Why 'blended finance' could help transitions to sustainable landscapes: Lessons from the Unlocking Forest Finance project

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Abstract: There is a momentum towards finding financing solutions for halting deforestation at the landscape level for the benefit of climate, biodiversity and delivery of ecosystem services. The Unlocking Forest Finance (UFF) project has, between 2013 and 2018, worked on the development of innovative financing mechanisms for sustainable landscapes in three sub-national Amazon regions of Brazil (Acre and Mato Grosso) and Peru (San Martin). This paper describes the approach of the UFF project as a case study of sustainable landscape financing, and portrays the key evolutions during the process. Relying on a reflection and consultation process among project partners, the paper then derives a set of lessons for sustainable landscape finance. It illustrates the current mismatch between the demand side of private 'impact' investors (i.e., those who look for social and environmental impact of investments beyond financial return) and the supply side of sustainable land use investments on the ground. The paper discusses how 'blended finance' models that combine funding from commercial, public, and philanthropic sources could contribute to financing sustainable landscapes.

Keywords: sustainable landscapes, blended finance, sustainability transition, green investment, biodiversity conservation

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1. Introduction

International policy commitments highlight the importance of balancing agricultural development with conservation of tropical forest landscapes for climate change mitigation (UNFCCC 2015), biodiversity conservation (CBD 2010), and generally sustainable development trajectories (UN 2015). The Amazon basin has over the last decades become one of the major producer and exporter regions of agricultural commodities (Macedo et al. 2012) at the expense of rampant deforestation (Nepstad et al., 2014; Soares-Filho et al., 2006).

Sustainable development and forest conservation also involves a financing challenge. Large-scale financing still tends to flow into economically attractive but often environmentally destructive agricultural activities (Niewöhner et al. 2016), although some national and intergovernmental development banks have included environmental safeguards for their investments (IFC 2012, Himberg 2015). To address the lack of financial resources for biodiversity conservation and sustainable land management (Waldron et al. 2013, Galaz et al 2015, UNDP 2016) there is a strong call for enhancing private financing to complement the notoriously underfunded government budgets (CBD High-Level Panel 2014). Some impetus comes from multi-stakeholder initiatives with participation of the private sector (commercial banks and management consultancies) who seek to tap into the growing demand for 'green' or 'impact investments' among international investors (Kidney et al 2015, GIIN 2016) for private investments in sustainable land use and conservation (CBI 2015, EC 2016, Huwyler et al. 2016).

Some academic scholars express concerns on the 'financialisation' and 'neo-liberalization' of conservation and development agendas (McAfee 1999, Fletcher 2010, MacDonald 2010) or relate financial instruments such as forest bonds to 'complete commodification' of nature (Hahn et al. 2015). Others point out that so far, the share of private for-profit investment into conservation is still very small and tends to be overrated due to an excessive use of market framing and jargon (Dempsey and Suarez 2016). And yet, the call for generating more private investments (GIIN 2016) is embraced by many actors in the conservation community, and efforts are undertaken to investigate the mechanisms by which private finance can be channelled to generate conservation benefits on the ground (Parker et al 2012, Trivedi et al. 2012). Moreover, conservation financing solutions increasingly aim at landscape level investments, to reduce transaction costs and enhance the scale and permanence of conservation outcomes, and to avoid leakage of detrimental activities outside the project area (e.g. Linden et al. 2012).

In this context, the Unlocking Forest Finance (UFF) project has, between 2013 and 2019, worked on developing innovative financing mechanisms for forest protection at jurisdictional level in the Brazilian states of Acre and Mato Grosso and in the San Martín Region in Peru. Agricultural expansion has a long track record of driving deforestation in all three jurisdictions (Aragão et al. 2014, Dourojeanni 2015).

Section 2 of this paper describes the UFF project as a case study of sustainable landscape financing. This section of the paper outlines the core rational underling the approach, then goes on by presenting the main elements and analytical tools adopted by the project, how they were adjusted over the project duration in response to the challenges met, and the main project outcomes. Section 3 derives lessons learnt to inform similar endeavours for sustainable landscape finance. The paper concludes that 'blended finance' models that combine commercial investments with public or philanthropic co-finance could help overcome the current mismatch between investor requirements and the realities of on-the ground investment opportunities in sustainable land management and conservation.

2. The Unlocking Forest Finance (UFF) project as a case study of sustainable landscape financing

The UFF project was financed by the German government's International Climate Initiative (IKI) coordinated by The Global Canopy Program (GCP), an Oxford based NGO, and implemented by a consortium of 12 institutions. Local implementing partners, based in each of the three regions, were in charge of day to day relationships with local governments, associations and other stakeholders, as well as data collection and analysis that contributed to the work of the academic project partners[9]. Local partners also ensured that the project outcomes were aligned with jurisdictional objectives. Several project partners had specific technical mandates, such as for instance land-use change modelling, climatic modelling, cash flow analysis, or ecosystem service assessments.

[9] The economics and finance work stream included Climate Bonds Initiative (CBI), Vivid Economics and the Brazilian National Institute for Space Research (INPE). The environmental work stream included the Helmholtz Centre for Environmental Research (UFZ), the International Institute for Applied System Analysis (IIASA) and the International Institute for Sustainability (IIS). The local partners were: Amazon Environmental Research Institute (IPAM) in Mato Grosso, the Company for Development of Environmental Services (CDSA) in Acre, and the Centre for Development and Research of the Highland Jungle (CEDISA) in San Martin. Additional partners were WWF-UK and the La Molina National Agrarian University (UNALM) in Peru.

The UFF project worked with sub-national regional jurisdictions since they provide sufficiently large scale for landscape investments but are more manageable than national level interventions. The project regions, Acre and Mato Grosso in Brazil and San Martin in Peru (see Figure 1), were chosen for their political commitment to sustainability, the institutional strength and good governance of regional governments, and a political support to explore innovative finance mechanisms for sustainable land use. Nevertheless, in Brazil and Peru alike, the political declarations of general support to sustainability often contrast with the crude reality of local development priorities a lack of institutional backing.

