Landscapes for People Food and Nature

Financing Strategies for Integrated Landscape Investment

Case Study: Atlantic forest Brazil

Gabrielle Kissinger

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Cover Photo

Brasilianische Araukarie Araukarien bei Campos do Jordaõ (Brazilian *Araucaria angustifolia* near Campos do Jordaõ). Photo by Adrian Michael, Wikimedia Commons.

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Acronyms

Acronym	Definition
ANA	Brazil National Water Agency (Agência Nacional de Águas)
APP	Permanent Preservation Area (Área de Preservação Permanente)
BANDES	Espírito Santo Banco de Desenvolvimento do Espírito Santo SA
BNDES	Brazil's National Bank for Economic and Social Development (Banco Nacional de Desenvolvimento Econômico e Social)
CAR	National Rural Environment Registry System (Cadastro Ambiental Rural)
CESAN	Espírito Santo Water Utility (Companhia Espírito Santense de Saneamento)
IDAF	Espírito Santo Agroforestry and Forestry Defense Institute (Instituto de Defesa Agropecuária e Florestal)
IEMA	State of Espírito Santo Institute for Environment and Hydrological Resources (Instituto Estadual de Meio Ambiente e Recursos Hídricos)
INCAPER	State of Espírito Santo Rural Research, Technical Assistance and Extension Institute (Instituto Capixaba de Pesquisa, Assistência Técnica e Extensão Rural)
INPE	National Institute for Space Research (Instituto Nacional de Pesquisas Espaciais)
GVMA	Greater Vitória Metropolitan Area, Espírito Santo
PACT	Atlantic Forest Restoration Pact
SEAG	Espírito Santo Department of Agriculture, Aquaculture and Fisheries Supply
SEAMA	State of Espírito Santo State Secretariat for the Environment and Hydrological Resources (Secretaria de Estado de Meio Ambiente e Recursos Hídricos)
SNUC	National System of Conservation Areas (Sistema Nacional de Unidades de Conservação)
TNC	The Nature Conservancy
VALE	Companhia Vale do Rio Doce

Contents

List of Boxes

List of Figures

Introduction

The interconnections of the water-food-energy-climate nexus[1] play out in a variety of ways—with water security increasingly underpinning economic and community health, land degradation impacting food and bio-energy production, and trade-offs occurring between these often having negative consequences. The search for positive solutions is increasingly steering a range of actors and stakeholders towards Integrated Landscape Management (ILM), to support the interrelated objectives of food production, ecosystem service provision and rural and urban livelihoods, while avoiding the tradeoffs and conflicts inevitable with single-sector approaches. Financing these initiatives requires rethinking how more traditional sector-based land use finance can function to serve integrated approaches. Finance solutions are required that recognize the value of integrated problem-solving, and the unique financing needs these initiatives require.

This is one of three case studies of the Landscapes for People Food and Nature (LPFN) initiative's investigation into the landscape analysis component of the "Finance case and financing strategies for integrated landscape management." The case studies were chosen from the 29 different integrated landscape management initiatives (ILIs) that were identified in the scoping phase of this research. Based on the scoping ILIs, the following *entry points for investment* were identified: biodiversity and conservation, production (agriculture, forests, water), and economic development (social, livelihoods). Institutional planning and coordination plays a role in every stage of this process, with each entry point, and is often a key attribute for actors to identify the trigger to pursue a landscape initiative. Once the identification of the need for integrated management solutions beyond the initial entry point occurs, multiple investments are pursued to support multiple outcomes. The scoping report also differentiated *major types of ILIs based on governance and leadership characteristics*: government-led or multi-lateral-led initiatives; regional initiatives or platforms; traditional, local or community-led initiatives; NGO, grassroots or civil society-led initiatives; and private sector-led initiatives. The various types appear to be financed differently (sources, share of public versus private finance, etc.) based on their governance and leadership characteristics. This case study phase of the research identifies three landscape initiatives that together exemplify the five typologies, in order to analyze the sources and structures of financial flows to landscape activities, the financial gaps and barriers for landscape actors, opportunities for innovations for action at the level

1. World Economic Forum, 2011. Water Security: The Water-Food-Energy-Climate Nexus. Island Press.

Facing page: Mata Atlântica :: Serra da Gandarela - Atlantic forest. Photo by Frederico Pereira on Flickr.

"Finance solutions are required that recognize the value of integrated problem-solving, and the unique financing needs these initiatives require."

of the landscape, financial institutions and national and sub-national governments.

- **Atlantic forest, Brazil**: Includes two scales of ILM activity—at the biome-scale with the PACTO Mata Atlântica (Atlantic Forest Restoration PACT, hereafter referred to as PACT) and state-level with activities in Espírito Santo. PACT is a stakeholder platform, and Espírito Santo is a government-led ILM approach at the state level.
- **Lake Naivasha, Kenya**: A government-led ILM that represents a stakeholder platform, and very strong private-sector leadership. The ILI includes a range of agricultural uses (horticulture, livestock, smallholders, fisheries); a range of sectors finding solutions (agriculture, geothermal, municipal, forest). IFC performance standards were triggered due to landscape (water) risks.
- **Namaqualand, South Africa**: While this started as a NGO-led initiative, it still contains portions which are led by NGOs, but is housed in a parastatal organization, which represents the stakeholder platform. ILM efforts have focused largely on bringing biodiversity perspectives into other sectors such as agriculture and livestock management, as well as mining and water use.

This case study investigates the PACT in the Atlantic Forest of Brazil, which is a stakeholder platform comprised of more than 250 signatory organizations and more than 170 restoration initiatives, creating an umbrella of activities to restore forests and reverse environmental degradation in the Atlantic Forest, while also creating jobs, protecting critical watersheds, increasing carbon stocks, and building greater public awareness and support for ecosystem service functions.

PACT is a regional initiative or platform, and contains strong representation by the NGO, government, research and private sectors. PACT integrates previous and on-going initiatives and existing and future restoration efforts in a coherent movement and creates synergies among all stakeholders working towards large-scale restoration. This case study explores this biome-specific stakeholder platform, and the activities motivated by it, which are enabled by largely federal-level policies and incentives. The state of Espírito Santo is then explored as an example of how broader regional ambitions become operationalized at the state and local level. While PACT is a stakeholder platform typology of ILM, Espírito Santo is a government-led typology. This is based in part on the strong role of government in Brazil; the crucial role Espírito Santo government ministries must play in programme, capacity and finance delivery; and the strong

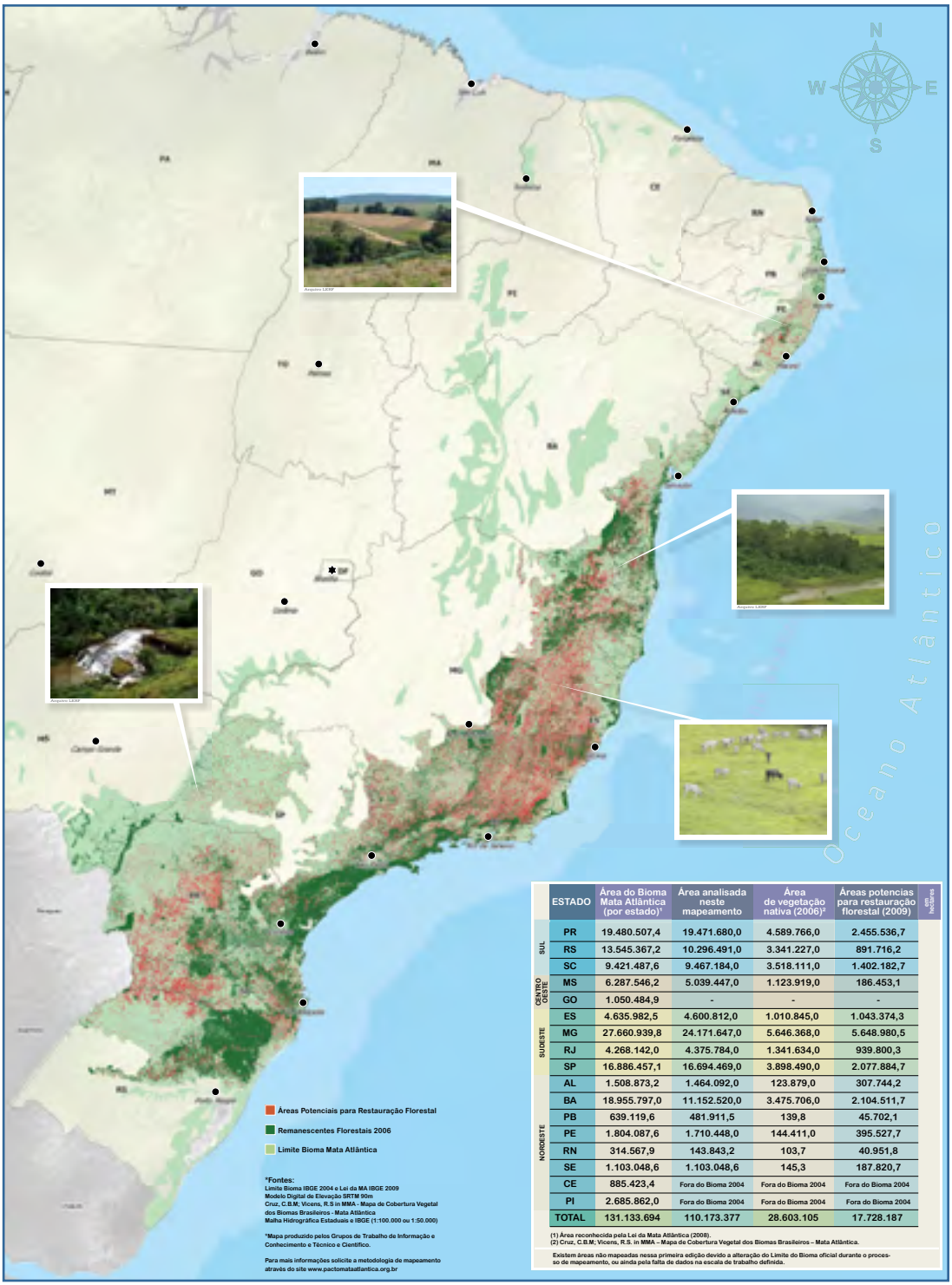
political support recent government administrations in Espírito Santo have brought to environmental solutions. As many of the government, NGO and academic/research actors involved in the region-wide PACT are also involved in Espírito Santo, both the PACT vision and capacity is scaled to the state and some local levels. Thus, though Espírito Santo demonstrates a government-led initiative, it is very much a state-level representation of PACT, with strong commitment from key stakeholders, but led by the state government.

