

Document of
The World Bank

Report No: ICR00002298

IMPLEMENTATION COMPLETION AND RESULTS REPORT
(TF-56350)

ON A

GRANT

IN THE AMOUNT OF US\$5.4 MILLION FROM THE
GLOBAL ENVIRONMENT FACILITY TRUST FUND

FOR THE BENEFIT OF

THE REPUBLIC OF COLOMBIA

THROUGH CONSERVATION INTERNATIONAL COLOMBIA

FOR THE

INTEGRATED NATIONAL ADAPTATION PROJECT

June 22, 2012

Environmentally and Socially Sustainable Development Department
Colombia and Mexico Country Management Unit
Latin America and Caribbean Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective June 2012)

Currency Unit = Colombian Peso (COP\$)

1.00 COP\$ = US\$0.0005

US\$ 1.00 = COP\$1833

FISCAL YEAR

January 1 – December 31

ABBREVIATIONS AND ACRONYMS

ACCION SOCIAL	<i>Agencia Presidencial para la Acción Social y la Cooperación Internacional</i> Presidential Agency for Social Action and International Cooperation
AOP	Annual Operational Plan
CAR	<i>Corporación Autónoma Regional</i> Regional Environmental Authority
CAS	Country Assistance Strategy
CI	Conservation International
CO2	Carbon Dioxide
COP	Conference of the Parties
CARDIQUE	<i>Corporación Autónoma Regional del Canal del Dique</i> Regional Environmental Authority of the Dique Canal
Coralina	<i>Corporacion para el Desarrollo Sostenible del Archipiélago de San Andrés, Old Providence y Santa Catalina</i> Regional Environmental Authority for the Sustainable Development of the Archipiélago of San Andrés, Old Providence and Santa Catalina
CPACC	Caribbean Planning for Adaptation to Global Climate Change Program
CRSBeIF	<i>Corales del Rosario, San Bernardo e Isla Fuerte</i> (Marine Protected Area) Corals of Rosario, San Bernardo and Isla Fuerte
CVC	<i>Corporación Autónoma Regional del Valle del Cauca</i> Regional Environmental Authority of the Valle del Cauca
DHF	Dengue Hemorrhagic Fever
DIMAR	<i>Dirección General Marítima</i> Colombian Navy – National Maritime Authority
DMEWS	Early Warning System to Improve Malaria and Dengue Surveillance and Control
ENSO	<i>El Niño</i> Southern Oscillation
GCC	Global Climate Change
GEF	Global Environmental Facility
ICM	Integrated Coastal Management
IDEAM	Meteorological, Hydrological and Environmental Studies Institute
IMDSCS	Integrated Malaria and Dengue Surveillance and Control System
INAP	Integrated National Adaptation Project

INVEMAR	<i>Instituto de Investigaciones Marinas y Costeras</i> Marine and Coastal Research Institute of Colombia
INS	<i>Instituto Nacional de Salud</i> Colombian National Health Institute
IRI	International Research Institute for Climate Prediction
JAMSTEC	Japan Frontier Research Institute
MACC	Mainstreaming Adaptation to Climate Change
M&E	Monitoring and Evaluation
MDG	Millennium Development Goals
MOE	Ministry of Environment
MOH	Ministry of Health
MPA	Marine Protected Area
MRI	Meteorological Research Institute of Japan
NCAP	Netherlands Climate Change Program
NC1	First National Communication
NEC	National Environmental Council
NGO	Non-Governmental Organization
NPU	National Park Unit
OECS	Organization of Eastern Caribbean States
PAHO	Pan American Health Organization
PDF B	Program Development Facility B
PDO	Project Development Objective
SAI	San Andrés, Old Providence and Santa Catalina Archipelago
SIVIGILA	<i>Sistema Nacional de Vigilancia en Salud Pública</i> National System of Surveillance in Public Health
SMIA	<i>Sistema de Manejo Integrado de Água</i> Rainwater Harvesting and Wastewater Recovering System
SINA	<i>Sistema Nacional Ambiental</i> National Environmental System
SPA	Strategic Priority “Piloting an Operational Approach to Adaptation”
UNFCCC	United Nations Framework Convention on Climate Change

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COLOMBIA
Integrated National Adaptation Project

CONTENTS

Data Sheet

- A. Basic Information
- B. Key Dates
- C. Ratings Summary
- D. Sector and Theme Codes
- E. Bank Staff
- F. Results Framework Analysis
- G. Ratings of Project Performance in ISRs
- H. Restructuring
- I. Disbursement Graph

1. Project Context, Global Environment Objectives and Design	1
2. Key Factors Affecting Implementation and Outcomes	2
3. Assessment of Outcomes	3
4. Assessment of Risk to Development Outcome.....	4
5. Assessment of Bank and Borrower Performance	4
6. Lessons Learned	5
7. Comments on Issues Raised by Borrower/Implementing Agencies/Partners	5
Annex 1. Project Costs and Financing.....	6
Annex 2. Outputs by Component	7
Annex 3. Economic and Financial Analysis	8
Annex 4. Bank Lending and Implementation Support/Supervision Processes	9
Annex 5. Beneficiary Survey Results	10
Annex 6. Stakeholder Workshop Report and Results.....	11
Annex 7. Summary of Borrower's ICR and/or Comments on Draft ICR.....	12
Annex 8. Comments of Cofinanciers and Other Partners/Stakeholders	13
Annex 9. List of Supporting Documents	14
MAP	

A. Basic Information			
Country:	Colombia	Project Name:	Colombia: Integrated National Adaptation Program
Project ID:	P083075	L/C/TF Number(s):	TF-56350
ICR Date:	06/05/2012	ICR Type:	Core ICR
Lending Instrument:	TAL	Borrower:	CONSERVATION INTERNATIONAL - COLOMBIA
Original Total Commitment:	USD 5.40M	Disbursed Amount:	USD 5.38M
Revised Amount:	USD 5.38M		
Environmental Category: B		Global Focal Area: C	
Implementing Agencies: Conservation International Colombia			
Cofinanciers and Other External Partners:			

B. Key Dates				
Process	Date	Process	Original Date	Revised / Actual Date(s)
Concept Review:	01/13/2004	Effectiveness:		07/13/2006
Appraisal:	02/13/2006	Restructuring(s):		05/11/2010
Approval:	04/11/2006	Mid-term Review:		
		Closing:	12/31/2011	12/31/2011

C. Ratings Summary	
C.1 Performance Rating by ICR	
Outcomes:	Satisfactory
Risk to Global Environment Outcome	Moderate
Bank Performance:	Satisfactory
Borrower Performance:	Satisfactory

C.2 Detailed Ratings of Bank and Borrower Performance			
Bank	Ratings	Borrower	Ratings
Quality at Entry:	Satisfactory	Government:	Satisfactory

