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Report No: ICR00003476

IMPLEMENTATION COMPLETION AND RESULTS REPORT
(TF-55569 TF-93210)

ON A

GLOBAL ENVIRONMENTAL FACILITY TRUST FUND GRANT

IN THE AMOUNT OF US$4.2 MILLION

TO THE

STATE OF ESPÍRITO SANTO

FOR THE

ESPÍRITO SANTO BIODIVERSITY AND WATERSHED CONSERVATION AND RESTORATION PROJECT

August 27, 2015

Environment and Natural Resources Global Practice
Brazil Country Management Unit
Latin America and Caribbean Region

CONTENTS

CURRENCY EQUIVALENTS

Exchange Rate Effective: April 2015 (Last Disbursement)
1 US$ = R$ 2.32
April 2012 (Midterm Review): US$1 = R$1.89
December 2014 (Closing Date): US$1 = R$2.65
FISCAL YEAR
(January 1 – December 31)

ABBREVIATIONS

ALP	*Aguas Limpas* Project
ANA	National Water Agency *(Agência Nacional de Águas)*
APA	Area of Environmental Conservation
APP	Areas of Permanent Protection *(Área de Preservação Permanente)*
BRL	Brazilian real
CAS	Country Assistance Strategy
CESAN	Espírito Santo Water Utility *(Companhia Espírito Santense de Saneamento)*
CPS	Country Partnership Strategy
DIF	Dynamic Information Framework
EA	Environmental Assessment
FDP	State Forest Development Plan
FM	Financial Management
FMA	Financial Management Assessment
FpV	*Florestas para Vida*
FUNDÁGUA	State Water Fund
GEF	Global Environment Facility
GEO	Global Environmental Objectives
GOES	Government of Espírito Santo
GVMA	Greater Vitória Metropolitan Área
ha	Hectare
IBio	*Instituto BioAtlantica*
IBRD	International Bank for Reconstruction and Development
ICB	International Competitive Bidding
ICR	Implementation Completion and Results Report
INCAPER	State Rural Research, Technical Assistance and Extension Institute *(Instituto Capixaba de Pesquisa, Assistência Técnica e Extensão Rural)*
IOIs	intermediate outcome indicators
IPM	integrated pest management
IRR	internal rate of return
ISR	Implementation Status and Results Report
IUCN	International Union for the Conservation of Nature
km	kilometer
km^2	square kilometers
M&E	monitoring and evaluation
m^3	cubic meters
MS	Moderately Satisfactory

MT	Management Team
MU	Moderately Unsatisfactory
NGO	nongovernmental organization
NPV	net present value
NTU	Nephelometric Turbidity Units
PA	Protected Area
PAD	Project Appraisal Document
PdA	*ProdutorES de Agua* Water Producers project
PDO	Project Development Objective
PES	Payment for Environmental Services
PIU	Project Implementation Unit
RPPN	Private Natural Heritage Reserves *(Reserva Particular do Patrimônio Natural)*
SEAMA	State Secretariat for the Environment and Hydrological Resources *(Secretaria de Estado de Meio Ambiente e Recursos Hídricos)*
SLM	Sustainable Land Management
SMV	Santa Maria da Vitória watershed
VALE	*Companhia Vale do Rio Doce*
ZEE	Ecological and Economic Zoning

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Country Director:	Martin Raiser
Senior Global Practice Director:	Paula Caballero
Practice Manager:	Raúl Alfaro-Pelico
Project Team Leader:	Gunars Platais
ICR Team Leader:	Gunars Platais

A. Basic Information			
Country:	Brazil	Project Name:	Espírito Santo Biodiversity and Watershed Conservation and Restoration Project
Project ID:	P094233	L/C/TF Number(s):	TF-55569,TF-93210
ICR Date:	08/27/2015	ICR Type:	Core ICR
Lending Instrument:	Grant	Borrower:	Espírito Santo State
Original Total Commitment:	US$4.20M[1]	Disbursed Amount:	US$4.20M
Revised Amount:	US$4.20M		
Environmental Category: B		**Global Focal Area: B**	
Implementing Agencies: State Institute for Environment and Hydrological Resources (IEMA)			
Cofinanciers and Other External Partners:			

B. Key Dates				
Process	**Date**	**Process**	**Original Date**	**Revised / Actual Date(s)**
Concept Review:	06/19/2007	Effectiveness:		03/10/2009
Appraisal:	05/15/2008	Restructuring(s):		06/29/2012 12/01/2013 12/31/2014
Approval:	11/18/2008	Midterm Review:	03/14/2012	04/18/2012
		Closing:	06/30/2012	12/31/2014

C. Ratings Summary[2]	
C.1 Performance Rating by ICR	
Outcomes:	MU
Risk to Global Environment Outcome:	Moderate
Bank Performance:	MU
Borrower Performance:	MS

[1] This includes the project preparation grant (TF055569) for $0.20 million.
[2] Ratings: HS=Highly Satisfactory, S=Satisfactory, MS=Moderately Satisfactory, MU=Moderately Unsatisfactory, U=Unsatisfactory, HU=Highly Unsatisfactory

C.2 Detailed Ratings of Bank and Borrower Performance			
Bank	**Ratings**	**Borrower**	**Ratings**
Quality at Entry:	MS	Government:	S
Quality of Supervision:	MU	Implementing Agency/Agencies:	MS
Overall Bank Performance:	MU	**Overall Borrower Performance:**	MS

C.3 Quality at Entry and Implementation Performance Indicators			
Implementation Performance	**Indicators**	**QAG Assessments (if any)**	**Rating**
Potential Problem Project at any time (Yes/No):	No	Quality at Entry (QEA)	None
Problem Project at any time (Yes/No):	Yes	Quality of Supervision (QSA)	None
GEO rating before Closing/Inactive status	Satisfactory		

D. Sector and Theme Codes

	Original	**Actual**
Sector Code (as % of total Bank financing)		
General agriculture, fishing, and forestry sector	72	72
General water, sanitation, and flood protection sector	13	13
Public administration-Agriculture, fishing, and forestry	15	15
Theme Code (as % of total Bank financing)		
Biodiversity	35	35
Land administration and management	17	17
Other rural development	13	13
Water resource management	35	35

E. Bank Staff

Positions	**At ICR**	**At Approval**
Vice President:	Jorge Familiar	Pamela Cox
Country Director:	Martin Raiser	John Briscoe
Practice Manager/Manager:	Raúl Alfaro-Pelico	Laura E. Tlaiye
Project Team Leader:	Gunars H. Platais	Gunars H. Platais
ICR Team Leader:	Gunars H. Platais	

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F. Results Framework Analysis

Global Environmental Objectives (GEO) and Key Indicators (as approved)

The Global Environmental Objective is to reduce threats to globally important biodiversity in the Recipient's territory from agricultural production systems and increase critical habitat for endemic species in two key rainforest watersheds in the Recipient's territory.

Revised Global Environmental Objectives (as approved by original approving authority) and Key Indicators and reasons/justifications

(a) GEO Indicator(s)

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 1:	**3,400 ha under environmentally friendly land use practices.**			
Value (quantitative or qualitative)	0	3,400		4,031
Date achieved	March 10, 2009	December 31, 2014		December 31, 2014
Comments (incl. % achievement)	Achieved. Through support from the State Rural Research Agency INCAPER to 879 properties, environmentally friendly land use practices cover 4,031 hectares.			
Indicator 2 :	**Payment mechanisms for watershed conservation established and implemented.**			
Value (quantitative or qualitative)	N	Y		Y
Date achieved	March 10, 2009	December 31, 2014		December 31, 2014
Comments (incl. % achievement)	Achieved. The state-wide *Reflorestar* payment for environmental services (PES) program has been implemented since 2012 on a strong legal basis through State Law 8995 (issued September 2008; amended by Law 9864 in June 2012), and a permanent funding mechanism FUNDÁGUA, i.e. the State Water Fund.			
Indicator 3:	**Sustainable Market-based mechanisms to finance Protected Areas (PA) management implemented.**			
Value (quantitative or qualitative)	N	Y		N
Date achieved	March 10, 2009	December 31, 2014		December 31, 2014
Comments (incl. % achievement)	Not achieved. The GOES did establish the State Water Fund FUNDÁGUA which is partly financed out of the state's oil and gas royalties and a funding source for PES and for conservation and biodiversity protection activities. Establishment and successful operation of FUNDÁGUA eliminated the need for market-based financing mechanisms in the short and medium term.			

Indicator 4:	**1,000 ha of critical habitat restored and/or protected from encroachment.**			
Value (quantitative or qualitative)	0	1,000		0
Date achieved	March 10, 2009	December 31, 2014		December 31, 2014
Comments (incl. % achievement)	Not Achieved. The GOES faced numerous implementation challenges in setting up a state-wide roll-out of the PES system causing delays in achieving the target of this indicator. However, the target is likely to be achieved and surpassed by 2017 according to the current *Reflorestar* implementation plan[3] as there already are 270 signed contracts with more in the pipeline and a projection of achieving 20,000 has by 2017 and 80,000 has by 2020 (see Annex 9).			
Indicator 5:	**Conservation of biodiversity in agricultural landscapes adopted on 3,600 ha.**			
Value (quantitative or qualitative)	N	Y		N
Date achieved	March 10, 2009	December 31, 2014		December 31, 2014
Comments (incl. % achievement)	Not achieved. At project completion, 12 private conservation areas[4] were created on an area of totaling 246.7 hectares. However, with successful implementation of the PES system, more than 4,000 ha of agricultural landscapes Protected Areas will be created as part of the Governors commitment to the restoration of 80,000 has of native forest as the state's contribution to the Bonn 2020 challenge (see Annex 9).			

[3] IEMA - FpV Evaluation Report, 2015.

[4] The project supported the creation of 12 Private Natural Heritage Reserves (*Reserva Particular do Patrimônio Natural*, RPPNs). Six are located within the selected watersheds and six are located in the adjoining areas and are equally important as they provide critical habitat continuity through ecological corridors for the endangered Muriqui monkey.

(b) Intermediate Outcome Indicator(s)

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 1:	**2 watershed management committees strengthened.**			
Value (quantitative or qualitative)	N	Y		Y
Date achieved	March 10, 2009	December 31, 2014		December 31, 2014
Comments (incl. % achievement)	Achieved. The two plenary committees were established, with board members elected. Over 10 ordinary sessions occurred during project implementation, and the watershed management plans were concluded in December 2014.			
Indicator 2:	**Plenary established.**			
Value (quantitative or qualitative)	N	Y		Y
Date achieved	March 10, 2009	December 31, 2014		December 31, 2014
Comments (incl. % achievement)	Achieved. The two plenary committees were established.			
Indicator 3:	**Definitive directorate elected.**			
Value (quantitative or qualitative)	N	Y		Y
Date achieved	March 10, 2009	December 31, 2014		December 31, 2014
Comments (incl. % achievement)	Achieved. Board members elected for the two plenary committees.			
Indicator 4:	**WSMC ordinary meetings (cumulative).**			
Value (quantitative or qualitative)	0	10		10
Date achieved	March 10, 2009	December 31, 2014		December 31, 2014
Comments (incl. % achievement)	Achieved. Over 10 ordinary sessions occurred during project implementation.			
Indicator 5:	**Establishment of two technical units to support watershed committees.**			
Value (quantitative or qualitative)	N	Y		N
Date achieved	March 10, 2009	December 8, 2011		December 31, 2014
Comments (incl. % achievement)	Not Achieved. The Committees requested and it was agreed that technical studies be carried out in lieu of establishing technical units. A number of technical studies were completed under the preparation of the Watershed Management Plans and the Dynamic Information Framework (Annex 10) that			

	are of direct relevance to the Watershed Management Committees.			
Indicator 6:	**Ecological and Economic Zoning (ZEE) for watersheds formulated.**			
Value (quantitative or qualitative)	N	Y		Y
Date achieved	March 10, 2009	December 8, 2010		December 31, 2014
Comments (incl. % achievement)	Achieved. The ZEE was concluded.			
Indicator 7:	**Critical biodiversity conservation areas and critical water supply areas identified.**			
Value (quantitative or qualitative)	N	Y		Y
Date achieved	March 10, 2009	December 8, 2010		December 31, 2014
Comments (incl. % achievement)	Achieved. Preliminary identification was based on the ZEE studies, such as the indication of the Mangarai River as a critical basin for restoration. The definite identification of critical areas is underway, using the models of the Dynamic Information Framework (Annex 10), concluded in 2014.			
Indicator 8:	**Water resource monitoring system implemented.**			
Value (quantitative or qualitative)	N	Y		Y
Date achieved	March 10, 2009	December 8, 2010		December 31, 2014
Comments (incl. % achievement)	Achieved. The water resource monitoring system has been instrumental in providing data and information for the modeling and input to the state Integrated Geospatial Databases (http://www.geobases.es.gov.br/portal).			
Indicator 9:	**Vegetative cover monitoring system implemented and information available to the general public.**			
Value (quantitative or qualitative)	N	Y		Y
Date achieved	March 10, 2009	December 8, 2010		December 31, 2014
Comments (incl. % achievement)	Achieved. The GOES acquired high-resolution images of the whole state, and IEMA implemented a vegetation monitoring system to support the *Reflorestar* Program, including the two watersheds. The system is operational, and all information is public (http://www.meioambiente.es.gov.br).			
Indicator 10:	**1,000 ha of degraded areas recovered.**			
Value (quantitative or qualitative)	0	1,000		0
Date achieved	March 10, 2009	December 31, 2014		December 31, 2014
Comments (incl. % achievement)	Not Achieved. The target was not achieved at project completion due to delays in PES implementation. Despite delays in PES implementation, the indicator will be achieved in 2016, according to the Reflorestar implementation plan which already has 270 contracts signed and the state has committed to contributing through the *Reflorestar* program with 80,000 has of forest restoration as a contribution to the Bonn 2020 challenge (see Annex 9).			

Indicator 11:	**Management Plan for Pedra Azul State Park under implementation.**			
Value (quantitative or qualitative)	N	Y		Y
Date achieved	March 10, 2009	December 31, 2014		December 31, 2014
Comments (incl. % achievement)	Achieved. Updated management plan under implementation.			
Indicator 12:	**Management Council for Pedra Azul State Park established.**			
Value (quantitative or qualitative)	N	Y		Y
Date achieved	March 10, 2009	May 19, 2010		December 31, 2014
Comments (incl. % achievement)	Achieved. Council members elected in May 2010 and holding quarterly meetings.			
Indicator 13:	**A new Financial instrument for biodiversity conservation identified and implemented.**			
Value (quantitative or qualitative)	N	Y		Y
Date achieved	March 10, 2009	December 31, 2014		December 31, 2014
Comments (incl. % achievement)	Achieved. The GOES created a dedicated sub-account within the State Water Fund FUNDÁGUA to finance biodiversity conservation activities.			
Indicator 14:	**8 Private Natural Heritage Reserves (RPPNs) established**			
Value (quantitative or qualitative)	0	8		12
Date achieved	March 10, 2009.	December 31, 2014.		December 31, 2014
Comments (incl. % achievement)	Achieved. 12 RPPNs were created. 6 are located inside the project area, (critical watersheds), and 6 are located in ecological corridors connecting the watersheds to surrounding preserved hotspots, which are critical for the conservation of the endangered Muriqui monkey.			
Indicator 15:	**300 landholders receiving Technical Assistance on SLM.**			
Value (quantitative or qualitative)	0	300		360
Date achieved	March 10, 2009	December 31, 2014		December 31, 2014
Comments (incl. % achievement)	Achieved. The State Rural Research Agency INCAPER, provided technical assistance on sustainable land use practices to 360 landholders in the period.			
Indicator 16:	**60 trainers (20 extension officials from municipalities and 40 members of technical associations and NGOs) trained on SLM.**			
Value (quantitative or qualitative)	0	60		100

Date achieved	March 10, 2009	December 31, 2014		December 31, 2014
Comments (incl. % achievement)	Achieved. The Project supported the training of 100 extension officials including government, municipal and NGO technical personnel along its implementation period.			
Indicator 17:	**4 experimental stations on SLM implemented.**			
Value (quantitative or qualitative)	0	4		5
Date achieved	March 10, 2009	December 31, 2014		December 31, 2014
Comments (incl. % achievement)	Achieved. The experimental stations are Biomas Station (Sooretama County), Pilot Forest (Jerônimo Monteiro County), ESALQ/Fibria, Vale Natura Forest (Linhares County), and INCAPER Experimental Farm (Viar County).			
Indicator 18:	**Short-term PES plan established for sustainable land use practices.**			
Value (quantitative or qualitative)	N	Y		Y
Date achieved	March 10, 2009	June 2012		December 31, 2014
Comments (incl. % achievement)	Achieved. The PES Law amendment, Law 9864/2012, includes both short-term and long-term PES mechanisms.			
Indicator 19:	**160 landholders receiving short-term PES.**			
Value (quantitative or qualitative)	0	160		31
Date achieved	March 10, 2009	December 31, 2014		December 31, 2014
Comments (incl. % achievement)	Not achieved. Despite delays in PES implementation, the indicator will be achieved in 2016. According to the Reflorestar implementation plan, there were at closing around 270 rural properties ready to sign the contracts for the PES implementation.			
Indicator 20:	**Percent increase in the number of properties certified for organic production or in the process thereof.**			
Value (quantitative or qualitative)	0	100		106
Date achieved	March 10, 2009	December 31, 2014		December 31, 2014
Comments (incl. % achievement)	Achieved. There were 68 properties certified for organic production in 2008. 72 properties received organic certification during the project. Currently, the state has 140 properties with certified organic production.			
Indicator 21 :	**A functioning PES program targeted toward protection of critical areas for water service supplies in the Jucu and Santa Maria da Vitória watersheds.**			
Value (quantitative or qualitative)	N	Y		Y
Date achieved	March 10, 2009	June 2012		December 31, 2014
Comments (incl. % achievement)	Achieved. The Reflorestar PES program instituted by the GOES is functioning state-wide, including priority areas in the Jucu and Santa Maria da Vitoria watersheds.			
Indicator 22:	**Main water users identified and engaged in the program.**			

Value (quantitative or qualitative)	N	Y		Y
Date achieved	March 10, 2009	December 31, 2014		December 31, 2014
Comments (incl. % achievement)	Achieved. SEAMA concluded the two watersheds water users' inventory and cadaster. The main user is the State Owned Sanitation Company CESAN, involved in project implementation.			
Indicator 23:	**160 landholders receiving payments for ecosystem services.**			
Value (quantitative or qualitative)	0	160		9
Date achieved	March 10, 2009	December 31, 2014		December 31, 2014
Comments (incl. % achievement)	Not achieved. The indicator was not achieved due to delays in PES implementation, but will be achieved in 2015, according to the Reflorestar implementation plan which already has 200 farmers under contract.			
Indicator 24:	**A project-level M&E Framework established.**			
Value (quantitative or qualitative)	N	Y		Y
Date achieved	March 10, 2009	December 31, 2014		December 31, 2014
Comments (incl. % achievement)	Achieved. The PIU has detailed M&E procedures for the diverse project activities, including the PES implementation. This provides timely and relevant information to the decision making bodies governing land use of the watersheds (including Watershed Committees, IEMA, INCAPER, CESAN, ANA)			
Indicator 25:	**A regional-level Information System covering the Jucu and Santa Maria da Vitória basins established.**			
Value (quantitative or qualitative)	N	Y		Y
Date achieved	March 10, 2009	December 31, 2014		December 31, 2014
Comments (incl. % achievement)	Achieved. The project funded the development of the "Dynamic Information Framework" (DIF) (Annex 10), as the underlying mechanism for bringing a geospatial portal to the two basins. The University of Washington developed the system. Link: http://pangaea.ocean.washington.edu/			
Indicator 26:	**Project Management Team (MT) set up and working effectively.**			
Value (quantitative or qualitative)	N	Y		Y
Date achieved	March 10, 2009	December 31, 2014		December 31, 2014
Comments (incl. % achievement)	Achieved. In addition to effective project implementation the Project Management team also designed and implemented the follow-on *Reflorestar* Program which is providing long term sustainability to project objectives.			
Indicator 27:	**Best practices and lessons learned disseminated in the municipalities of the State and to other states.**			
Value (quantitative or qualitative)	N	Y		Y

Date achieved	March 10, 2009	December 31, 2014		December 31, 2014
Comments (incl. % achievement)	Achieved. The project was the basis for the creation of the *Reflorestar* Program, which promotes PES in the entire state. Project results were presented at a number of national (Rio de Janeiro, São Paulo, Brasília) and international (China, Panama, Peru, and US) technical events.			