Atlantic forest, Brazil

Brazil's Atlantic forest (Mata Atlântica) is one of the Earth's five most important biodiversity "hotspots" and one of the highest priority regions for conservation in the world (UNESCO, 2013). A few hundred years ago, this forest covered an area of more than 130 million hectares along the eastern coast of Brazil, the northern tip of Argentina and the eastern part of Paraguay. Within Brazil, less than 12 percent of the original Atlantic Forest cover remains, spread over isolated fragments less than 50 hectares in size (Ribeiro et al 2009). Most of Brazil's population (60 percent), economic activity (70 percent) and a significant amount of agriculture (including cattle, sugarcane, coffee, rubber, banana, and citrus fruit) is located in the Atlantic forest (World Bank, 2008). Due to the past degradation and considerable fragmentation of the remaining Atlantic Forest, restoration is the only means to rebuild and maintain the environmental services and genetic flux of the forest. Due to the strong interdependence between natural capital and the future of the regional and national economy, solutions to social, economic and environmental challenges cannot be addressed in isolation. Integrated landscape management interventions are being pursued in the Atlantic forest by a range of actors, at a variety of scales.

Atlantic Forest Restoration PACT

The Atlantic Forest Restoration Pact (hereafter referred to as PACT) is the culmination of at least twenty years of growing interest to address the restoration of degraded lands in the Atlantic forest. Formally established in 2009, this assemblage of national and international NGOs, research institutions, governmental agencies, and private companies formed as a network. PACT's mission is to orchestrate public and private institutions, governments, companies and landowners to integrate their efforts and resources towards the preservation of biological diversity, generation of employment and income



	ESTADO	Área do Bioma Mata Atlântica (por estado)[1]	Área analisada neste mapeamento	Área de vegetação nativa (2006)[2]	Áreas potenciais para restauração florestal (2009)	Em hectares
SUL	PR	19.480.507,4	19.471.680,0	4.589.766,0	2.455.536,7	
	RS	13.545.367,2	10.296.491,0	3.341.227,0	891.716,2	
	SC	9.421.487,6	9.467.184,0	3.518.111,0	1.402.182,7	
CENTRO OESTE	MS	6.287.546,2	5.039.447,0	1.123.919,0	186.453,1	
	GO	1.050.484,9	-	-	-	
SUDESTE	ES	4.635.982,5	4.600.812,0	1.010.845,0	1.043.374,3	
	MG	27.660.939,8	24.171.647,0	5.646.368,0	5.648.980,5	
	RJ	4.268.142,0	4.375.784,0	1.341.634,0	939.800,3	
	SP	16.886.457,1	16.694.469,0	3.898.490,0	2.077.884,7	
NORDESTE	AL	1.508.873,2	1.464.092,0	123.879,0	307.744,2	
	BA	18.955.797,0	11.152.520,0	3.475.706,0	2.104.511,7	
	PB	639.119,6	481.911,5	139,8	45.702,1	
	PE	1.804.087,6	1.710.448,0	144.411,0	395.527,7	
	RN	314.567,9	143.843,2	103,7	40.951,8	
	SE	1.103.048,6	1.103.048,6	145,3	187.820,7	
	CE	885.423,4	Fora do Bioma 2004	Fora do Bioma 2004	Fora do Bioma 2004	
	PI	2.685.862,0	Fora do Bioma 2004	Fora do Bioma 2004	Fora do Bioma 2004	
	TOTAL	131.133.694	110.173.377	28.603.105	17.728.187	

(1) Área reconhecida pela Lei da Mata Atlântica (2008).
(2) Cruz, C.B.M; Vicens, R.S. in MMA – Mapa de Cobertura Vegetal dos Biomas Brasileiros – Mata Atlântica.

Existem áreas não mapeadas nessa primeira edição devido a alteração do Limite do Bioma oficial durante o processo de mapeamento, ou ainda pela falta de dados na escala de trabalho definida.

Figure 1. *PACT Map of potential areas for forest restoration Source: PACTO Mata Atlântica: http://www.pactomataatlantica.org.br/pdf/mapeamento-areas-restauracao.pdf*

within the restoration production chain, application of payments for environmental services to motivate landowners towards sustainable land use practices and the alignment of agricultural activities with the legal requirements in the 17 states covered by the Atlantic forest biome.

The aim of the Atlantic Forest Restoration Pact is to restore 15 million hectares of degraded and low productive lands by 2050, and to achieve that by the coordinated and integrated action of its members. The PACT is now active in 8 states, with more than 250 signatory organizations and more than 170 registered restoration initiatives (PACTO Mata Atlântica, 2012).

The first step PACT took was creation of a map of potential and priority areas for forest restoration, which identified: a) remaining Atlantic forest remnants, b) areas eligible for carbon projects, c) restoration areas that would not conflict with agricultural production, d) areas important for water quality (ecosystem services), e) capacity and infrastructure, f) areas best suited to self-recovery in restoration (low-cost alternatives), g) areas with low suitability for agriculture; and h) areas that farmers needed to restore in order to comply with the forest code. The map is a blueprint for the long-term restoration plan, already containing integrated solutions at a coarse scale. Figure 1 shows the potential map for forest restoration.

Importantly, the cost of restoration in the Atlantic forest can be prohibitively expensive.[2] Thus, in order to maximize the restoration outcomes with the most economical investments, PACT strategically assessed how to gain increased ecosystem function without investment (natural regeneration), though this has not been completed in most regions; began exploration of how to bring landowners into compliance with existing legal codes; prioritized the areas of highest-conflict and those forest areas most important for ecological and socio-economic benefit; and finally, incentivizing actors in high priority areas. This strategic deployment of resources and finance seeks to maximize the impact of scarce resources, delivering those to the areas for which change brings greatest ecological, social and environmental benefit.

The integrated management objectives that the PACT's members are pursuing include enhanced water supply, water quality and watershed protection, flooding control, forest restoration, building enforcement and incentives for environmental regulation compliance (particularly the Brazilian Forest Code), and green certification and increased market demand for timber and non-timber forest products from native species. The latter is seen to bring multiple benefits, including biodiversity protection, poverty alleviation and job creation (Brancalion et al, 2012). Further, economic alternatives based

on forest products for lands not suitable for agriculture or abandoned lands is critical to serve production needs, and shift expansion away from forests. Particularly in the state of Espírito Santo, increasing yields on low productivity pasture is essential as a means to enable reforestation. Achieving the concurrent goals of conservation, restoration and increased agricultural production requires that each management objective be enabled or supported through interventions in other sectors, as Table 1 depicts. For instance, achieving success in reaching forest restoration goals requires devising new approaches to pasture management in order to boost productivity of cattle and slow extensive pasture practices. Another critical example is the need to address both the quality

Management objective	Actors implementing or investing in objective[1]	Key integrated management components in order to achieve success[2]
Forest restoration	Entire PACT membership	Requires new approaches to pasture management, shifting use to marginal lands, increasing productivity in pasture; legal compliance (to Forest Code and others)
Water supply and watershed protection	Public agencies and industries	Requires changing agricultural land use upstream, reforestation, protected areas
Flood control	Municipal, regional, and federal agencies	Reforestation, riparian protection, protection of existing forest remnants and mangroves
Green certification	Industrial conglomerates such as producers of biofuel, soy bean and wood pulp, but also applies to small-and medium-sized coffee growers	Legal compliance, reforestation
Better use of timber and NTPF products from native forests (biodiversity protection and poverty alleviation/job creation)	Private sector, NGOs, social movements, small farmers, public agencies	Supply chain development with linkage to production standards
Alternative use of marginal lands	Research institutions, NGOs, state governments, farmers	Increase livestock productivity to free up hectares available for restoration; Incentivize land users to reforest on marginal lands; creation of a new forest economy
Corridors- ecological connectivity	Entire PACT membership	Legal compliance, incentivize land users to set aside Mata Atlântica forest, promote land use compatible with forest cover (e.g. agroforestry)

Table 1. *Atlantic Forest, Brazil: Cross-sectoral and integrated management components to achieve land use management objectives. 1. Adapted from Melo et al 2013. 2. Author-generated, based on expert interviews*

and quantity of municipal water supplies through changing agricultural practices upstream and protecting and restoring critical water producing areas. This method is far more economical than building expensive new water treatment plants, and reduces demands on existing infrastructure.

The integrated landscape management objectives and corresponding finance occur between local to state and regional scales, enabled by a legal framework that motivates all actors across the region to participate. The following section elaborates the legal enabling environment, which drives both the integrated landscape management objectives as well as financing strategies. Section III explores how the overarching integrated landscape management objectives are operationalized and financed at a state and local level, in the State of Espírito Santo. The experiences in Espírito Santo offer tangible insight into how financing incentives by various actors working in concert can shift land use behavior, particularly via payments for ecosystem services (PES).

The enabling environment for integrated landscape management

Brazil has adopted a policy framework to support integrated landscape management objectives, though it is largely sector-based (forests, water, agriculture), and appears to support integrated management more as a consequence of cumulative activities rather than as a driver (meaning they were not all designed with integrated management as a core purpose). Each national-level policy described below encourages linkages and integrated approaches in different ways, and to varying degrees. With the recent passage of the Forest Code revisions in 2012, these policies now work more synergistically, motivating actors to invest in order to encourage legal compliance with the Code and/or other relevant laws.

The Revised Brazilian Forest Code (2012) – The Code requires landowners to protect and/or restore the Permanent Preservation Areas (PPA) and Legal Reserves (LR) within their properties and both must be spatially identified and registered in a new Rural Environmental Registry (CAR). Refer to Box 1 for more detail. Legal reserve areas must comprise 20 percent of an Atlantic forest property, and it is left to the discretion of the landowner where these occur. The CAR provides for a crucial new information system, which forms the basis for any assessment of legal compliance and monitoring, which was lacking previously in the original forest code. The Code also authorizes important finance mechanisms to incentivize land users via payment for environmental services (PES); compensation for environmental conservation measures, such as qualification for obtaining agricultural credit, access to agricultural

2. Anecdotal evidence collected through interviews suggests a per hectare cost of restoration/reforestation is between US$4,000 - $8,000 per hectare. Thus, restoration of one million hectares at US$4,000/ha would cost US$ 4 billion.

Box 1. 2012 Revised Brazilian Forest Code: Sections of highest relevance for Atlantic Forest integrated landscape management

Allows for:

1. *Permanent Reserve Areas (APPs): those covered by native vegetation, currently protected or not, including riparian areas, areas surrounding lakes, mangroves and areas containing steep slopes and that are important sources of natural capital. They must be managed in accordance with any basin or water resources management plans, and must be registered in the Rural Environmental Registry (CAR). The removal of natural vegetation from these areas is not allowed unless deemed to be of public utility or social interest of low environmental impact under the Law.*

2. *Legal reserve areas: Those that are not APPs that contain native vegetation cover, subject to the following minimum percentages in relation to the area of property: Amazon: 80%, Cerrado: 35%, Atlantic forest and other regions of the country: 20%. After the implementation of the CAR, the suppression of new areas of forest or other native vegetation can only be authorized by the relevant state environmental agency. If the unified methodology is applied to complete Ecological-Economic Zoning (ZEE) in the state, the federal government can:*

    a. *Reduce, solely for regularization through restoration, reclamation or compensation, a Legal Reserve area with a consolidated forested rural area, in the Amazon, up to 50 % of the property, excluding priority areas for biodiversity conservation and water resources and ecological corridors;*

    b. *Broaden the areas of legal reserve up to 50% of the percentage provided for in the Act (e.g. non-Amazon biomes), for compliance with national targets to protect biodiversity or reducing the emission of greenhouse gases.*

    The location of the Legal Reserve area in rural property should take into consideration the following studies and criteria: the watershed plan, Ecological-Economic Zoning, formation of ecological corridors with other Legal Reserve with Permanent Preservation Area with conservation areas or other legally protected area, areas of greatest importance for biodiversity conservation and also areas of greatest environmental fragility. The authorized state agency or institution shall approve the location of the legal reserve after the inclusion of the property in CAR. Legal reserves can be established between collective farms.