The Brazilian state of Mato Grosso is an agricultural powerhouse that equates the area of France and the UK (Richards et al., 2015). Land-use change is driven by large private producers (mainly beef, soy, corn, cotton), who are well organized and connected to the government. Acre is dominated by forest and use of forest products, but with large pasture areas prone to intensification. Due to its remote geographic location and the history of the state, Acre has so far a small percentage of cleared land, weak transportation links to consumer regions and for Brazilian terms a strong government influence on the economy. On top of the established protected areas, Mato Grosso and Acre's forests are protected by Brazilian federal law (Law 12.651/2012), with legal limits on land conversion per property depending on the biome, and mechanisms being developed at national scale to monitor compliance at the farm level (Azevedo et al. 2017, Roitman et al. 2018).

The landscape of San Martín is dominated by forest cover. Agricultural areas are spread around the cities, containing large mosaics of smallholder farms that produce a range of products for local consumption. San Martin is the Peruvian region with largest forest loss driven mainly by agriculture expansion before the year 2000, but has since then managed to protect 65% of its land area (CEDISA 2015). In coordination between national, regional and local governments, the region has restored degraded lands and implemented land use zoning and planning as well as innovative payment mechanisms for ecosystem services.

Figure 1 – Geographical location of the three project regions

2.1. Approach and main assumptions

The project vision was to specify and help provide the financing for the regional governments' sustainable development agendas. The project intended to define optimal portfolios of sustainable 'transition activities' that would allow the regions to shift from a continuation of the current development trajectory (Business as Usual – BAU) to a sustainable development (Sustainable Ecosystem Management – SEM). The transition portfolio was composed of sustainable agricultural activities promising high yields as well as non-revenue generating conservation and livelihoods activities. The rationale behind the environmental impact of the transition (i.e. what makes land use 'sustainable') rested mainly on a 'land sparing' mechanism (Cohn et al. 2014). It suggests that sustainable intensification of agricultural management systems - and productive use of currently unused degraded land - would enhance economic benefits (via yields increase from productivity gains) and at the same time protect forests by reducing deforestation pressures (Maertens et al. 2006). A substantial body of literature has detailed the conditions under which the land sparing hypothesis may work (Byerlee et al. 2014; Phalan et al. 2013; Strassburg et al. 2012, Soares-Filho et al. 2014, Azevedo et al. 2017). In the UFF jurisdictions, land zoning policies and command and control measures were meant to ensure that land sparing delivers for forest conservation.

In the UFF project, land-use modelling of forest cover effects and valuation of the resulting ecosystem service benefits (TEEB 2011, de Groot et al. 2012) was supposed to show the positive environmental impact of the transition. Investors would thereby receive a financial and a non-financial return. An implicit assumption was that impact investors would accept a

financial return below the market interest rates of conventional investments. The invested capital from public and private investors would be channelled to financing the regional transition via an appropriate financial mechanism (e.g. a green bond). Given the regional governments' political support for a sustainable development path, it was assumed that the transition would kick off once sufficient capital could be raised.

2.2. Project elements and analytical tools

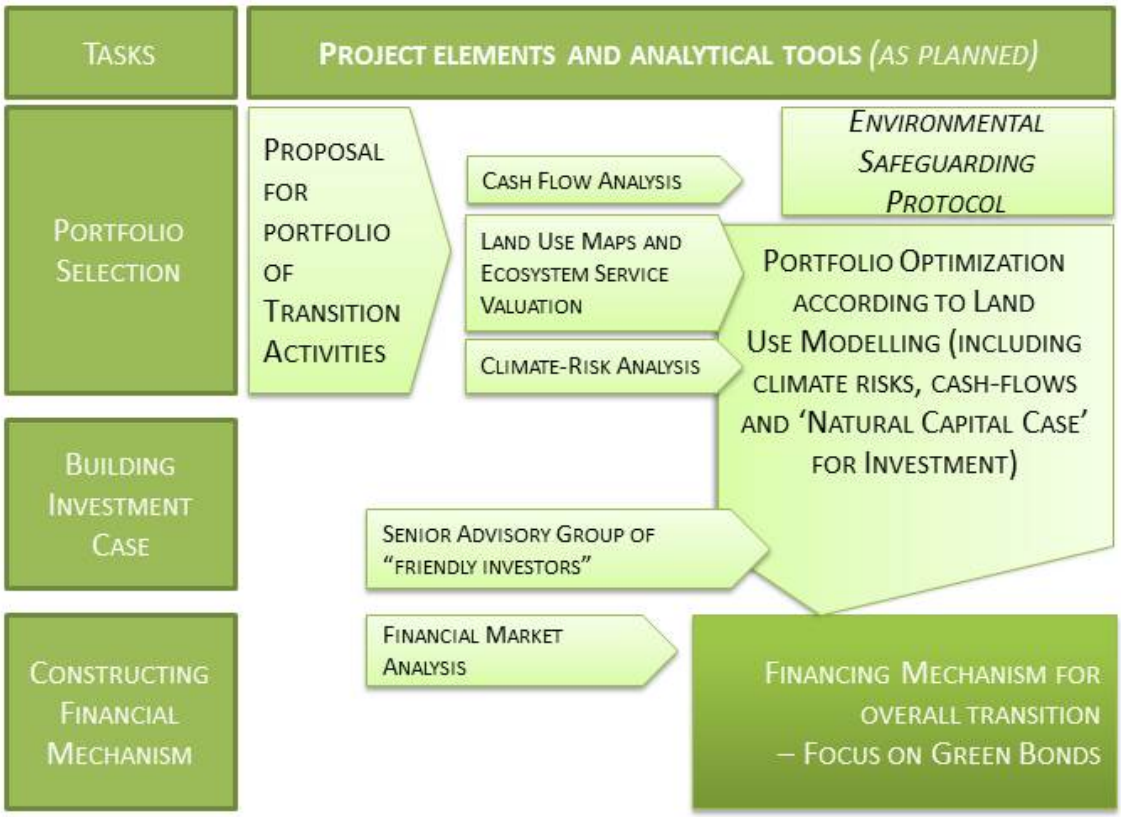
This section presents the key elements and analytical tools by which the project aimed to support the development of sustainable finance solutions. It also explains the adaptations and additions that were made. An innovative project like this is also a continuous learning process (Jugdev 2012) so that the reasons for changes and adaptations feed into the key lessons presented in Section 3. Figure 2 compares the elements and analytical tools of the UFF project as it was originally planned (upper part) and as it was implemented (lower part).