Quality of Supervision:	Satisfactory	Implementing Agency/Agencies:	Satisfactory
Overall Bank Performance:	Satisfactory	Overall Borrower Performance:	Satisfactory

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):	No	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)		
Central government administration	28	28
General agriculture, fishing and forestry sector	41	41
Health	17	17
Sub-national government administration	14	14
Theme Code (as % of total Bank financing)		
Biodiversity	17	17
Climate change	33	33
Land administration and management	17	17
Malaria	17	17
Water resource management	16	16

E. Bank Staff		
Positions	At ICR	At Approval
Vice President:	Hasan A. Tuluy	Pamela Cox
Country Director:	Gloria M. Grandolini	Isabel M. Guerrero
Sector Manager:	Karin Erika Kemper	Abel Mejia
Project Team Leader:	Richard Damania	Walter Vergara
ICR Team Leader:	Richard Damania	
ICR Primary Author:	Suzana Nagele de Campos Abbott	

F. Results Framework Analysis

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

The project development objective was to support Colombia's efforts to define and implement specific pilot adaptation measures and policy options to meet the anticipated impacts from climate change.

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

n/a

(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 :	Strengthened IDEAM capability to produce and disseminate relevant climate change information through availability of continuous, accurate and reliable climate data for adaptation initiatives of relevance to health, mountain ecosystems and insular areas.			
Value (quantitative or Qualitative)	Limited capability	Capability Strengthened		Achieved (see comments below)
Date achieved	07/13/2006	12/31/2011		12/31/2011
Comments (incl. % achievement)	All 157 weather stations updated, upgraded and operating, providing accurate and reliable data. These stations are already integrated to the Hydrometeorological Network of IDEAM and the Weather Reference.			
Indicator 2 :	Six pilot adaptation activities have been implemented and monitored in pilot areas.			
Value (quantitative or Qualitative)	No activities	Six pilot adaptation activities		Achieved (see comments below)
Date achieved	07/13/2006	12/31/2011		12/31/2011
Comments (incl. % achievement)	A total of seven activities were piloted. Of these 3 were communal water supply systems implemented for 227 people. In addition actions to reduce vulnerability of 4 farming systems in 8 localities under implementation. Guidelines to update information & maps on forest fires & landslides			
Indicator 3 :	Guidelines to incorporate climate variability and climate change designed and integrated into regional development plans in Chingaza Massif			
Value (quantitative or Qualitative)	No guidelines	Guidelines designed and integrated.		Achieved (see comments below)
Date achieved	07/13/2006	12/31/2011		12/31/2011
Comments (incl. % achievement)	Communities have developed 9 Adaptive Land Use Plans in their territories to reduce vulnerabilities to CC. Land Use Plans of 2 municipalities, La Calera and Chocahi, incorporate reduction of vulnerability to CC and adaptation measures.			
Indicator 4 :	Adaptation pilots designed & implemented with corresponding monitoring systems in place, for Colombian Caribbean insular areas including increased management performance of key marine ecosystems & reduced vulnerability in water supply to local			

	communities			
Value (quantitative or Qualitative)	No pilots	Pilots designed and implemented		Achieved (see comments below)
Date achieved	07/13/2006	12/31/2011		12/31/2011
Comments (incl. % achievement)	Marine monitoring stations operating. Ecological assessments & mgt guidelines of MPAs developed & executed. Research program for CC impacts on corals underway. Rainwater systems in 3 pilot areas operating. Capacity building workshops implemented			
Indicator 5 :	Strengthened public health program able to meet the increased threats from dengue and malaria induced by climate change			
Value (quantitative or Qualitative)	No program	Strengthened program		Achieved (see comments below)
Date achieved	07/13/2006	12/31/2011		12/31/2011
Comments (incl. % achievement)	Accurate climate models to forecast dengue and malaria outbreaks (75% of predictability). Models were used to predict transmission dynamics in municipalities affected by floods during La Niña in 2010-11			

(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 :	Climate change forecast models operative and providing climate variability information in selected hydro meteorological areas.			
Value (quantitative or Qualitative)	No models	Models operative		Achieved (see comments below)
Date achieved	07/13/2006	12/31/2011		12/31/2011
Comments (incl. % achievement)	CC and CV models are available at national level, including the influence of ENSO			
Indicator 2 :	Relevant climate information supporting decisions in pilot areas implementing adaptation measures			
Value (quantitative or Qualitative)	No information	Information supporting decisions in pilot areas		Achieved (see comments below)
Date achieved	07/13/2006	12/31/2011		12/31/2011
Comments (incl. % achievement)	Daily weather & climate forecasts operational at national level. Weather forecasts for the Sabana of Bogota in place. Weather forecasts for 41 main cities in country, including rainfall and maximum temperatures now available every 6 hours.			
Indicator 3 :	Local climate change scenarios available in pilot areas			
Value (quantitative or Qualitative)	No scenarios	Scenarios available in pilot areas		Achieved (see comments below)

Date achieved	07/13/2006	12/31/2011		12/31/2011
Comments (incl. % achievement)	See comments in Indicator 2			
Indicator 4 :	Reliable and accurate data reporting from 157 key upgraded stations			
Value (quantitative or Qualitative)	No reliable and accurate data reporting	Reliable and accurate data reporting from 157 key upgraded stations		Achieved (see comments below)
Date achieved	07/13/2006	12/31/2011		12/31/2011
Comments (incl. % achievement)	Improved reference network for CC: 157 meteorological stations operating and providing data			
Indicator 5 :	10 professionals with MS in meteorology trained			
Value (quantitative or Qualitative)	No professional trained	10 professionals trained		Partially Achieved (see comments below)
Date achieved	07/13/2006	12/31/2011		12/31/2011
Comments (incl. % achievement)	8 professionals graduated with MSC degrees, all of them currently working at IDEAM			
Indicator 6 :	Detailed description of the water and carbon cycles in high mountain moorlands			
Value (quantitative or Qualitative)	No description	Detailed description of water and carbon cycles		Achieved (see comments below)
Date achieved	07/13/2006	12/31/2011		12/31/2011
Comments (incl. % achievement)	Carbon and water cycles models (including ecological, hydrological and social variables) developed and implemented in high mountain ecosystems. Water (8) and carbon (8) monitoring networks installed			
Indicator 7 :	One agro-forest system suitable for the Rio Blanco watershed in Chingaza shows financial viability (income analysis)			
Value (quantitative or Qualitative)	No system	One agro-forest system shows financial viability		Achieved (see comments below)
Date achieved	07/13/2006	12/31/2011		12/31/2011
Comments (incl. % achievement)	Socioeconomic evaluation of an agro forestry system in High Mountain Ecosystem finalized.			
Indicator 8 :	Guidelines to incorporate climate variability and climate change designed and integrated into regional development plans in Chingaza Massif			
Value (quantitative or Qualitative)	No guidelines	Guidelines designed and integrated into regional development plans		Achieved (see comments below)
Date achieved	07/13/2006	12/31/2011		12/31/2011
Comments	Two municipal territorial plans; 8 "adaptative life plans" in 8 communities in the Chingaza			