Authorizes:

1. *Creation of the Rural Environmental Registry (CAR) under the National System of Information on the Environment (SINIMA), allowing for a nation-wide electronic public record. It is mandatory for all rural properties, with the aim of integrating the environmental information of rural properties and possessions, composing databases for control, monitoring, environmental planning and economic development and combating deforestation (Article 29).*

2. *The federal executive branch to take the following action in order to promote ecologically sustainable development, subject to existing conservation programmes, the adoption of technologies and practices that reconcile agricultural and forest productivity, and reduce environmental impacts (Article 41):*

    a. ***Payment or incentive for environmental services** for: a) sequestration, conservation, maintaining and increasing inventory and decreasing the carbon flux; b) the preservation of the natural scenic beauty ; c) the conservation of biodiversity; d) the conservation of water and water services; e) climate regulation; f) the appreciation of the cultural and traditional ecosystem knowledge; g) the conservation and soil improvement; h) maintenance of Permanent Preservation Areas , Legal Reserve and restricted use;*

    b. *Compensation for environmental conservation measures necessary to achieve the objectives of the Act, using the following tools: i) obtaining agricultural credit in all its forms , with lower interest rates, as well as limits and deadlines larger than those on the market; ii) hiring of agricultural insurance in better conditions than those prevailing in the market; iii) deduction of Permanent Preservation Areas, Legal Reserve and restricted use of the calculation basis of the Property Tax Territorial Rural - ITR , generating tax credits; iv) allocation of a portion of the funds raised by charging water users for maintenance, rehabilitation or restoration of APPs and Legal Reserve areas; v) financing lines to meet voluntary conservation initiatives of native vegetation, protection of endangered native flora, forest management and sustainable agroforestry; vi) tax exemption for key inputs used in recovery processes of recovery and maintenance APPs, legal Reserve and restricted use areas;*

    c. *Incentives for commercialization, innovation and acceleration of recovery actions, conservation and sustainable use of forests and other forms of native vegetation, such as: a) preferential participation in programs to support the marketing of agricultural produce; b) allocation of funds for scientific and technological research and extension related to the improvement of environmental quality (Brazil, 2012).*

insurance at below-market rates, and allowing Permanent Preservation Area (Área de Preservação Permanente - APPs) and legal reserves to be deducted from the rural property tax calculation base; and incentives for commercialization, innovation and acceleration of recovery actions, conservation and sustainable use of forests and other forms of native vegetation. The Code also allows for the allocation of a portion of the funds raised by charging water users to be applied to the maintenance, rehabilitation or restoration of APPs and Legal Reserve areas. Legal reserves can be restored using up to 50 percent of exotic species in the beginning, which has positive financial implications for farmers, but also potential delays for the establishment of native species. Please refer to Box 1 outlining the sections of the Code that are of highest relevance to Atlantic Forest integrated landscape management and finance.

Rural Environmental Registry (Cadastro Ambiente Rural) (CAR) – The CAR creates a nation-wide electronic public record, and adapts and harmonizes similar approaches started in the states of Amazonas, Bahia, Mato Grosso, Pará, Rondônia, and Acre. This information component is critical to combat illegal activity and a long history of rural non-compliance in the Atlantic forest. The registry and mapping have already proven highly effective in São Félix do Xingu municipality in Pará state, in the Amazon basin. In Para there is a high correspondence between decreases in deforestation rates and the number of properties in the registry (see Figure 2). Under the CAR, farmers have a grace period, after which they must be registered in CAR. Once registered and shown to be compliant with relevant laws, landholders can access rural credit through financial institutions. Currently, a significant gap exists in that there is not adequate data to assess whether landholders are legally compliant or not. Thus, a significant focus for PACT members now is contribution of the technical and capacity requirements to create the information/database and spatial tools necessary (housed within state agencies) and to augment state extension service capacity to register landholders.

Brazil's Law on the regulation, use and protection of native vegetation of the Atlantic Forest Biome: Passed in 2006, and a separate law from the Forest Code, this law defines management objectives for the biome, mandating that the cutting and removal of primary forest or advanced secondary forest is largely prohibited. Management objectives seek protection and use of the Atlantic Forest Biome to ensure the maintenance and restoration of biodiversity, vegetation, fauna and water regimes for present and future generations; stimulation of research, dissemination of technologies for sustainable management of vegetation and increased public awareness about the need for recovery and

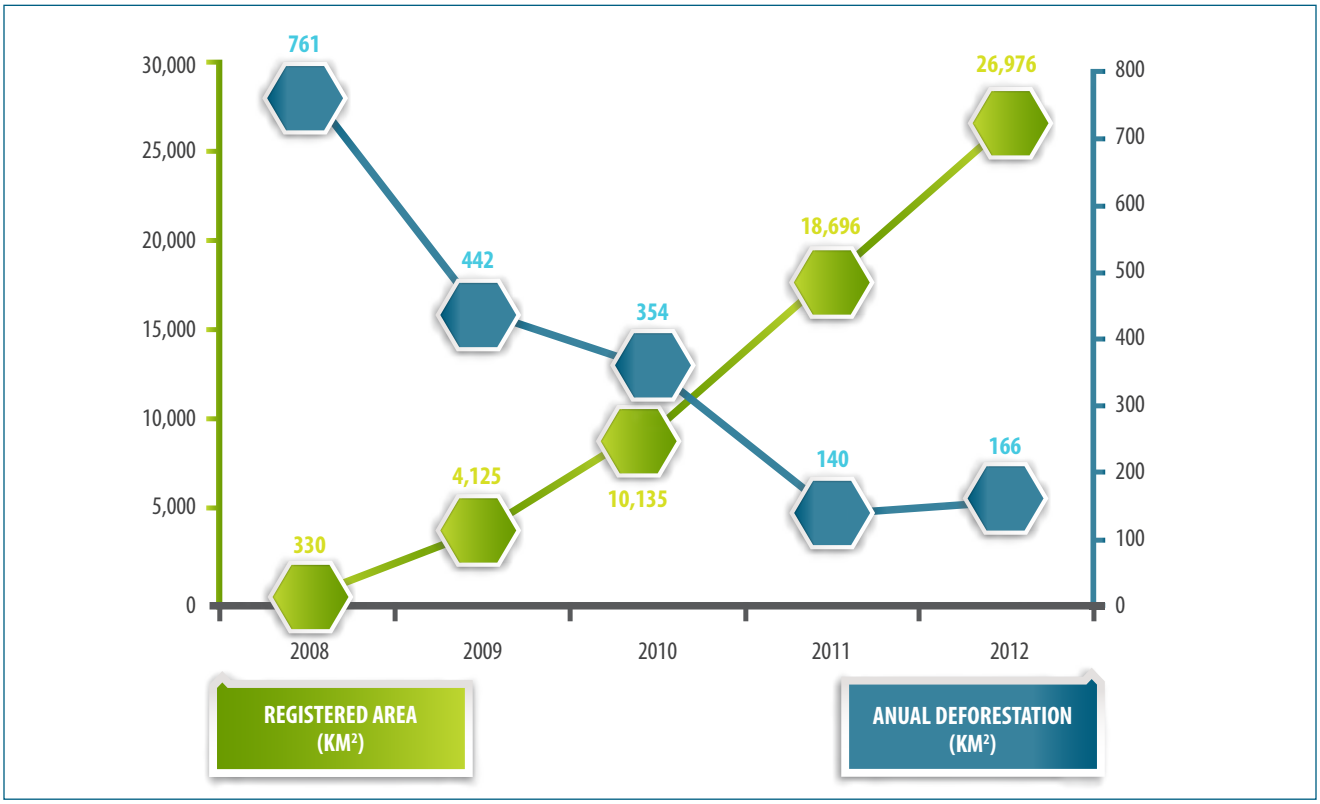


Figure 2. *Example of Effect of CAR on deforestation rates in São Félix do Xingu, Pará State, Brazil. Source: The Nature Conservancy, Oslo-REDD Exchange, 2013.*

maintenance of the ecosystem; the promotion of public and private activities that are compatible with the ecological equilibrium and defining a balance in urban and rural needs in order to harmonize economic growth with maintenance of the ecological balance. The law mandates environmental impact assessments must be carried out for activities impacting native vegetation. There are also provisions related to secondary growth. If cutting or removal of vegetation in advanced regeneration stages is authorized, it shall be subject to the environmental compensation provision such an area equivalent to the size of the area deforested with the same ecological characteristics, in the same watershed, where possible in same watershed, must be allocated. Article 36 established the creation of the Restoration Fund for the Atlantic Forest Biome (Brazil, 2006), although up to now the fund has not been established.

Ecological Corridors Project of the Pilot Programme to Conserve the Brazilian Rainforest (PPG-7/MMA): This project was led by the Brazilian Ministry of the Environment and covered both the Atlantic forest and Amazon. As of December 31, 2013, it is no longer operational in Espírito Santo, though project partners will meet in early 2014 to debrief and identify how to maintain the initiatives and

objectives of the programme in other institutions and activities. The objectives of the project included: a) reducing fragmentation, maintaining or restoring landscape connectivity and facilitating gene flow between populations, b) landscape planning, integration between protected areas, construction of ecological corridors in the Atlantic Forest and the conservation of existing ones on Amazon, c) demonstrate effective viability of wildlife corridors as a tool for biodiversity conservation in the Amazon and Atlantic Forest, d) promoting behavioral change among stakeholders, create business opportunities and incentives for activities that promote environmental conservation and sustainable use, and bringing an environmental perspective to development projects. The German government was a significant funder via Brazil's Ministry of the Environment and GIZ efforts, and was carried out in the central corridor of the Atlantic forest (Espírito Santo's efforts, including the Reflorestar project, have included Corredores Ecológicos priorities).

Brazil's National Water Resources Management System and policy, at both federal and state levels, allows for decentralization of water resources management, defines the watershed as the territorial unit for the implementation of the policy and corresponding institutional arrangements (World Bank, 2008), and also water users to be charged (Pagiola et al 2013). The revenue from water charges is managed by basin committees, however, and not by the central government, which encourages decentralized PES approaches (ibid).

ABC Plan – Approved in 2011, the Plano de agricultura de baixa emissão de carbono – (ABC Plan) is a national plan for promoting low carbon emission agriculture. The plan aims to stimulate sustainable practices in agriculture that reduce GHG emissions and increase carbon sequestration. The ABC Plan consists of seven programmes, all of which promote mitigation technologies, except the seventh one, specifically focused on climate change adaptation: a) Rehabilitation of Degraded Pastures; b) Integrated Crop-Livestock-Forest and Agroforestry Systems; c) Tillage System; d) Biological Nitrogen Fixation (BNF); e) Planted Forests; f) Treatment of Animal Waste; g) Adaptation to Climate Change. Financing and rural credit associated with the ABC Plan are described in the next section.

