet moved forward with implementation beyond the Feasibility Study.

Discussion

The proposed REDD pilot project in Xe Sap NPA provides an opportunity for exploring the relationship between mitigation and climate resilience within local social-ecological systems. Resilience in the context of climate change refers to the ability of a system to recover from, and adapt to changing social and ecological conditions emerging from the interactive effects of both climate and non-climate drivers. Climate resilience relates to the degree of functional diversity of system elements, allowing for redundancy and response-diversity (Groffman et al. 2006). Functional diversity relates to both ecological elements (such as biodiversity) as well as social elements (such as livelihood strategies). Climate resilience is supported by flexibility and mobility of system elements to adapt to spatially and temporally distributed impacts and resource abundance (Adger 2001) and maintain desirable ecosystem service functions (Nörstrom et al. 2014). Resilience is a function not only of endogenous elements and processes but also exogenous forces, inter-scalar dynamic processes and macro-scalar change drivers rooted in environmental, social and economic processes (Carpenter et al. 2001).

Within the proposed REDD pilot project in Xe Sap, planned interventions to conserve forest biomass through REDD may also promote ecosystems services such as water regulation and the diversity and abundance of species suited to mature forests. Improved water regulation by enhanced forest cover in select areas would be expected to buffer stochastic variation in precipitation patterns by mitigating the severity of both flood and drought periods for downstream communities, moderating climate conditions (see also Bonan 2008) and stabilize sloping areas against landslides and catastrophic erosion. Potential increases in the abundance of forest-loving species may support overall resilience and enhance the provision of some consumable resources for local communities during periods of food insufficiency resulting from climate-related disturbances to agricultural production such as floods and droughts.

While these co-benefits for adaptation in the project indicate potentially important synergies consistent with other studies (Guariguata et al. 2008), there are also important trade-offs. Within Xe Sap, shifting cultivation constitutes a key interface between social and ecological system components; supporting local livelihoods as well as providing a disturbance regime that has played a key structuring role in the historical ecology of the system (see also Turner 2005). While intensive agricultural systems are relatively fixed in space and time, extensive shifting cultivation regimes are spatially and temporally mobile, capturing intermittent resource abundance whilst allowing local communities to respond adaptively to disturbances and threats emergent from socio-political conditions (Scott 2009) and environmental drivers including changing climate regimes (Fox et al. 2013). Shifting cultivation within the otherwise forested landscape of Xe Sap may also enhance biodiversity values. By creating breaks in forest cover, providing differential successional stages and habitat patches and an increase in the edge-area ratio of forest stands, shifting cultivation increases structural heterogeneity (Finegan and Nasi 2004). The diversity of species assemblages within these heterogeneous shifting cultivation mosaics have been shown to be higher than under conditions of contiguous mature forest cover (Xu et al. 2009). Swidden systems incorporate a broad diversity of species and cultivars both within the cropping area and in fallows in order to provide for diverse dietary needs of shifting cultivators, to spread risk in the event of crop failure, and to distribute labour requirements (Schiller et al. 2006, Hett et al. 2012). Ethnobotanical surveys of similar upland swidden landscapes in Laos found an average of 60 -70 domesticated and semi-domesticated species in upland rice fields and a further 25 species which had been incorporated into adjacent fallow lands (Rerkasem et al. 2009), presenting a much higher degree of agrobiodiversity than intensive, sedentary
agricultural alternatives. Similarly, wild species such as ungulates, wild pig, a number of edge-loving species of birds and the predators of these species such as large cats, show a marked preference for heterogeneous landscapes (Acevedo et al. 2006, Shrestha 2004). Floral species assemblages are similarly diverse. A biodiversity study in shifting cultivation areas found 418 plant species in fallows versus 319 species in nearby mature forest stands (Rerkasem and Rerkasem 1995) strongly suggesting that swidden landscapes compare favourably with mature forest stands for a number of biodiversity values.

While the spatial and temporal flexibility of traditionally-practiced long-fallow shifting cultivation regimes play a key role in supporting climate resilience and are not considered to be a driver of permanent forest conversion (Thomas et al. 2009), these dynamic processes have been widely interpreted framed as a risk for forest carbon conservation (see also Mertz et al. 2009, Dwyer and Ingalls 2015). Key interventions proposed for the REDD project—LUP and boundary demarcation, supported and enforced through patrolling activities—while possibly strengthening local resilience by bolstering resource claims through tenure formalization, also restrict the temporal and spatial flexibility of these extensive systems (Fujita and Phanvilay 2004), concentrating shifting cultivation within limited spaces, promoting sedentarization and agricultural intensification (Ducourtieux et al. 2005). This creates a number of problems. The extensive use of forested areas for shifting cultivation and the productivity of associated NTFPs in Xe Sap depends upon long-fallow periods. The long duration of the fallow period allows for the accumulation of nutrients in biomass for soil fertility, suppression of weeds, and the diversity and abundance of NTFPs and other species. Short fallow systems resulting from state-regulated LUP are, by contrast, typically depauperate of biodiversity (Rerkasem et al. 2009, Foppes and Ketphanh 2000), exacerbate negative impacts on soil and water resources through increased erosion (Mertz et al. 2009) and, where the fallow period falls below a minimum threshold, have been predicted to prompt the collapse of the agroecosystem more generally (Foley 2009). Further, declining rice yields under short-fallow systems have been shown to significantly increase supplementary hunting pressures on local biodiversity (Robichaud et al. 2009) and unsustainable extraction of NTFPs. Increased pest and weed pressures and declining soil fertility under short-fallow and intensive agricultural systems require additional pesticide and other chemical inputs (Crissman et al. 2001), each with their own sets of environmental and social impacts which are particularly problematic within poor regulatory environments such as Laos.