(incl. % achievement)	area. Guidelines for land use planning in High Mountain Ecosystems developed.			
Indicator 9 :	Agro-productive systems exhibiting reduced income variability in pilot areas in comparison to control areas			
Value (quantitative or Qualitative)	No Data	Agro-productive systems exhibiting reduced income variability in pilot areas		Achieved (see comments below)
Date achieved	07/13/2006	12/31/2011		12/31/2011
Comments (incl. % achievement)	100 agro forestry systems in 210 ha.; 24,800 kms of live fences with native species; 103 participatory ecological restoration processes; 7.1 ha restored in watersheds, landslides			
Indicator 10 :	Design and implementation of rain-fed communal water supply systems			
Value (quantitative or Qualitative)	No rain-fed communal water supply systems	Design and implementation of rain-fed communal water supply systems		Achieved (see comments below)
Date achieved	07/13/2006	12/31/2011		12/31/2011
Comments (incl. % achievement)	3 rainwater communal systems (SMIA) designed and implemented in 3 pilot areas;			
Indicator 11 :	Development of guidelines and implementation of pilot management plans for atolls, keys and corals, accordingly with established MPA Guidelines (SF-MPA and CRSBeIF-MPA) Demarcation plan for coral conservation areas in SF-MPA and CRSBeIF-MPA implemented			
Value (quantitative or Qualitative)	No guidelines	Guidelines developed and implemented		Achieved (see comments below)
Date achieved	07/13/2006	12/31/2011		12/31/2011
Comments (incl. % achievement)	Demarcation plan for coral conservation areas in SF-MPA (100%) and CRSBeIF-MPA (20%) defined			
Indicator 12 :	Define and implement participatory enforcement strategy for SF-MPA and CRESBeIF-MPA.			
Value (quantitative or Qualitative)	No strategy in place	Enforcement strategy defined and implemented		Achieved (see comments below)
Date achieved	07/13/2006	12/31/2011		12/31/2011
Comments (incl. % achievement)	80% of "no take" areas demarcated. Marine & coastal resources & management guidelines developed for Cayo Bolivar & Albuquerque that contemplates productivity; biodiversity; natural habitat studies; communication program; participatory evaluation			
Indicator 13 :	Pilot guidelines designed for incorporating CC in housing in SAI			
Value (quantitative or Qualitative)	No guidelines in place	Guidelines piloted		Achieved (see comments below)
Date achieved	07/13/2006	12/31/2011		12/31/2011

Comments (incl. % achievement)	Guidelines for housing developed and discussed			
Indicator 14 :	Development of population policies incorporating GCC effects in the coastal zone for SAI			
Value (quantitative or Qualitative)	No policies in place	Policies developed		Achieved (see comments below)
Date achieved	07/13/2006	12/31/2011		12/31/2011
Comments (incl. % achievement)	Population policy finalized and under discussion by the national government.			
Indicator 15 :	Operation and maintenance of ocean automatic monitoring stations system			
Value (quantitative or Qualitative)	Stations not operating and maintained	Stations operated and maintained		Achieved (see comments below)
Date achieved	07/13/2006	12/31/2011		12/31/2011
Comments (incl. % achievement)	Increase in the piezometric network in 39% to measure groundwater level and the effects of saline intrusion and its impact of water availability in San Andres Island			
Indicator 16 :	Implementation of IDMSCS in 24 municipalities to attain a 30% reduction in the rate of infection in the intervened areas			
Value (quantitative or Qualitative)	IDMSCS not in place	IDMSCS in place in 24 municipalities		Partially achieved (see comments below)
Date achieved	07/13/2006	12/31/2011		12/31/2011
Comments (incl. % achievement)	Early warning systems to improve malaria and dengue surveillance and control designed and implemented in 8 municipalities. Institutional capacity strengthened to diagnose and provide training in quality control to local staff in pilot areas.			
Indicator 17 :	Develop reliable and accurate climate models to forecast dengue and malaria outbreaks			
Value (quantitative or Qualitative)	Models not developed	Models developed		Achieved (see comments below)
Date achieved	07/13/2006	12/31/2011		12/31/2011
Comments (incl. % achievement)	Malaria models developed in 5 pilot areas. Dengue models developed in 5 municipalities. Effectiveness of methodology has been tested. Impact of water systems & indirect climate change evaluated.			

G. Ratings of Project Performance in ISRs

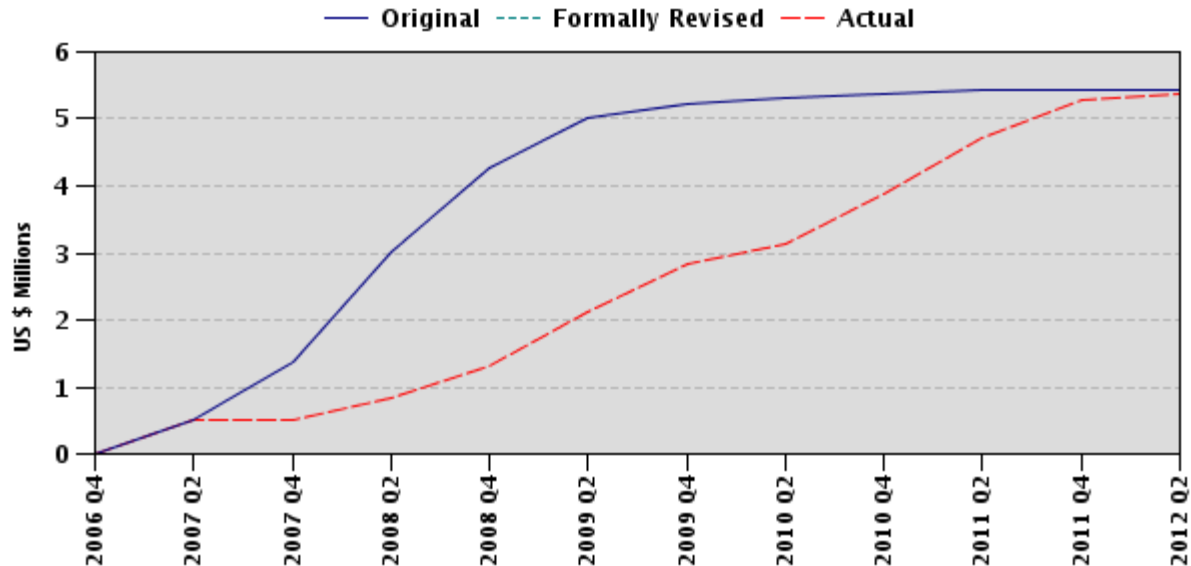
No.	Date ISR Archived	GEO	IP	Actual Disbursements (USD millions)
1	06/28/2006	Satisfactory	Satisfactory	0.00
2	12/27/2006	Satisfactory	Satisfactory	0.50
3	06/24/2007	Satisfactory	Satisfactory	0.50
4	12/09/2007	Satisfactory	Satisfactory	0.86