Other initiatives — A great complexity of related activity is occurring at various scales in the Atlantic forest, which are too numerous to document here. The SOS Atlantic Forest Foundation (SOS Mata Atlântica) is working with Conservation International and The Nature Conservancy to incentivize Private Natural Heritage Reserves (RPPNs) and strengthen the National System of Conservation Units (SNUCs). The

SOS Atlantic Forest Foundation is also working with the National Institute for Space Research (INPE) to monitor and create on-line mapping system which allows for open access to data on forest cover, areas the Mata Atlântica law applies to, priority areas, and other attributes.[3] Instituto BioAtlântica has created GeoAtlântica,[4] which is a free platform for the integration of geo-referenced data on the Atlantic Forest and its coastal systems.

Enabling incentives for integrated landscape management

A number of the enabling policies and institutions mentioned above also contain enabling incentives, such as the ABC Plan and the National Water Resources Management System and policy. In addition, other innovative enabling incentives are explored below.

The **ABC Plan** for low-carbon agriculture is intended to be in place from 2010 to 2020, and is expected to require approximately R$ 197 billion (US$ 82.7 billion)[5] from 2011 to 2020, to be financed with budgetary sources or through credit lines (Central Bank approved by Resolution No. 3896 of 17/08/10), and to reduce greenhouse gas emissions. The Federal Government has already created a credit line to finance farmers, and this facility has provided U.S. $3.15 billion in rural credit between 2011/2012, with interest rates of 5.5 percent per annum and a term of up to 15 years to pay.[6] States are still ratifying their own state ABC Plans, and the financing has taken time to become established and operational. Many of those interviewed for this research who work with or are rural producers were largely unaware of the potential of this opportunity and how it could leverage finance for core or related activities, such as rehabilitating degraded pastures, afforestation, agro-silvopastoral systems and agroforestry. Moreover, until now most of the funding from the ABC has been allocated to the Southeast and South regions of Brazil.

Water fees charged to users and polluters by the watershed committees, enabled under the National Water Resources Management System and policy, have recently developed capacity at watershed scales to build the ability of watershed committees to both collect fees and help carry out projects. Watershed committees are increasingly a key source of finance for restoration projects. These are watershed-level stakeholder platforms, comprised of governments (state and municipal), private sector (companies) and civil society organizations. Revenue sources are established by law and came from various sources, including the electricity sector, water fees, petrol taxes, and other sources.

Payments for ecosystem services: Besides the water-focused PES examples mentioned above, research

3. See: http://mapas.sosma.org.br
4. See: http://ibio.org.br/
5. All currency comparisons in this paper assume an exchange rate of 1 BRL = 0.42 USD.

and innovation is occurring with carbon and biodiversity-focused PES as well. A significant amount of effort is occurring at various scales in Brazil—from the first municipal PES scheme in Extrema, to state and biome-levels—to identify workable solutions. However, the sharing of lessons learned between these activities is often limited. More effort is needed to identify how to lower transaction costs, seek synergies between PSA activities and spatial conservation priorities and related policies, and increase recognition of the value of the ecosystem service to the land user (Guedes and Seehusen (eds.), 2012).

Funds from environmental compensation and impact mitigation from infrastructure projects — Brazilian law allows for environmental compensation (mitigation funds from development projects) to be used for the benefit of protected area management and adjacent areas in buffer zones. This now provides an important source of funding for conservation and restoration, and the potential to increase the amount of funds to sustainable land management depends on further legal reform, government commitments, and transparency.[7] A significant portion of the funds currently are absorbed into government operating budgets and are not allocated to the uses originally defined in law. Article 33 of Decree 4340 outlined the priorities for the use of funds for environmental compensation in protected areas (those existing or to be created) as: a) tenure and land demarcation, b) preparation, review, or implementation of management plans; c) acquisition of goods and services required for deployment, management, monitoring and protection of the unit, including its buffer zone; d) development needed to create new protected area studies, and e) development of research necessary for the management of the protected area and buffer zone (Brazil, 2002). The Environmental Compensation Federal Committee first met in August 2011 and has since allocated R$ 386 million (US$ 162.1) from 54 infrastructure projects.

BNDES Atlantic forest Initiative (Iniciativa BNDES Mata Atlântica) — Housed within the National Bank for Economic and Social Development (BNDES), this initiative provides financial support to non-reimbursable funds for restoration projects in the biome. In 2009, the BNDES received the first project proposals, from which 15 were selected for funding. Financial support focuses on restoration projects of riparian forests and protected areas in the biome, with the following objectives: a) compliance with the Atlantic Forest Law; b) information dissemination and public awareness about the importance of conservation and reforestation of native species of the biome; c) carbon sequestration, d) watershed protection, and promoting similar initiatives. The area contracted thus far are 2,876 hectares and contracted value is

6. See: http://www.agricultura.gov.br/desenvolvimento-sustentavel/plano-abc/financiamento

7. Gustavo Pinheiro, The Nature Conservancy, Brazil, personal communication.

R$ 40.3 million (US$ 17.1 million). Projects have a duration of three to four years, with a minimum of two years for maintenance.

Atlantic Forest Conservation Fund (AFCoF II) — Coordinated by the Brazilian Ministry of the Environment, this fund has just completed its second phase, which lasted three years (2010-2013). Objectives of the fund are to contribute to the protection, sustainable management and recovery of the Atlantic Forest by supporting initiatives to identify and create protected areas and Private Natural Heritage Reserves, building capacity for establishment of PES projects, and creating a surveillance system for the biome. The project is part of the International Climate Protection Initiative of the German Ministry for the Environment, Nature Conservancy and Nuclear Safety (BMU), which provides financial support through the KfW development bank, mediated by the Brazilian Biodiversity Fund (Funbio). Funbio is a private non-profit organization that raises funds and provides services for biodiversity conservation.

Credit for increased livestock productivity (Intensifica Pecuaria) — This new credit line for farmers to increase livestock productivity. In order for livestock producers to access the finance, they must have a management plan that identifies how they will apply model techniques and procedures that contribute to greater sustainability and development in livestock production. Management plans are to contain targets and timeframes for compliance with verification items.[8]

Green stock exchange (BVRio) — This is a new mechanism to help comply with the Forest Code, which acts similar to a carbon market, but transacts legal reserve quota's rather than credits of tonnes of carbon dioxide equivalent. The Brazilian Forest Code creates the supply and demand, and the market mechanism provides a means for farmers to meet compliance obligations. The first market was launched by BVRio Quotas Environmental Reserve, created by the previous Brazilian Forest Act version, which allowed compensation of legal reserve between farms. The 2012 Forest Code broadens the exchange of legal reserve quotas beyond watersheds, and is now allowable within and between Brazilian states. While the federal law is in place, state laws still need to be enacted to operationalize the programme in each state.

A farmer with a deficit of legal reserve hectares can "buy" from those with excess of forests beyond the legal reserve requirement, and the mechanism also allows those who have conserved forest to accrue a benefit. While the market is being established, farmers can buy and sell at discount. Over 1.5 million hectares of forest surplus have now been registered, and 500,000 hectares are ready to be traded as soon as

8. R.F. Curado, P.A. Pereira, Secretaria de Assuntos Estratégicos da Presidência da República. http://www.sae.gov.br/site/?p=19520, posted 4 December 2013.

the new forest code is regulated, in various biomes of Brazil. BVRio is focusing efforts now on the necessary state enabling laws, identifying the surplus and deficit in each region, and setting up the information platform (registry) and trading platform in each region.

- The deficit in legal reserve areas under the old version of the Forest Code was 50 million hectares, and in the new version of the Forest Code, it is estimated to be 25-30 million hectares.
- Creation of the market mechanism relies heavily on government for the enabling environment, however once market infrastructures are in place, the government role is minimal, and the market provides a service to help landowners with their legal compliance obligations (freeing landholders from penalties)
- The operating cost of the mechanism is anticipated to be covered by the transaction costs of 2 percent for buyers and 2 percent for sellers.
- BVRio is an NGO. Primary funders of the establishment of BVRio include the UK Prosperity Fund, Swiss Agency of Development and Cooperation – SDC, Climate and Land Use Alliance, ClimateWorks Foundation and the Moore Foundation.[9] Once up and running, it is anticipated to transition to another entity.

FIBRIA is the world's leading producer of bleached eucalyptus pulp. It is a Brazilian company that is a member of the PACT and has committed to restoring 21,000 hectares of Atlantic forest in Espírito Santo, Bahia, and Minas Gerais states, by 2025. Fibria estimates the cost of restoration will range from R$ 6,000 to R$ 12,000/ha (US$ 2,500 – US$ 5,000/ha). Thus, the total estimated cost is expected to be R$ 168 million (US$ 70 million). These funds would come primarily from Fibria's operating budget, but Fibria has also signed a partnership agreement with The Nature Conservancy , which could contribute R$ 3 million toward the total cost. Restoration activities have begun on 11,550 ha, with on-going monitoring to check if natural regeneration rates are as projected. Following PACT's recommendations, Fibria is using native species for restoration, but also anticipates using eucalyptus in the mix of species, as a way for landholders to generate income while native species get established. In partnership with CI and TNC, Fibria is seeking financing from BNDES to provide seedlings and guidance to smallholders interested in restoration on their land.

9. Alex Hofmann and Leonel Mello, BVRio, personal communication, 5 November 2013.

Espírito Santo, Brazil

UNESCO describes the rainforests of southern Bahia and northern Espirito Santo states as the world's richest in terms of the number of species of tree per hectare (UNESCO, 2013). Espírito Santo has experienced significant forest clearing over the last fifty years and also suffered from high levels of government corruption and lack of environmental enforcement, despite the existence of federal and state environmental laws. Under the last two government administrations, concerted efforts have been pursued to address these issues by combatting corruption, developing a legal framework promoting water and land use management, creating the first state-wide PES law in Brazil, directing some of the state's significant oil revenues to forest conservation and restoration, and boosting enforcement capabilities. Related to the overall PACT goals, the state of Espírito Santo has set a goal of reforesting 30,000 hectares with native species in water critical areas, over the next few years. This state-level commitment has formal and informal connections to the larger umbrella of federal, state and PACT goals. Many of the government, NGO and academic/research actors involved in PACT are also involved in implementation at sub-regional scales and with watershed committee's. Thus, these actors are cultivating connectivity between programmatic objectives and scales in the Atlantic forest.

Espírito Santo's efforts demonstrate an integrated approach linking forests, water, rural and urban resource use and demands, is based on an inter-secretariat approach within government, contains innovative finance mechanisms such as payments for ecosystem services (PES) and the potential for greater coordination between land use practices and access to rural credit, private sector engagement, and federal and state legal framework supporting integrated land use interventions.