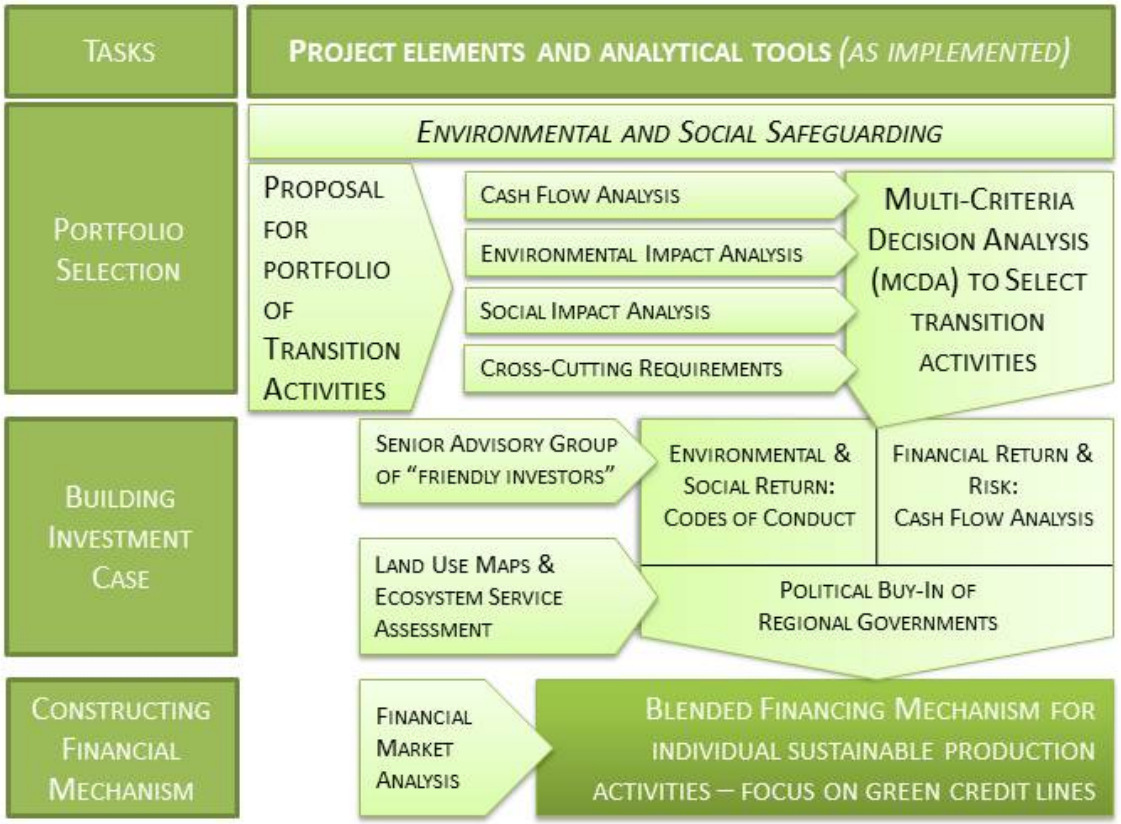
- *Portfolio selection:* The project needed to assess and choose which so-called "transition activities" would be supported by the financing mechanism.
- *Building an investment case:* The project needed to provide the information upon which investors could benchmark their investments against their own financial risk-return profile, and their requirement of social and/or environmental impacts.
- *Constructing a financing mechanism:* The project needed to decide which type of financing mechanism to develop and then identify the roles of different actors for generating the intended outcomes.

2.2.1. Portfolio selection

The local project partners first made a **proposal for a portfolio of 'transition activities'** that were seen as promising with respect to advancing sustainability and forest conservation. The proposal took account of the regional governments' sustainable development strategies or plans and included revenue generating and non-revenue generating activities. Annex 1 shows the proposals for activities to be included in the transition plans in the three project regions.

Figure 2 – Overview of elements and analytical tools in the UFF project, as it was originally planned (upper part) and as it was done (lower part)





The **portfolio-optimization model** intended to integrate economic and environmental analyses. To evaluate the expected financial outcomes and the overall economic feasibility of the transition activities, **cash-flow analysis** and **risk analysis** were conducted. Projected prices as well as current and future costs and revenues under BAU and SEM scenarios were used to estimate two standard financial metrics for return on investment of the transition: Net Present Value (NPV) and the Internal Rate of Return (IRR). NPV relied on a discount rate (e.g. 8% for Mato Grosso). The calculations included costs of investment for changing management systems as well as transaction costs, e.g. for technical assistance, organizational support, and financial services. Risk analysis with Monte Carlo simulations captured the uncertainty in long-term future price and cost developments and provided the likelihood of a range of financial outcomes. Table 1 presents the summary results of the cash-flow and risk analyses for investing into the transition in Mato Grosso. The key outputs of the analysis are explained at the bottom of the table. IRRs are generally very high in Mato Grosso – with most ranging 10-25% - suggesting sustainable supply chains can be an attractive investment proposition. However, they are high risk investments and are frequently associated with a high probability of loss: the chance of a loss is higher than 25% in most cases, Variability in input costs and output prices along with uncertainty in underlying data are key drivers of large variance in NPV and thus risk associated with investment propositions.