5	06/19/2008	Satisfactory	Satisfactory	0.86
6	12/19/2008	Satisfactory	Satisfactory	2.03
7	06/25/2009	Satisfactory	Satisfactory	2.71
8	12/19/2009	Satisfactory	Satisfactory	3.12
9	06/02/2010	Satisfactory	Satisfactory	3.87
10	02/22/2011	Satisfactory	Satisfactory	4.71
11	08/11/2011	Satisfactory	Satisfactory	5.40

H. Restructuring (if any)

Restructuring Date(s)	Board Approved GEO Change	ISR Ratings at Restructuring		Amount Disbursed at Restructuring in USD millions	Reason for Restructuring & Key Changes Made
		GEO	IP		
05/11/2010	N	S	S	3.50	Change in Pilot Area under Component B and incorporating Safeguard Policies

I. Disbursement Profile



1. Project Context, Global Environment Objectives and Design

1.1 Context at Appraisal

Colombia's First National Communication (NC1) to the United Nations Framework Convention on Climate Change (UNFCCC) issued in 2001 provided the foundational information for this project and it indicated the country's high vulnerability to the expected impacts of climate change, identifying high mountain habitats, insular and coastal areas and health, as areas of primary concern. At the time of Appraisal of the Integrated National Adaptation Project (INAP, the Project), studies commissioned as part of the preparation of the Second Communication had confirmed and provided greater detail on trends and impacts in these areas. Colombia's main vulnerabilities to climate change were found to include the following:

- **Highland Andean ecosystems were found to be vulnerable to climate change impacts.** As elsewhere climate change impacts are particularly severe at higher altitudes. In particular, the fragile moorlands, unique to the Northern Andes, with endemic and abundantly diverse flora and fauna, as well as with storage capacity for water and carbon in the soil were expected to be seriously affected by increases in temperature. The Meteorological, Hydrological and Environmental Studies Institute (IDEAM) had recorded increases in temperature and decreases in rainfall from 1961-1990, and projections by the Meteorological Research Institute of Japan indicated that this trend was expected to worsen. Hydrological and temperature changes in the mountains were expected to result in a loss of global biodiversity ("no way up" for unique mountain species) and also in the loss of the environmental goods and services provided by these habitats, especially water supply, basin regulation, and the associated hydropower potential. With two thirds of Colombia's power hydro-generated, any decrease in hydropower potential could potentially result in a shift towards thermal power capacity, with consequent increases in greenhouse gas emissions.
- **Sea level and sea surface temperatures were expected to affect insular areas of the country.** Several studies by global scholars as well as in the National University of Colombia had analyzed the possible impacts of a doubling of carbon dioxide (CO₂) emissions between the years 2050 and 2080, and found significant potential impacts on sea level, sea surface temperatures in comparison to the averages for the period 1961 to 1990 and ocean acidity. Sea level rises would likely cause saline intrusion into aquifer-based freshwater supplies in insular and coastal areas, affecting freshwater systems and their biodiversity. Possible small island impacts identified major population displacement as one of the main threats of climate change. In San Andres Island, for example, the NC1 estimated a loss of 17 percent of land area, including most of the coastal zone, by 2060. Small islands with dense populations and lack of interior land on which to relocate coastal communities were expected to suffer socially destabilizing impacts. Finally, the subsidence of reefs and atolls in the western Caribbean were seen to have potential implications on sovereignty of the oceanic area under domain. Increases in sea surface temperatures had been linked to the bleaching of corals in the Caribbean and were expected to induce a pole-ward shift of local fisheries. Higher sea surface temperatures were already threatening the viability of corals in the western Caribbean, much of it located in the Colombian territorial sea that constituted the nursery of an estimated 65 percent of fish species in the area. Coral beds in the western Caribbean, in particular at remote atolls and reefs were seen as unique, including endemic species of

global biodiversity value. Coral losses were expected to result in a loss of biodiversity, an increase of vulnerability of coastal areas and serious threat to food security of island populations.

- **Climate change could cause increased exposure to tropical vector diseases.** The two mosquito-borne diseases with the largest global impact on human health and well-being, dengue and malaria, had recently reemerged as significant public health burdens in Colombia. The incidence of malaria, during epidemic years, had increased from 1.5 per 1,000 inhabitants in 1964 to 18.0 per 1,000 inhabitants in 1998. Colombia had its first case of dengue hemorrhagic fever in 1989, and there was a clear increasing trend in transmission, with a four-fold increase from 1997 to 2002 when over 80,000 persons were affected with dengue. Almost half of Colombia's population of over 20 million lived in areas where the mean temperature was well within the range of dengue and malaria vectors. It is clearly important to understand the determinants of the incidence and severity of these diseases. Some models suggested at that time that an increase of two degrees Celsius within these areas was expected to result in an increase in the exposure to both diseases. Further, climate change was expected to significantly increase epidemics in temperate climates, including mountain areas, which had not previously experienced transmission. The implications for an already stressed health sector were considered serious.

Adaptation to these three climate related risks formed the focal themes of the Project.

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

The project development objective was to support Colombia's efforts to define and implement specific pilot adaptation measures and policy options to meet the anticipated impacts from climate change. Information gathering was a priority since so little was known at that time about what would happen and how to adapt. The efforts would be focused on high mountain ecosystems, insular areas, coastal risks and on human health concerns related to the expansion of areas for vectors linked to malaria and dengue, as identified in the National Communications and other studies.

The Project's Key Indicators included the following:

- Availability of continuous and reliable climate information of relevance to major climate change vulnerabilities in health, mountain ecosystems and insular areas (157 climate stations modernized), through data and analysis provided routinely by IDEAM.
- Six pilot adaptation activities have been implemented and monitored, addressing vulnerabilities to climate change in high mountain ecosystems, insular and coastal areas and health, including:
 - Maintenance of the hydropower generation ability, measured through sustained water regulation of the Las Hermosas Massif on the Amoya River watershed;
 - Adaptation program designed and incorporated in regional development plans for the Las Hermosas Massif; positive impacts on biodiversity and land degradation documented;
 - Adaptation program designed and incorporated in regional development plans for the Colombian Caribbean insular areas including increased management performance of key marine ecosystems and reduced vulnerability in water supply to local communities; and

- Strengthened public health program incorporating management measures to meet the increased threats from dengue and malaria induced by climate change resulting in a 30 percent reduction of malaria and dengue morbidity within the pilot areas by project completion.