Espírito Santo's integrated landscape management approach

While 87 percent of Espírito Santo was covered by Atlantic forest in 1500, only 8 percent remained by 2005 (Espírito Santo, 2006). The state recognizes that its natural resource abundance will not translate into broad-based economic development and improvements in social welfare unless the state takes action to ensure these benefits reach society, and is managed for multiple benefits. This is articulated in the State's Vision 2025, which states the imperative that development strategies combine economic benefits with the improvement of social and environmental well-being (Espírito Santo, 2006). The Vision 2025 defines five major environmental challenges that

must be part of the state development strategy:

1. Manage water resources to ensure the supply of quality water for human consumption, industrial activities and irrigated agriculture;
2. Conserve and restore native forest of the Atlantic Forest in the State (including increasing native vegetation of the state to 16 percent (20,000 hectares) by 2025);
3. Mitigate the impacts of industrial development on environmental quality;
4. Reconciling agricultural development with the conservation of soil, including promoting agroforestry;
5. Proper disposal of solid waste

Political support by the Governor of Espírito Santo for forest conservation, improved water management and payments for ecosystem services as early as 2005 created a driving force to identify options for creation of a PES mechanism. The State approached the national water agency, Agency National de Agua (ANA), received some federal funding, and then pursued its own state PES law, with the first payments made through ANA. With the enactment of Law No. the 8995 in 2008 (Espírito Santo, 2008), the state became the first in Brazil to establish a law on PES, and the ProdutorES de Àgua programme was created. However, the mechanism only benefited existing forests and areas adjacent to rivers, streams and around springs, and had fixed payments. Therefore, the programme had little effect on increasing forest cover in the state, as it did not address degraded landscapes, restoration potential, and the integrated mosaic land use patterns characteristic of the Atlantic forest (Sossai, et al, 2012a).

The Global Environmental Facility (GEF) financed the Espírito Santo Biodiversity and Watershed Conservation and Restoration (Floresta para Vida) Project, to provide short-term PES payments aimed at inducing the adoption of biodiversity-friendly production practices, as well as the initial costs of developing a program of long-term PES payments intended to be financed by the water utility of Vitoria (CESAN). The Águas Limpas project sought to expand wastewater and water treatment, sanitation and storage capacity for Greater Vitória Metropolitan Area (GVMA) and by strengthening SEAMA and IEMA via better planning and information systems (e.g. geo-referencing, cadaster of water users and licensing, and related to enforcement). The investments that Águas Limpas made helped to support the capacity necessary for the Florestas para Vida project, and the two projects shared the same institutional arrangements and administrative/financial units (World Bank, 2008).

At the same time, the CampoSustentável initiative was established to contribute to economic, social and environmental sustainability of "Capixaba"[10] farms through a coordinated effort between the Department of Agriculture, Aquaculture and Fisheries Supply (SEAG) and State of Espírito Santo Rural Research, Technical assistance and Extension Institute (INCAPER). The goal was to support farmers in planning, diversifying and increasing agricultural production, and conservation.

In 2009, the State Water Resources Fund (FUNDÁGUA) was created in order to direct part of oil and natural gas royalty revenue to watershed management (including strengthening watershed committees), the PES mechanism, and to introduce financing through the Espírito Santo Development Bank (BANDES) to promote forest cover and environmental stewardship of land areas with significant water resources interest (State of Espírito Santo, 2009).

The ProdutorES de Água ran for three years with funds from FUNDÁGUA. The governor established a new goal of 30,000 hectares of forest to be restored by 2015 and 230,000 hectares by 2025, prompting revision and maturation of the ProdutorES de Água and the PES law, along with better programmatic coherence between Floresta para Vida and CampoSustentável.[11] When FUNDÁGUA was created, 3 percent of oil royalties should go to IEMA, and of that, 60 percent should go to PES and forest cover and environmental land stewardship, 40 percent went to water programmes. One restriction of this allocation is that it did not allow a donor or contributor to direct payments to a specific area (for instance, upstream from a specific water treatment plant). The law was reformulated in order to give more discretion to the Secretary of State for the Environment and Water Resources (SEAMA) to raise and invest resources (State of Espírito Santo, 2012b), which has provided more discretion for earmarks, so investors can target their investments to geographic areas of greatest concern to them. In this new formulation, 2.5 percent goes to forest, .5 percent goes to water, thus a larger allocation is provided for forest restoration. The 3 percent contributes US$ 2 million per month to fund both water and reforestation/conservation.

It was recognized that the fragmented implementation of these programmes and lack of aligned management objectives restricted the ability to reach the scale necessary to achieve the State's goals (Sossai et al, 2012a). The World Bank had provided technical and significant loan support to Águas Limpas. But grant funding and technical capacity was also needed to help develop the ProdutorES de Água PES mechanism (and later, Reflorestar) through the targeted Espírito Santo Biodiversity and Watershed Conservation and Restoration (Floresta para

10. Capixaba is the name given to somebody from the state of Espírito Santo.

11. Gunars Platais, World Bank and Marcos Sossai, IEMA, personal conversation 1 November 2013.

Vida) Project (see more info below). The project strategically focuses on the Jucu and Santa Maria da Vitória water basins, which contains 401,000 hectares (9 percent of Espírito Santo territory), contains 40 percent of its original forest cover, which is >35 percent of the remaining rainforest in the entire state. These two watersheds also provide 95 percent of the Greater Vitória Metropolitan Area (GVMA) water supply, as well as hydroelectricity. Despite a R$ 5.2 million investment in water treatment to overcome increases in turbidity levels, CESAN's operating costs continue to increase each year, due to decreases in forest cover and traditional agriculture practices (Sossai et al 2012b). The GVMA houses roughly half of the state's population and generates 62 percent of state GDP (World Bank, 2008). The World Bank's involvement brought a significant focus to the integration of the forest and water programmes, the institutional arrangements necessary, and enhanced technical capacity on the PES mechanism design. Table 2 describes this progression of programmatic development, with the current Reflorestar programme encapsulating many of the sector-based and stand-alone projects in more holistic and integrated approach.

The World Bank and GEF defined a targeted programme of action in 2008 via the Espírito Santo Biodiversity and Watershed Conservation and Restoration Project that sought to reduce threats to globally significant biodiversity and the mainstreaming of

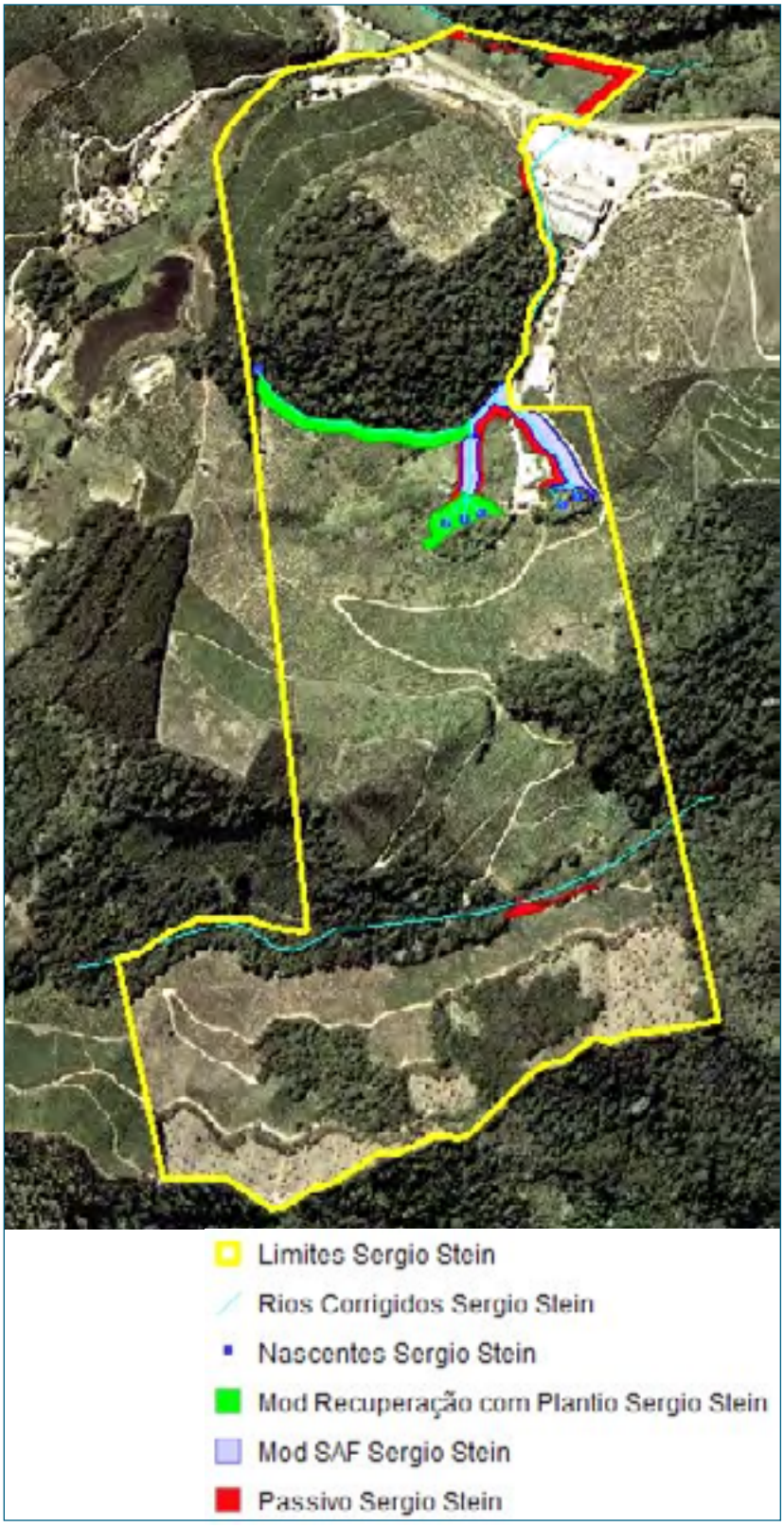


Figure 3. *Stein farm, Jucu watershed, Espírito Santo, Brazil*

Program	Timeline	Objective
Reflorestar (Reforestation Programme)	2011 – present	Reflorestar builds upon all previous programmes, particularly Florestas para Vida, and the ProdutorES de Água (the first state PES programme).
Espírito Santo Biodiversity and Watershed Conservation and Restoration Project (Florestas para Vida or Forests for Life)	2008 – 2013	Sought to focus finance, technical capacity and support to IEMA to promote sustainable land use practices via Reflorestar with 160 farmers on 3,400 hectares prioritized in the Jucu and Santa Maria da Vitória water basins. Sought to reduce threats to biodiversity, from the adoption of improved practices and sustainable production. Depended on info and capacity from Águas Limpas.
ProdutorES de Água (Water Producers)	2008 – 2010	First state PES programme, created by Law No.8995, funded by FUNDAGUA. Sought forest conservation, conservation and enhancement of biodiversity, erosion reduction, carbon sequestration. Focused on the Benavente, Focused on the Benavente, São José and the Guandu river basins. Max allowable payment: R510 per hectare per year.
CampoSustentável	2009 – present	Goal is to support farmers in planning, diversifying and increasing agricultural production, and conservation. Aims to contribute to economic, social and environmental sustainability of farms and Capixaba farms. Run by SEAG and INCAPER..
Águas Limpas (Espírito Santo Water and Coastal Pollution Management Project)	2004 – 2012	US$ 275 million (from state, World Bank and CESAN) was invested in the 52 municipalities served by CESAN. Focus is expanding wastewater and water treatment, sanitation and storage capacity for GVMA and by strengthening SEAMA via better planning, information systems (geo-referencing, cadastre on water users and licensing, and related to enforcement). Built capacity for Florestes Para Vida project.