G. Ratings of Project Performance in ISRs

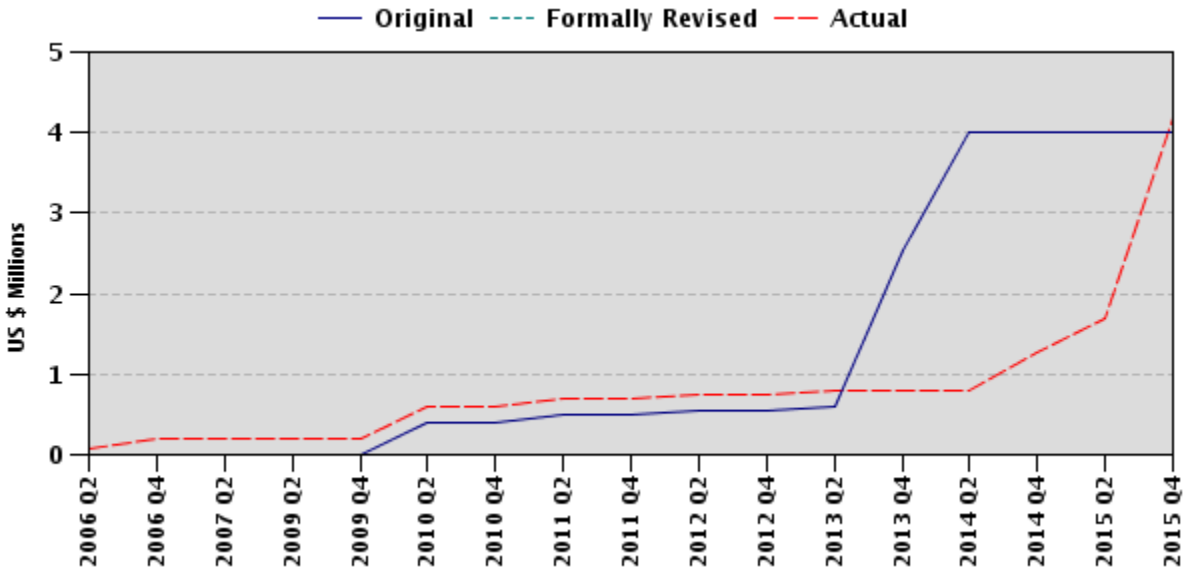
No.	Date ISR Archived	GEO	IP	Actual Disbursements (US$ millions)
1	04/04/2013	Satisfactory	Moderately Satisfactory	0.79
2	07/09/2013	Satisfactory	Moderately Unsatisfactory	0.79
3	03/10/2014	Satisfactory	Moderately Satisfactory	0.95
4	12/18/2014	Satisfactory	Moderately Satisfactory	1.71
5	01/09/2015	Satisfactory	Moderately Satisfactory	1.71

H. Restructuring (if any)

Restructuring Date(s)	Board Approved GEO Change	ISR Ratings at Restructuring		Amount Disbursed at Restructuring in US$ millions	Reason for Restructuring and Key Changes Made
		GEO	IP		
06/29/2012	N	S	MS	547,409 (13.7 %)	The first restructuring aimed to (a) extend by 18 months the closing date, from June 30, 2012, to December 31, 2013; and (b) reallocate funds from components 2, 3, and 4 to component 1, without the need for reallocation of funds among disbursement categories. The extension of the closing date was justified by the need of additional time for the implementation of the Payments for Environmental Services (PES) program under component 3. That is a requisite for achieving the Project Development Objective (PDO) of improving farmer income and improving biodiversity conservation in the watersheds.
12/01/2013	N	S	MU	594,474 (14.86 %)	The second restructuring was also a level two restructuring, extending the Closing Date from December 31, 2013 to December 31, 2014, adding to a total of 30-months' extension. The original extension effectively restored the

Restructuring Date(s)	Board Approved GEO Change	ISR Ratings at Restructuring		Amount Disbursed at Restructuring in US$ millions	Reason for Restructuring and Key Changes Made
		GEO	IP		
					project to a 5-year originally planned implementation period. The second extension looked to grant the state additional time to disburse the funds that were either committed or under contract. At the time of the second restructuring, 50% of the remaining funds had already been committed (under contract). The goal was to transfer the remaining 50% to a special forest and biodiversity subaccount within Fundágua, with the particular objective of PES.
12/30/2014	N	S	MS	1.71 million (40.71 %)	The third restructuring, also a level two, entailed the inclusion of the capitalization of FUNDÁGUA as an activity under Component 3 and as a disbursement category of the withdrawal schedule in the legal documents. This new category allowed the transfer of US$2.262 million to the SEAMA-FpV subaccount of FUNDÁGUA, set up, by law, for PES. The restructuring also reallocated US$100,000 in grant funds under "Categories 1, 2b, and 2c to the new Category 3 (Capitalization of FUNDÁGUA). The restructuring made possible a single disbursement of US$2.262 million to FUNDÁGUA during the grace period.

I. Disbursement Profile



1. Project Context, Global Environmental Objectives, and Design

1.1 Context at Appraisal

1. The Atlantic Forest biome, due to its exceptional level of species diversity and its vulnerability to continuing threats, is one of the five "hottest biodiversity hotspots" among the world's top priority conservation areas. The approximately 508,000 ha of this biome remaining in the Brazilian State of Espírito Santo (11 percent of the state's surface area) are less than 8 percent of its original extent, and are fragmented, inhibiting the movement, dispersion, and genetic flow of species, making their survival difficult.
2. **Target areas.** The project focused on two critical, high-biodiversity watersheds in south-central Espírito Santo: the watersheds of the Jucu and the Santa Maria da Vitória Rivers, comprising 401,000 ha. Of particular interest are the mountainous upper parts of the two watersheds, which were settled more than a century ago by European immigrants and are still primarily held by smallholder agricultural families (Annex 11).
3. These two watersheds are unique in the state, and in the Atlantic Forest biome, because they retain more than 40 percent of their original forest cover. They represent more than a third of the state's remaining rainforests. They also encompass four conservation units (a state park, a biological reserve, and two Areas of Environmental Conservation [APAs]). Despite human pressure, the area still harbors extremely high levels of biodiversity across all categories, and contains priority areas for biodiversity conservation within the Atlantic Forest's Central Ecological Corridor. The two rivers also provide around 95 percent of water supplies for the Greater Vitória Metropolitan Area (GVMA). The GVMA is the 14th largest urban center in Brazil, with a population of about 1.6 million, and produces 62 percent of the state's GDP.
4. **Threats.** Land use patterns have resulted in severe degradation in the two watersheds. Intensive farming [5] is causing a reduction of forest cover, fragmentation, encroachment of steep slopes and protected riparian forest, soil erosion, water pollution, silting of rivers, and pasture degradation (see Annex 8 for aerial photography of project sample farms). Riparian corridors are particularly threatened due to their suitability for irrigation and their accessibility. These trends are threatening biodiversity by reducing and degrading the area of natural habitat, and adversely affecting the quality and timing of water supplies.
5. In Brazil, environmental problems have traditionally been addressed with command and control instruments. As in other states and countries, however, implementation and enforcement of environmental legislation have been deficient. Increasing awareness of the value of environmental services by those benefiting from their effects or suffering from their loss, and of the failure of traditional approaches to conserving them, has led to a search for new approaches, such as the use of Payments for Environmental Services (PES).

[5] Primarily corn, beans, tubers, horticulture, coffee, bananas, fruit trees, planted forest, cattle, and poultry.

6. PES are incentives offered to farmers or landowners in exchange for managing their land (behavior change) to provide some sort of ecological service. PES is a market-based approach to conservation financing based on the twin principles that those who benefit from environmental services (such as users of clean water) should pay for them, and that those who contribute to generating these services (such as upstream land users) should be compensated for providing them. Many different forms of PES arrangements exist worldwide.
7. Setting up these arrangements are not straightforward as they each depend on the idiosyncrasies of the particular location including its legal and institutional arrangements (or the lack thereof). Previous attempts at attaining land use change have failed because they did not consider the need to improve the quality of life of the landholders. Many lessons have been learned over the past two decades of PES implementation and yet one overriding lesson is that each situation is unique making it difficult to apply a generic formula for the establishment of a PES program. The Florestas para Vida project is a case in point as is described below.

Rationale for Bank involvement

8. The main objective of the *Espírito Santo Biodiversity and Watershed Conservation and Restoration Project* (generally known as *Florestas para Vida*, FpV) was to support the Government of Espírito Santo (GOES) in promoting environmentally friendly land use practices in two key Atlantic Forest watersheds, and adopting PES as an instrument for improving biodiversity conservation. Thus, it would directly contribute to the Country Partnership Strategy (CPS) for 2008-11, which addressed Protected Areas (PAs) and implementation of PES mechanisms.
9. Global Environment Facility (GEF) support was warranted due to the project's benefits to globally significant biodiversity conservation, enhancement of the Atlantic Forest Biome protection, and creation of long-term financing instruments for biodiversity conservation that could be replicated in other areas of Brazil and elsewhere.
10. The World Bank has for many years been the International Financial Institution with the single largest biodiversity and conservation portfolio. It has supported over 650 projects in 122 countries during the last 25 years. From fiscal years 2004 to 2013 the Bank was present in 74 countries with 245 biodiversity conservation projects worth US$1.058 billion. It has supported the introduction of terrestrial and marine global initiatives and innovative means of internalizing global environmental externalities at the local level in a participatory manner seeking means in which to support the poorest.

1.2 Original Global Environmental Objectives (GEO) and Key Indicators (*as approved*)

Project Development Objective and key indicators

11. The Project Development Objective is to support the adoption of environmentally friendly land use practices on 3,400 ha in two key Atlantic Forest watersheds in Espírito Santo, thereby contributing to improved biodiversity conservation. Key

indicators include an increase in area (3,400 ha) under sustainable land management (SLM) practices, which will be accomplished in part through the:

- Establishment and implementation of institutional arrangements for payment mechanisms for watershed conservation; and
- Supporting the adoption of SLM practices through the implementation of PES mechanisms and the participation and capacity building of local actors.

Project Global Environmental Objective and key indicators

12. The Global Environmental Objective is to reduce threats to globally important biodiversity in the Recipient's territory from agricultural production systems and increase critical habitat for endemic species in two key rainforest watersheds in the Recipient's territory. Key indicators include area of critical habitat restored[6] and/or protected from encroachment, which will be accomplished in part through:

- Implementation of sustainable market-based mechanisms to finance PA management and conservation of biodiversity in agricultural landscapes.

13. This document assesses the Project's achievement against the GEO, as stated in the Grant Agreement.

1.3 Revised GEO and Key Indicators, and reasons/justification

14. The project GEO was not revised.

1.4 Main Beneficiaries

15. Biodiversity conservation is a public good that offers benefits across a wide range of temporal and spatial scales both locally and globally. The project's primary target group was 160 small farmers in the upper parts of the Jucu and Santa Maria da Vitória (SMV) watersheds.[7] While the gender dimension, aiming toward active gender equality in Project implementation, was not specifically considered in the FpV project it was internalized in the *Reflorestar* Program. In the longer term, the beneficiaries would include the entire population of the GVMA, whose water supplies would be more reliable and of higher quality; the Espírito Santo Sanitation Company (CESAN), which would experience significant reductions in water treatment costs; and other water users.

16. Public beneficiaries included the GOES, as well as public institutions in charge of biodiversity protection, environmental management, sustainable rural development, and water resources management, especially the State Institute of the Environment and Water Resources (IEMA), the State Rural Research Institute (INCAPER), the Water Agency (AGERH), and the University of Espírito Santo (UFES).

17. Communities and community associations and civil society associations benefited mainly from Component 3A, which supported adoption of SLM practices. The Project also aided Watershed Management Committees by funding institutional

[6] Restoration is officially defined by Federal Law 9985 of 18 July 2000 as returning a degraded ecosystem or wildlife population as close as possible to its original condition.

[7] The two watersheds encompass 10 municipalities of varying size, including the GVMA.

strengthening and technical studies (such as Ecological and Economic Zoning, ZEE).

1.5 Original Components (*as approved*)

18. The FpV Project had four components:

19. **Component 1. Strengthening Watershed Management.** The main activities of this component included (a) establishing and strengthening watershed management committees, (b) prioritizing intervention areas, (c) preparing economic-ecological zoning plans for both watersheds, and (d) developing a communication strategy.

20. **Component 2. Targeted Biodiversity Protection and Protected Area (PA) Management.** The main activities in this component included (a) rehabilitating degraded areas; (b) implementing the management plan for Pedra Azul State Park and establishing a PA management committee; (c) developing and implementing new instruments for biodiversity conservation, such as a conservation trust fund[8]; and (d) supporting the implementation of two ecological corridors within the watersheds of the project.

21. **Component 3. Integrating Biodiversity in Production Landscapes.** The main activities in this component included: (a) removing obstacles to adoption of land use practices that would be beneficial to both landholders and the environment, such as lack of knowledge or non-availability of inputs; and (b) measures to stimulate the adoption of practices that generate positive impacts (e.g. conserving biodiversity and protecting water services) but are unattractive to landholders. This subcomponent sought to remove these barriers and address these tradeoffs by fostering a range of markets[9] for biodiversity goods and services, and in particular by developing pilot PES mechanisms in collaboration with water users (such as CESAN and hydroelectric power producers), mechanisms that would also contribute to PA support.

22. **Component 4. Monitoring and Evaluation, and Project Management.** Main activities in M&E included establishment of monitoring and evaluation (M&E) mechanisms at two distinct levels: (a) a project-level M&E framework for the project's activities that tracked progress in implementation, measured intermediate outcomes, and evaluated project impacts; and (b) a regional-level Information System covering the two project watersheds that will allow key variables to be tracked across various institutions. A communication and strategy was also developed and implemented under this component.

1.6 Revised Components

23. The project components were not revised.

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[8] A conservation trust fund is an independent, long-term financial mechanism specialized in providing payments for conservation, leveraging resources from a broad spectrum of donors and institutions.

[9] This range of markets could include water (quality and quantity), biodiversity, scenic beauty, and carbon.

1.7 Other significant changes

24. The Project had three "Level Two" restructurings, resulting in a total extension of 30 months and authorization to reallocate funds among different categories, and to do a single disbursement of US$2.262 million to FUNDÁGUA during the grace period.

25. The first restructuring was approved in June 2012, extending the closing date from June 30, 2012 to December 31, 2013, and reallocating funds from components 2, 3, and 4 to component 1 (but without reallocating funds among disbursement categories). The 18-month extension restored the original 5-year implementation period, which had been reduced to 3.5 years due to an oversight in the Grant Agreement which specified a Closing Date different from that in the PAD and due to a delay in effectiveness. The extension was necessary for implementation of the PES program under Component 3—a requisite for achieving the project's PDO—and to allow ongoing consultancies and watershed management plan studies to be concluded. Further details of the three restructurings are presented in Sections 2.2 (Implementation) and 2.5 (Post-completion Operation).

2. Key Factors Affecting Implementation and Outcomes

2.1 Project Preparation, Design, and Quality at Entry

26. The overall thrust of the project was the linkage between PES, land use and biodiversity conservation and to address threats to water supply and critical habitats in a win-win situation for local farmers and nature (see Annex 8). The project concept design was initiated in 2006, taking advantage of the ongoing operations in the state, mainly the *Water & Coastal Pollution Management* (P087711, commonly known as *Águas Limpas* Project, ALP) and the *Ecological Corridors* Projects. The project proposal was presented in 2006 by the BioAtlântica Institute (IBio), with support from three other nongovernmental organizations (NGOs), Instituto de Pesquisas da Mata Atlântica (IPEMA), Conservation International (CI), and the Promar Foundation. The environmental assessment was concluded in early 2007, and the PIF was submitted to the GEF in December 2007. The appraisal mission occurred in March 2008. The project was approved in October 2008, and became effective in March 2009.

27. The project used the experience of previous projects in Brazil and abroad[10], and incorporated best practice derived from PES experience worldwide [11] and conservation strategies recommended by the IUCN.[12]

[10] Several WB projects were referenced, including the São Paulo Ecosystem Restoration of Riparian Forests (P088009) and the Rio de Janeiro Sustainable Integrated Ecosystem Management in Productive Landscapes of the North-Northwestern Fluminense (P075379) projects. International experiences in PES implementation from WB prpojects, such as the Costa Rica Ecomarkets (P052009) and Mainstreaming Market-Based Instruments in Environmental Management (P093384/P098838), the Mexico Environmental Services (P087038/P089171), and Regional Integrated Silvopastoral Ecosystem Management (P072979) projects were also used.

28. The ALP aimed to secure long-term water supply and water quality in the state's coastal areas, supporting institutional strengthening of the state environmental agency, among other actions. FpV preparation assumed that PES could be based on a comprehensive water users' information system funded by the ALP.

29. The project preparation also benefited from the *Ecological Corridors* Project,[13] which covers the entire state and aims to increase the connectivity among remaining fragments of Atlantic rain forests. FpV was designed to intensify the Corridor activities in the two selected watersheds, prioritizing areas within the corridors to implement its activities, especially rehabilitation of degraded lands.

30. Thus the project was built in coordination with two other World Bank operations, taking advantage of their prior actions, and complementing their efforts to advance on relevant development objectives, such as improving water quality management and implementing ecological corridors. The PES mechanism developed under FpV would also provide a sustainable long-term mechanism through which the state could meet its objective of improving water supplies. FpV used the ALP's implementation arrangements, with a common governance structure and administrative/financial unit. FpV would also develop and test practices and incentives which, upon demonstrated success, could be more widely applied by Ecological Corridors, such as restoring degraded land and, in particular, developing new financial instruments such as PES.

31. Implementation arrangements were simple, sharing the ALP's management structure. The Project Implementation Unit (PIU) was placed within the executing agency, IEMA, with support from INCAPER. The goal was that IEMA staff would carry out most project activities, except for financial management, to be conducted by the ALP PIU. As project preparation concluded, mid-2008, public entities and important private actors[14] were highly committed to its successful implementation. The GOES made forest and watershed conservation and sustainable natural resources use, including biodiversity conservation, one of its central themes, and earmarked part of the oil and gas royalties to finance forest management and conservation, through the FUNDÁGUA trust fund.[15] In addition, project preparation had the effective participation of NGOs with relevant activities in the region.

32. The Project's design and quality at entry met the requirements with sufficient detail to achieve the PDOs and GEOs. The project's clear logical framework (Annex 7) and the fact that the PDO and GEO remain relevant, throughout a 10-year time frame (see below), have led the Project Design and Quality at Entry to be rated as **Satisfactory.**

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[11] Pagiola, S., and G. Platais. 2007. *Payments for Environmental Services: From Theory to Practice*. Washington, DC: World Bank.

[12] Pirot, J.-Y., P. J. Meynell, and D. Elder. 2000. *Ecosystem Management: Lessons from Around the World. A Guide for Development and Conservation Practitioner*s. Gland and Cambridge: IUCN

[13] Part of the Pilot Program to Conserve the Brazilian Rain Forests (PPG7).

[14] The project received support from large corporations, such as the mining company, Vale.

[15] FUNDÁGUA's balance in late 2014 was about US$20 million, with annual income of about US$7 million.

2.2 Implementation (including any project changes/restructuring, midterm review, Project at Risk status, and actions taken, as applicable)

33. Project supervision was conducted jointly with the ALP project through September 2011. Given that the FpV project was blended with ALP, reporting of FpV progress was done under the ALP Implementation Status and Results Report (ISR). Due to system design the ALP ISR did not reflect the full set of indicators of the FpV. Despite this system shortcoming, progress on FpV was detailed in Aide Memoires. The first ISR addressing exclusively the FpV Project was issued in January 2012.