1.3 Revised GEO (as approved by original approving authority) and Key Indicators, and reasons/justification

The GEO and the PDO were not revised.

1.4 Main Beneficiaries

The Project Appraisal Document did not identify its main beneficiaries specifically. By extrapolating from and summarizing the information presented in the PAD, using the Project's GEO and PDO and the specific activities it financed, its main beneficiaries could be expected to include: (a) the global environment that would benefit from activities aimed at preventing degradation of global commons (e.g., to conserve globally important biodiversity in marine ecosystems, protect biodiversity, prevent land degradation and conserve environmental services in a highly diverse mountain biotope); (b) the government and academic institutions, both those that would benefit from both improved capacity to produce and disseminate climate information and those that would benefit from availability of timely climate information to guide the design of projects, resource allocation, research and operational decision making; (c) the population living in pilot project areas that would receive social benefits from an increased adaptive capacity of ecosystems in those areas; (d) the population living in pilot municipalities where the Integrated Dengue and Malaria Surveillance and Control System (IDMSCS) would be implemented who might be able to respond to the information¹; and (e) other countries around the world that would be expected to benefit from early learning on climate change adaptation programs.

1.5 Original Components (as approved)

The total project cost was estimated to be US\$15.0 million, of which US\$5.4 million was to be financed under the GEF SPA Grant. The Project included five components, as follows:

Component (A): Making climate, climate variability, and climate change information available for adoption of adaptation measures and policies

(Total Cost US\$3.1 million; GEF funding US\$1.0 million)

This component, implemented by IDEAM, sought to strengthen Colombia's capabilities to produce and disseminate climate information, in support of adaptation to climate change measures and programs. The component would strengthen IDEAM's capabilities to provide: (i) forecasts to improve resource management and biodiversity conservation decisions in high mountain ecosystems; (ii) climate scenarios to develop ecosystem management plans, land conservation and adaptation options in Páramo, insular and coastal areas; and (iii) warnings for malaria and dengue and possibly how the disease might migrate. The following activities were to be supported: (i) improvements in technical and scientific capabilities at IDEAM to produce

¹ The PAD mentions that the Project was expected to reduce malaria and dengue incidence by 30 percent within pilot areas. This expectation was later curtailed when it became clear that it would not be possible to achieve this impact with only the activities included under the Project.

information relevant to climate change; (ii) development of local climate change scenarios in support of selection of adaptation measures; (iii) strengthening the existing climate data network of relevance to climate change by supporting equipment renovation of 157 key climate stations (out of 3100 operated by IDEAM) with at least 20 years of high quality data (for 1961 to 1990), including quality control and assurance; and (iv) strengthening scientific and technical personnel to ensure long term sustainability of the project activities.

Component (B): Design and implementation of an adaptation program that supports maintenance of environmental service (including hydropower potential) in the Las Hermosas Massif in the central range of the Andes

(Total Cost US\$3.47 million; GEF funding US\$1.57 million)

The Massif is the most humid high altitude moorland in the planet. Hence, it is considered a highly diverse biotope of particular concern for climate change impacts. It is also important for potential hydropower generation. The selection of Massif was made on the basis of the significant biodiversity in the ecosystem, including endangered or threatened species. The selection of Las Hermosas would provide synergies between the Project and the Amoya River Project, which sought to reduce greenhouse gas emissions from the power sector. This component, implemented by IDEAM, was to support the following activities: (i) ecosystem planning and management in Las Hermosas Massif, to maintain its high biodiversity assets; (ii) maintenance of potential for hydropower generation through adoption of measures to protect the Amoya watershed; (iii) adaptive land-use planning model that sought to reduce impacts from climate change on land degradation; (iv) improvement of productive agro-ecosystems and reduction of their socioeconomic vulnerability to climate change impacts. The Project sought to maintain the existing level of access to environmental services.

Component (C): Adaptation measures in Caribbean Insular areas

(Total Cost US\$2.9 million; GEF funding US\$1.3 million)

The objective of this component, implemented by the Instituto de Investigaciones Marinas y Costeras (INVEMAR) and the Corporación para el Desarrollo Sostenible del Archipiélago de San Andrés, Old Providence y Santa Catalina (Coralina), was to support the implementation of physical adaptation measures in order to reduce the vulnerability of the Caribbean Insular area, especially with regard to changes in rainfall, temperature and sea-level rise. The activities under the component were to include: (i) implementation of Global Ocean Observatory System-based monitoring stations in the Western Caribbean (complementing the regional network under CPACC); (ii) integrated water resources management to enhance the availability of fresh water in the Caribbean Insular areas (San Andrés Island); (iii) implementation of the marine-protected areas system in the Seaflower Reserve and the Corales del Rosario, San Bernardo e Isla Fuerte (CRSBeIF) to improve the climate resilience of the habitat; and (iv) select aspects of Integrated Coastal Management to reduce the vulnerability of ecosystems, infrastructure and populations living near the coast.

Component (D): Responses to the increased exposure to tropical vector-borne diseases (malaria and dengue) induced by climate change

(Total Cost US\$4.7 million; GEF funding US\$1.0 million)

The objective of this component, implemented by the Instituto Nacional de Salud (INS), was to address the increased exposure to tropical vector-borne diseases (malaria and dengue) induced by climate change through the implementation of an Integrated Dengue and Malaria Surveillance and Control System (IDMSCS), including an Early Warning System for Malaria and Dengue

Surveillance and Control (DMEWS). The Project was ambitious and sought a 30 percent reduction in both malaria and dengue morbidities in pilot areas as a result of improvements in health management and prevention of additional exposure caused by climate change. Under the Project, the IDMSCS was to be implemented in approximately 12 pilot municipalities for both malaria and dengue, selected on the basis of perceived climate threats. The Project was to support the design, implementation and operation of the IDMSCS by developing a framework that permits the continuous evaluation of the local risks of dengue and malaria transmission and the determination of actions to prevent epidemics before they began. The Project sought to contribute to the strengthening of the institutional capabilities through the evaluation and strengthening of local (municipal) health agencies and through the National Health Surveillance System. The Project aimed to change the existing reactive institutional organization into a proactive public health system for addressing malaria and dengue.

Component (E): Project Management

(Total Cost US\$0.73 million; GEF funding US\$0.53 million)

This component, implemented by IDEAM and Conservation International Colombia (CI-Colombia)², was to support the overall technical coordination of the Project's activities (including the implementation of a technical monitoring system), as well as the administrative and financial management of the Project. It was to include goods, consultants' services, travel and operational and incremental costs of the Project, including staffing (the Project Coordinator, a Procurement Specialist and others, and the Project's external audits).

1.6 Revised Components

The Project's components were not revised. However, the location of the activities under Component B, were not implemented in Las Hermosas Massif, as originally planned, but in the Chingaza Páramo and the National Natural Park Los Nevados due to security concerns. This modification was provided through a project restructuring approved by the Board on May 11, 2010.