Table 2. *Espírito Santo integrated land use management programs*

biodiversity in production landscapes through the following:

1. Strengthening watershed management: strengthening watershed committees, preparing an economic-ecological zoning plan for the watersheds, vegetative cover monitoring system. Estimated cost: US$ 2.5 million.
2. Targeted biodiversity protection of protected area management: state park management plan, new instruments for biodiversity conservation, recuperation of degraded lands, support to two Ecological Corridors. Estimated cost: US$ 4.2 million.
3. Mainstreaming biodiversity in production landscapes: Estimated cost: US$ 4.3 million.

a) Inducing adoption of sustainable land use practices: technical assistance to farmers adopting silvopastoral or organic farming practices, establishment of PES scheme.

b) Establishing payments for environmental services: Detailed technical studies on water supply problems, socioeconomic evaluation of critical areas for water service supplies, institutional structure for payment mechanism, preparing a work plan with CESAN and hydroelectric producers.

4. Monitoring and evaluation: M&E at two levels: project-level and regional-level information systems. Estimated cost: US$ 1 million.

a) Therefore, the overall project costs were estimated at US$ 12 million, of which US $4 million was provided through a GEF grant, which would leverage an additional US $8 million. The US $8 million was derived from: the government of Espírito Santo (US$ 4.14 million), an IBRD loan (US$ 1.683 million), and local farmers and VALE (US$ 2.177 million).

The Reflorestar programme took shape in 2011 and was formalized in 2012 with a series of legal reforms and decrees. A revised PES law (No. 9.864) was then approved in 2012, seeking to financially support landowners to maintain and restore ecosystem services, develop projects and acquire inputs necessary to maintain ecosystem services (State of Espírito Santo, 2012a). Further, the law allowed for a much higher maximum payment value, thus making restoration attractive for landholders. Decree No 3182-R further defined the types of land use that the Reflorestar programme would recognize as generators of environmental services, including: a) standing forest; b) planting seedlings for recovery; c) natural regeneration; d) agroforestry e) silvopastoral systems and f) managed forests (State of Espírito Santo, 2012c).

Reflorestar's launch was grounded on the following assumptions: a) continuous alignment and tuning between agencies, including IEMA, and INCAPER and IDAF, as well as between municipalities; b) establishment of partnerships with organizations aligned with interests and objectives of the programme; c) proposals for actions that promote incentives for the small and medium farmers; d) improved environmental practices through conservation and recovery of forest cover, and activities to promote sound soil management. Reflorestar seeks to diversify interventions in forestry beyond increasing forest cover and distribution of native species, to include other environmental, social and economic benefits. For example,

Box 2. The role of farmer organizations in scaling up PES

In scaling up the Florestas para Vida project across the state of Espírito Santo through the Reflorestar programme, working with farmer cooperatives can bring efficiencies and provide an important means of reaching farmers without clear land title. The Movement of Small Producers (MPA) is an informal social and environmental organization comprised of groups of 5-40 families (2,000 families in total) across 35 municipalities primarily in the north of Espírito Santo, which comprises 40% of the state's municipalities. The MPA's goals are to ban pesticide use, promote the production of healthy food and sustainable land use, and to address social issues farmers face, such as the viability of rural farming and jobs for youth. Forty percent of MPA members do not have formal tenure rights, but the MPA can work with other groups to establish agreements in Reflorestar. The organization is funded solely by contributions from each family and small-scale fundraisers.

MPA's participation with Reflorestar provides a means for farmer-to-farmer sharing of experiences and the benefits of sustainable land management and PES incentives, and helping them to navigate the complex decisions of how to maximize their investment to increase food production and or income, while increasing and maintaining environmental services.

the use of agroforestry (referred to as SAF) can provide ecological, social and economic benefits beyond what the predominant commercial timber species of eucalyptus and rubber can, which are often established as plantations and are land and capital intensive. Reflorestar provides a direct incentive through PES to incentivize legal compliance (Brazil's Forest Code, Atlantic forest law and others) and opens the door to discuss sustainable land use options with landowners, which provides opportunities for a cultural shift in how farmers view land (Sossai et al, 2012a). The programme includes monitoring and also benefits from improved IDAF enforcement. There are also strong linkages to build upon the ecological corridors project, which has since ramped down.

Reflorestar's incentive structure

The incentive structure for Reflorestar is based upon determination of what incentive is needed to promote a change in land use behavior. Activities with higher long-term net present value, such as agroforestry and silvopastoral systems (or a combination of both) receive shorter-term payments set at a level high enough to finance the initial investment costs. Restoration payments are paid over three years, with 50 percent of the amount paid in the first year, when the bulk of expenditures occur. Once farmers overcome the initial investment costs, the returns from these profitable practices, including agroforestry (SAF), silvopastoral systems and managed forests, will be sufficient to sustainably maintain the land use. In contrast, for practices without long-term financial benefits, such as natural regeneration and standing forest, payments must be longer-term, but the payments can be set at a lower level per annum. Table 3 below describes the Reflorestar incentive and PES payment structure. The incentive column is a one-time payment, to cover the costs of implementation of practices encouraged through Reflorestar. The PES column payments recognize the

environmental services generated by practices maintained and / or implemented. For conservation and restoration measures, PES payments are intended to cover the opportunity costs of maintaining land under conservation practices, are paid over five years and are renewable.

A land use management plan is developed for every participant in Reflorestar, which shows existing forest areas such as APPs and legal reserves and the areas of focus for improved practices. NGOs and private companies have been contracted to undertake activities in the field (development of management plans, technical assistance, monitoring of compliance), which adds to IEMA's field implementation capacity. Participants are not obligated to bring their entire property under compliance with environmental laws, but receive lower payments if they do not, and higher payments if legal requirements are exceed.

Incentivizing integrated management solutions at the farm-scale in Reflorestar

An example of how integrated landscape finance, incentivize and influence landholder decision-making is provided in Figure 3. The property has been enrolled in IEMA's PES programmes for 3 years, and consists of a main 58 hectare parcel, plus 20 hectares adjacent and 20 hectares nearby.

On the primary 58-hectare parcel, 20 percent is under legal obligation not to be cleared of trees, but more needs to be conserved under the Atlantic forest law. He currently has a 5 meter wide riparian buffer (for which he receives R$ 11,200), but could do 15 metres wide and receive an additional R$ 6,800 in compensation, however his cattle herd is currently occupying part of that area because it is closer to his home and road. In reviewing his options, Mr. Stein recognizes the incentive is of interest, and he can reforest the additional riparian buffer with palm and

Modality	Initial payment	PES incentive
Standing forest	Not applicable	R$ 200 per ha
Recovery with planting	R$ 6,863 (US$ 2,873)	R$ 180,00 per hectare
Natural regeneration	R$ 2,202 (US$ 922)	R$ 170,00 per hectare
Agroforestry	R$ 7,585 (US$ 3,176)	Not applicable
Silvopastoral	R$ 3,034 (US$ 1,270)	Not applicable
Managed forest	R$ 4,782 (US$ 2,002)	Not applicable

Table 3. *Reflorestar initial payment and payment for ecosystem service returns to landowners*

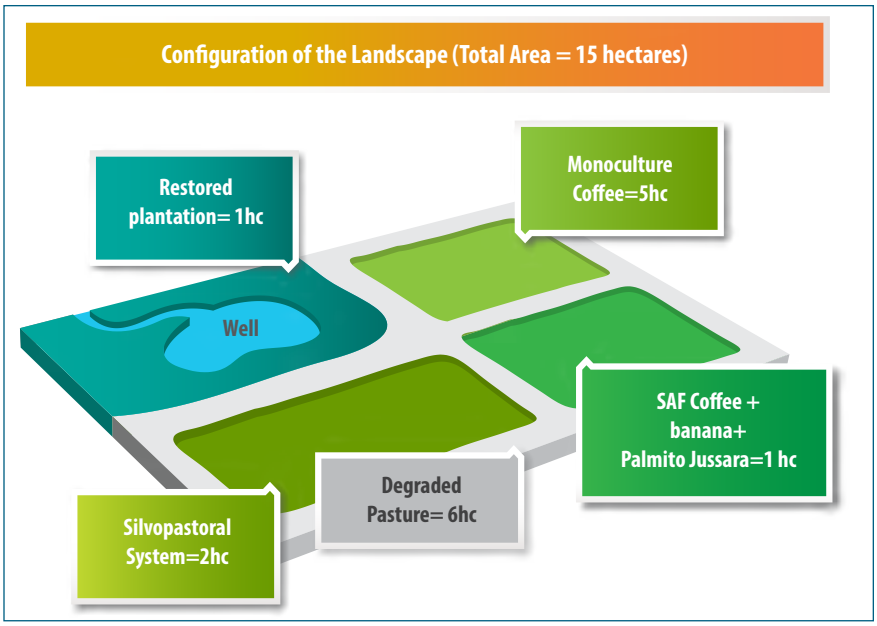


Figure 4. *Reflorestar: Recovery of forest around spring, agroforestry and silvopastoral system*

other commercial species, as well as non-commercial native species, with Reflorestar's assistance. As for the new siting of his livestock feedlot, he mentions his interest to improve the productivity of his cattle herd. The IEMA extension agent informs him that his new corral option could also include an improved pasture component under the silvopastoral component of Reflorestar. Mr. Stein noted this was not attractive to him originally, as he assumed he must plant eucalyptus, which would compete with pasture productivity. However, the IEMA extension agent informs him that he can access leguminous species as part of Reflorestar, which will improve soil productivity.

Farmers benefit beyond the incentive and PES payment, through increased income opportunities. In this example on a hypothetical farm in Figure 5, the recovery of forest around a spring, plus an agroforestry and silvopastoral system demonstrates how the Reflorestar incentives conceptually work on the landscape. This example demonstrates both cumulative benefits from PES and increased returns. With the improvements made on-farm that qualify for Reflorestar payments, benefits to the farmer include a short-term total return = R$ 11,651.73 (+17 percent) Total yield long-term = R$ 22,356.09 (+ 125 percent). The environment and society benefits from better land use, resource protection, erosion control, improvements in chemical management, improved soil management, diversification of production and reduced risks of the loss of production. To incentivize the farmer to take this step, Reflorestar attunes the incentives to reflect the up-front costs of adoption. Therefore, each intervention (with the exception of monoculture coffee, see Figure 4) receives payments to overcome up-front investment and long-term carrying costs.