34. Project implementation was slower than expected, mainly due to the executing agency's limited capacity to implement the project, particularly since it was also tasked with simultaneously developing and implementing another PES program, *ProdutorES de Agua* (PdA). In late 2008, the National Water Agency (ANA) launched the PdA program[16] to support the development of local PES mechanisms countrywide. Motivated in part by the discussions of PES during FpV preparation, the GOES was among the first to join the Federal Program. With ANA support, it created a second state PES program, PdA, to be developed simultaneously to the FpV. This occurred after FpV appraisal, but prior to effectiveness. SEAMA and IEMA were responsible for both projects. The burden of developing two PES programs concurrently contributed to delaying the development of the FpV's own PES program for almost three years, since IEMA concentrated its efforts on PdA. Moreover, PdA proved problematic, with complex contractual requirements that taxed IEMA's limited personnel (and exacerbated by government-wide restrictions on hiring additional staff), and constrained by certain aspects of Espírito Santo's PES law (Law 8995).[17] As a result, PdA enrolled only about 3,000 ha in its first three years.[18]

35. Although PdA was initially separate from FpV, the FpV team provided considerable technical assistance to IEMA on diagnosing and addressing its problems, in the expectation that lessons learned would ease implementation of FpV's PES activities. Moreover, in 2011 it was decided to use the implementation arrangements developed for PdA to implement FpV's PES program, rather than developing a separate structure. The FpV team's assistance led to the adoption of a revised PES law in 2012 and to the replacement of PdA by a new PES program, *Reflorestar*, which addressed the problems of the earlier program and incorporated many features that had been planned for FpV, such as complementary short-term and long-term payments to address the different requirements of restoring degraded habitats and conserving intact forests. *Reflorestar* is to be implemented in the field by NGOs contracted for this purpose, thus overcoming IEMA's limited implementation capacity.

[16] See http://produtordeagua.ana.gov.br.

[17] Among other problems, the PES law limited payments to conservation of existing forest and specified payment levels that were too low to induce restoration of degraded areas.

[18] For comparison, Costa Rica (a country of similar size to Espírito Santo) enrolled over 200,000 ha in its PES program in its first three years.

36. Slow procurement also contributed to project implementation delays. For example, the delays in contracting the hydrological modeling resulted in the late identification of priority areas for conservation. The 2012 and 2013 project restructurings aimed to provide additional time for Project development.

37. The project, through GEF and counterpart funding, supported a number of activities that complemented PES or contributed to its implementation. Ecological and Economic Zoning (ZEE) was intended as a planning tool to be used by the state and municipalities to optimize land use decisions. The lack of good-quality mapping information handicapped its use, however. This handicap was corrected by contracting for the development of high-resolution maps of the entire state. The watershed management plans of the Jucu and SMV Rivers are critical tools for the watershed management committees. Increasing the river monitoring stations has been providing much needed detailed information on water flow dynamics. Updating the Pedra Azul Park management plan was instrumental in revitalizing the local support and vision for the park and the surrounding community. Finally, the establishment of a Dynamic Information Framework, while challenging, is starting to pay off, with some well-calibrated models of the state's hydrology, which will provide critical support to decision making in times of crisis (droughts, floods) and for better planning (Annex 10).

38. In view of IEMA's institutional capacity weakness, the first restructuring reduced counterpart funding for Component 1 by 11 percent. This freed resources for field activity implementation (Component 4). The achieved goal was for IEMA to hire an NGO that, together with TNC,[19] would accelerate preparation of PES contracts.

39. The last ISR, issued in December 2014, indicated significant project advances during 2012-14, but also showed that it took two years for IEMA to reinforce the field teams with contracted consultants to expedite the landholders' technical visits and PES contract preparation.

2.3 Monitoring and Evaluation (M&E) Design, Implementation, and Utilization

M&E Design

40. The project has two objectives, a PDO and a GEO, and aggregated make the project ambitious and aspiration with outcomes on adoption of land use practices and habitats for species and impacts related to reduction of threats and biodiversity conservation considering the time frame, scope and funding envelope of the project. None of the PDO indicators specifically deals with these and therefore there is a gap between PDO outcomes and impacts and measurement of progress towards these. The Results Framework includes two PDO indicators, three GEO indicators, and a number of IOIs totaling 24 indicators.

41. The PDO and GEO influence diagram and table, presented in Annex 7, illustrate how the different outcomes contribute to the PDO and GEO. Component 1 and 3B IOIs have a direct influence on the PES mechanism establishment. Component 3A IOIs also add directly to the goal of reaching 3,400 ha under environmentally

[19] IEMA has a Technical Cooperation Agreement with TNC to support project implementation in the field.

friendly land use practices. M&E instruments are a tool for project development, but also improve the effectiveness of the PES contracts. The project outcomes and IOIs are also directly related to the GEOs. Component 1 and 3B indicators refer directly to the implementation of the market-based mechanisms. Component 2 and 3B IOIs add to the goal of habitat restoration. Some indicators are straightforward, such as recovering severely degraded areas; others are more involved, such as the implementation of short-term PES, since it includes, for example, habitat restoration activities. Finally, adoption of SLM practices, Component 3A, impacts in a straight line the goal of conservation of biodiversity in agricultural landscapes. Even though arrangements for results monitoring were described in detail and provided a vehicle for M&E, 24 indicators is considered too many.

M&E Implementation

42. M&E implementation was compromised by the project's joint supervision with the ALP through 2011. The ISRs and aide-memoires issued from 2009 to 2011 focused on the ALP and did not include the FpV IOIs. The joint supervision missions did not detail the problems related to the overall delays in project implementation. This is generally the case with many blended GEF projects.

43. The first independent ISR addressing the project indicators was issued in January 2012, six months before the original closing date. After 2012, the M&E system was applied according to the PAD's guidelines. The team faced problems in obtaining data from other implementing agencies, notably INCAPER and CESAN, and the large number of IOIs made consolidating information and making decisions difficult. Despite that, the Bank's team succeeded in obtaining sufficient evidence of different levels of achievements, and took numerous actions to expedite implementation.

M&E Utilization

44. As mentioned, the data collected was instrumental in diagnosing and addressing the problems of the first PES law and of the PdA program, and contributed to preparation of a revised PES law and the successful launch of the *Reflorestar* Program.

2.4 Safeguard and Fiduciary Compliance

45. ISRs throughout implementation consistently rated safeguard compliance as **Satisfactory**, a rating with which this ICR agrees. The implementation agency is the State Environmental Institute, which is comprised of environmental experts. Moreover, the project interventions aim to restore degraded ecosystems and promote preservation. As originally identified during preparation, people that were affected by the project were impacted in a positive way thereby corroborating that there were no negative impacts on livelihoods through activities supported by the project.

46. Financial management (FM) and procurement were regularly reviewed and audited. Procurement compliance was consistently rated as **Satisfactory** by the ISRs, but FM had a **Moderately Satisfactory** rating since early 2013, due to minor shortcomings in FM. The last FM supervision mission listed a series of FM deficiencies, including inconsistencies in the system used to execute the physical

and financial monitoring and issuing of the Unaudited Interim Financial Reports, lack of routine bank reconciliation, and delay in updating the Operational Manual with the information on the structure of FUNDÁGUA, among other points. Nonetheless, given the project's FM good documentation and recordkeeping, auditors' clean opinion, and the action plan agreed between the Bank and the project team for adopting corrective actions, the final Fiduciary Compliance rating remained **Moderately Satisfactory**.

2.5 Post-completion Operation/Next Phase

47. Total disbursement reached 100 percent, including the fund transfer during the grace period. At closing, disbursement plus commitments was approximately 50 percent. As discussed, this low disbursement ratio was mainly caused by PES implementation delays. By late 2014, however, PES implementation was strongly underway, with implementation of *Reflorestar* and the engagement of contracted consultants to undertake PES implementation in the field. For that reason, the third restructuring authorized the transfer of US$2.262 million of undisbursed funds to the biodiversity subaccount of FUNDÁGUA, to be used in future PES payments.

48. The fund transfer, upon Project closing, called for specific post-completion arrangements regarding FM and results monitoring, and the Team created new provisions to guarantee that the GEF resources transferred to FUNDÁGUA will be properly invested in PES projects, fulfilling the Bank's OP10.20 requirements. The GOES agreed that FUNDÁGUA's Annual Report will have a note that details the use of funds from the biodiversity subaccount (a segregated account was opened at the Bank of Brazil under Nr. 72884-5), and that this note will be audited by SECONT (the GOES's internal audit agency), which will validate the information and issue an opinion on the proper use of funds. SECONT's opinion on the Annual Reports of FUNDÁGUA will be published annually and made available on the SEAMA website.

49. The Team also defined post-completion arrangements regarding the follow-up to the GEO indicators, which may bring important lessons for future projects in Brazil and abroad. The Bank continues to support the GOES and is initiating the *Espírito Santo Integrated Sustainable Water Management Project* (P130682) with the aim of contributing to the GOES's goal of advancing its 2025 Development Plan, which aims to improve the population's wellbeing through environmental preservation and conservation. That project includes a component that will continue supporting the implementation of PES in the SMV and Jucú basins. It is worth noting that unlike FpV (which was financed by a GEF grant), the new project is financed entirely by a loan, demonstrating both the GOES's continued commitment to the FpV's objectives and the FpV's success in inducing the state to continue and scale-up its activities.

50. The *Reflorestar* Program[20] is scaling up the pilot run under the FpV project and is now applying the PES scheme throughout the state in areas identified as priority for conservation and restoration. The identification of these critical areas

[20] http://www.es.gov.br/Noticias/164591/programa-reflorestar-inicia-cadastro-online-nesta-sextafeira-04.htm

is done in part through the project supported Dynamic Information Framework[21] (Annex 10). The state was the first in Brazil to recently join[22] the Bonn 2020 initiative[23] with a commitment of reforesting 80,000 hectares of native forest in the Atlantic Rainforest (the second most endangered biome on the planet) as announced at the 2015 Global Green Growth Forum meeting held in Santiago, Chile (Annex 9). The Bank's and other partner's support and technical assistance empowered the state to do so. Forest restoration of 80,000 hectares is a significant undertaking for a small state but it has launched full heartedly into the effort with a projection of 7,500 has in 2015, 5,000 in 2016 and 7,500 in 2017. Espírito Santo's forest restoration effort gave it a jumpstart as it was hit earlier in the year with a drought which significantly impacted water availability.

3. Assessment of Outcomes

3.1 Relevance of Objectives, Design, and Implementation

3.1.1 Relevance of Objectives

51. Although 10 years passed from the Project's conception to its closing, and taking into consideration three CAS/CPSs, its main objectives have remained relevant throughout the entire period. Preparation began in 2005 and continued until appraisal and approval in 2008. Therefore, all preparation occurred under the umbrella of the CAS 2003-07 and GEF 3 and 4. Project implementation began in 2009 and closed in late 2014, under GEF replenishments 4, 5, and 6, and CAS/CPS 2008-11 and 2012-15.

52. The Project objectives of supporting the adoption of environmentally friendly land use practices, reducing threats to globally important biodiversity from agricultural production systems, and increasing habitats for species continues to be highly relevant The biodiversity conservation and forest restoration activities established in the project were in a sense prescient as they contributed positively to help mitigate the drought the state encountered earlier in 2014. Increasing critical forest cover and protecting riparian zones are known watershed management practices with positive impact on water availability. One of the four strategic objectives of the CPS for 2012-15 is to improve the sustainable management of natural resources, and includes a series of topics consistent with the Project objectives. The Objective therefore remains **Highly relevant**.

Higher-level objectives to which the project contributes

53. The Project was conceived under GEF 3 guidelines, in line with the strategic long-term objectives for biodiversity conservation. The goal was to catalyze the sustainability of PAs by helping to develop new, sustainable financing sources for PAs and for agricultural activities in PA buffer zones and corridors (Strategic Program 1). It also aimed to mainstream biodiversity conservation in production

[21] http://pangaea.ocean.washington.edu/
[22] http://www.es.gov.br/Noticias/175111/es-anuncia-adesao-a-desafio-internacional-em-prol-das-florestas.htm
[23] http://www.wri.org/our-work/project/forest-and-landscape-restoration/bonn-challenge

landscapes by strengthening watershed management (Strategic Program 4), removing obstacles to the adoption of SLM practices,[24] and fostering new market-based instruments to provide incentives for the conservation of biodiversity of goods and services (Strategic Program 5).

54. By the time the project was completed, GEF 6 had already begun. The project's PDO and GEO contributes directly to all four biodiversity goals in the GEF 6 Programming Directions. The objective of adopting environmentally friendly land use practices also contributes to the goal of reversing current global trends in land degradation by promoting good practices conducive to Sustainable Land Management. Considering GEF 6's new program priorities, the GEO remains **Highly relevant**.

55. Regarding national policies, FpV's objectives are closely aligned to the Sectoral Plan for the Mitigation and Adaptation of Climate Change for a Low Carbon Emission Agriculture (ABC Plan). The Plan supports landholders in maintaining forest cover on their farms and restoring degraded areas and adopting more suitable land use technologies. The Project goals are also consistent with the national *Produtor de Agua* Program[25]. Thus, at the country level, the FpV PDO remains **Highly relevant**.

56. In conclusion, the operation remains relevant to achieving country, Bank, and global development objectives. Therefore, the relevance of objectives is rated as **High**.

3.1.2 Relevance of Design

57. Overall, the Project was well researched and prepared, project components were clearly linked in the change theory, and proposed activities covered the range of expected outcomes and outputs. The PDO/GEO were ambitious and aspirational and the project has a logical relationship among supported activities, outputs, and outcomes towards linking PES, watershed management and biodiversity conservation.

58. The project consisted of four components related, at different levels, with the project's broad objectives of supporting SLM practices, reducing threats to biodiversity, and increasing habitats for species. Components 2, 3, and 4 contribute directly to the PDO achievements. Component 1 focused on the implementation of market-based mechanisms for conservation. Although it was targeted at water resources management objectives, it also addressed biodiversity conservation by establishing long-term funding and implementation mechanisms for conservation in an area of globally important biodiversity.

59. This ICR concludes that the inclusion of institutional arrangements in the Project indicators was necessary, and indicates good design. PES implementation was key for achieving Project goals. The Project is based on the assumption that the

[24] Sustainable land use means managing land without damaging ecological processes or reducing biological diversity over the long term.

[25] The *Produtor de Água* Program supports use of PES to encourage adoption of SLM practices and restoration of degraded land.

development of new, sustainable financing sources for the PAs and for agricultural activities in PA buffer zones and corridors are crucial for a long-term conservation strategy.

60. Project resources were minimal when compared to the State Budget.[26] The adoption of results indicators reflecting new policy implementation was a valid strategy for motivating the state to implement the PES mechanism and initiate a statewide reforestation program based on environmental services. The results were mixed. The state issued five legal instruments to implement the PES, which can be considered a major Project contribution. However, other policy goals, such as participating municipalities adopting ZEE and the implementation of new mechanisms to finance PAs, were not achieved.

61. Overall project design was considered Satisfactory with some shortcomings in the quality of the Results Framework which did not reflect the level of ambition and aspiration of the objectives. The Relevance of Design has been rated **Modest**.

3.2 Achievement of Global Environmental Objectives

62. Several significant achievements under the project point to a successful project design and implementation: 1) Increase of forest cover in targeted areas; 2) First state wide implementation of PES and a functioning PES program; 3) Establishment of a dedicated source of funding for PES; 4) Drafting and approval of first state wide PES law - which contributed to triggering the drafting of a national PES law; 5) Improved inter-institutional coordination; 6) Strong up and downstream links with improved water supply to utilities and payment to contracted farmers for change in land-use practices; 7) Implementation of a first of a kind PES portal that has allowed for significant time savings in program management; 8) Increased institutional capacity which has allowed SEAMA-IEMA to establish important partnerships with the private sector and the NGO community thus expanding its capacity to deliver on program implementation and its leadership role in the Pact for the Restoration of the Atlantic Rainforest.

63. The Project had a compound Objective with three outcomes: (a) supporting adoption of environmentally friendly land use practices by local farmers, (b) reducing threats to globally important biodiversity from agriculture, and (c) increasing habitat for endemic species, all in the two key rainforest watersheds. For purposes of this ICR, the three outcomes were reviewed and rated separately. Overall objective achievement was rated by taking into account the ratings and relevance of each of the individual outcomes.

64. PES implementation delays affected all outcomes, since numerous planned activities depended on PES-provided funding. Typically, PES participants would adopt SLM practices (such as silvopastoral practices), conserve additional areas (beyond legal requirements), and undertake restoration activities. However, with PES implementation now underway, it is possible to expect with a reasonable level of confidence that the remaining outcome indicators will be achieved.

[26] The amount is also minor when compared with the State Funds assigned to the *Reflorestar* Project.

65. According to the implementing agency's final evaluation report, a longer time frame is required to assess the Project's conservation and restoration results. At Project closing, 31 properties had already received PES, and another 270 had signed contracts, indicating scalability and achievement of levels of restoration hitherto unseen. At this writing 3166 properties were registered, 200 had received their first payment and 902 properties were under technical preparation for a PES contract. The 1500 property 2015 target is well within reach. The potential for significant long-term outcomes is considerable.

66. The PDO of supporting the adoption of environmentally friendly land use practices by local farmers was achieved. Its first indicator, implementation of a PES program for watershed conservation, was achieved. As a result of the work undertaken under FpV and the GOES' parallel efforts on PdA the statewide *Reflorestar* PES program was launched in 2012 and is now being implemented state-wide, including in the FpV's priority areas, with a target of 7,500 hectares by end of 2015.

67. The target of 3,400 ha under environmentally sustainable land use practices as a result of Project-supported actions, was attained and surpassed, and addresses the threats of severe degradation identified at the outset. Numerous activities contributed to the adoption of SLM practices, such as the 360 landholders receiving TA on SLM, the extension officials trained on SLM, the 75 new rural properties certified for organic production, and the five experimental stations implementing new SLM practices for research and demonstration purposes in the state. As part of the communication strategy adopted by the project the creation of an easily identifiable logo and a series of comic books designed *ad honorum* by a well-known local artist on the various themes of the project was very popular and a great success among the younger school audience (Annex 12). Moreover, the amount of land under SLM will increase significantly in the next few years, as PES implementation proceeds. The achievement of this portion of the Objective has been rated **Substantial**.

68. The goal of increasing habitats for species was not achieved, according to the indicators. Despite the efforts made by client and Bank teams to promote the implementation of this project component, progress was severely limited due to PES implementation delay that jeopardized key targets: A functioning PES program targeted toward protection of critical areas, 160 landholders receiving PES, and 1,000 ha of degraded areas recovered. The establishment of 12 new private nature reserves (*Reservas Particulares do Patrimônio Natural*, RPPNs) covering 247 ha did, however, contribute toward increasing habitats for species and protecting areas from encroachment. Even though small, the area in which these protected areas and corridors were created are considered critical for endemic species such as the endangered Muriqui monkey and, therefore, another important conservation achievement, albeit at a smaller scale than originally planned. There is anecdotal evidence on these first properties adopting conservation measures that there has been a visible increase in wildlife sightings and overall activity. Considering the low level of impact achieved by these activities during the Project's lifetime, the achievement of this part of the PDO has been rated **Modest.**

69. The second global objective, of reducing threats to globally important biodiversity from agriculture, was achieved, considering the outcome indicators. The Project conceived a sustainable market-based mechanism to finance PA management and conservation of biodiversity in agricultural lands. The goal was to develop a pilot PES mechanism, charging water users, in collaboration with major water users.[27] The Project succeeded in reinforcing the watershed management committees' institutional capacity, and engaged main water users in the program. Motivated by the discussions led by the project, the GOES decided to earmark 2.5 percent of oil and gas royalties to finance forest management and conservation, through FUNDÁGUA. This obviated the need for a PES mechanism funded by water fees as originally thought.[28] Other IOIs also contributed to the objective of reducing threats to globally important biodiversity. The conclusion of ZEE for the two watersheds, and the implementation of the new Pedra Azul State Park Management Plan, have direct impacts on local threats to biodiversity. Finally, the recently concluded state of the art vegetative cover monitoring system and the regional information system developed by the Project are being instrumental in increasing habitats not only in the two watersheds but in the state. Based on that, the achievement of this portion of the PDO has been rated **Modest.**

70. Even though the quantitative outcome indicator targets related to the restoration of critical habitats and conservation of biodiversity in agricultural landscapes were not fully achieved during the Project's lifetime they are now on track to being surpassed in the next three years. The *Reflorestar* Program is working towards achieving 20,000 hectares of restored forest cover by 2017. This should be considered as long-term Project outcomes. In addition, the Project had a number of major achievements, including: implementation of PES with earmarked funds; adoption of environmentally friendly land use practices on 879 properties; creation of 12 private PAs; preparation of ZEE and watershed management plans for the two watersheds; support for the Pedra Azul State Park new management plan; and a state-of-the-art Dynamic Information Framework. As a result of all of the above, the Achievement of Global Environmental Objectives is rated **Modest**.