1.7 Other significant changes

The May 2010 project restructuring also triggered two additional safeguard policies: Indigenous Peoples (OP 4.10) and Pest Management (OP 4.09). The Indigenous Peoples policy was triggered when the Bank learned that the Government had started a process to include as beneficiaries of the health activities under Component D an Indigenous group of the Guayaberos, located in San José del Guaviare. This group represented a new and previously unanticipated beneficiary of the activities under this Component. The Pest Management policy was triggered proactively and conservatively even though the Project under Component D did not contemplate either any increase in the use or purchase and use of pesticides since activities under the Project were limited to the implementation of early warning systems and improved surveillance and control of vector borne diseases, as opposed to implementation of activities to mitigate eventual outbreaks of these diseases.

² CI-Colombia is a recognized NGO with broad environmental experience in high mountains and insular ecosystems. CI-Colombia did not implement the Project, per se, but rather acted as a coordinator for its required administrative and financial management processes.

2. Key Factors Affecting Implementation and Outcomes

2.1 Project Preparation, Design and Quality at Entry

The Project Appraisal Document reports that the Project was among the first submitted to the GEF Council under the Strategic Priority on Adaptation (SPA). The SPA was established by GEF in 2004, in response to UNFCCC guidance, as a \$50 million allocation inside of the GEF Trust Funds. The SPA was a groundbreaking initiative designed to support pilot and demonstration projects that were expected to provide real benefits and could be integrated into national policies and sustainable development planning.

Pioneering Project. INAP was a pioneering adaptation project and without the benefit of much experience, it needed to be designed as a series of pilots in an effort to “road-test” different approaches across different landscapes. Colombia was seen as an appropriate choice for several reasons. First, the country had played a leading role in the region and worldwide in the field of climate change. It was also considered a fitting choice given the well-documented vulnerability and potentially large impacts that climate change would impose on the country’s development prospects and process. Impacts were anticipated to have significant and long-term effects on fragile and unique ecosystems, accelerate the pace of land degradation, contribute to the impoverishment of biodiversity of species of global importance, increase the exposure of Colombians to tropical vector diseases, and generally affect the quality of life for its citizens. Also environmental institutions in Colombia are stronger than in many other countries especially outside LAC and the country’s environmental agencies are staffed with cadres of well trained scientists.

Preparation did not benefit from the vast learning that has now resulted from adaptation to climate change projects financed by the Bank and others worldwide since the Project was approved. Still, it was path breaking in securing rapid approval for a program of activities that responded to the adaptation priorities and concerns that the Government had identified in NC1 and in the preparation of NC2. These included the need for information on climate, climate variability and climate change that would provide policy makers with timely information needed to reduce the country’s vulnerability, including through the adoption of adaptation measures. The Project’s cutting-edge nature included at that time the diversity of the different ecosystems in which it supported pilot projects, and some of the activities pioneered with potential multiple applications in the region. But as with any adaptation project, success can only be judged ex-post – after climate impacts have occurred and hence appropriate measures of success remained elusive in this early effort.

Rationale for Involvement. The Bank’s Country Assistance Strategy dated December 24, 2002 included as a strategic focus the protection and conservation of strategic ecosystems, increasing their adaptive capacity with regard to global climate change impacts. The Project also responded to the guidelines of the SPA, which required the establishment of “pilot or demonstration projects to show how adaptation planning and assessment can be practically translated into national policy and sustainable development planning”. The Bank’s extensive previous involvement in supporting Colombia in its efforts to ensure environmental management and climate change mitigation made support for jump-starting adaptation efforts, as included under the Project, the next logical step in a successful program of assistance.

Lessons of Experience. Project design incorporated lessons learned from the Bank’s work on environmental issues in Colombia, mostly related to environmental management and climate

change mitigation initiatives. It was expected to benefit from the capacity of environmental institutions that had been strengthened under earlier projects, and through the Steering Committee, sought to complement the activities under those initiatives by mainstreaming the climate change challenge into the decision making processes of participating agencies. While there had been very limited experience with adaptation programs when the Project was prepared, its design benefited from experience in the implementation of some of the earliest adaptation programs in the Caribbean. That experience highlighted the paucity of information, the need to ensure sustainability and local ownership of monitoring and data collection, and for reliable methods to secure and compile data collected. Climate data collection was seen as a long-term activity that demanded long term commitments. Also, the experience in the Caribbean had illustrated that years of continuous work would be required to establish the basis for successful adaptation programs. It was clear this was in fact the first tentative step in a long haul process for which long-term commitments would be needed to meet growing adaptation to climate change challenges.

Project Design. With few models from which to learn, the preparation team considered different project design alternatives. One model considered would involve a project focused on institutional strengthening and building enabling environments. Experience suggests capacity building without actual projects to anchor new learning are seldom effective. The other model would involve addressing only one adaptation measure, in one geographic area and implemented by one single institution. The team made a conscious decision to proceed with a multi-faceted focus as expressed in NC1. This involved engagement in different vulnerable geographies (coasts and mountains) as well as across sectors (health, agriculture, water). It also highlighted what has now become a common challenge in adaptation projects – the need for cross-sectoral activities and coordination.

The Project's Results Framework was designed to respond to the factors described above: the limited lessons and experience from adaptation projects, the Government's expressed interest in adopting a multi-faceted approach aimed at improving climate change monitoring and implementing pilot approaches in different ecosystems, and the Bank's and Government's determination to act quickly and seize the opportunity offered by the SPA. The Project's Development Objectives and the Key Indicators selected to measure progress towards them were defined cautiously mostly as outputs. While today this Results Framework may appear under-ambitious, in retrospect, it was judged reasonable at preparation given the absence of experience in the design and implementation of adaptation projects at the time. The Project counted on very limited funding, and it was clear from the outset that sustainability of pilot investments, which by definition are gradual and long-term in nature, would require continued funding beyond that available under the Grant. The Project was not designed to be a research project, comparing the results of activities in pilot areas against a base case, nor was it designed to result in a measurable, increased capacity of pilot areas to adapt to climate change during its short implementation period. It was designed to jump-start a Government effort and a *process* to internalize climate change adaptation in Government policy, based on continuous efforts that would utilize improved information and data and the experience gained in the implementation of diverse pilot activities under the Project. This would allow for a learning process in climate change and adaptation issues that would ultimately strengthen institutional capacity. As a result, the Key Indicators by which the Project's achievement of its Development Objectives were to be judged were basically output, as opposed to outcome or intermediate outcome indicators.