Challenges and next steps

A key challenge for Reflorestar in the future is how to effectively scale the programme across the state. The initial focus on the Jucu and Santa Maria de Vitória watersheds by the Florestas para Vida project allowed the programme to develop the information systems, build capacity,

12. Miguel Ângelo Aguiar, INCAPER, personal communication.

13. In order for rural producers to access below-market-rate credit (such as that available for family farms—Programa Nacional de Fortalecimento da Agricultura Familiar (PRONAF)), they require a letter of aptitude from INCAPER.

consolidate partnerships and establish a successful PES mechanism, which are key elements for scaling up. INCAPER's recent acquisition of federal funds to step up extension in the north and south of Espírito Santo[12] can provide critical capacity, particularly related to linking farmers to PES, and low-interest rural credit[13] to spur changes in land use that can have a positive impact on water, forests and agriculture. Effective engagement of farmer's cooperatives and associations will also contribute important peer-to-peer information sharing and decision-support to increase up-take among rural producers (See Box 2).

Another key challenge is how to deepen the integrated management approaches currently underway in order to achieve the effectiveness sought. This requires better integration and coordination between government ministries, for alignment of information systems, delivery of rural extension services, and tighter coordination between IEMA and INCAPER which will build towards more efficient integrated public finance management. But this also requires harmonizing sources of investment to deliver the financing needed for systemic approaches to changing land use behavior. For instance, depending primarily on water finance can limit the geographic spread of the programme, targeting those areas investors prioritize, while deprioritizing other areas. Therefore, coherently orchestrating how all stakeholders and ecosystem service users can be effectively motivated, and their investments and contributions can reach maximum value and impact for integrated sustainable development and restoration outcomes will be crucial.

Projecting how the integration of conservation, restoration and increased agricultural production goals can work requires long-term planning and evaluation of where trade-offs and conflicts will occur. While the focus of interventions in Espírito Santo have focused largely on the interface between forests, water, and agriculture, strategic gains can be made by focusing on specific interventions in livestock production. Livestock occupies approximately 38 percent of the state area, agricultural crops account for 15.3 percent, and forestry occupies 4.6 percent of the state area.[14] Strassburg et al assessed strategies for overcoming land use conflicts between sectors and determined that increased livestock and pasture productivity is essential in order to reconcile the expansion plans of crop production and the restoration of native forest cover. Further, their findings indicate that maximizing synergies and reducing the risk of future conflicts between agricultural production and restoration can be achieved through compatible activities such as the adoption of intensive silvo-pastoral systems with rotational grazing techniques (Strassburg et al, 2011). This could provide an opportunity to allocate public investments wisely and signal to the private sector areas

14. Plano Estratégico da Agricultura Capixaba (PEDEAG) (2007 – 2025) Accessed on 29 November 2013 at http://www.incaper.es.gov.br/pedeag/index2.htm

suitable for agricultural production and value chain development, in order to minimize future conflicts in the economy and use of land.

Further investments by the World Bank are expected to be made in water sanitation, road improvements and risk management in 2014. The land use component may be 20 percent of the estimated > $200 million cost. CESAN would pay for a portion of the overall project cost through their operating costs, and thus can pass these costs on to ratepayers. Importantly, hydrological modeling will be a key information product from this project, and will inform decision-making and investment, such as what the necessary costs will be to affect land use change, and what benefits would be (to CESAN and other water users) to stop the unsustainable trends.

Financing integrated landscape management

Finance is differentiated between the funding that supports the stakeholder platform and the finance necessary for PACT members to carry out planning, restoration, capacity building and other implementation activities and the funding necessary to shift land use behavior among non-PACT actors (landowners, farmers).

Financing the stakeholder platform

While very difficult to estimate the amount of finance that was necessary to invest in the multi-stakeholder dialogue, research and decision-making, and organizational capacity among all PACT members, it is clear that PACT's success with integrated management outcomes across the biome will not be possible without an investment over at least ten years. The PACT itself will soon achieve the status of a NGO, although this transition to a more formal arrangement was widely debated because some members feel that creation of a new entity would compete for limited resources that are currently being sought by the members. PACT currently has a full-time Executive Secretary and a part-time finance and admin support, and will continue to operate with a minimum structure to mainstream member projects. As a network of many NGOs, private companies, research institutions and government agencies, the PACT will be able to act on behalf of a multi-stakeholder movement to apply for large international funding opportunities to support collective investments in restoration projects, which would not be accessible to each institution individually (Melo et al, 2013).

> ***"By developing the information systems to track compliance, and deploying smart investments and incentives to motivate landowner compliance, a significant amount of investment in improved land management will be made by landowners themselves, while also improving their long-term profits in many cases."***

Finance to shift land use behavior across the biome

Figure 2 depicts the major strategic priorities the PACT made in order to maximize the restoration outcomes with the most economical investments. Given the high costs of restoration in the Atlantic forest, PACT strategically assessed how to gain increased ecosystem function without investment through natural regeneration, while focusing minimal investment in developing adequate infrastructure for nurseries and seedlings, as well as extension services (often carried out by NGOs due to lack to state services). The next strategic prioritization was how to bring landowners into compliance with the existing and revised legal codes. By developing the information systems to track compliance, and deploying smart investments and incentives

Figure 5. *Atlantic forest integrated landscape management approach*

to motivate landowner compliance, a significant amount of investment in improved land management will be made by landowners themselves, while also improving their long-term profits in many cases (due to maintenance of ecosystem services, on which they depend). Lastly, by prioritizing the areas of highest-conflict and those forest areas most important for ecological and socio-economic benefit, PACT members are able to direct incentives to those actors in high priority areas. This can maximize the impact of scarce resources, by focusing on areas for which change brings greatest ecological, social and environmental benefit.

Federal, state, multi-lateral and private investment is authorized through legislation and coordinated across actors: Finance that is authorized by legislation, such as water fees or payments for ecosystem services, provides substantial funding for integrated landscape management in the Atlantic forest. The Reflorestar programme provides a robust incentive structure and restoration payments through PES, tied to landowners seeking legal compliance, or going beyond minimum legal requirements. This public-sector managed model attracts private sector investment, such as VALE (a mining company) and Fibria, a pulp company, which has invested in seedlings, fertilizer, training and technical support that is aligned with Reflorestar objectives. Fibria's investments of R$ 168 million (US$ 70 million) to restore 21,000 hectares by 2025 across three Atlantic forest states is a significant private sector investment, that also brings critical technical capacity, seedlings, and augments extension agent contact with landholders.

Brazil has developed strong models of how technical assistance and access to rural credit can only be achieved when legal and sustainable land use practices are achieved, as per relevant federal laws. However, Brazil could have chosen to simply boost enforcement of existing laws, rather then create a bundle of incentives to motivate landowners. Previous efforts focusing solely on enforcement did not achieve the expected results. Thus, new approaches to create access to information and monitoring through CAR, policies on rural credit, and the Forest Code working in unison should be evaluated to test the efficacy of this approach over time.

Oil and gas revenues currently offer a large source of revenue for restoration, and are the primary source of finance for the Reflorestar programme. Oil and gas royalties provide Espírito Santo with $22 million/yr for water and forest conservation.

NGOs play a large role in delivering finance, sourced from donors and philathropists, to stakeholder platforms such as PACT, helping to leverage public investment, and working with private sector actors to

15. http://www.plantabillion.org/

16. Aurélio Padovezi, TNC Brazil, personal communication, 25 November 2013.

identify opportunities for investment (such as Vale, a mining company active in Espírito Santo, and Fibria, a pulp company).

One example was the 10-year Critical Ecosystem Partnership Fund's (CEPF) programme, which began in 2001, with an earmark of US$ 8 million over five-years. In 2007, an additional US$ 2.4 million contribution was committed for CEPF's Consolidation Phase in the Atlantic Forest, lasting three years, from 2008 to 2011. Eighty-eight percent of CEPF resources for the Atlantic Forest were directed to local institutions, with more than 460 institutions involved in Phase I of CEPF projects in the Atlantic Forest. A 2006 survey showed that the institutions accountable for implementing the projects leveraged another US$ 9.6 million from various other public and private funding sources. CEPF leveraged the use of resources from other projects and programmes in the biome, such as the Pilot Program for the Protection of Tropical Forests in Brazil – Demonstration Projects Sub-program (PDA Atlantic Forest); the Natural World Heritage Sites Program; the Protection of the Atlantic Forest of Minas Gerais Project (Promata-MG), of the State Forestry Institute (IEF) with support from the German Kreditanstalt für Wiederaufbau (KfW); the Rio Rural Program of the Secretariat of Agriculture of the State of Rio de Janeiro; the Nature Conservancy (TNC); and the Ecological Corridors Project. CEPF focused effort on institutional strengthening of actors in priority regions for biodiversity conservation, such as the Golden Lion Tamarin Mosaics Project, which was coordinated by a group of partner institutions (Golden Lion Tamarin Association, Valor Natural, CI-Brazil, SOS Atlantic Forest Foundation) with the support of the Atlantic Forest Biosphere Reserve and The Nature Conservancy in the Serra do Mar corridor (CEPF, 2011).

Another example is TNC's "Plant a Billion Trees" campaign,[15] which seeks to raise funds from individuals and corporate donors for restoring degraded lands and forests in the Atlantic forest. The campaign has raised almost $5 million to date, and engaged more than 2000 individuals.[16] TNC and Instituto BioAtlântica are working with states to collect data and spatial platforms for the CAR. This leveraging of technical capacity is a large investment, and a critical element in tracking legal compliance.

Integrated finance occurs significantly at the sub-regional scale, through PACT intermediaries working directly with landowners: Due to the fragmented forests, mosaic of land uses, and small parcel sizes, and significant amounts of private land, broader biome management objectives must be carried out at the farm-scale. Rural extension and technical assistance (done by state agencies and some of the PACT members) and bi-lateral contracts directly with land-

owners provide a primary route for finance to flow, whether through PES, access to below-market credit, or to enable investments by landowners in income-generating activities that are aligned with PACT objectives.

A significant portion of funds for restoration comes from environmental compensation and mitigation of environmental damage in Brazil. However, this also requires capacity to channel those funds to the right activities. Many development projects that need to operationalize their environmental restoration activities to offset impacts do not have the capacity and staff to undertake these activities. TNC is one of a number of PACT members identifying how to create relationships with landowners in order to provide necessary technical support to understand impacts and degradation, what is needed to attain legal compliance, and complete site and restoration plans. TNC can aggregate inputs and supply seedlings, fertilizer, and other needs, and then monitors the land for 4 years (as part of an ecological protocol).

Increased capacity across a full range of actors is a critical benefit resulting from finance that sought integrated outcomes. In Espírito Santo, IEMA has worked in partnership with the state extension service, INCAPER, to establish and water resource monitoring system that now provides critical information to local, state, and national water resource managers. This has increased INCAPER's management capacity, which previously had a few monitoring stations spread out throughout the state. The University of Washington is undertaking detailed hydrological modeling that will form a critical basis for a hydro-meteorological network, to inform on-going assessments of water risks and decision-support for ecosystem service providers and users. Similarly, integrated land use mapping of the Jucu and Santa Maria de Vitória watersheds, made possible with a R$ 3.6 million TNC-funded contract, provides a land use information platform intended to be open access and available for all Ministries and users that can utilize the information. Depending on how well this is mainstreamed into the ministries information systems, this one information portal could be the repository for all information related to forest code and Atlantic forest legal compliance, restoration activities, agricultural extension prioritization, PES and qualification for rural credit.