3.3 Efficiency

71. Degradation in the Jucu and SMV watersheds has caused significant increases in turbidity[29] levels, driving up water treatment costs. Without intervention, both turbidity and water treatment costs would continue to increase. *Reflorestar*'s PES program will help halt or reverse these trends by inducing landholders to conserve remaining forest areas, restore critical degraded areas, and replace current agricultural practices with SLM ones. The cost of implementing *Reflorestar* and

[27] Such as CESAN and hydroelectric power producers.

[28] FUNDAGUA has performed well, with a current balance of about US$20 million. However, the GOES is aware that political uncertainty and shifting priorities may reduce FUNDAGUA funding and is actively seeking additional ways to capitalize it, with the objective of eventually being able to operate exclusively off the interest generated.

[29] Turbidity is a measure of water clarity, how much the material suspended in water decreases the passage of light through the water. Suspended materials include soil particles (clay, silt, and sand), algae, plankton, microbes, and other substances.

complementary interventions in critical areas is estimated to be US$9.7-12.8 million (over 30 years, at a 10 percent discount rate). The estimated benefits, in terms of reduced water treatment and port dredging costs, range from US$13-15.5 million, if turbidity is stabilized at current levels, to about US$15.9-18.4 million if turbidity is reduced to the levels of a decade ago. Even at the lower estimate, benefits exceed estimated costs, giving a net present value (NPV) of about US$3.7 million and an internal rate of return (IRR) of 12.7-14.1 percent) if turbidity is stabilized, and an NPV of about US$5.8-6.5 million and an IRR of 15.6-16.8 percent if it is reduced to the levels of a decade ago. The land use changes that reduce turbidity would also provide important biodiversity co-benefits by preserving forest remnants, increasing vegetation cover, and improving connectivity among PAs.

72. The bulk of benefits would be received by landholders participating in PES (US$5.6-7.9 million) in the form of higher income from farming activities and by water company CESAN (US$5.5-$8.4 million) in the form of reduced treatment costs (thus benefiting its customers, which include most of the state's population).

73. Efficiency is being rated **Modest** because although the estimated benefits from land use changes providing biodiversity co-benefits (the bulk of which would be from landholders participating in PES and in the form of higher income from farming activities and through the reduced treatment costs of CESAN), will be significant when the full benefits of the PES are realized, as of right now, they have not been fully realized or are not expected to be fully realized in the next 6 months."

3.4 Justification of Overall Outcome Rating

Rating: Moderately Satisfactory.

74. The Project's overall outcome is rated as **Moderately Unsatisfactory.** This is justified as follows:

- Overall relevance is rated **Substantial**. The Project's objectives were highly relevant to the goals, intentions, and context underlying the initiative and the relevance of design was Modest.
- Efficacy was rated **Modest**. Achievement of one PDO outcome was rated Substantial and of the other two was Modest.
- Efficiency was rated **Modest**.
- Due to the substantial relevance, modest efficacy and modest efficiency, the project's overall outcome merits a **Moderately Unsatisfactory** rating.

75. Despite the MU overall outcome rating, it is noteworthy that the Project succeeded in helping the State establish the first state-wide PES mechanism which will certainly generate long-term benefits.

3.5 Overarching Themes, other Outcomes, and Impacts

(a) Poverty Impacts, Gender Aspects, and Social Development

76. The PAD concluded that the Project "does not present risks of negative socioeconomic impact. In adopting SLM practices, landholders may actually achieve higher levels of income through organic farming or silvopastoral

practices." The ICR preparation mission verified, however, that some organic producers have problems selling their harvests, and may occasionally face financial difficulties. In addition, there is no production chain approach to support organic producers.

77. Information available thus far does not allow a conclusion on whether adoption of SLM practices by landholders are leading to positive social impacts. This is an important point corroborating the need for follow-up monitoring and an in-depth look at farm economies. This will allow identifying Project adjustments necessary to support higher and sustained incomes for landholders.

(b) Institutional Change/Strengthening

78. The Project contributed to strengthening SEAMA's—and particularly IEMA's—institutional capacity. In particular, the preparation of the regional information system using a state-of-the-art Dynamic Information Framework (DIF), as the underlying mechanism for bringing a geospatial portal to Espírito Santo (Annex 10) deserves special attention. The system can support the development and operation of distributed, landscape/hydrological models that are sensitive to climate and land cover and land use changes from field to watershed to water basin scales. It provides a secure repository for the georeferenced data required for model development, and facilitates updating and augmenting of datasets, as appropriate. The new system will be instrumental for the state to advance basin management and provide critical information to manage the ongoing water supply crisis.

(c) Other Unintended Outcomes and Impacts

79. The implementation of PES in the entire state through the *Reflorestar* Program is a major unintended outcome, with local and regional positive impacts. *Reflorestar* will allow restoration and conservation of Atlantic Rainforest hotspots throughout the state, contributing to conserving local biodiversity while benefiting regional ecological corridors and increasing connectivity among remaining Atlantic Rainforest fragments.

80. The need to implement the management and monitoring arrangements agreed with the World Bank led the state to look for new technological management alternatives. This resulted in a new technical and financial management system considered unprecedented in Brazil.

81. A sound forest cover monitoring and inspection system was developed and deployed across the entire Espírito Santo state territory.

82. The state has also generated interest in the implementation of a PES program receiving delegations from other states in Brazil and also from abroad (Ghana and Mozambique).

3.6 Summary of Findings of Beneficiary Survey and/or Stakeholder Workshops

83. Not Applicable.

4. Assessment of Risk to Development Outcome

84. Rating: **Moderate**

85. This Moderate rating is based on a balance among (a) the implementation stage the PES program has reached; (b) the country's macroeconomic conditions; (c) the executing agency's institutional capacity and accumulated knowledge; and, (d) the strong commitment by the government, at the highest level, to achieving restoration of the Atlantic Rainforest at scale.

86. Even though PES implementation is still limited to 301 properties as of this writing, demand has increased significantly, indicating the potential for substantial uptake in the months and years ahead. Given the early stages of implementation, however, the mid- and long-term PES impact on landowner production systems and revenue, and, as a consequence, acceptance of PES, is understandably still uncertain.

87. The GOES continues to demonstrate a high commitment to implementing vegetation restoration and conservation, as initiated by FpV. The GOES recently adhered to the Bonn 2020 challenge with a commitment to restore 80,000 ha of native forest over the next four years (Annex 9). However, PES funding is based on oil and gas royalties, which may be significantly reduced due to the fall in oil prices. In addition, the current country macroeconomic difficulties are affecting all states, including Espírito Santo. It is reasonable to expect a reduction in government revenue, tightening of government spending, and increasing competition for state resources, which could compromise the resources currently dedicated to PES. However, FUNDÁGUA funding and its allocation to PES are set by law, and so legislative changes would be required to reduce it. In addition, PES is currently still using only a fraction of the FUNDÁGUA funding available, and the establishment of a dedicated subaccount using the remaining FpV funds guarantees a minimum level of funding.

88. Although it took some time, the difficulties faced in Project implementation have now been overcome. The technical capacity of the relevant state agencies has been strengthened, and NGOs and other actors have been contracted to undertake activities in the field, complementing the limited personnel in state agencies. It is possible that fresh implementation obstacles may arise, but the new *Integrated Sustainable Water Management Project* will be able to assist in resolving them.

5. Assessment of Bank and Borrower Performance

5.1 Bank

(a) Bank Performance in Ensuring Quality at Entry

89. Rating: **Moderately Satisfactory**

90. The Bank took advantage of ongoing operations in the region and in the state, mobilizing a team aware of the local political and technical conditions, and well versed in the challenges involved in carrying out the project. In addition, preparation involved NGOs with deep knowledge of the area's ecological characteristics, and Bank staff with previous experience in payment for environmental services implementation. The higher relevance of the PDO, and the higher objectives from Project preparation to its closing, is evidence of the quality at entry.

91. The implementation arrangements were as simple as possible, with a small PIU receiving support from another operation's financial management structure. The arrangement performed well, since the problems encountered in procurement and fiduciary compliance were minor.

92. The GOES, with support from the Project team, did a remarkable job in amending the initial PES legislation, establishing criteria suitable for the local conditions.

93. Anticipating what the contingencies might be when implementing something new, such as PES, when there is no past experience on which to draw, is challenging. The Bank team flagged early on that the PIU lacked sufficient personnel to adequately undertake all the activities they were called upon to perform under the FpV project. Once this was internalized by the state, the team assisted GOES in taking steps to address the problem, by unifying FpV's PES efforts with those of the initially separate PdA program, and by contracting NGOs to undertake activities in the field. Considering the above, Bank performance has been rated **Moderately Satisfactory**.

(b) Quality of Supervision (including of fiduciary and safeguards policies)

94. Rating: **Moderately Unsatisfactory**

95. The Bank and client teams successfully resolved numerous implementation issues and succeeded in launching the PES program and eventually fully disbursing project funds. The Bank fulfilled its fiduciary supervisory duties, including regular supervision missions during the implementation stage, technical advice from Bank specialists on highly complex technical issues that required specific expertise, and supervision on financial management and procurement issues.

96. Until 2011, project supervision was conducted jointly with the ALP and reported under the ISR of the parent project. The Bank system did not allow to fully report all findings of the child (blended) project within the structure of the parent ISR. It is also understandable that the small FpV project did not carry as much weight when compared to the substantial infrastructure investments of the parent project. When the parent project closed in 2011, the FpV project was separated with considerable difficulty within the system, which contributed to the delays in issuing an independent ISR. The first independent ISR was issued in early 2012, and duly highlighted the relevant implementation problems.

97. The Bank Team explored many alternatives to advance Project implementation, and succeeded in increasing project disbursements only at the end of the project, when conditions were right for full implementation and launching of the PES scheme. Despite the team being proactive in addressing problems, tight supervision budgets and the need to combine missions with other projects limited their ability to do so.

98. Because of the above and considering there were shortcomings in the proactive identification of opportunities for a timely revision of the Results Framework, the Bank's quality of supervision has been rated **Moderately Unsatisfactory**.

(c) Justification of Rating for Overall Bank Performance

99. Rating: **Moderately Unsatisfactory**

100. Overall, the implementation of the PES scheme took longer than anticipated. The Bank was proactive in following up on Project implementation and bringing specialized expertise when needed. Given local and national level limitations, which were beyond the project's control, the team was not able to obtain a faster implementation of the PES Program in the state. Due to this, the Bank's overall performance has been rated **Moderately Unsatisfactory**.

5.2 Borrower

(a) Government Performance

101. Rating: **Satisfactory**

102. The recipient of the GEF grant was the GOES. The Project was overseen by a Steering Committee[30] composed of the heads of numerous state secretariats and CESAN, which fulfilled its responsibilities throughout the project implementation. Moreover, the GOES demonstrated a strong commitment to Project implementation, passing PES legislation in 2008, allocating state revenues for funding PES, and amending the legislation in 2012. The ISRs consistently rated government performance as **Satisfactory**. The ICR team agrees with that rating, since the project benefited from strong government dedication from its conception to its closing.

(b) Implementing Agency or Agencies Performance

103. Rating: **Moderately Satisfactory**

104. The Project Implementation Unit (PIU) was placed in IEMA, and its technical team was supposed to carry out most project activities, including implementing the M&E system. This arrangement did not take into consideration that IEMA has a small technical team, and that staff assigned to the PIU were also responsible for managing other state projects, such as the PdA program. IEMA's institutional limitations, associated to the long lead time demand for hiring external consultants, affected the implementation of the PES mechanism. The administrative and financial unit of the Water and Coastal Pollution Project conducted the Project financial management and, overall, it performed well, with a **Moderately Satisfactory** rating, due to minor issues. Considering the above-mentioned factors, the implementing agency's performance is rated as **Moderately Satisfactory**.

(c) Justification of Rating for Overall Borrower Performance

105. Rating: **Moderately Satisfactory**

106. The GOES demonstrated a strong commitment to the project objectives from conception to closing. The laws and decrees issued to implement PES in the state, the allocation of part of the oil and gas royalties to fund conservation, and its

[30] This committee is identical to the one that oversees the *Water and Coastal Pollution* Project (P087711).

recent commitment to the 20x20 Bonn Challenge with 80,000 ha of native forest restored in four years (Annex 9) are concrete evidence of GOES' commitment.

107. The PIU's institutional capacity deficiencies contributed to slow progress throughout project implementation. Administrative issues, some of them beyond the PIU's control, prevented the project from fully achieving all its targets in the expected time. The ICR team rated the Project's overall borrower performance as **Moderately Satisfactory**, based on a balance between the positive and negative points already mentioned.

6. Lessons Learned

108. Albeit with considerable delay, by the end of FpV the GOES had in place a well-functioning PES program, *Reflorestar*, which is poised to make a major contribution to environmental management in the state. In the process, many lessons have been learned about implementation of PES in Brazil, for which Espírito Santo has been a pioneer. These include, among others:

- the importance of documenting the expected economic and financial costs of degradation and the corresponding benefits of conservation[31];
- the need for information allowing critical areas to be identified and the effects of degradation to be estimated, both as an input to the economic analysis and as a means of targeting interventions so as to minimize costs and maximize benefits[32];
- the need to avoid placing excessive details about PES arrangements in laws, reserving laws for general principles while addressing the details in implementing regulations;
- the need to avoid excessively complex contractual requirements;
- the need to have specific contract forms, and appropriate payment levels, for restoration and conservation;
- the need for simple and effective implementation arrangements, minimizing transaction costs as much as possible, to economize on scarce budgetary and human resources;
- the potential for synergies between watershed and biodiversity conservation[33];
- the need to design dedicated funding mechanisms for PES carefully so to avoid creating disincentives to participation by individual service users[34].

109. Another important lesson is the need to persevere in the face of the initial stumbles that are inevitable in any pioneering effort. In this respect, FpV benefited from a strong commitment from the highest levels of the GOES, state agencies

[31] The economic analysis prepared during appraisal (and updated in Annex 3) was instrumental in convincing the GOES and CESAN to support FpV, and to continue supporting *Reflorestar* after the end of FpV.

[32] Accordingly, under FpV the state invested in a high resolution mapping exercise that identified past and current land use. It also invested in building a Dynamic Information Framework that will allow critical decisions about land use to be made based on sophisticated hydrodynamic models (Annex 10).

[33] Thus, the online system designed for *Reflorestar* greatly facilitated follow-up with landholders enrolled in the PES program, and consequently facilitated the ability of the executing agency to sign contracts.

[34] The FpV had intended to finance PES with contributions from water users—primarily CESAN. However, the earmarking of considerable resources for PES in FUNDAGUA—while providesa long-term funding stream for PES—reduced the pressure for CESAN and other water users to make direct contributions to PES.

such as IEMA and INCAPER, and stakeholders such as CESAN—a commitment matched with a willingness to learn from initial errors and modify plans accordingly.[35]

110. These and other lessons, aside from being incorporated into the design of *Reflorestar*, are being documented and disseminated so that other interested parties, in Brazil and elsewhere, may learn from them—through publications,[36] presentations in a variety of forums, south-south exchange study tours, and other means. São Paulo is incorporating many of these lessons in its own PES programs. Learning is expected to continue: an impact evaluation of *Reflorestar*'s impact on land use begun under FpV is being continued under the *Integrated Sustainable Water Management Project*.

111. From the Bank's perspective, the lessons include:

- The need to give special attention to the Risk Assessment Frameworks of projects implementing innovative approaches, such as the FpV.[37]
- Joint supervision of GEF projects with other projects, while bringing savings, can result in insufficient attention being paid to many activities.

7. Comments on Issues Raised by Borrower/Implementing Agencies/Partners

(a) Borrower/implementing agencies

112. As the project's coordinating and executing agencies, the State Secretariat for Environment and Water Resources (SEAMA) and the State Institute for Environment and Water Resources (IEMA) are extremely pleased with its successful completion.

113. They assert that the project's benefits went beyond those initially planned. In particular, they highlight the implementation of the State PES Program, which extended beyond the initially targeted watersheds to the entire state.

114. Other examples of results that exceeded expectations are:

- State professionals acquired expertise and management capacity that allowed them to look beyond their original experience and find ways of reaping additional benefits.
- The need to implement the management and monitoring arrangements agreed with the World Bank led the state to look for new technological management alternatives. This resulted in a new technical and financial management system considered unprecedented in Brazil.
- A sound forest cover monitoring and inspection system was developed and deployed across the entire Espírito Santo state territory.

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[35] As demonstrated by the GOES revising the PES law and replacing the initial PES program with a new one.

[36] For example, several chapters on *ProdutorES de Agua* and FpV in the book: *Experiências de Pagamentos por Servicos Ambientais no Brasil* (Pagiola and others, 2013).

[37] In this case, the primary problem the Project faced had been mentioned but perhaps insufficiently emphasized: IEMA's limited implementation capacity. This problem was exacerbated by the GOES's decision—taken after FpV preparation had been completed—to design and implement a second PES program simultaneously with FpV.

- The state joined the 2020 Bonn Challenge with the goal of recovering 80,000 ha of native forest by 2020.
- A specific forestry sub-account was created in the States Water Fund (FUNDÁGUA) to provide sustainable financing for forest cover restoration.
- The state's increased institutional capacity has since enabled important partnerships with the private sector and NGOs, increasing the Project's investment power.

115. As a consequence of these project supported activities, the state of Espírito Santo is becoming a national reference on environmental issues.

116. The state recognizes that the project went through delays, some due to institutional capacity while others were extraneous such as the long and heated national debate over the new Forest Code. Some of the benefits that this debate eventually brought to the state is not captured in the ICR. They also point out that many easily verifiable results and benefits, which were not initially expected, were not set up to be measured or documented through project indicators. As such, the state believes that the ICR does not reflect or capture these benefits even though they are undoubtedly a result from project intervention.

117. The state recognizes that implementing a competing federally funded environmental services program (PdA) did not accelerate the implementation of FpV. However, it laid the groundwork that allowed FpV to flourish once it was launched.

118. The state recognizes that it was ambitious beyond its capacity to execute the many activities planned for the FpV project.