The **climate risk analysis** for the Amazon region had been modeled as part of the project but it was not integrated into the financial risk analysis due to general difficulties of accounting for climate impacts into cash-flow models. Notably, the cost calculations within the economic analysis allowed estimating the capital requirements for stimulating the transition of the whole jurisdiction to sustainable management systems. Positive environmental impacts from the overall transition were supposed to be included in the portfolio optimization by **valuation of ecosystem services** benefits (i.e. at regional scale, the ecosystem service impacts would be incorporated into the BAU and SEM trajectories).

It was noticed relatively soon in the project that the approach to optimize the investment portfolio based on a comprehensive modeling approach including ecosystem service benefits would not be feasible. No currently available tool could integrate the different transition activities, provide the analysis at the granular level needed to compile an optimal portfolio, and also isolate the impacts of investments in specific transition activities. Nevertheless, the

cash-flow analysis remained crucial to understand the economic potential and feasibility of the proposed transition activities[10].

Table 1 – Results of the cash-flow and risk analyses for investments into the transition of agricultural supply chain activities in Mato Grosso

Supply chain*		Central Scenario		Range of outcomes at 95% confidence		Probability of loss
		IRR	Mean NPV (R$ million)	Adverse scenario (VAR if negative) (R$ million)	Upside chance (R$ million)	
Aquaculture	Production	19%	7.4	(13.4)	33.7	29%
	Processing	8%	0.2	(41.0)	68.7	58%
Brazil Nuts	Production	35%	5.7	(7.9)	33.6	33%
	Processing	27%	11.0	8.0	15.7	<1%
Milk	10 Years	17%	24.8	(13.2)	65.6	10%
	15 Years	26%	287	183.3	398.1	<1%
Agroforestry Systems	10 Years	-17%	-168.9	(431)	403	84%
	15 Years	12%	98.1	(280)	782	42%
	20 Years	18%	411.7	(42)	1,157	4%
Timber	Eucalyptus	11%	2,780	(6,203)	19,558	39%
	Native	13%	382	(53)	894	5%
	Teak	13%	2,393	(2,135)	10,505	24%

* Beef and soy were also part of the transition portfolio in Mato Grosso, but the results are not presented here due to concerns about data reliability.

The **internal rate of return (IRR)** is the discount *rate* that makes the net present value (NPV) of all cash flows from the transition equal to zero
The **mean NPV** is the most frequently occurring NPV arising from the simulations and the most likely outcome.
The **adverse scenario** is the lower bound of the 95% confidence interval (worst case). It equals the value at Risk (VAR) if the value is negative.
The **upside chance** is the upper bound of the 95% confidence interval (best case).
The **probability of a loss** is given by the percentile at which the NPV is zero.

Calculations by Vivid Economics (2015)

[10] Some project partners suggested to be more explicit in the cash-flow modeling about different options for agricultural management, in particular to include various degrees of sustainable agriculture (e.g. for coffee: organic vs. agroforestry production) to provide targeted results that reveal potential trade-offs between financial and ecological return.

The **social and environmental safeguarding**, initially thought of as a formulation of safeguarding protocols for the implementation of the financial mechanism, evolved into a continuous advisory function (Rode et al. 2014) to raise awareness and stimulate reflection on environmental and social concerns and possible mitigation measures. As such, the initial idea was scrutinized that the ecosystem service assessment based on land-use modeling would suffice to understand and demonstrate the multiple dimensions of social and environmental impacts (also to convince investors). A first set of concerns were related to the possibility of 'rebound effects' counteracting the positive effect on forest cover (Matson and Vitousek 2006, Maestre et al. 2012, Villoria et al. 2014). Moreover, merely demonstrating the effects on forest cover and selected ecosystem services at regional level did not account for local environmental impacts of the specific farm-level agricultural management changes. The project decided to ensure at least a 'no-net-loss' at farm-level with respect to key environmental indicators. It included a qualitative **environmental impact assessment** of the micro-level effects on soil, hydrologic regime, water quality, climate, air quality, biodiversity, landscape aesthetics, required inputs for production, and waste. Complementary, the project also included **social impact assessments** for each proposed transition activity, covering aspects such as the expected improvements in farmer income, employment generation, food security and health (Bausch and Rode 2015). Similar to the 'no net loss' criteria for environmental impacts, several social aspects were determined as 'no-go' and, if violated, would lead to direct exclusion of the activity (e.g., predominance of illegal activities, land disputes, or violations of Conventions of the International Labor Organization - ILO). The project also recognized that activities would need to fulfil additional "cross-cutting" requirements, for instance existing technical capacity, prevalence of potential implementing entities, and non-prohibitive transaction costs (e.g. for transport or monitoring in remote areas).

The initial optimization approach for portfolio selection was replaced by a **multi-criteria decision analysis (MCDA**) (Saarikoski et al. 2016, Esmail and Geneletti 2018). The MCDA allows prioritizing activities according to their expected performance on environmental, social, financial, and other criteria. Although in principle a good idea, the decision matrix with 30 criteria became very complex and difficult to handle. Moreover, many activities either violated a 'no-go' criterion or failed to meet the expectations according to at least one of the dimensions. The group discussion for determining the weighting factors (and 'no-go criteria) revealed the plurality of views and interests among the project consortium of how to deal with trade-offs between economic and environmental dimensions. For instance, heated controversy

arose around the question whether eucalyptus plantations as a monoculture of non-native species in Mato Grosso could be included as a transition activity. Promotion of eucalyptus plantations as a source of bio-energy was a key component of the regional government's development strategy. It was expected to have significant economic potential and decrease illegal logging in the state. At the same time, the impacts of eucalyptus plantations on local hydrology and biodiversity had been rated as clearly negative.

2.2.2. Building an investment case

The portfolio optimization results were originally intended to also make the financial and environmental investment case for the regional transition. It became increasingly obvious, however, that financial viability for most of the transition activities was challenging, due to long repayment or very high transaction costs, as well as complex governance to implement such a transition at scale. As a consequence, non-revenue generating activities were dropped from the portfolio, which in turn further weakened the positive environmental impact of the envisioned transition. Discussions with potential investors also revealed that the project would be more likely to succeed if investors were not restricted to a pre-determined portfolio but could select the activities of interest to them. Although the cash-flow and risk analyses remained the main tool for showing the financial viability of investments into the transition, investors also raised concerns about the format of results. They were unlikely to trust the cash flow analysis by the project without demonstration of a track record with successful implementation and repayments.