Small grants and micro-loans, within an umbrella integrated finance approach, can be important sources of finance at sub-regional and local scales. The CEPF sought to overcome obstacles to scaling such as the small number of professional NGOs and the intermittent nature of major funding sources by creating an Action Fund for Conservation, of which a portion would deliver small-scale investment (with no individual

17. This very limitation is also its key strength, in that it provides an alternative to traditional legal compliance mechanism, which have not been as successful in the Atlantic forest.

grant greater than $10,000) in specific civil society efforts to strengthen local organizations to bring critical conservation areas under improved management (CEPF, 2001). This programme was meant to build off the success of the UNDP - GEF Small Grants Programme operating in the Brazilian Cerrado.

Lessons Learned and recommendations

Market failure, a lack of legal enforcement, perverse incentives and the opening of the agricultural frontier, with the associated exploitation of timber and charcoal production, promoted forest degradation in the Atlantic forest. In Brazil, environmental externalities have been addressed by legislation, though enforcement has been a major challenge in the past. However, **the combination of legislation, a strong stakeholder platform with coordination at multiple scales, and targeted incentives and investment, all within the context of an integrated approach to managing environmental services, is having profound effect**. As the Forest Code revisions, national water laws and iterations of Espírito Santo's PES law (and even current revision of the national PES law) demonstrates, getting the policy right is crucial, and must be tailor-made to fit local circumstances. These integrated policies were designed to motivate a range of investments and innovations in finance, which has spurred considerable private sector investment, though much more can be done. In cases where there is an over-reliance on government funding, or a single source of revenue such as oil and gas royalties, other ecosystem service users can "free-ride" and gain the benefits without participation. Adequate information on ecosystem user exposure to environmental (and social) risk is critical to motivate adequate investment to address those risks.

Scattered interventions that are driven by landholders' willingness to access financial incentives may not achieve the coordinated and synergistic landscape management outcomes hoped for: The PES approach in Espírito Santo depends on an individual farmer's willingness to participate. This points to one of the fundamental limitations of PES—that if a farmer is unwilling to provide the service, a prospective ecosystem service buyer may have no ability to effectively incentivize a change in land use behavior.17 While 'targeting' (e.g. prioritizing the Jucu and Santa Maria de Vitória watersheds in Espírito Santo) is an important tool to pri-

oritize sites or choose programmatic design elements to maximize a PES scheme's operational and financial efficiency (Engel et al, 2008), there is still necessary evaluation of whether this is sufficient to meet landscape management objectives, or whether the most that can be achieved is a "sum of the parts" approach.

Similarly, while the BVRio green bond provides a very innovative means for farmers to trade forest legal reserve quotas and thereby incentivizes compliance to the new Forest Code, it is not a panacea. The demand for CRAs will need to be high enough to stimulate supply. Similar to PES, the mechanism does not allow for spatial targeting of priority areas, such as the most biologically diverse, most at-risk from conversion, or a differentiation in the pricing to recognize the ecosystem service value of specific forest types. This mechanism may be best suited in the Cerrado and Amazon, where legal reserve requirements are greater (80 percent forest cover requirement in the Amazon) and may be less suited to the complex mosaic of land use in the Atlantic forest. There may be opportunities for the intermediaries transacting quotas with landowners to try to target certain landowners in specific geographies to participate or to bundle quotas across multiple farm units for aggregated results.

Transparency and improved capacity of institutions to adequately utilize and spend existing funds for integrated outcomes is essential: Significant funds already exist, but are not yet fully allocated to the purposes defined in existing legislation: As mentioned above, environmental compensation and mitigation funds from infrastructure and development projects can provide a significant source of funds. However most of these funds are currently absorbed into government operating budgets and are not allocated to the uses originally defined in law. Watershed committees are also increasingly a key source of finance for restoration projects, and significant capacity-building has gone into developing their ability to carry out projects. Further consideration of how to coordinate multi-sectoral finance strategies at the watershed scale is now possible with the development of this capacity.

Improved orchestration of finance for integrated outcomes is needed, and requires identifying the right institutional arrangements to deliver that need: To achieve the PACT restoration goals, significant new finance sources are necessary. As mentioned above, transparency and improved capacity of institutions to unlock and manage finances is crucial in Brazil. However, there is also a need to identify which credible institution (or a new one created specifically for this purpose) can take on the responsibility and fully house the function of coordinating and monitoring flows of integrated finance. The PACT stakeholder platform

creates the enabling conditions and helps implement the shared vision for the region, but has not identified such a fiduciary responsibility as within the scope of its mandate. The Brazilian National Development Bank (BNDES) already oversees a range of public funds that require coordination for deployment in the Atlantic forest, including climate funds, the Amazon Fund, Mata Atlântica Fund, ABC Plan credit lines, and rural credit programmes. These funds serve all of the integrated components of the Atlantic forest restoration goals, including finance for both restoration and production needs. However, BNDES does not have an explicit mandate to oversee integrated finance in the Atlantic forest. This requires further consideration of whether a revision in their mandate, along with new capabilities, is warranted, or whether another entity should be created to fill this role. One option could be the Banco do Brasil, which is the financial institution in the lead to provide loans to farmers and with the highest rate of ABC loans.

The improved orchestration of finance can assist in overcoming the conflict between agriculture and forestry in the Atlantic forest, promoting a more holistic landscape approach. The new Forest Code has the potential to provide a stronger means to achieve this, particularly if tighter alignment is made between requirements for restoration at the farm-level and access to finance for agricultural production. The low-carbon agriculture plan (ABC Plan) is expected to require approximately R$ 197 billion (US$ 83.3 billion) from 2011 to 2020, to be financed with budgetary sources or through credit lines. The ABC Plan seeks to incentivize activities very similar to those PACT is pursuing, including rehabilitating degraded pastures, agro-sylvopastoral systems and agroforestry, and afforestation. However, it is still unclear how ABC Plan credit can leverage or complement other sources of funds for the same activities. Also, it is unclear how the new line of credit promoting livestock productivity (intensifica pecuaria) will be aligned with the Plan ABC, if at all. Further analysis of how to promote and orchestrate these sources to enable a more integrated outcome is necessary. The biggest challenge is to demonstrate to farmers that converting degraded pasture to forest is financially viable, in order to encourage farmers to access loans and engage these activities.

Oil and gas revenues offer a large source of revenue for restoration in Espírito Santo, but dependence on this sector alone disenfranchises other ecosystem service users that could be motivated to invest. Espírito Santo is currently relying on oil and gas royalties amounting to $22 million/yr for water and forest conservation. However recently announced changes at the federal level to how these funds are allocated across all states, not just producing states, will likely affect Espírito

“The improved orchestration of finance can assist in overcoming the conflict between agriculture and forestry in the Atlantic forest.”

Santo's discretion in the access to and use of those funds. The impact this may have on the Reflorestar programme is unclear, however Espírito Santo is looking into use of endowments as a hedge against possible fluctuations and to ensure that long-term finance is available.

Payments for ecosystem services offer an important incentive for landholders and can be a useful tool in the mix of finance options for integrated land management, however careful consideration must be made of tool limitations and lessons learned, to guide best application of PES. PES is particularly useful for smaller landholders in mosaic landscapes where the opportunity cost of land is low. Early experience with ProdutorES demonstrated that while the objectives of the programme sought integrated land management, the PES incentives were not originally attenuated to that and therefore the integrated outcomes were not achieved (i.e., forest cover did not increase significantly as expected). One of the reasons is that it takes time to work through land use decisions and implementation by farmers. The Reflorestar experience showed that each decision on a land use intervention is an incremental process and depends on each farm. This also points out to the importance of PES payments being complemented with technical support. The redesign of the PES mechanism in the Reflorestar programme identified the need for the PES needs to set a level of funding that is high enough to overcome costs for farmers to implement the change. On the other hand, it can't be too high that they would be enticed to enroll, take the payment, and then abandon the programme. Identifying how best to engage the ecosystem service users is also critical for longer-term sustainability of the mechanism. In Espírito Santo, the water company, CESAN is not motivated to pay for negative externalities to the degree that they may if the oil revenues were not available for PES.

The Atlantic forest is a mosaic landscape, and offers important lesson s for how REDD+ can be a part of broader sustainable landscape management. The Amazon Fund does allow for some funds to be allocated to the Atlantic forest when used for monitoring purposes. The experience in the Atlantic forest also illustrates the importance of integrating forest-sector activities into broader landscape approaches in mosaic forest contexts. This context also demonstrates the importance of enabling policy and regulatory frameworks, and the role of finance to incentivize legal compliance for forest conservation. The Atlantic forest also demonstrates how those who value the forest most—ecosystem service users dependent on municipal water supplies—may not yet adequately value the service forests provide, or understand the importance of strategic investments

to maintain the service (which in all cases is far more economical than constructing new water treatments plants). Information systems are critical to create awareness of forest values, eliminate conflicts and to monitor the use and legal compliance. Information systems that are developed to serve integrated landscape management needs (e.g. forests, water, pasture, infrastructure and development) to have more utility in informing conflicts, possible trade-offs and areas for strategic investment than single-sector ones. However, progress made in Espírito Santo (and likely in other states) demonstrates that while integration was part of the CAR and Reflorestar information system design and intent, it has not yet been operationalized within other departments beyond IEMA. The complexities of implementation should not be shortchanged, and the development of capacity and systems takes considerable time.

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Appendix I: List of Interviewees

Name	Organization
João Carlos Augusti	Fibria
Marcos Sossai	IEMA
Sandro Souza	IEMA
Fabiano Novelli	Corridores Ecológicos
José Renato Casagrande	Governor of Espírito Santo
Fernando Vega	The Nature Conservancy
Gilberto Tiepolo	The Nature Conservancy
Aurélio Padovezi	The Nature Conservancy
Gustavo Pinheiro	The Nature Conservancy
Miguel Calmon	IUCN
Peter May	Federal Rural University of Rio de Janeiro
Roldan Murian	Federal Rural University of Rio de Janeiro
Miguel Ângelo Aguiar	INCAPER
Cesar Pereira	INCAPER
Pedro Luís Pereira Teixeira de Carvalho	INCAPER
Stefano Pagiola	World Bank
Gunars Platais	World Bank
André Guimaraes	Conservation International
Leonel Mello	BVRio
Alex Hoffmann	BVRio
Agnieszka Latawiec	IIS
Bernardo Strassburg	IIS
Lúcio Bedê	Terra Brasilis
Sergio Stein	Farmer
Valmir Jose Noventa	Movement of Small Producers/ Movimento dos Pequenos Agricultores (MPA)
Dorizete Cosme	Movement of Small Producers/ Movimento dos Pequenos Agricultores (MPA)

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