Annex 1. Project Costs and Financing

Project Costs and Financing

(a) Project Cost by Component (in US$ million equivalent)
(Total rows and percentage column will be calculated by the system)

Components	Appraisal Estimate (US$ million)	Actual /Latest Estimate (US$ million)	Percentage of Appraisal
1. Strengthening Watershed Management	**2.5**	**1.4**	**56**
2. Targeted Biodiversity Protection and Protected Area (PA) Management	**4.2**	**2.5**	**60**
3. Integrating Biodiversity in Production Landscapes	**4.3**	**6.2**	**144**
4. Monitoring and Evaluation, and Project Management	**1.0**	**1.9**	**190**
Total Baseline Cost	**12.0**	**12.0**	**100**
Physical Contingencies			
Price Contingencies			
Total Project Costs			
Project Preparation Facility (PPF)	**0.2**	**0.2**	**100**
Project Development Facility (PDF)			
Front-end fee (IBRD only)			
Total Financing Required	**12.2**	**12.2**	**100**

(b) Cofinancing
(The appraisal estimate will be entered from the Financing data in SAP/AUS; Percentage of Appraisal column will be calculated by the system)

Source of Funds	Type of Financing	Appraisal Estimate (US$ million)	Actual/Latest Estimate (US$ million)	Percentage of Appraisal
[Borrower]		8.0	8.0	100
[IBRD/IDA]				
[GEF]		4.2	4.2	100
[Donor A]	[World-Bank-administered TF]			
[Donor B]	[Parallel financing]			

Annex 2. Outputs by Component

Component 1. Strengthening Watershed Management		
	Indicator	**Output**
Component 1. Strengthening Watershed Management	**1.1 -** 2 watershed management committees strengthened.	The two committees were established, with board members elected. The watercourses classification was approved in late 2014. The watersheds management plans were prepared, and the first versions were delivered December 2014. IEMA representatives participate in all regular meetings of both committees.
	1.2 - Establishment of two technical units to support watershed committees.	Not achieved.
	1.3 - Ecological and Economic Zoning (ZEE) for watersheds formulated.	The state ZEE was concluded in 2010. Participating municipalities, however, have not officially adopted the ZEE. The state is reviewing the ZEE, aiming to detail some areas and improve its applicability.
	1.4 - Critical biodiversity conservation areas and critical water supply areas identified.	Preliminary identification of critical biodiversity areas was based on the ZEE study, such as the indication of the Mangarai River as a critical basin for vegetation restoration. The definite identification of critical areas is underway, using the Dynamic Information Framework model (Annex 10), which was concluded in 2014. In addition, IEMA is using aerial photos (2008 and 2014) to assess land use changes and identify conservation priority areas.
	1.5 - Water resource monitoring system implemented.	The water resources monitoring system is being implemented by IEMA and INCAPER. The state is implementing weather monitoring radar in partnership with Vale. The water resource monitoring data have been instrumental in providing inputs to the modeling effort and the state Integrated Geospatial Databases. This in turn will provide decision makers with resource- (water, land use) and sector- (water, forestry, agriculture) specific information.
	1.6 - Vegetative cover monitoring system implemented and information available to the	The GOES acquired high-resolution images and photos (2008 and 2014) of the whole state, and IEMA implemented a vegetation monitoring system to support the *Reflorestar* Program, including the two watersheds.

	general public.	The system is operational, and all system information is public. The image data bank can be accessed through http://189.84.218.229/aplicmap/geral.htm?71acf474feee4b58ff80c8a165307849. The vegetative cover monitoring system was used as an input for the preparation of the Dynamic Information Framework.
Component 2. Targeted Biodiversity Protection and Protected Area Management		
	Indicator	**Output**
Component 2. Targeted Biodiversity Protection and Protected Area Management	**2.1 -** 1,000 ha of degraded areas recovered.	Not achieved.
	2.2 - Management Plan for Pedra Azul State Park under implementation.	Updated management plan under implementation.
	2.3 - Management Council for Pedra Azul State Park established.	Council members elected in May 2010.
	2.4 – A new Financial instrument for biodiversity conservation identified and implemented.	The GOES created a dedicated fund (FUNDÁGUA) to finance biodiversity conservation activities. So far, the main fund source is state oil and gas royalties, but the GOES is looking for additional funding sources, such as water user fees. The state is still studying how to charge water users, aiming to compensate for environmental services. The GOES also prepared a technical and economic feasibility study to implement visits at the Pedra Azul State Park (PEPAZ), aiming at PA economic sustainability.
	2.5 - 8 Private Natural Heritage Reserves (RPPNs) established.	12 RPPNs were created. 6 are located inside the project area, (critical watersheds), and 6 are located in ecological corridors connecting the watersheds to surrounding preserved spots. The RPPNs located inside the basins are: • Rancho Chapadão - 28.6 ha – 2010 - Santa Leopoldina • RPPN Pau-a-Pique - 30.5 ha – 2011 - Santa Leopoldina • RPPN Macaco Barbado - 2.93 ha – 2011 - Santa Maria de Jetibá • RPPN Rancho Chapadão II - 21.53 ha – 2011 - Santa Leopoldina • RPPN Rio Fundo - 15.92 ha – 2012 - Marechal Floriano • RPPN Palmares – 17 ha – 2013 - Santa Maria de Jetibá.

		6 RPPNs were created in the Santa Teresa County, neighboring Santa Maria de Jetibá and Santa Leopoldina counties. The area is strategic for biodiversity conservation and protection of the Muriqui monkey (Brachyteles hypoxanthus). The RPPNs located in the area are: • RPPN Linda Laís - 3.48 ha – 2009 • RPPN Vale do Sol - 67.52 ha – 2010 • RPPN Olho D'Água - 19.09 ha – 2010 • RPPN Bei Cantoni - 4.1 ha – 2011 • RPPN Meu Cantinho - 2.72 ha – 2013 • RPPN Beija-Flor -33.34 ha – 2013. The total area of the 12 RPPNs is 260.20 ha.
Component 3. Mainstreaming Biodiversity in Production Landscapes		
	Indicator	**Output**
Component 3A. Inducing Adoption of Sustainable Land Use Practices	**3.1 -** 300 landholders receiving Technical Assistance on SLM.	The State Rural Research Agency (INCAPER) Report informed that the Agency had provided technical assistance on sustainable land management to over 800 landholders during 2010 to April 2014.
	3.2 - 60 trainers (20 extension officials from municipalities and 40 members of technical associations and NGOs) trained on SLM.	The Incaper 2012 Report informed that 32 extension officials received training on sustainable soil management practices. The Project supported the training of 100 extension officials along its implementation period. Including a silvopastoral practices event, and a property assessment methodology training, by Lerf-Piracicaba.
	3.3 - 4 experimental stations on SLM implemented.	The experimental stations are: • Biome Station (Sooretama County) • Pilot Forest (Jerônimo Monteiro County) • ESALQ/Fibria • Vale Natura Forest (Linhares County) • INCAPER Experimental Farm (Viar County).
	3.4 - Short-term PES plan established for sustainable land use practices.	State Law 8995, issued September 8, 2008, created the payment for environmental services. The GOES revised the PES legislation, issuing, in June 2012, Law 9864, with new criteria for implementing the PES, including short-term mechanisms.
	3.5 - 160 landholders receiving	Not achieved. Due to the PES implementation delay, by December 2014, only 9

	short-term PES.	landowners had signed the PES contracts and were receiving PES payments.
	3.6 - Percent increase in the number of properties certified for organic production or in the process thereof.	The baseline was 68 properties certified for organic production in 2008. During project implementation, another 72 properties received organic production certification. Currently, the state has 140 properties with certified organic production, for a total of 2,600 ha.
Component 3B. Establishing Payments for Environmental Services	**3.7 -** A functioning PES program targeted toward protection of critical areas for water service supplies in the Jucu and Santa Maria da Vitória watersheds.	The GOES revised the PES legislation, issuing, in June 2012, Law 9864, with new criteria for implementing the PES. At the same time, the GOES reviewed the FUNDÁGUA, Law 9866, setting aside 2.5% of the state oil and gas royalties to fund conservation and biodiversity protection activities. The Mangarai watershed was selected as a critical area for vegetation restoration. Additional areas will be selected with the use of the Dynamic Information Framework, finalized December 2014.
	3.8 - Main water users identified and engaged in the program.	SEAMA and IEMA concluded the Jucú and Santa Maria da Vitoria watersheds water user inventory and cadaster in 2008. The activity was funded by the *Águas Limpas* Project. The main user is the state-owned sanitation company, CESAN (Espírito Santo Water Utility, *Companhia Espírito Santense de Saneamento*), besides numerous small irrigation projects. CESAN has supported water-monitoring activities, mainly in the Mangaraí creek.
	3.9 - 160 landholders receiving payments for ecosystem services.	Not achieved. Due to the PES implementation delay, by December 2014, only 31 landowners had signed the PES contracts and were receiving PES payments. However, the *Reflorestar* implementation plan indicates that this goal will be achieved in 2015.
Component 4. Monitoring and Evaluation and Project Management		
	Indicator	**Output**
Component 4. Monitoring and Evaluation and Project Management	**4.1 -** A project-level M&E Framework established.	The PIU has M&E procedures for the diverse project activities, including the PES implementation. Its technical and economic component can be accessed at http://reflorestar.cargeo.com.br. In addition, the consulting company, Accenture, (contracted by Vale as a counterpart activity), developed numerous management tools, including an investment simulator for the short-term PES implementation.
	4.2 - A regional-level Information System covering the Jucu and	The project funded the development of the Dynamic Information Framework (DIF), as the underlying mechanism for bringing a geospatial portal (PCGAP) to

	Santa Maria da Vitória basins established.	the two basins (Annex 10). The University of Washington developed the system; see http://pangaea.ocean.washington.edu/. The DIF encompasses the landscape/hydrological models that are sensitive to climate and land cover and land use changes from field to watershed to water basin scales. It provides a secure repository for the georeferenced data for Espírito Santos, required for the model development, and to facilitate updating and augmenting of the datasets, as appropriate. With this framework in place, the GOES agencies address a set of management issues, progressing from how weather affects the land surface, to how changes in land use might alter water flow, and then to how changes in water and land use might impact the mobilization of sediments.
	4.3 - Project Management Team (MT) set up and working effectively.	The team in charge of FpV was also responsible for implementation of the state *Reflorestar* Program. IEMA staff did not succeed in implementing the project without additional support, and hired independent consultants in 2014 to do property assessments and prepare PES contracts, among other activities.
	4.4 - Best practices and lessons learned disseminated in the municipalities of the state and in other states.	The project was the basis for the creation of the *Reflorestar* Program, which promotes PES in the entire State of Espírito Santo. IEMA received visitors from other states and countries looking for information on PES implementation. The project results were presented at different technical events.

Annex 3. Economic and Financial Analysis

1. The ecosystem conservation and restoration activities in the *Florestas para Vida* (FpV) Project were expected to bring significant watershed benefits and important biodiversity conservation benefits. An economic and financial analysis focusing on the FpV Project's watershed protection activities was conducted in the PAD.[38]

Economic and financial analysis in the PAD

2. The economic analysis conducted in the FpV PAD considered:

   (a) **Farm-level costs and benefits.** The farm-level analysis took into consideration the costs of switching from current to sustainable land uses, and the opportunity costs of the foregone benefits from land uses replaced by project-supported activities[39] (in some cases, these opportunity costs were negative, since some sustainable land uses are profitable to farmers once established).

   (b) **Other costs.** The economic analysis also took into consideration the costs of providing Technical Assistance and other support to participating farmers, and the overhead costs borne by the project.

   (c) **Benefits.** The downstream benefits of improved watershed management could be estimated only for CESAN, the water utility.[40] CESAN's water treatment costs have increased substantially due to increased water turbidity resulting from upstream erosion. Cruder estimates were also made for savings in hydroelectric power reservoir maintenance and port operations.

3. **Net returns.** The economic analysis used a break-even calculation, since there were no data on the extent to which land use changes would affect water services. It was estimated that even slowing the continued increase in turbidity levels would result in substantial benefits, primarily in the form of cost savings to CESAN. The PAD estimated that the project would break even if sedimentation could be reduced by at least 0.5 percent (relative to the no-project baseline). It arrived at a rough estimate of the NPV of benefits resulting from a 1 percent reduction in sedimentation of about US$20 million.

4. **Financial analysis.** The analysis showed important benefits to all major water users, including CESAN, with a net profit of US$1 million; the Port Authority, with savings close to US$0.9 million; the hydroelectric plants operators; and CESAN customers, with savings of US$0.13 million derived from reductions in electricity and

[38] As a GEF project, the FpV was not required to conduct an economic analysis. Since the water utility, CESAN, and others water users were expected to provide substantial financing for conservation through the PES program, an economic analysis was undertaken to demonstrate the magnitude of the benefits these users would receive.

[39] The analysis was based on data obtained from the background study undertaken during project preparation, expertise from IEMA and INCAPER, technical coefficients, and production costs from the Agribusiness Development Center (*Centro de Desenvolvimento do Agronegocio*, CEDAGRO).

[40] The analysis was based on data supplied by CESAN on turbidity and input costs from 2003 to 2007.

water rationing. The Government, however, would have a negative result given that net payment of taxes will be reduced due to a decrease in operating costs. Participating landholders were also expected to receive net benefits, either by adopting new land uses that would be profitable to them once established (for which they would receive short-term support), or by receiving long-term compensation exceeding the opportunity cost of the foregone land uses when they adopted conservation land uses. These land use changes would be induced through complementary programs of Payments for Environmental Services (PES), which would offer short-term support for the adoption of sustainable production practices and long-term support for the adoption of pure conservation practices.

Updated economic analysis

5. Because of the various delays noted in this ICR, implementation of the short-term and long-term PES programs called for under FpV's Component 3 only began in the latter part of the project. The GOES planned to continue implementing these programs past the end of the FpV project, with support of the new *Espírito Santo Integrated Sustainable Water Management Project* (P130682), which was approved in 2014 and which became effective in 2015.[41]

6. During implementation of the FpV project, the Mangaraí sub-watershed was identified as one of the primary sources of sediment affecting CESAN's water intake in the Santa Maria River, which provides 32 percent of the water used in the Vitória metropolitan region. It was thus decided to focus the watershed conservation efforts in this sub-watershed. These efforts will be implemented in the field through the state's *Reflorestar* program.[42] *Reflorestar*'s activities will eventually be extended to other parts of the Santa Maria watershed, and to other watersheds. Like the FpV, *Reflorestar* offers short-term support for the adoption of sustainable production practices and long-term support for the adoption of pure conservation practices.[43] The economic analysis here focuses solely on the activities in the Mangaraí sub-watershed.

7. Sediment loads in the Santa Maria River have increased over the years, causing significant problems to the water sector. CESAN draws water from an intake at Santa Maria to supply the Carapina and Santa Maria treatment plants, which together produce almost 40 percent of Vitória's water and serve over 35 percent of its population. The PAD had relied on data up to 2007; the analysis here uses more recent data, through 2013.[44] Figure A3.1 shows how average and maximum turbidity have increased in the last decade. Average turbidity was about 28 Nephelometric Turbidity Units (NTU) in

[41] In a sense, FpV support to PES continues even though the project is now closed, since the remaining funds have been placed in the FUNDÁGUA trust fund, which will use them to finance PES.

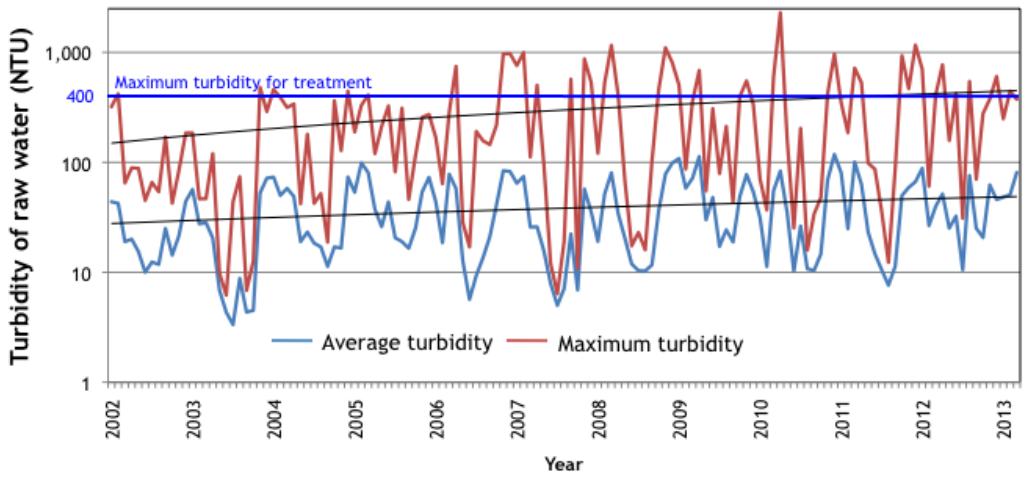
[42] FpV had originally intended to establish its own implementation arrangements for PES in the Jucu and Santa Maria watersheds. Since the SES had also, in parallel, developed its *ProdutorES de Água* PES program, it was more efficient to rely on that program for field arrangements. *Reflorestar* replaced *ProdutorES de Água* in 2012. Both *ProdutorES de Água* and *Reflorestar* benefited from technical assistance from the FpV project.

[43] In this, it differs from *ProdutorES de Água*, which offered payments only for conservation. This is an example of the lessons of FpV being incorporated into the wider state PES program.

[44] Turbidity varies substantially from year to year, so these new estimates are more reliable than the estimates in the PAD, which were based on only four years of data.

2002–03, but almost 50 NTU in 2012–13. Sediment loads also affect two hydroelectric plants (Rio Bonito and Suíça) along the river, and the Port of Vitória, where the river ends its journey.

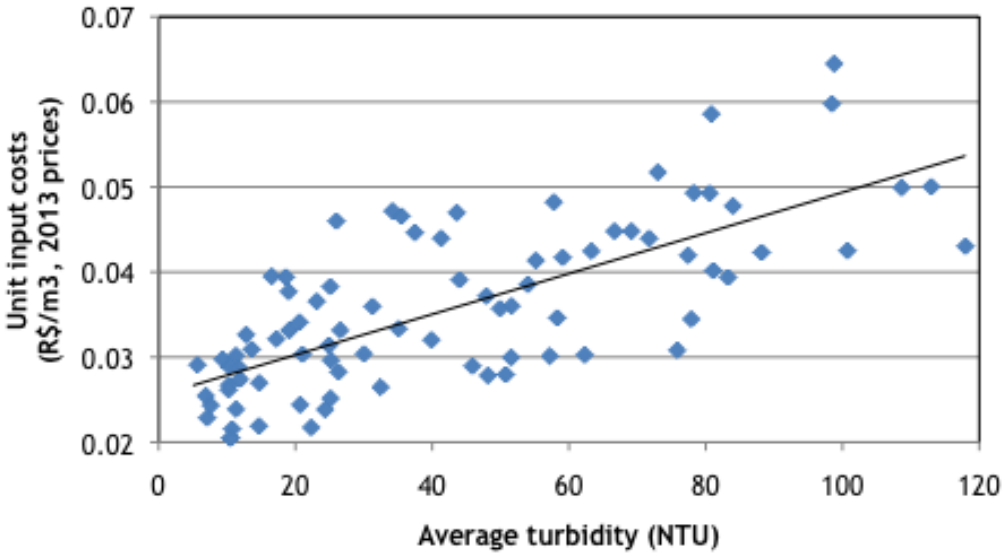
Figure A3.1 Turbidity of water delivered to the Carapina Treatment Plant



8. *Without project.* The turbidity of the water used in the Santa Maria water system has increased substantially over the years (figure A3.1). Average turbidity levels doubled from 2002–03 to 2011–12, increasing water treatment costs. CESAN invested R$2.8 million in 2005 to install dissolved air flotation units at the Carapina Treatment Plant to reduce input costs, but as shown in Figure A3.2, input costs are still strongly affected by average turbidity levels.[45] Filters must also be cleaned much more frequently at times of higher turbidity, further increasing costs. Furthermore, treatment must be interrupted when turbidity exceeds about 400 NTU, potentially resulting in service interruptions.[46] As can be seen in figure A3.1, turbidity peaks have become both higher and more frequent, resulting in much more frequent interruptions of treatment. Treatments were interrupted four times due to excessive turbidity in 2012.

[45] The data in figure A3.2 are for 2006–13, and thus incorporate the effect of the air flotation units.
[46] The Santa Maria treatment plant, which also draws its water from the same intake, is less vulnerable to interruptions because its newer design allows treatment at turbidity levels up to 1,000 NTU. Moreover, Santa Maria is much smaller, with less than 10 percent of Carapina's capacity.