The non-financial return demonstrated by ecosystem service valuation was confirmed as attractive for regional governments to justify their sustainable development policies at large. For investors, however, the link between ecosystem service valuation results and the specific investment proposals became increasingly weak as the project moved away from seeking finance for a region-wide transition. Moreover, it turned out that most investors would prefer to see a trustworthy institution provide a verification or label that would allow them to "tick the box" on environmental and social returns. The project therefore decided to include on-farm environmental standards to determine eligibility of farmers to receive support and as a basis for the social and environmental monitoring of their performance. This steered a discussion whether to rely on recognized existing label or certification schemes or to define separate standards. Existing schemes could be advantageous to farmers in terms of sales and market access (e.g. small-holder palm oil producers are keen on certification with the standards proposed by the Roundtable for Sustainable Palm Oil - RSPO) and have higher

credibility for investors. On the other hand, upon analysis of some well-known labels and industry standards, they were seen as complex yet insufficiently strict with respect to key requirements (e.g. no deforestation). Therefore the project defined its own **'Codes of Conduct' (CoC)** for agricultural management practices, based on a benchmarking with existing certification schemes (e.g. Fairtrade, Rainforest Alliance) and commodity-specific voluntary standards (e.g. Brazilian Round Table for Sustainable Beef – GTPS, Round Table for Sustainable Palm Oil - RSPO).

2.2.3. Designing the financing mechanism

To inform and validate the design ideas for a financial mechanism and to understand investor requirements, the project invited 'friendly investors' from several multilateral finance institutions, international banks and international funds to join a **Senior Advisory Group**. In addition, local partners consulted experts and representatives of local finance institutions.

Although in principle the project was open to any financing mechanism that would turn out to be suitable for channeling investments to the transition activities, the idea of green bonds dominated the discussions for a long time. When the project realized that green bonds would be difficult to implement and turned its attention to sector specific investments, the network of advisors and contacts from the finance community also needed to be adapted.

2.3. Evolutions and outcomes in the three regions

In Acre, the UFF project had a promising start with strong political support from the regional government to move towards a sustainable forest-based economy. With a semi-public organization as local partner, outputs from UFF could be directly incorporated into the government agenda and productivity and sustainability targets. In a previous project, GCP had already conducted a precursory analysis of supply chain sustainability in Acre focused on cattle and recovery of degraded areas (Trivedi et al. 2012) as well as a preliminary ecosystem service valuation study. The UFF portfolio for a sustainability transition became the state's official portfolio of investments. The state made efforts to market it to potential investors and used it in negotiating a second phase for the KfW REDD+ funding. Due to political development and subsequent changes in personnel, the project progress unfortunately slowed down and Brazil's economic and political crises were additional hurdles to attract finance.

In Mato Grosso, consultations with producer associations, governmental officials and other local stakeholders lead to the proposal and validation of transition activities and to a vision of economic activities and land use in the state in 2030, under BAU and SEM scenarios. In spite

of large amounts of data on costs and economic returns of these activities, as well as on environmental data and institutional arrangements, the feasibility and the governance of potential investments remained too unclear to actually attract investors and set up a financial mechanism. The UFF project however, had an important role in the development of strategies for sustainable land use and forest conservation and indirectly contributed to attracting new funding sources. The diagnostic and the development of the SEM scenario for 2030 helped the state government define a long term plan for development activities. According to several government officials, the UFF transition activities and the mode of thought on how they could gain scale contributed to the Produce, Conserve and Include (PCI) strategy presented during COP 21 in Paris (see similarities e.g. in a report commissioned by the PCI[11]). The PCI has since then established a governance structure with an Executive Director and during COP 23 in Bonn received investments from KfW and from the UK to implement REDD policies in the state.

In San Martin, the UFF project signed a MoU with the Regional Environmental Authority. The investment proposals for sustainable production of eight agricultural transition activities were presented to the International Development Bank (IDB) and the national agricultural development bank Agrobanco. In 2017, Agrobanco signed a MoU to develop a green agricultural credit line with favorable credit conditions to provide incentives for sustainable production following the UFF Code of Conduct. For this purpose the UFF project received an extension until March 2019. The smallholder palm oil association JARPAL joined in to channel the credits to producers and provide technical assistance within a pilot. In late 2017, however, Agrobanco had to stop the engagement due to an internal crisis, and by the end of 2018 the project was still negotiating with other investors for piloting the green agricultural credit line.

3. Lessons for sustainable landscape finance

In 2017, the UFF project organized a consultative reflection process among project partners to evaluate experiences and elicit lessons for sustainable landscape finance. The process had three parts: (1) individual contributors to the project were invited to express their personal opinions within an anonymous survey (10 participants), (2) technical partner institutions sent evaluations on the extent to which their contribution had been useful to achieve project

[11] See URL: http://www.mt.gov.br/-/7722820-comite-pci-estrutura-plano-de-acao-para-captar-investimentos

objectives, (3) the results of points 1 and 2 were discussed within a webinar. The authors of this paper extracted, synthesized, and structured the results of these evaluation procedures and derived six key lessons to inform other initiatives on financing sustainable landscapes.

Lesson 1: The financial return from sustainable land use activities tends to be overestimated

The assumption that there is a clear investment case for a transition to sustainable landscapes may be overly optimistic. The UFF project could not identify private sector funding sources that would accept a rate of return below the interest rates for traditional investments. The large majority of impact investors demand environmental and social returns as co-benefits without compromising financial returns. The supply side of sustainable investment opportunities, however, cannot easily meet these conditions. Although some transition activities promise high expected financial returns (e.g., sustainable management in cattle), they are not necessarily replicable throughout an entire region. Typically, sustainable production systems avoid negative externalities by applying stricter environmental standards than their competitors. In addition, the costs of technical assistance as well as environmental monitoring and certification need to be covered. The governance of implementing such activities is also a challenge due to the size and variability of the landscape. As a result, the UFF project had to reassess the idea of a portfolio that cross-finances non-revenue generating activities.