The cessation of shifting cultivation within the largely forested landscapes of Xe Sap would be expected to lead to the simplification of habitat diversity and the rupture in key disturbance regimes, thus contributing to declining overall biodiversity (Cumming et al. 2006) and possibly paving the way for a regime shift in the social-ecological system (Scheffer et al. 2001). The simplification of these landscape mosaics and the segregation of ‘social spaces’ from ‘nature spaces’ through LUP in Xe Sap would further limit the diversity and spatial fluidity of complex functional interactions between social and ecological system components (see also Xu et al. 2006), reducing resilience (Carpenter and Brock 2004) and the spatial and temporal parameters conditioning social responses to climate change impacts (Folke et al. 2004).

The proposed project activities under REDD necessarily entail social impacts by disrupting traditional agricultural practices. While supplemental activities supported by additional donor funding were intended to minimize these social costs during the CarBi project period, the social legitimacy and sustainability of REDD is ultimately contingent upon its own ability to compensate for these impacts. In theory, the proposed REDD project might utilize revenues generated through the sale of carbon credits to compensate forest users at a rate equal to or greater than alternative land uses, but it remains an open question whether carbon revenue will (1) be sufficient to meet this criterion and (2) if it is, will in fact accrue to local forest users. Recommended social safeguards suggest minimal standards for ensuring appropriate compensation, but these are weakly developed within the REDD framework in general—and under VCS in particular (Gilroy et al. 2014)—and are poorly regulated. While the project may consider certification under the Climate, Community and Biodiversity (CCB) standards, giving greater weight to non-carbon values and adopting more robust social safeguards, it
is doubtful there will be compensation for customary land-uses not recognized by formal tenure or that these additional provisions may be no more than instrumental concerns, marginalized in the cost calculations of carbon market efficiency (Melo et al. 2014).

Nevertheless, robust social safeguards and the inclusion of biodiversity values within the REDD project, however enhanced, cannot by themselves address the larger structural issues which impinge upon the social-ecological systems in Xe Sap. Like many historic forest conservation interventions, the proposed REDD activities focus attention on the proximate drivers of forest loss stemming from the livelihood strategies of poor communities without adequately addressing the macro-scalar dynamics of forest change and governance rooted in the broader political economy (cf Sunderland et al. 2007). While hydropower development, road construction and concessions for agriculture and mining within the vicinity of the NPA have significant impacts on forest conditions and were known to displace shifting cultivators, they were not addressed as such within proposed interventions here or elsewhere because of the way planned versus unplanned deforestation is framed within REDD practice in Laos (Dwyer and Ingalls 2015). While all drivers of forest change impact on the social-ecological system, and WWF has sought to address these drivers through other aspects of the CarBi Project, a proposed REDD project which would carry on well-beyond the life of the CarBi Project, selectively excludes those drivers which originate in the decision-making apparatus of the state. This presents a deep problem for achieving climate synergies through the REDD project, not only because it fails to address structural drivers of deforestation but also because it prompts state managers to curtail local forest uses, potentially undermining local livelihoods and exacerbating tension between communities and the state. In the absence of external financial resources and incentives, state administration of Xe Sap has been superficial at most, effectively devolving the governance of forest areas to local communities. Community (versus state) management of forests has been shown to achieve better protection (Persha et al. 2011), deliver greater co-benefits for local livelihoods (Chhatre and Agrawal 2009) and, by positioning local resource users as decision-makers, enhance resilience (Folke et al. 2002). The REDD project risks pushing governance in the wrong direction, slowing—or possibly reversing (Phelps et al. 2010)—decentralization of protected area management and undermining local adaptive governance.

Conclusion

REDD’s potential to achieve synergies for climate adaptation is attenuated by its tendency not to see the (complexities of) the forest for the (simplicity of its) trees. While it is well-recognized that forests are much more than carbon it is commonly assumed that other values—including those that undergird resilience to climate change—will be preserved or enhanced through REDD interventions. This is doubtful. REDD-as-practiced may reduce landscape heterogeneity and biodiversity by disrupting local disturbance regimes, undermine the resilience of local communities by simultaneously curtailing livelihood processes and allowing structural drivers of change remain unchallenged and, by incentivizing centralization, undermine local adaptive governance. REDD would be better positioned to achieve synergies for climate adaptation if it were larger and yet lighter. A larger and more informed REDD could engage constructively with multi-scalar and structural drivers of change, while a lighter, more nuanced REDD may play a more effective and navigational—rather than prescriptive and technocratic—role in negotiating change along the social-ecological nexus supporting, rather than undermining, dynamic processes foundational to climate resilience.

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