Stakeholder and Partner Involvement. During preparation, local institutions worked closely in developing the pilot adaptation measures under the pilots, and stakeholders were consulted. The Project took into account community perceptions to social well-being and threats to their

economic development. Pilots were selected with consideration to community participation in implementation and, in some cases, on potential for beneficiary co-financing. Partnership arrangements (Section 2.2), which were in place at the time of preparation and throughout implementation, served to provide a constant source of advice from renowned international and national institutions.

2.2 Implementation

The US\$5.4 million grant for the Project was approved, signed and declared effective on July 13, 2006. A Mid-Term Review was held, as scheduled, on June 23-27, 2009 to evaluate progress achieved in the Project's implementation³. The Grant closed as scheduled (without extension) on December 31, 2011. The Project's Implementation Status and Results Reports rated its implementation performance as Satisfactory throughout implementation. The following factors, described below, impacted its implementation and initial design: Government commitment, implementation arrangements, the security situation in Colombia, and a Quality of Lending Portfolio Review.

Government Commitment. Throughout implementation, the Government at the highest levels confirmed ownership and leadership of the Project. It became the Government's flagship adaptation program, and its implementation experience and findings were internalized to inform national efforts at formulating adaptation policy. The Government routinely highlighted the Project in high-level seminars and discussions on climate change, where the challenges of climate impacts were presented and discussed in an effort to support a process of internalizing climate concerns in sector policies. The Project's design and implementation guided the development of the CONPES note on climate change in its section on adaptation, and was the backbone of Colombia's Second National Communication to the UNFCCC (NC2). The Project's results are now being used routinely in the development of Colombia's national sector policies, some examples include: the National Development Plan 2010-2014 (Act 1450 of 2011), Policy for Integrated Water Resources (2010), the National Strategy for the Coordination of Policies and Actions in the Field of Climate Change - National Council Document on Economic and Social Policy (CONPES 3700-2011) and the National Public Health Plan. In addition, on a Regional and Local level, measures for adaptation to climate change have been incorporated in the management and formulation of Development and land management Plans in many municipalities. The results have also been incorporated in the IPCC most recent Assessment and the approach to glacier monitoring has been shared in exchanges with other developing countries (notably Nepal at a SAR climate change conference and an exchange and throughout Latin America).

Implementation Arrangements. The Project's implementation arrangements were complex, but necessarily so, given the cross-sectoral nature of adaptation. They comprised four executing agencies (IDEAM, INVEMAR, Coralina and INS), and an agency that was charged with managing the Project's administrative and financial management processes (CI-Colombia). Executing agencies implemented activities under their respective components with the support of national, regional and local government entities (Ministry of Social Protection, Ministry of Agriculture, National Park Unit, autonomous regional authorities, state and municipal health authorities), local and regional organizations (CI-Colombia, other NGOs, universities and associations), and beneficiaries of pilot activities. A Steering Committee constituted by

³ The PAD stated that the MTR would be carried out no later than June 30, 2009.

representatives of the Ministries of Environment, Social Protection and Energy, of the Executing Agencies and other public entities, approved the Project's Annual Operating Plans, provided guidance on implementation, and aimed to ensure the achievement of its objectives in a coordinated manner. Partnership arrangements with international and local institutions were secured to provide Executing Agencies with best-practice guidance and assistance in implementation of activities for which they were responsible⁴.

While obviously complex, any simplification or streamlining of these arrangements for purposes of the Project would invariably have detracted from the Project's impact on the Government's ability to internalize adaptation to climate change in its development programs. The Steering Committee served to elevate the Project's programs and experience, thereby providing a platform, which the Government used, for expanding its benefits beyond the few pilot and other activities it financed to impact sector policies and programs.

Project Restructuring. A delicate public security situation made it impossible for any of the Project's key partners to work in the area of Las Hermosas (Component B). The situation of social unease was expected to prevail throughout the implementation period. As a result, the Government and Bank teams identified alternative project sites with similar ecosystems (high mountain moorlands of high importance for water regulation and rich in biodiversity) that would address security concerns and provide geographic conditions that were technically suitable for project purposes. Both Chingaza Massif Páramo and the National Natural Park of Los Nevados met these criteria, and were substituted for the pilot activities in Las Hermosas through a project restructuring (Section 1.6). On-the-ground activities and interventions would be carried out in Chingaza Páramo, while only modeling efforts would be developed in Los Nevados. The Chingaza Páramo was considered a very important strategic area. Within its environmental services, it supplied fresh water to almost 20 percent of Colombians, principally in Bogotá. Given its key importance to the country, a significant number of public and private institutions were implementing activities in the area that would be complimentary to the adaptation measures to be supported under the Project. The Parque Nacional de Los Nevados is a protected area, in which many scientific studies had been conducted, facilitating the access to data and resources. The Las Hermosas Massif site was still expected to benefit from the Project since the guidelines to incorporate global climate change issues on land use planning that would be developed for the Chingaza Páramos, as well as the experience to be obtained from the implementation of the adaptation measures in the new pilot, were expected to be directly applicable to Las Hermosas and would eventually be used as an input for the development of the Hermosas Massif management plans. The project restructuring also triggered two additional safeguard policies (Section 1.7).

⁴ Partnership arrangements were secured with the Meteorological Research Institute (MRI) of Japan, to provide support to IDEAM under Component A, specifically to provide data from the Earth Simulator for use in the development of local climate scenarios and selection of adaptation measures, training and scientific exchanges; the International Research Institute for Climate Prediction (IRI) to provide assistance in making climate, climate variability and climate change information available for day to day operations in selected sectors, as well as scientific expertise and training; the Center for Disease Control (CDC) to assist INS under Component D by sharing information on experiences and data scientific exchanges; with the National Parks Unit to assist with the monitoring of the Sea Flower Marine Reserve, supporting on site vigilance and data collection; the Netherlands Climate Change Program (NCAP) to assist INVEMAR in conducting pilot projects of adaptation measures to sea level rise in coastal areas; and the Universidad Nacional de Colombia, as IDEAM's main scientific partner, participating in training, technical capacity building and leading the definition of climate change scenarios.

Quality of Lending Portfolio Review. The project was subject to a Quality Assessment of Lending Portfolio Review (QALP) in 2008. The preliminary assessment by QALP expressed anxiety over the complex nature of the Project and the Bank's supervision team provided a detailed response highlighting many factual errors in and disagreements with the review's findings. The main areas of difference concerned the design of the Project's results framework and arrangements for monitoring, the role of the Government and its ownership of the Project, the fact that the Project was processed under the SPA and was not a traditional investment project⁵, and mechanisms for supervision and incorporating best practice. The Bank's supervision team felt that the QALP review team had not understood the context in which the project was designed and its focus, specifically the definition of its PDO. It clarified that the Project's PDO was to be measured by the definition and implementation at the end of the Project of these pilot adaptation measures and that the Project was not concerned with producing outcomes related to climate mitigation or to changed environmental conditions as implied by QALP. QALP's final assessment assigned a rating of "3" (i.e., Moderately Likely) for Likelihood of Achieving DOs, provided several suggestions on how to improve the Project and commented "The team is to be congratulated on assisting Colombia in designing and implementing an innovative and pioneering operation – the first of its kind to support national efforts to adapt to climate change. This is likely to be a very important area of international assistance for the global community for the coming decades. A "learning by doing" approach is quite appropriate at this early stage, though it will be important to use evaluations like this QALP and the upcoming MTR to review earlier decisions, question assumptions and find more efficient solutions, where needed".