The UFF approach to unlock private financing for a comprehensive regional transition has not materialized. A sector-based approach with investments into specific profitable pro-environmental activities may work, but is less prone to deliver landscape-wide benefits. For now, the conservation community should be cautious not to overestimate the role of private sector finance geared towards environmentally sound investments. Apart from legal constraints or strong incentive measures for sustainable land use, developing partnerships for ‘blended finance’ of sustainable landscapes could leverage private investments. ‘Blending’ refers to financing models that combine commercial and other financing sources to stimulate investment with complementary risk and return appetites. Thus, investors who seek low-risk financial returns can be matched with those giving risk capital as well as complementary non-repayable donor money, and public guarantees or subsidies. Blending has become a common term in development finance (Romero 2013, OECD 2015, Pereira 2017) and has been

employed in the renewable energy sector (Tonkonogy et al. 2018). The Project Finance for Permanence (PFP) approach to secure commitments from several sources within a long-term sustainable financing strategy for biodiversity conservation (Linden et al. 2012) could also be seen as a blended finance model.

Lesson 2: Land sparing is uncertain and requires safeguards to ensure positive environmental impacts

The experience of the UFF project is unable to confirm or refute the 'land sparing' hypothesis that agricultural intensification can reduce deforestation. During the project it became clear, however, that the premise of this hypothesis is insufficient to build a pro-environmental initiative. For one, the possibility of 'rebound effects' has to be kept in mind: Under more intensive agriculture, increased profitability and higher returns to land compared to alternative land uses may encourage the conversion of additional forest land into agriculture and lower market prices of agricultural products could lead to increasing demand for agricultural products, which in turn incentivizes further agricultural expansion (e.g., Villoria et al. 2014). Experience in Brazil shows that, in absence of strong institutions, periods of strong deforestation historically coincided with periods of high commodity prices, likely driven by higher profit margins for producers (Assunção et al. 2015). Direction and size of effects can also depend on the driver of productivity gains (market-driven vs. technology-driven – Byerlee et al 2014), the type of agricultural actors (small-holders vs. agro-industrial – Gutierrez-Velez et al. 2011), the geographical location of productivity increase (forest frontier vs. agricultural centres – Baretto et al. 2013), as well as economic, socio-political, institutional and local-level contextual factors (Meyfroidt et al. 2014, Kremen 2015). Moreover, completely independent socio-economic factors can counteract potential land sparing, e.g. via increased immigration from other regions. Against this background, for agricultural investment in land sparing to deliver the positive effects on forest cover, strong legislation and monitoring should confine any intensified activity (Phalan et al. 2016). Effective governance needs to enforce compliance and possibly reward farmers who invest in sustainability beyond the legal obligations. The attempts to estimate environmental impacts in the UFF project revealed the multiple uncertainties and risks for harm on many environmental and social impact dimensions, in-situ at farm level and in the surrounding landscape. A transition to sustainable land use should therefore look at regional land use effects and deploy environmental safeguards at site level, for instance via agricultural production standards (IFC 2013).

Lesson 3: Ecosystem services valuation does not easily attract investors

The project had dedicated significant resources to land use modelling and ecosystem service assessments and valuation, as they were initially expected to play a role both for estimating environmental impacts and for communication purposes. For Mato Grosso, the land use scenario modeling led to a thorough scientific analysis illustrating the dynamics under which certain market and policy conditions affect forest cover (Irribarem et al. 2018). Regional governments were interested in ecosystem service valuation as arguments for their sustainable development agenda. For investors, however, the modelling results turned out to be of limited relevance. One could argue that the modelling and ecosystem service valuation might have been able to make a targeted contribution if the project had settled earlier for a specific and realistic set of investment interventions[12]. But even then, land use models cannot easily capture the fine scale of smallholder activities. Moreover, the majority of private international investors prefer to see a label from a trustworthy institution instead of complicated quantitative information on ecosystem services.

Notably, the project soon gave up the idea of strengthening the viability of the transition portfolio by attracting cash flows directly from beneficiaries of ecosystem services, such as selling carbon credits from emissions reductions or asking local water companies to pay for reduced costs of water purification (Schomers and Matzdorf 2013, Grima et al. 2016). Although these approach may contribute to the financing of transitions to sustainability (Chan et al. 2017), they require specific stakeholder processes and verification procedures that were outside the scope of the project.

Lesson 4: Investors have requirements related to risk and scale of investments

The project found that institutional commercial investors typically seek large-scale investments with a solid track-record to evaluate their financial risk, whereas projects on sustainable agriculture or with conservation benefits tend to be small-scale and without track-record. What might appear as lack of interest in investing in sustainable agriculture was, in fact, a mismatch between what the project could offer and investors' demands. The UFF project had to understand investor requirements concerning green bonds (GCP 2017). Green bonds are successfully used to finance portfolios of already well-established projects,

[12] Within the long process of portfolio selection, the project had for a long time been trapped in an unfortunate cyclic-reasoning: tell me the impacts so that I can choose the portfolio vs. choose the portfolio so that I can tell you the impacts.

technologies, or programs in the areas of green energy and mobility, usually mobilizing large sums above US$50 million and often over $1 billion (CBI 2015). Due to the instrument's characteristic (fixed interest rate, repayment at maturity), an issuer of a green bond needs to minimize risk and guarantee returns to investors. This does not reflect the realities of the current scale, return and risk structures of sustainable landscape investments on the ground (see e.g. Schneeweiß 2016). Moreover, there are institutional and political barriers. For instance, regional governments often lack the capacity to issue a bond, since national governments typically define debt levels, and because international rating agencies assign regional government bonds lower ratings. National governments, for reasons of fairness and political considerations, rarely support projects confined to specific regions. Companies as bond issuers are free to allocate the resources geographically, but are likely to restrict the investments to sector specific high-return interventions benefiting the companies' core business.