Figure A3.2 Impact of turbidity on water treatment costs at Carapina



Source: World Bank calculations based on data from CESAN.
Note: Data from 2006–13, following installation of air flotation units at Carapina

9. Without improved management in the Santa Maria da Vitória watershed, it is likely that these costs would continue to increase, since they have throughout the last decade. As figure A3.1 shows, average turbidity had doubled to just under 50 NTU in the last decade. As figure A3.2 shows, this has resulted in average treatment costs increasing by about R$0.01/$m^3$, even after a R$3 million investment in air flotation units designed to reduce treatment costs (about R$4 million in 2013 prices). At current production levels of about 60 million m^3, this increase in turbidity has thus increased treatment costs by about R$0.6 million a year.

10. Without intervention, it is assumed that average turbidity would continue to increase according to the trend observed in the last decade, reaching about 80 NTU in a decade and causing average input costs for water treatment to increase by an additional R$0.01/$m^3$. At current average annual production levels of about 60 million m^3, this would increase annual input costs for water treatment by about R$0.6 million at Carapina within a decade, and about R$1 million by 2030.[47] Beginning in 2018, CESAN is planning to ramp up annual production at Carapina from 60 million m^3 to 115 million m^3 by 2030. Taking this increased production into account, the additional costs will reach almost R$2 million a year in 2030. Further investments in filtration measures are likely to be required to keep pace with rising average turbidity levels, probably at about 10-year intervals. Assuming such investments are similar in magnitude to those in air flotation

[47] At the time the FpV PAD was being prepared, data were only available for 2002–07. This resulted in higher estimates of the cost of degradation because (a) part of the data available were from the period prior to the installation of the air flotation filters, when the unit input costs resulting from a given level of turbidity were higher; and (b) the analysis projected an increase in turbidity based on that observed during 2002–07, which was distorted by normal variations in turbidity levels. By using only data from the period following the installation of air flotation filters and using a longer period of observation to project turbidity trends (smoothing out the impact of natural variations), this analysis reduces the impact of these problems.

units, the additional cost would come to about R$2.4 million in present value terms. The higher peaks of maximum turbidity, and their increased frequency, impose additional costs.

11. The Port of Vitória is also likely to suffer from the need for more frequent dredging to maintain the water depth necessary for the safe passage of ships. Current annual dredging costs average about R$1.5 million (US$2.6 million), but are expected to increase to about R$2.5 million once the ongoing program to deepen and widen the shipping channel is completed.

12. *With project costs*. (1) *Reflorestar* supports a mix of productive practices (agroforestry, silvopastoral practices) and pure conservation practices (reforestation of riparian corridors) that would reduce erosion compared to current practices. Landholders are offered payments ranging from R$2,300/ha (about US$1,150) for natural regeneration to R$7,200/ha (about US$3,600) for adoption of agroforestry, over three years, with pure conservation uses also receiving longer-term payments of US$90/ha/year to US$110/ha/year to maintain forest cover. We use as an illustrative example a farm adopting agroforestry on 1 ha, silvopastoral practices on 2 ha, and regenerating forest on 1 ha, and which also has 1 ha of standing forest eligible for a conservation payment. This farm would receive total payments of about R$16,400 (about US$8,200), and conservation payments of R$295/year (US$145/year). About 15 to 20 percent (about 2,600 ha to 3,500 ha) of the Mangaraí sub-watershed would need to be conserved or converted to less erosive uses to achieve substantial reductions in erosion, assuming the most erodible areas are targeted.[48] The total cost of payments would thus be about US$5.6 million to US$7.9 million in present value terms over 30 years. The transaction cost of implementing the program would increase total costs to about US$7.5 million to US$10.6 million.[49]

13. (2) In addition, a range of other investments (such as restoration of rural roads and community water and sewage treatment) would be undertaken in the Mangaraí watershed with the aim of reducing erosion and improving water quality downstream, at a total expected cost of about US$4.1 million.[50] Adding the cost of these measures would further increase the total cost in Mangaraí by about R$4.11 million, or US$2.2 million. The total cost of activities in Mangaraí would thus be about US$9.7 million to US$12.8 million.

14. *With project benefits*. The planned interventions would generate three main benefits:

(a) CESAN would benefit from reduced water treatment costs. There is considerable evidence, from Espírito Santo itself, other sites in Brazil, and

[48] The area that would need to be conserved or converted to improved land uses to have a meaningful impact on sediment loads is not yet known; the hydrological model being developed with FpV support will allow this area to be estimated, but these estimates were not yet ready at time of writing. Here we use the upper end of the likely range so as to have more conservative estimates of expected project benefits.

[49] Based on current *Reflorestar* transaction costs of about R$1,000/ha. It may be possible that average costs would be lower in Mangaraí because of a greater concentration of contracts in a small area.

[50] No such activities were contemplated in the FpV. However, experience has shown the importance of including a range of erosion-reduction activities in addition to land use changes, so the corresponding costs are included in the present analysis.

elsewhere in the world, that turbidity levels are closely related to erosion in the watershed.[51] It is difficult to predict how much turbidity might fall with improved watershed management. If the interventions succeed in stabilizing turbidity at current levels (that is, avoid any further increase in turbidity), they would result in savings in average input costs at Carapina alone of R$8.2 million (US$4.3 million) over 30 years.[52] Stabilizing turbidity at current levels would avoid the need for further investments in new filtering equipment, resulting in additional estimated savings of RS$2.4 million (US$1.2 million) in present value terms. Further savings would come from reductions in the number of interruptions in treatment, in avoiding the higher costs for washing filters, and in reduced need for additional investments in storage capacity. In the absence of strong data on the magnitude of these costs and how they would have increased, we round up total benefits to US$6 million. If the measures being undertaken succeed in actually reducing turbidity from current levels, the benefits would be higher. Returning average turbidity levels to those observed at the beginning of the century would reduce the cost of inputs for water treatment by R$5.5 million (US$2.9 million) over 30 years, bringing total benefits to almost US$9 million.

(b) The Port of Vitória would also benefit from reductions in sediment delivery, by avoiding the need for more frequent dredging. There are no data on which to base predictions of possible sedimentation impact due to watershed degradation in the new, deeper channel. If dredging costs would have risen by 20 percent over the next 30 years in the absence of watershed conservation, maintaining sediment loads at current levels would avoid about R$3.6 million (US$1.9 million) in additional dredging costs.[53]

(c) Participating landholders would benefit from increased income, partly from the payments they receive to maintain protective land uses such as forests, but mostly from the higher profitability of land under agroforestry or silvopastoral practices.[54] IEMA estimates that annual income (including payments) on a typical 15-ha farm would increase from about R$10,000 to about R$12,000 within 3 years and to about R$22,000 in 10 years.

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[51] Teixeira and Senhorelo (2000) find that turbidity is closely correlated to sediment transport in the Jucu watershed. Similar results were obtained in watersheds in Rio Grande do Sul by Chaves (2010) and Carvalho and others (2004). The proportion of sediment eroded that finds its way to river outlets tends to be higher in smaller watersheds such as that of Mangaraí (Walling 1999).

[52] The benefits of reduced turbidity would have been higher had conservation measures been undertaken prior to the 2005 investments in additional filtration units, since unit water treatment costs were higher then; moreover, the capital cost of the additional filtration units would also have been saved.

[53] The two hydroelectric power plants in the Santa Maria da Vitória watershed are also affected by sedimentation. However, they are both located higher in the watershed, and so would not benefit from conservation in the Mangaraí micro-watershed. They might benefit if the program were later expanded to other parts of the watershed.

[54] Although these practices are profitable, they are not adopted because of the high initial investments required; the payments offered by *Reflorestar* would help overcome this constraint.

Assuming, conservatively, that net income increases by only 10 percent of these amounts, income would increase by about R$2,900/ha (US$1,500/ha) in present value terms, over 30 years, or a total of about US$6.8 million over the area covered by the project in Mangaraí.

15. Total benefits for PES activities in the Mangaraí sub-watershed are thus estimated to be about US$13 million to US$15.5 million, assuming that turbidity is stabilized at current levels, or about US$15.9 million to US$18.4 million if turbidity is reduced to the levels observed a decade ago.[55] Even at the lower estimate, these benefits exceed the estimated US$9.7 million to US$12.8 million costs for this component's activities in the sub-watershed, giving an NPV of about US$2.9 million to US$3.7 million (with an IRR of 12.7 to 14.1 percent) if turbidity is stabilized at current levels and of about US$5.8 million to US$6.5 million (and IRR of 15.6 to 16.8 percent) if it is reduced to the levels of a decade ago.[56]

16. The bulk of benefits would be received by CESAN (US$5.5 million to US$8.4 million) in the form of reduced treatment costs and avoided investments, and by participating landholders (US$5.6 million to US$7.9 million) in the form of higher income from farming activities. The bulk of costs would be borne by the GOES (via FUNDÁGUA), through its support to the *Reflorestar* program and other investments.[57] The financial burden of long-term conservation payments would fall on FUNDÁGUA, but would be relatively low (less than US$200,000/year) and easily borne, given FUNDÁGUA's budget of about US$2.5 million a year.

17. *Sensitivity.* These results are robust to significant changes in assumptions. In part, this is due to the costs and benefits of land use changes being tied together: if adoption of sustainable land use practices is lower than forecast, the benefits would decline (since the impact on erosion and the increase in landholder benefits would be lower), but so would the costs (since both payments and transaction costs would decline). The component would still be economically beneficial even if both the estimated benefits to CESAN or the benefits of the new practices to landholders were reduced by about a quarter, if turbidity were stabilized to as much as half, and if turbidity were reduced (at the lower end of the range of estimated benefits).

[55] Although the Mangaraí sub-watershed is only part of the Santa Maria watershed, it has been identified as a principal source of the sediment affecting water turbidity at the Santa Maria intake. Many of the proposed land use changes would reduce erosion in Mangaraí, thus offsetting possible increases in erosion elsewhere in the watershed.

[56] These estimated net benefits are lower than those estimated in the PAD because of (a) improved estimates of the relationship between turbidity and water treatment costs, (b) omission of some benefits included in the PAD analysis (primarily benefits to hydroelectric power plants) because of the location of the target sub-watershed (downstream of the hydroelectric power plants), and (c) inclusion of costs not considered in the PAD analysis (interventions such a restoration of rural roads, that complement land use changes).

[57] As noted, FpV will continue to contribute to these costs through its contribution to FUNDÁGUA.

Annex 4. Bank Lending and Implementation Support/Supervision Processes

(a) Task Team Members
Lending

Name	Title	Unit
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André Guimarães	Project Preparation Coordinator	IBio
Carlos Velez	Lead Economist	LCSUW
Chris Diewald	Consultant	
Daniela Arruda	Team Assistant	LCSEN
Dinesh Aryal	Operations Officer	LCSEN
Erick C.M. Fernandes	Adviser	ARD
Gunars Platais	Sr. Environmental Economist, TTL	LCSEN
Isabella Micali Drossos	Legal Counsel	LEGLA
Luciano Wuerzius	Procurement Analyst	LCSPT
Luis Alberto Andres	Infrastructure Economist	LCSSD
Nelvia Hayme Diaz	Language Program Assistant	LCSEN
Patricia de la Fuente Hoyes	Sr. Finance Officer	LOAFC
Ricardo Tarifa	Sr. Environmental Specialist, (former TTL)	LCSEN
Stefano P. Pagiola	Sr. Environmental Economist	ENV
Susana Amaral	Financial Mgmt Analyst	LCSFM
Teresa M. Roncal	Sr. Operations Analyst	LCSAR

Task Team Members
Supervision/ICR

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Patricia Miranda	Legal Counsel	LEGOP
Stefano P. Pagiola	Sr. Environmental Economist	ENV

(b) Staff Time and Cost

Stage of Project Cycle	Staff Time and Cost (GEF)*	
	No. of staff weeks**	US$ Thousands (including travel and consultant costs)
Lending		
FY06	2.38	4.26
FY07	11.61	76.55
FY08	25.89	133.66
FY09	6.76	34.31
Total:	**46.64**	**248.78**
Supervision/ICR		
FY09	6.35	32.57
FY10	8.28	47.03
FY11	5.85	59.75
FY12	9.06	61.10
FY13	8.87	53.52
FY14	5.02	39.11
FY15	5.89	37.57
Total:	**49.32**	**330.64**

* Since project is financed by GEF, costs include GEF funds

* Staff weeks corresponding to costs prior to 2000 are no longer available in the World Bank's accounting systems.

Annex 5. Summary of Borrower's ICR and/or Comments on Draft ICR

Below follows the English translation of the Borrower's comments. The original Portuguese version has been archived and can be found in the World Bank's records.

To Mr.GUNARS H. PLATAIS
Environmental Economist
World Bank

Ref. Espírito Santo Biodiversity and Watershed Conservation and Restoration Project (P094233)

Dear Mr. Platais,

We received and reviewed the Implementation Completion Report (ICR00003476) of the Espírito Santo Biodiversity and Watershed Conservation and Restoration Project – "*Florestas para Vida*" (TF 093210), which received a USD 4 million non-reimbursable grant from the Global Environment Fund, having the Espírito Santo State Government as recipient and the World Bank as implementing agent.

As the project's coordinating and executing agencies, the State Secretariat for Environment and Water Resources (SEAMA) and the State Institute for Environment and Water Resources (IEMA) are extremely pleased with its successful completion. Its benefits went much beyond those initially desired, particularly concerning the implementation of the State Program for Payment of Environmental Services (PES), which extended beyond the initially targeted watersheds to the entire state of Espírito Santo.

Other findings provide sound evidence that the project's results far exceeded expectations, as you shown in the following list of those considered most important. 1) State professionals acquired expertise and management capacity that allowed them to look beyond their original experience and find ways of reaping additional benefits. An analysis of the local impacts from an economic standpoint shows that the state was able to prepare unexpected outputs like the Strategic Plan for the Forest Value Chain, in addition to assessing forest restoration opportunities and preparing a business case, among other economic approaches. 2) The need to monitor the Project according to the monitoring arrangements agreed with IBRD led the Project Steering Unit (PSU) to look for novel technological alternatives. This resulted in a new technical management system for PES projects that might be considered unprecedented in Brazil, producing time savings of up to 400% in certain routine workflows and procedures. 3) A sound forest cover monitoring and inspection system was developed and deployed across the entire Espírito Santo state territory. The system allowed close to 300,000 hectares of forest fragments in the initial stages of natural regeneration to advance to subsequent successional states. This helped to increase the state's forest cover, with positive impacts on extremely

relevant biodiversity-, water-, soil-, and climate-related environmental services. 4) Strengthened in its ability to take on challenging targets, not just for the government's strategic planning but also with the international community, the SEAMA/IEMA system's ability to plan and execute large-scale forest cover restoration actions increased, as proved by the state government's accession to the 2020 Bonn Challenge of recovering 80,000 hectares by 2020. 5) A specific fund (FUNDÁGUA) was created to support actions to increase forest cover, providing a long enough flow of financial resources (oil and natural gas royalties) to allow the state to advance in renewable sources. 6) The SEAMA/IEMA system's increased institutional capacity has since enabled important partnerships with the private sector and NGOs, which substantially increased the Project's investment power. Particularly important are those with the mining companies *Vale* and *Samarco*, *Fibria Celulose*, the NGOs TNC, IUCN, WRI, *Instituto Terra*, *Instituto BioAtlantica* and with the *Pacto pela Restauração da Mata Atlántica* (Pact to Restore the Atlantic Rainforest), in whose Council the state has held a seat since its creation in 2009. 7) As a consequence of the above-referred evidence, the state of Espírito Santo is moving to the national forefront and becoming a reference in environmental issues, which can also be considered a benefit achieved through the Project.

Unexpected events during the Project's implementation also had a great impact on its development, at times creating delays, at others making it necessary to redirect activities. However, despite their unexpectedness, in the end these situations proved essential for the project to achieve the level of progress and maturity it did. Many project activities had to be reviewed and adjusted to local realities, which increased local buy-in. A clear example of this occurred in 2012, when the country was heatedly discussing adjustments to the Forest Code. At the time, given the uncertainty surrounding the new Code, when many believed that the recovery obligations caused by environmental liabilities might be suspended, a large number of rural producers abandoned the Project thinking their environmental liabilities might be waived with the new Code. As a result we had to readjust our Project—which had to be attractive in itself, not just because it would enable legal compliance—focusing on profitable practices like agroforestry and silvipastoral systems and productive forests. In sum, despite delaying the Project's implementation this unforeseen event brought unexpected benefits that were unfortunately not captured by the evaluation conducted.

It is important to emphasize this, since many results and benefits that are easy to verify were not initially expected, and could therefore not be measured or documented through project indicators. As such, we believe that the Project's overall evaluation does not reflect or capture the benefits achieved, as you will see by the specific comments and suggestions presented below.

Specific comments:

Issues that affected the Project's implementation and results
Water Producer Program (Programa Produtor de Água – PPA) – National Water Agency - ANA

Aside from the above example about the changes in the Brazilian Forest Code, it is also important to note that another PES scheme was implemented in Espírito Santo simultaneously to the one designed under the FPV Project.

This happened in 2008 with the creation of the Water Producer Program, a simplified PES scheme implemented based on the PES model designed by the National Water Agency (ANA).

Note that the state started working with PES between 2004 and 2005, when the first efforts were made to prepare the Concept Note of the Espírito Santo Biodiversity and Watershed Conservation and Restoration Project (generally known as *Florestas para a Vida* or FPV) that later led to the development of a PAD.

The slowness in preparing the PAD and consequently in receiving the GEF funds needed to start implementing the Project—among them the passing of the late IBRD project lead Mr. Ricardo Tarifa—created much anxiety in the state, which started considering the possibility of implementing the model provided by ANA. In fact, since ANA's model proved easy to adapt, the state was able to prepare the legal framework and start the Water Producer Program in less than a year. However, the legal instruments designed to support the Water Producer Program would later prove to be incompatible with the proposed FPV's PES mechanism. Since the former only supported recognition of conserved forests and changing the legal framework was impossible, it would not be feasible to implement the FPV.

This scenario changed only when it was ascertained that the PES mechanism implemented was not stimulating reforestation in new areas, since producers did not find the financial benefits attractive enough. This would make it impossible for the state to achieve the main goal of its 2025 Development Plan: increasing forest cover from 11% in 2006 to 16% by 2025. In view of the above, the state decided to review its legal framework, which ended up incorporating the exact directives discussed under the FPV.

Despite having seemed negative for the FPV due to the implementation delays it caused, its cost-benefits ended up being quite positive for many reasons:

The launch of the Water Producer Program in 2009 allowed the state to try out the PES mechanism and solve issues that would have come up when implementing the FPV, like defining standards for contracts, documents, workflows, etc. In addition, without the Water Producer Program, the FPV would have had to develop its own legal framework, and considering that its first disbursement only took place in August 2009, it would have taken quite some time to hire a consulting firm to support this activity and enable the start of the first PES pilots. On the other hand, although the legal norms imposed by the PPA did not allow the FPV to be implemented, its first revision in 2012 not only made it possible to implement the FPV's PES rules, it also enabled adjustments to avoid errors that would certainly have been made if the state had not experimented with the PPA first.

As such, although the Water Producer Program may initially have seemed responsible for delaying the FPV, a careful chronological analysis of the steps that would have been necessary would doubtless show that the Water Producer Program actually helped to advance the FPV's design and implementation.

In addition, aside from providing various testing opportunities, for a long time the Water Producer Program alleviated the political pressure that the FPV would certainly have suffered. Hence, the Project was able to develop its own PES mechanism unrestrained, which came to be implemented in 2012—four years after the GEF funds were approved.

Diversified action fronts.

A brief analysis of the project scope shows clearly that considering the limited staff available for the project's technical management, it was much too daring in taking on so many action fronts in its four investment components. Furthermore, some of them did not provide the executing agency with full management capacity, which introduced a great uncertainty in its execution.