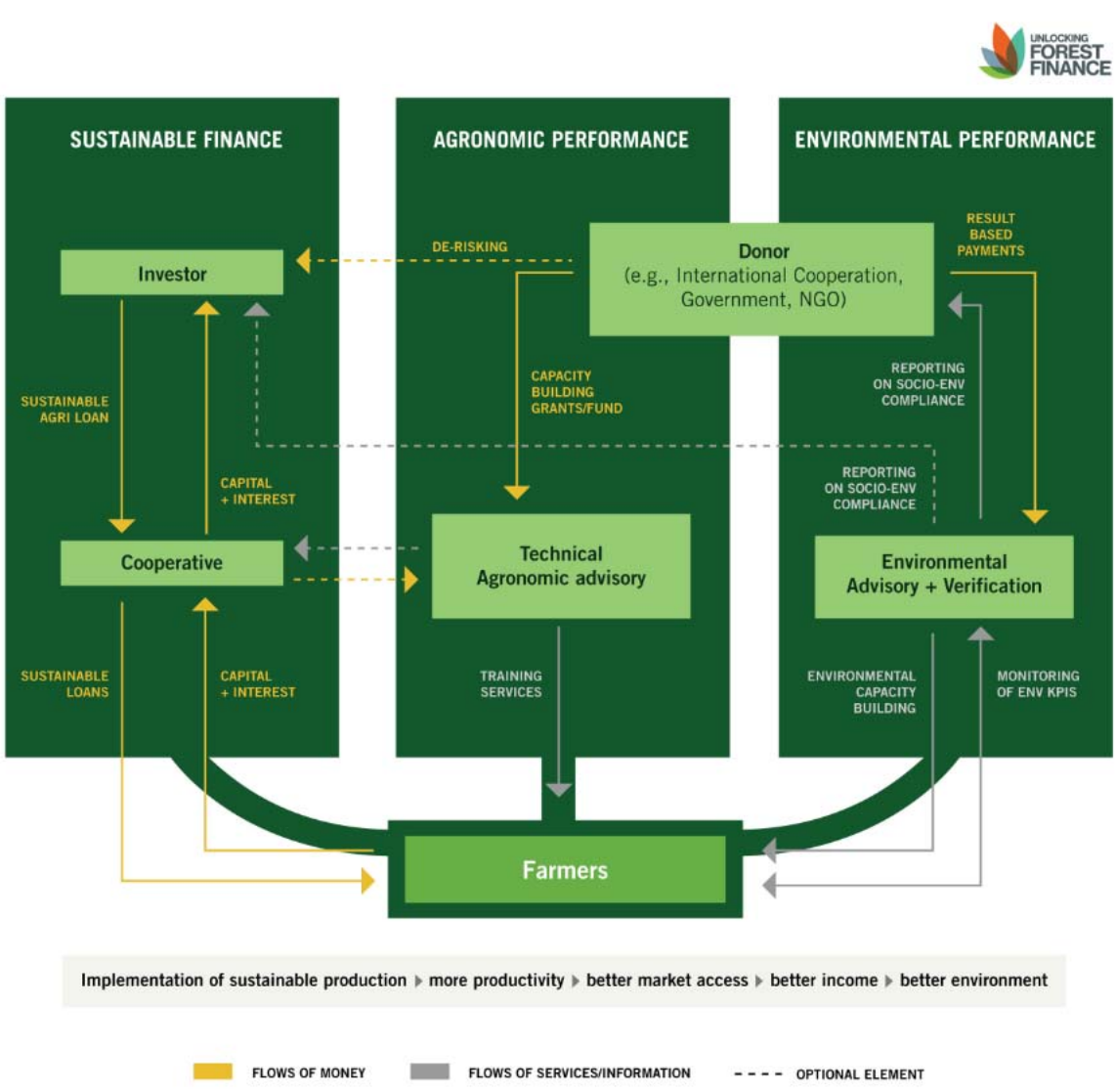
This lesson reinforces the recommendations of adequately matching investor requirements with investable projects on the ground. Related to the issue of scale, relatively small early stage interventions seem more suitable for philanthropic funding or subsidized government support, whereas tested models ready for up-scaling could be suitable for national or international commercial banks, potentially within blended finance models to cover non-reimbursable elements.

Lesson 5: Designing 'green' agricultural credit schemes is the low-hanging fruit for channeling investments for sustainable land use

At farm-level, most financing mechanism to stimulate sustainable land use activities boil down to providing credit to agricultural producers or producer associations. Based on Brazilian experiences, Forest Trends (2015) provides an overview of the financial and non-financial barriers as well as recommendations for using rural credit to promote sustainable agriculture. The experiences in the UFF project confirm that producers and in particular smallholders face significant obstacles to access finance, such as guarantee requirements and inadequate credit conditions. 'Green' credit models for sustainable agriculture need to address these barriers, and in addition provide the right incentives, technical support, and monitoring framework for more sustainable production practices. Once successfully tested, these models could be up-scaled and attract higher volume financing instruments such as green bonds.

For San Martin, the project proposed a concept for a green credit line and started planning for its implementation with the support of the national agricultural bank,. (see Figure 3). It involves a commercial finance entity providing credit with affordable terms to producer cooperatives or associations as intermediaries, who pass it on to farmers. A non-commercial component involves the support of donors (e.g., philanthropist, international cooperation, multilateral banks, or national governments) who provide the means for 'de-risking' (e.g., via guarantees) and for covering additional costs of technical assistance and environmental monitoring.

Figure 3 - Conceptual model of the green credit scheme for San Martin



Lesson 6: The institutional setting is crucial for a transition (and lack of finance is not the only barrier)

The UFF project started out with a macro-level perspective of a regional transition; many of the reasons that slowed down the project or required adaptations were due to an insufficient understanding of the micro-level intricacies. For instance, the assumption that an agricultural sector would immediately invest into the uptake of sustainable land use activities once finance becomes available does not consider that each farm decides individually, often influenced by non-financial aspects such as traditions and habits, land titles, know-how about management options and technologies, the level of coordination and association among farmers, trust in institutions, risk attitudes, etc. (Chavez and Perz 2012, Lastra-Bravo et al. 2015). To gain the scale envisioned by the project, the financial mechanism would need to channel money to producer association and/or cooperatives and to remote locations, involving high transaction costs and capacity of local finance provider to administer and govern. Overall, a viable mechanism requires shared knowledge, collaboration and trust among different local institutions including banks, regional and local governments, farming associations, NGOs operating in the area, etc. (cf., Vatn 2010). Finally, the project learned from the experience in Acre how political circumstances can quickly change, with major implications for the project evolution. When the project started scrutinizing the proposed transition activities according to institutional requirements, many of them failed, at least on a regional scale. It is therefore a key lesson to factor in all the facets of the institutional setting. For constructing a financial mechanism, important stakeholders such as investors, financial intermediaries, politicians, and producers need to be included from the outset to design and validate a workable model. In particular for investors, this is an iterative process, in which financial mechanism choice depends on the identification of investors interested in that model and vice-versa.

4. Conclusions and recommendations

The UFF experience shows that unlocking finance to conserve tropical forests and stimulating a transition towards sustainable land use at landscape scale requires combining at least three different perspectives: a landscape (here: regional) transition perspective, a farm-level perspective, and the perspective of financial investors. Designing financial mechanisms requires a detailed understanding of each perspective as well as their interactions.

Initiatives to enhance private financing for sustainable land use need to be aware that investment opportunities on the ground rarely meet the financial requirements of commercial investors, especially when technical assistance, monitoring and enforcement of environmental standards increase costs of the transition to more sustainable production. Safeguarding against the possibility of indirect land use effects (rebound effects) poses additional challenges, requiring public legislation and enforcement within adequate governance systems. On the finance side, new models of 'blended finance' should be developed that combine different funding sources. The concept of green agricultural credit developed by the UFF project in San Martin combines private with philanthropic sources to cover technical assistance and reduce risks.

To which extent can the UFF approach be up-scaled and applied to other regions and countries? We would argue that the basic idea of the project was good, but the initial approach required significant modifications, as indicated throughout the paper. Based on lessons from the UFF project, future efforts may be much better equipped and move significantly faster towards financing a transition to sustainable landscapes. Project partners need to build a joint vision and a broad understanding of the three perspectives (landscape-level, farm-level, and financial investors) and how they interact. Projects could start out with a rapid screening of viable transition activities, focusing on a few key economic, social and environmental criteria as well as producers' willingness to change their production systems and clearly identified needs for financing. A simple version of an MCDA could be useful to illustrate and weigh the different expected impacts and to structure the group process to understand and select the portfolio. Specific locations with manageable scale should be identified for each transition activity, for which to assess the economic potentials and risks to farms as well as the social and environmental impacts at farm and aggregated levels. The micro-level understanding should inform the construction of an institutional set-up to deliver capital to farmers, as illustrated by the example from San Martin. At the same time, a careful analysis of policy instruments is required to avoid deforestation at regional level, which also needs to address the indirect consequences of farm-level investment and safeguard against possible counteracting effects. Concerning analytical tools, we recommend two types of cash-flow analyses with risks and returns for farmers and for investors. Social and environmental impact assessments should consider both on-farm and wider landscape impacts. In addition, two different types of institutional analysis are needed: an analysis of the current policy setup and how its level of enforcement can safeguard the land sparing potentials, and an analysis of the

administrative requirements to provide farmers with finance, technical assistance, and monitoring procedures.

Against this background, adequate financial investors and donors can be identified for the different elements of a ‘blended’ sustainable financing model. Costs to ensure direct benefits for conservation or to monitor environmental impact may be covered by philanthropic sources; technical assistance could be provided by NGOs or stakeholders to help implement the transition at farm-level, and the government or international development banks could provide “de-risking” components. Private commercial impact investors could then receive financial returns similar to those of traditional investments. Blended finance and related hybrid financing schemes have been challenged with respect to high transaction cost as well as uncertain requirements and benefits such as social and environmental performance, inclusive governance, and transparency (Warner 2013, Eurodad 2013). Nevertheless, their potential for investments into conservation and sustainable land use should be further explored.

Unlocking a notable contribution of private finance for transitions to sustainability requires increased attention from investors to the social and environmental impacts of different investments and on better differentiating investment options. True impact investments that avoid negative externalities or even help provide public goods will rarely be able to compete in terms of profitability with those that externalize social or environmental costs. They should be rewarded by an acceptance of lower rates of financial return.

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Annex 1 – Initial proposals for investment portfolios in the three project regions

Acre		Mato Grosso		San Martin
Revenue-generating productive activities				
Animal protein		**Large scale producers**		**Supply chains**
Cattle Beef		Cattle- Beef		Cocoa
Aquaculture		Planted Forests (Teca and Eucaliptus)		Coffee
Grains		Native Forests		Oil Palm
				Sacha Inchi
Forests		**Small scale producers**		Aquaculture
Timber (reforestation, community & concessions)		Bovine - Milk		Rice
Natural Rubber		Aquaculture		Heart of palm
Brazil Nut		Swine		
Acai		Rubber Plantations		
		Agroforestry Plantations (Cacao, Rubber and Banana)		
		NTFP (Non Timber Forest Products) Castanha, Pequi, Cumbaru, Babacu, Acai, Buriti, Bacaiuva		
Conservation activities				
State System of Protected Areas		Forest Code		Regional Conservation System
Restoration of Riparian Areas		Implementation of REDD+		
		Consolidation of existing Protected Areas (State and Federal)		
		Implementation of the Plan for Monitoring and Control of Forest Fires in MT		
Indigenous peoples & areas		**Indigenous peoples & areas**		**Indigenous peoples & areas**
Community Development Plans		Management Plans for Indigenous Territories		Development plans for indigenous communities