Component 1, which includes activities like preparing watershed management plans and strengthening basin committees, exemplifies this quite well. As it happens, the Project makes the Implementing Agency responsible for an activity that is not just the duty of the state. The Basin Committee is responsible for approving the Watershed Management Plan (a project output), and the state is responsible for supporting it. The state fosters the formation of committees and helps to keep them functioning, if the committees allow them to do so. The state

can also support the committees by contracting and preparing watershed management plans, but their approval and consequent implementation depends on a collegial body in which the state merely holds a seat. As a result, the entire process must be conducted in a way that is participatory enough for any documents generated in the future not to be considered invalid. In this regard, we failed to foresee the difficulties and time it would take to prepare the ToRs, and subsequently monitor the performance of the contract to prepare the watershed management plan, in a highly participatory manner. The project timeline merely took into account the time needed to obtain the no objections, conduct the competitive bidding process, and sign and perform the contract. In addition, delays in reaching prior milestones does not warrant a shortening in the execution period to adjust it to the length of the grant agreement. This would certainly compromise the outputs. In fact, it will need to be revised.

Other planned project actions also show a bold diversification in its scope considering the limited staff resources, which hinders the project's implementation capacity. But as we mentioned before, despite their diversity, all actions are somehow linked to each other. Which does not mean they are essential to reach the project objectives.

To be direct, and considering that Component 3 is the most important to achieve the project's objectives, a number of actions in other components can be considered fundamental for its success:

- Implementation of a Forest Cover Monitoring System - Component 1
- Water Monitoring System - Component 1
- Definition of Areas for Forest Cover Restoration - Component 1
- Establishment of a Monitoring and Evaluation Methodology - Component 4
- Implementation of a Management System - Component 4
- Strengthened Team - Component 4.

Reduced team

This point is directly related to the previous item about the excessively daring execution scope.

If there had been enough professionals available to carry out all planned activities, including administrative personnel from IEMA, as executing agency, to support contracts in execution, the evaluation results might have been different.

Nevertheless, the project contributed to and enabled continuing education for state professionals dedicated specifically to forest recovery activities. Today they follow the lines of the *Reflorestar* Program, which has its own team, duly structured and designed to grow.

In terms of constructive criticism, it is clear that the size of the team was not appropriately dimensioned to perform all project activities, and insufficient personnel was allocated to make this possible. The team was spread thin and this created delays.

We also failed to consider that in certain cases (e.g., when preparing the watershed management plans), the Implementing Office would depend on the efforts of other segments of society. As a result, actions that were secondary to achieving the project's main objectives ended up demanding more time and effort than expected, which on occasion compromised actions of greater priority.

As to the reduced number of full-time technical staff available to implement the Project, one of the lessons we learned is that this type of deficiency can be corrected by recruiting a management unit. As such, we included one in the new project proposal presented to the Bank, the Water and Landscapes Management Project (*Projeto de Gestão de Águas e da Paisagem*).

Likewise, aiming to solve the lack of technical personnel in the field, the Implementing Office opened a competitive bidding process with the Bank's authorization and recruited a company to prepare technical projects for PES. Rural producers thus received the assistance they needed and were able to achieve the indicators proposed. This new action was also incorporated into the new project proposal.

Finally, we question an aspect referred to in Paragraph 95, which evaluates the Bank's project supervision as moderately unsatisfactory due to the lack of reports on recurrent delays. It must be noted that during most of the FPV's execution, its institutional and implementation arrangements were linked to those of the *Águas Limpas* Project, which due to the volume of investments and project scope demanded more attention at that point. However, in view of the above, which clearly shows the reasons and motives that led to the project's delays, it makes no sense to attribute such a rating in the final version of the evaluation report due to the lack of reports.

Final comments

Even though we presented most of the lessons learned during the FPV throughout this document, below are a few that were not mentioned before.

Whenever designing a project and defining its implementation period, account must be taken of the political cycle of the grant recipient. It must also consider that some activities may take longer than planned. As such, unless there are considerable unjustified delays in the project's execution, it is not advisable to match the length of the grant agreement to the time needed to conduct a study.

To the contrary, once it is clear that it will take longer to perform a certain activity, the project should be flexible enough to adjust to that situation without compromising the quality of the final output.

The project scope should have been dimensioned using modeling tools to determine the number of people needed to execute it and the professional profiles needed, checking to see whether the grant recipient would truly have access to the necessary professionals, which would allow the project scope to be better dimensioned.

Regardless of the defined project dimension, it should have been possible to hire external personnel (through a management company) to implement the Project so as not to overburden the already overburdened structures of the state. This was the case of the Ecological Corridors of ES Project, which was supported by a consulting firm throughout its execution, expediting small-scale actions and simplifying project management. The same approach was applied to the *Àguas Limpa*s Project.

Vitória, June 19, 2015

Marcos Franklin Sossai
Florestas para Vida Implementation Manager
Reflorestar - Forest Conservation and Recovery Program Manager

Annex 6. List of Supporting Documents

Project Appraisal Document (Report No. 40547-BR) – October 23, 2008

Restructuring Paper 1 (Report No. 70498-BR) – June 27, 2012

Restructuring Paper 2 (Report RES12668) – December 1, 2013

Restructuring Paper 3 (Memo) – December 31, 2014

Country Partnership Strategy 2012–2015 (Report No. 63731-BR) – September 21, 2011

ISRs - FpV

01 27/01/2012

02 26-Jun-2013

03 18-Feb-2014

04 31-Dec-2014

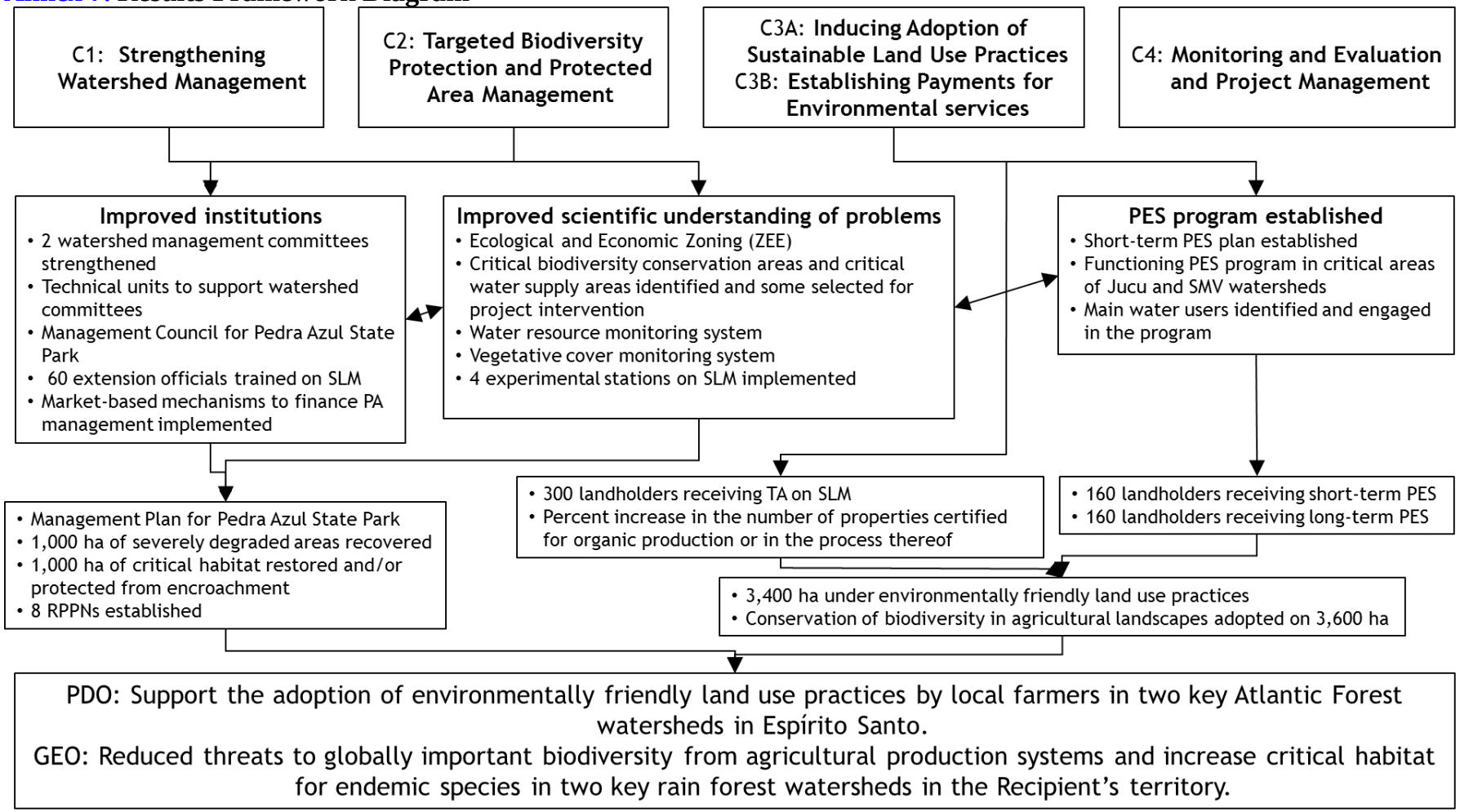
Aide-Memoires: Joint Supervision Missions: Espírito Santo Water and Coastal Pollution Management Project.

- ✓ December 2006
- ✓ June 2007
- ✓ March 2008
- ✓ March 2009
- ✓ July 2010
- ✓ December 2010

Financial Management Supervision Reports:

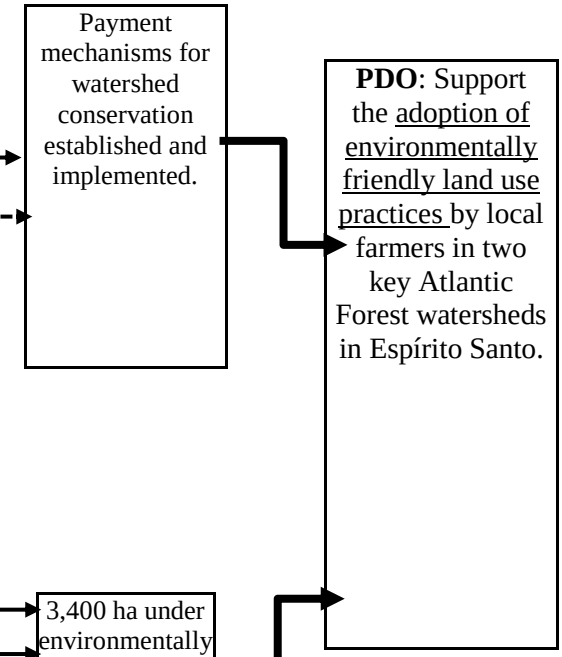
- ✓ May 2008
- ✓ October 2014

Annex 7. Results Framework Diagram

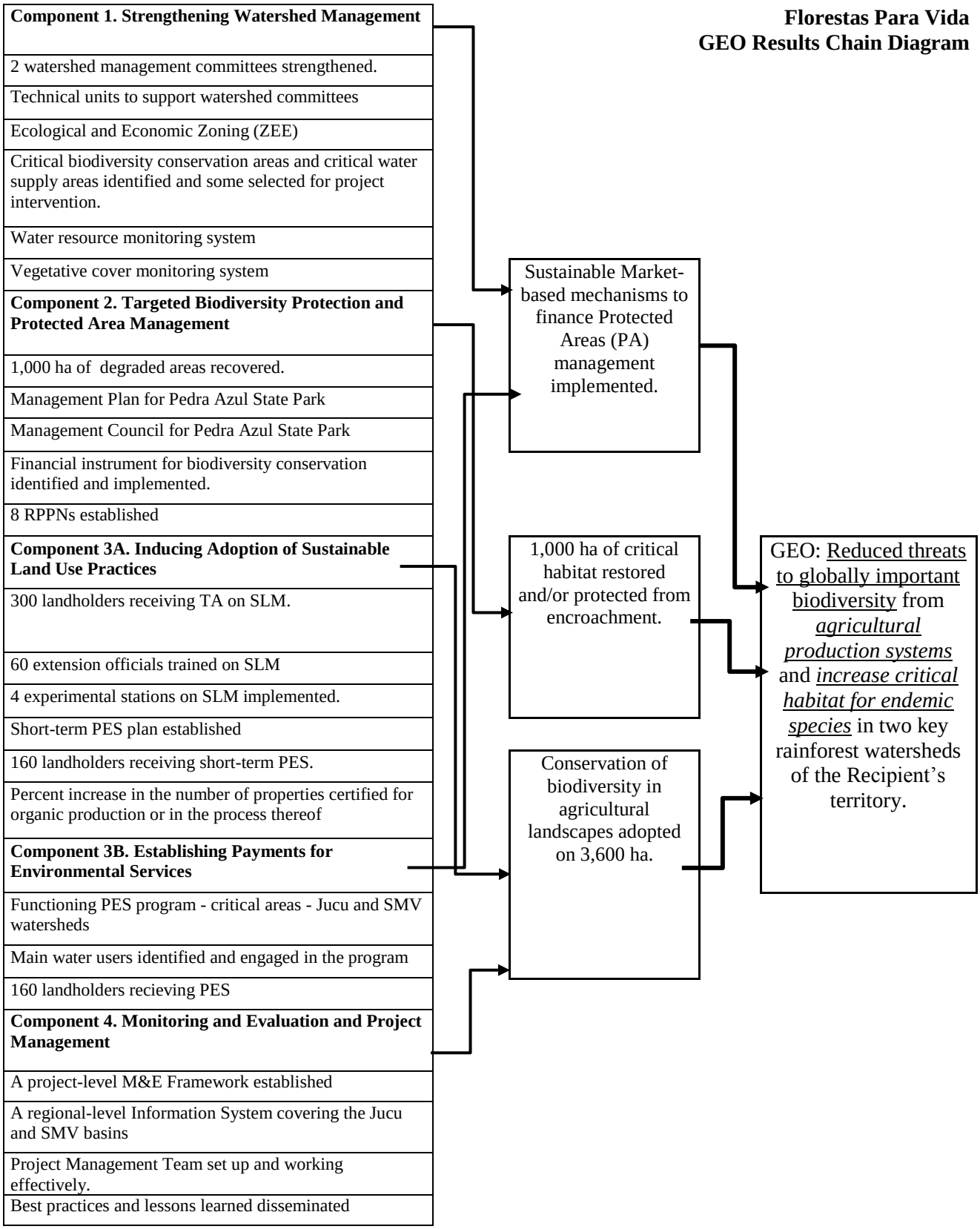


Florestas Para Vida
PDO Results Chain Diagram

Component 1. Strengthening Watershed Management
2 watershed management committees strengthened
Technical units to support watershed committees
Ecological and Economic Zoning (ZEE)
Critical biodiversity conservation areas and critical water supply areas identified and some selected for project intervention.
Water resource monitoring system
Vegetative cover monitoring system
Component 2. Targeted Biodiversity Protection and Protected Area Management
1,000 ha of degraded areas recovered.
Management Plan for Pedra Azul State Park
Management Council for Pedra Azul State Park
A new Financial instrument for biodiversity conservation identified and implemented.
8 RPPNs established
Component 3A. Inducing Adoption of Sustainable Land Use Practices
300 landholders receiving TA on SLM.
60 extension officials trained on SLM
4 experimental stations on SLM implemented.
Short-term PES plan established
160 landholders receiving short-term PES.
Percent increase in the number of properties certified for organic production or in the process thereof
Component 3B. Establishing Payments for Environmental Services
Functioning PES program - critical areas - Jucu and SMV watersheds
Main water users identified and engaged in the program
160 landholders receiving PES
Component 4. Monitoring and Evaluation and Project Management
A project-level M&E Framework established
A regional-level Information System covering the Jucu and SMV basins
Project Management Team set up and working effectively.
Best practices and lessons learned disseminated



Florestas Para Vida
GEO Results Chain Diagram



PDO: *Support the adoption of environmentally friendly land use practices by local farmers.* **GEO:** Reduced threats to globally important biodiversity from *agricultural production systems* and *increase critical habitat for endemic species in two key rain forest watersheds in the Recipient's territory*.

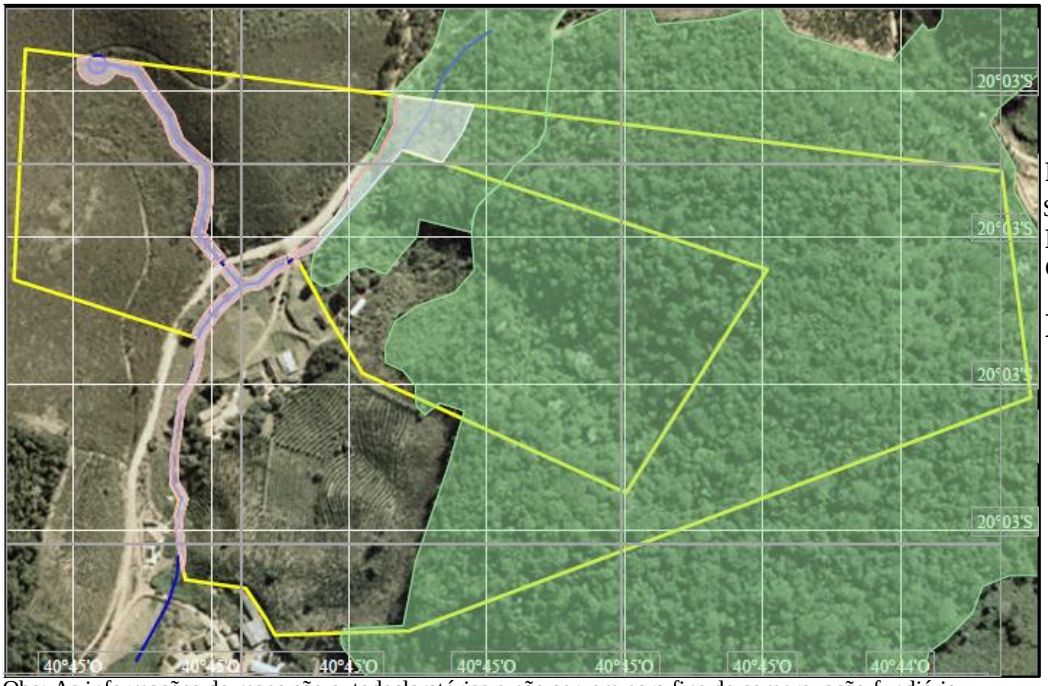
Activities	Outputs	Outcomes		
		Short Term	**Medium Term**	**Long Term**
Component 1. Strengthening Watershed Management	2 watershed management committees strengthened	Improve institutions perfomance	Favors PES and Mkt based mechanisms implementation	Increase habitats for species
	Ecological and Economic Zoning (ZEE)	Improved natural Resources management		
	Critical biodiversity conservation areas and critical water supply areas identified and some selected for project intervention.	Project implementation efficiency improvement	Protection of critical biodiversity conservation areas. Increase habitats for species.	
	Water resource monitoring system	Improved scientific understanding of problems	Favors PES implementation	Increase habitats for species
	Vegetative cover monitoring system	Improved understanding of problems	Improved natural resources management and law enforcement	
Component 2. Targeted Biodiversity Protection and Protected Area Management	1,000 ha of degraded areas recovered.	Critical habitats restored. Increase habitats for species.		
	8 RPPNs established	Increase critical habitats protected from encroachment		
	Management Plan for Pedra Azul State Park	Improved natural Resources management		Increase habitats for species
	Management Council for Pedra Azul State Park	Improve institutions performance	Improved natural Resources management	
	A new Financial instrument for biodiversity conservation identified and implemented.	Allows PES implementation	Critical habitats restoration and preservation financing	
Component 3A. Inducing Adoption of Sustainable Land Use Practices	300 landholders receiving TA on SLM.	Modify landholders practices	Adoption of friendly land use practices.	Reduce threats from agriculture production.
	60 extension officials trained on SLM	Increased number of landholders receiving TA		
	4 experimental stations on SLM implemented.	Develop, improve and demonstrate SLM practices		
	Short-term PES plan established	Prepare PES contracts	PES implementation	Increase habitats for species
	160 landholders receiving short-term PES.	Habitats restoration and protection financed		
	Percent increase in the number of properties certified for organic production or in the process thereof	Adoption of friendly land use practices		Reduce threats to biodiversity from agriculture production
Component 3B. Establishing Payments for Environmental Services	Functioning PES program - critical areas - Jucu and SMV watersheds	Habitats restoration and protection financed		Increase habitats for species
	Main water users identified and engaged in the program	Favor Mkt based mechanism implementation to fund the PES.		
	160 landholders receiving PES	Habitats restoration and protection financed		

Component 4. Monitoring and Evaluation and Project Management	A project-level M&E Framework established	Improve project implementation efficacy and efficiency		Positive effects on the PDOs and GEOs
	A regional-level Information System covering the Jucu and SMV basins	Improved scientific understanding of problems	Improve natural resources management	Increase habitats for species
	Project Management Team set up and working effectively.	Improve project implementation efficacy and efficiency		Positive effects on the PDOs and GEOs
	Best practices and lessons learned disseminated	Allows successful experiences replication	Increase habitats for species and reduce threats to biodiversity outside the project areas. "*Reflorestar Project encompassing the whole State*"	

Annex 8. Land Use Planning – Current Land Use and Proposed Conversion

Programa Reflorestar
Município de Santa Maria de Jetibá ES

Mapa de Uso Atual



Obs: As informações do mapa são autodeclaratórias e não servem para fins de comprovação fundiária.

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N

Escala = 1 : 3386
Datum: WGS84

Propriedade
Sítio Orgânico Gesund Leewend
Proprietário
Gerson Berger

Legenda

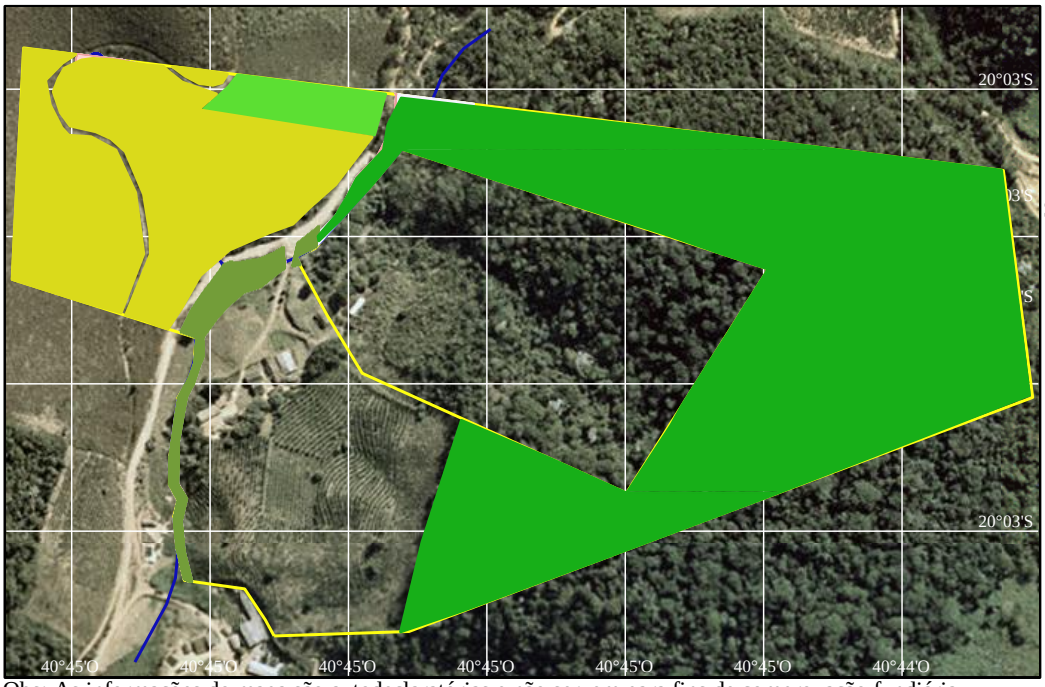
- Rio
- Nascente
- Área com cobertura florestal **[8,90 ha]**
- Limite da Propriedade **[17,37 ha]**
- Edificações
- Afloramento Rochoso
- Passivo Ambiental **[0,45 ha]**
- APP Hídrica **[0,75 ha]**
- UCS Estaduais

Coordenada de Referência (UTM 24S wgs84)
316781, 7780962

http://reflorestar.cargeo.com.br/precadastro/impressao_mapa_uso/683/a

Programa Reflorestar
Município de Santa Maria de Jetibá ES

Mapa de Uso Proposto



Obs: As informações do mapa são autodeclaratórias e não servem para fins de comprovação fundiária.

KM
0 0.1 0.2

N
Escala = 1 : 3386
Datum: WGS84

Propriedade
Sítio Orgânico Gesund Leewend
Proprietário
Gerson Berger

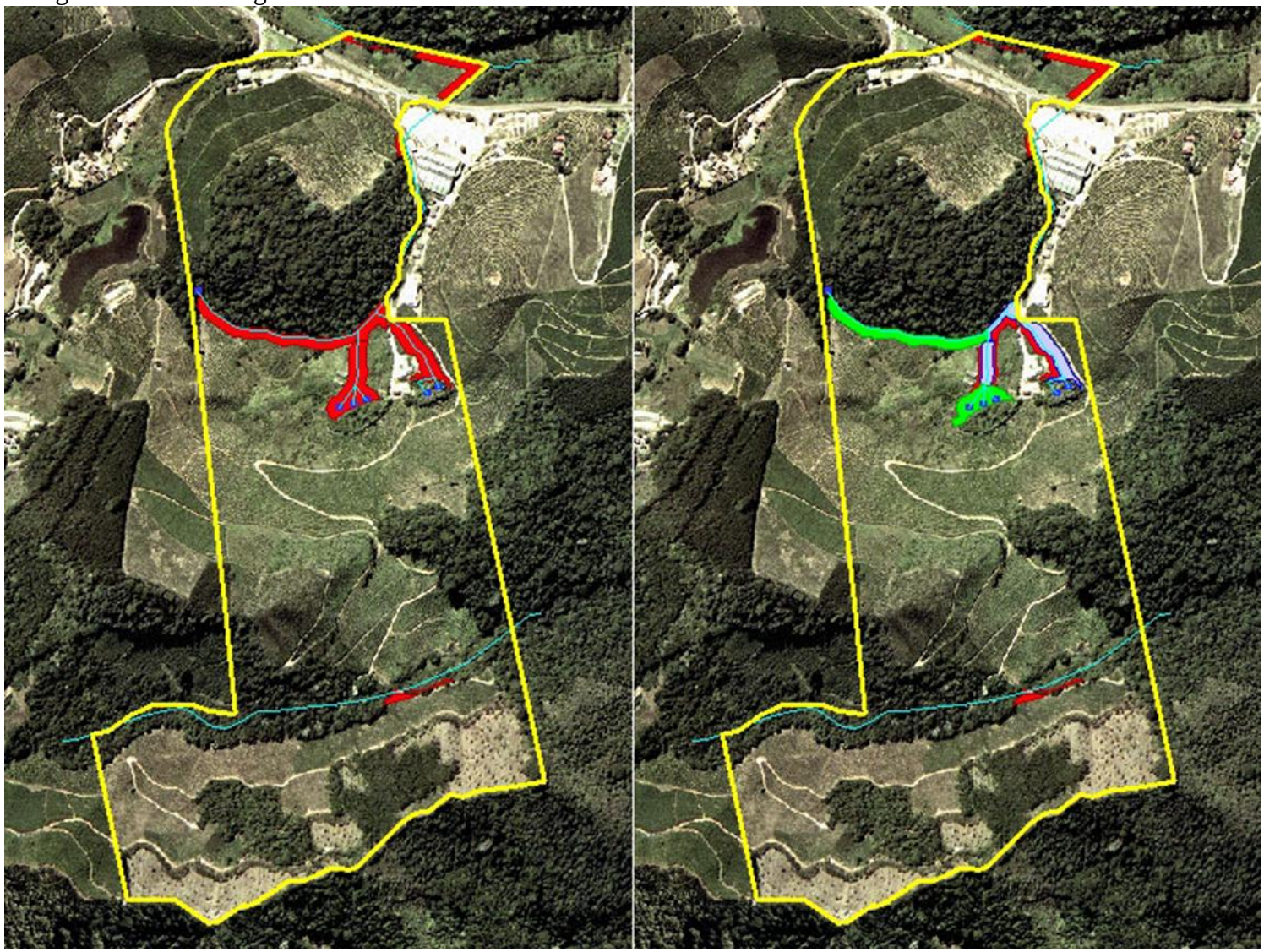
Legenda

- Rio
- Nascente
- Limite da Propriedade **[17,37 ha]**
- Edificações
- Afloramento Rochoso
- Floresta em Pé **[8,73 ha]**
- Recuperação com Plantio **[0,36 ha]**
- Regeneração Natural **[3,33 ha]**
- SAF **[0,31 ha]**
- Passivo Ambiental **[0,45 ha]**
- UCS Estaduais

Coordenada de Referência (UTM 24S wgs84)
316781, 7780962

http://reflorestar.cargeo.com.br/precadastro/impessao_mapa_uso/683/proposto/

A property (outlined in yellow) that has been assessed by the Reflorestar team. Noncompliant areas are marked in red. Proposed changes are marked in green and blue.



Annex 9. Release – State of Espírito Santo Joins the 20x20 Initiative

Released 18 June 2015 by the Governor of Espirito Santo's Communications Office to local, national and international news outlets.

RELEASE: The Brazilian state of Espírito Santo set to restore 80,000 hectares of forests and join the 20x20 Initiative for the global movement of large-scale restoration launched at the "Bonn Challenge"

JUNE 2016. The state of Espírito Santo announced its new membership of the 20x20 Initiative at the Second Global Forum on Sustainable Growth in Santiago, Chile this week, in leading up to the COP 21 meeting in Paris this December. The 20x20 Initiative was launched at the Climate Convention's COP 20 in December 2014 in Peru. The Initiative is an effort led by countries and organizations in Latin America and the Caribbean (LAC) to restore and prevent deforestation by at least 20 million hectares of degraded land by 2020.

The 20x20 Initiative is aligned with a range of global actions such as the Forests Statement of the New York Climate Summit, the Bonn Challenge to restore 150 million hectares by 2020, and the national Atlantic Forest Restoration Pact. To date, nine countries and three regional programs have joined the Initiative, with goals that propose actions for forest restoration and conservation, avoided deforestation, and sustainable land use practices.

Espírito Santo's contribution, established by law in the 2015/2018 Government's Strategic Plan, aims to recover 80,000 hectares over the next four years. Actions established in the Forest Conservation and Recovery Program, *Reflorestar*, will help to achieve this.

The State's entry into the Initiative emphasizes a consistent and continuous track record of progress made in the last ten years on developing and implementing of forest conservation and recovery policies, which are starting to produce significant results.

In addition to direct benefits such as the preservation and recovery of critical environmental services for quality of life, (water, soil, and biodiversity), Espírito Santo's ability to plan large-scale actions in the field of forest restoration, allowing it to take on global extent responsibilities, such as the 20x20 Initiative, is especially noteworthy. A further important benefit concerns the restoration economy, considered a sustainable development pathway for Brazil, which reinforces important links in the forest production chain. This is aligned to Brazil's expectations to launch a national restoration plan, PLANAVEG, currently undergoing public consultation and led by the Ministry of the Environment.

Enabling conditions that allowed the State of Espírito Santo to take on the 20x20 Initiative include the State Government prioritizing public policy development focused on forest conservation and restoration, and partnership that support the state through knowledge transfer, technology and institutional support. These have enabled the implementation of major actions for structuring and advancing the Reforestation Program. Noteworthy partnerships include The Nature Conservancy, the International Union for Conservation of Nature, the World Resources Institute, the World Bank, Instituto Bioatlântica, and the Global Environment Facility, among others.

Additional Information:

On the State of Espírito Santo Joining the Initiative
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About the 20x20 Initiative
Rachel Biderman, WRI Brasil and Walter Vergara, WRI
rbiderman@wri.org and Wvergara@wri.org
About Bonn Challenge
Miguel Calmon, IUCN and Carole Saint-Laurent, IUCN and GPFLR
miguel.calmon@iucn.org and carole.saint-laurent@iucn.org
About the Atlantic Forest Restoration Pact
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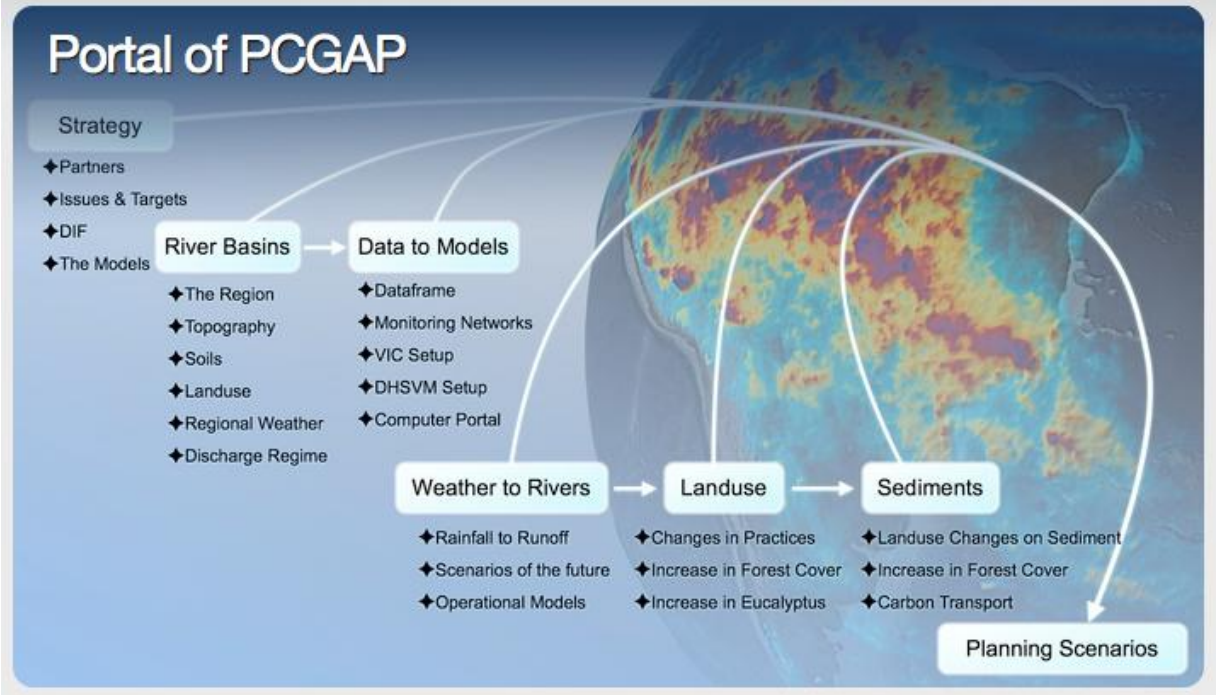
apadovezi@wri.org

Annex 10. Dynamic Information Framework – PCGAP
Portal Capixaba de Gestão das Águas e da Paisagem

The project Portal Capaixaba de Gestao das Aguas e da Paisagem[58] (PCGAP) was established as part of FpV to provide a sophisticated Decision Support System (DSS) that would enable scenario analyses for decisions on the resources of Espírito Santo. The system has time series data sets in state of the art computer models that can be utilized by staff in National Agencies to analyze the resource base and develop predictive scenarios and appropriate interventions, with climatic and ecosystem changes in mind. The application of modern "landscape/hydrology" models of river basins represents a powerful tool for the analysis of coupled landscape properties, water resources, and future change scenarios (due to climate, or land use practices).



The process of PCGAP was to first present the overall project Strategy. The Partners (Parceiros) are led by IEMA, with CESAN, INCAPER, UFES (Jerônimo Monteiro, Vitoria), and the University of Washington. The Issues and Targets were identified, progressing from how weather impacts the land surface, to how changes in landuse might alter water flow, and then to how changes in water and landuse might impact the mobilization of sediments. The strategy for PCGAP is to use computer "hydrology/landscape" models to assimilate multi-sector information, within a "dynamic information framework (DIF)," to provide resolutions to the questions of FpV. The framework is developed for the Jucú and the Santa Maria da Vitória (JSMV) watersheds at a relatively high resolution (using the DHSVM model), to the

[58] http://pangaea.ocean.washington.edu/

State of Espírito Santos and the Rio Doce (ES), at a more coarse resolution (using the VIC model), taking advantage of the scaling of effort and availability of data required).

The properties of the River Basins were established, as a means of organizing information for multiple users, within the framework of model requirements for data. The Region was summarized. Topography (for relief and flow networks) at multiple scales was derived from the 90-m SRTM (Shuttle Radar Topography Mission). The properties of Soils for ES were abstracted from the EMBRAPA 1:5M dataset, and from GEOBASE for the JSMV. The reference for Landuse for ES was from the MODIS satellite, while the Landsat-derived IEMA2007 product was used for JSMV. Regional Weather, as daily historical gridded forcings of rain and temperature, was taken primarily from a "re-analysis" product from the UW, with local meteorological information informing JSMV. The discharge regime was developed from ANA records. Graphics illustrated the primary patterns in the overall hydrology of the region, and the "sensitivity" of the region to variations in temperature and rain was examined, as the basis for climate scenarios.

Data to Models describes the process by which the information in River Basins is incorporated into the models. The Dataframe establishes the specific requirements. The VIC Setup describes how VIC was setup, calibrated, and validated with time series records. Similarly, the DHSVM description documents setup, calibration, and validation. Both models performed (surprisingly) well.

With the "toolbox" established by River Basins and Data to Models, PCGAP is ready to analyze the questions motivating the project. Weather to Rivers describes first how Rainfall is translated into Runoff, and to soil moisture and ET. Interactive graphics help examine seasonal and interannual patterns. Future Scenarios look at what might happen under possible future climates. If the model is maintained in an Operational mode, could the actual conditions of rainfall intensity and soil moisture be monitored, and could extreme events (floods or droughts) be anticipated via the development of a preventive alert system?

A major question for PCGAP is, *"How do changes in landuse affect the movement of water across the landscape?"* This question is examined in Landuse, by evaluating the potential hydrologic responses to different landuse scenarios in the Rio Jucu and Rio Santa Maria da Vitoria river basins. Landuse Scenarios were developed from the IEMA2007 dataset, by comparing to a more historical dataset (GEOBASE 1997), and by increasing agricultural crops by 25%, eucalyptus by 25% and 50%, and reverting to a vegetation type characteristic of Mata Nativa. For both the Jucu and SMV basins, increased lowland agriculture caused higher unregulated annual water yields especially during the low-flow seasons. When existing agriculture was converted to forests, annual water yield decreased but evapotranspiration was increased. Increasing eucalyptus areas decreased ischarge by an average of 25% in the Jucu, However, the difference in discharge between Euc.+25% and Euc.+50% was indiscernible.

Based on future scenario analysis, effects of landuse change on seasonal and annual water yields are a net balance of change in basin moisture storage size, vegetation-soil interaction, and flow regulation. Forest to crop conversation reduces the transfer of precipitation to the ground due to lower evapotranspiration rates, thus increasing discharge. Agriculture in this region of Brazil has also caused soil compaction, lowering infiltration rates and hydraulic conductivity, causing excess in overland flow.

Landuse in SMV results in very high sediment loads, far beyond natural, especially during storms. Historical data are sparse, and rarely show impacts of major storm events. Hence a field sampling program was developed with CESAN, focusing on pre- and during- storm sampling, using automated samplers (provided by the UW). Detailed measurements of sediment concentration and sediment chemical composition showed that very high sediment loads, bearing pronounced chemical signals of how the land is sued, are mobilized during storm events, likely dominating overall sediment transport. While not yet well-developed, the sediment module of DHSVM was able to capture the basic dynamics of storm events, suggesting that, with further development, it would be useful in pin-pointing the most sensitive areas.

The overall goal is to be able to support Planning Scenarios. Results to date show that the PCGAP construct, with its ability to summon and dynamically synthesize information from multiple sources, can provide significant input to regional planning. The next step is to continue building the Phase 1 PCGAP into a robust Decision Support System (DSS). Production of spatial maps of planning scenarios, maps of adaptability, zoning for agricultural activities, and flooding probabilities at short term and longer-term time scales is imminently feasible, as seen in the work to date.

Annex 11. Map of the area of influence of the project

Annex 12. A sampling of communication material developed under the project

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