A key concern was the disparate and seemingly unrelated project components. It is arguable that it is not essential, even if desirable, to integrate all elements of a project. After all adaptation responses on the coast have little to do with those needed to respond to climate change in páramos. Nevertheless, despite differences of opinion, the Project's Implementation Status and Results Reports highlight that the Bank's supervision team benefited from the QALP review and addressed some important findings. A panel of external peer review experts was established, and served to provide guidance on implementation. While the panel did not have specific funding allocations, three experts selected to provide input on Components A, B and C voluntarily read output documents, and provided comments in an informal manner. A scientific panel was put in place to provide input on the technical concept for Component D. All of these experts were invited to meetings of the Steering Committee. IDEAM also counted on expert input when it presented the Project's results at the First National Climate Change Congress where the academy and scientists were present and discussed the main findings for each of the Project's components. The team reviewed and calibrated the Project's PDO Indicators, especially the indicator related to the design and implementation of the Integrated Malaria and Dengue Surveillance and Control System, to more adequately reflect the Project's pilot nature and short implementation period (although this change was not reflected in a project restructuring). A dedicated program was

⁵ The supervision team's response highlighted that: "...the project was funded through the SPA. The SPA was created by the UNFCCC to be managed by the GEF with the specific purpose of "establishing pilot or demonstration projects to show how adaptation planning...can be practically translated into projects that will provide real benefits" (SPA Guidelines, GEF Council Document C.27, October 2005). Although for archiving purposes the project is a SIL, it is not a conventional investment loan."

developed and used by IDEAM as a project control and monitoring tool. Finally a health expert was incorporated in the Bank's supervision team.

The project was also scrutinized by an IEG policy review team that submitted a draft report that has been commented upon by the Government of Colombia. At the time of writing there is no further information about this review.

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

Monitoring activities included not only those to monitor the Project's progress, but also, perhaps more importantly, activities under all of the Project's components aimed at providing timely and reliable information aimed at focusing adaptation to climate change. This section describes project monitoring; other monitoring results are described in Section 3.2 below.

Design. As described in Section 2.1, the Project's Results Framework included outcome and monitoring indicators (Section 1.2, Annex 2 and PAD Annex 3) that were basically output indicators. IDEAM was responsible for the development of the Project's technical monitoring and evaluation system, and for submitting annual project progress reports integrating the results of the monitoring and evaluation activities and setting out measures recommended to ensure the efficient implementation of the Project. (CI-Colombia was responsible for the Project's financial and administrative monitoring reports). IDEAM was to have a functioning monitoring system in place six months after effectiveness, and CI provided technical advice to IDEAM for this purpose.

Implementation and Utilization. By the time of the MTR, IDEAM had established a web-based monitoring system for project management. The system allows different executing agencies (and others) to assess information and include comments and information on progress, thereby making information on adaptation programs accessible to multiple users that are implementing, supervising or designing similar activities. It is possible to obtain information on individual components/sub-components, and view progress by different time periods and percentage advances by component. It is also a repository of information on implementation: minutes of meetings, documentation on processes, pictures and other relevant information. The system automatically produces monthly reports that monitor progress, and that were used to update progress in the Project's Implementation Status and Results Reports. Nevertheless, concerns were highlighted in those ISRs that more quantifiable data would have been useful to monitor progress on the basis of a clearer indication of quantitative achievements. Also, results, when they became available were posted on the web page of each executing agency, and available for downloading. Progress reports were also provided on CI's web page with all of their annexes. INVEMAR created a newsletter to inform specific results; IDEAM included all results on their web page, and Coralina and INS used their web pages for dissemination of many results. INVEMAR still posts regular newsletters on their website, www.invemar.org.

2.4 Safeguard and Fiduciary Compliance

Safeguard Compliance. The Project was expected to be entirely positive from an environmental perspective, particularly by protecting vulnerable ecosystems from the impact of global climate change. Nevertheless, the Project triggered the Environmental Assessment (OP/BP 4.01) and Natural Habitats (OP/BP 4.04) safeguard policies. An Environmental Assessment was prepared during preparation since minor environmental impacts could be expected from some investments under pilot projects, and an environmental management plan, requiring detailed assessments as part of the preparation of adaptation measures, was agreed and followed. The May 2010 project restructuring triggered two additional safeguard policies: Pest Management (OP 4.09) and

Indigenous Peoples (OP/BP 4.10) (Section 1.7). An Indigenous Peoples Plan (IPP) was prepared in the context of the restructuring. The Project's Implementation Status and Results Reports report no issues with compliance with safeguard policies, and records visits by social scientists to monitor especially implementation of the IPP. The Reports noted only guidance by the social scientist on how to improve documentation of the participatory processes followed and a verification of compliance with earlier recommendations.

Fiduciary Compliance. CI-Colombia was responsible for financial management, including disbursements, and procurement under the Project. CI-Colombia had limited previous experience with the Bank's fiduciary requirements, but handled the Project's fiduciary aspects proficiently. The PAD noted that other executing agencies could execute their own procurement processes under CI-Colombia's supervision, and recommended the hiring of a full-time procurement consultant, which it did. CI-Colombia experienced some initial difficulties with procurement staff and procedures, after which a detailed Action Plan was agreed that provided for intensive procurement review during the following year, assignment of additional full-time procurement staff, semi-annual auditing, continuous training, and semi-annual ex-post reviews. Subsequent independent reviews rated procurement processes and management as satisfactory, and no further issues surfaced. Similarly, the only time financial management surfaced as an issue was in mid-2009 when a mission agreed upon a corrective action plan to address moderate shortcomings—recommendations to better record quality control processes. Audits were submitted in a timely fashion, and contained unqualified opinions. Also to maintain fiscal prudence a buffer was maintained to guard against exchange rate risk and hence there is a small amount undisbursed at project closure from this buffer.

2.5 Post-completion Operation/Next Phase/ and Other Relevant Partners

The GOC has internalized the products, intermediate outcomes, and activities financed by the Project. Several project-financed activities have already been incorporated under Implementing Agencies' routine responsibilities, and will no doubt count on continued financing through the Government's normal budgetary channels (e.g., activities under Component A implemented by IDEAM). Nevertheless, the Government has continuously sought external financing, both for the technical and financial assistance that it brings, for implementation of specific adaptation programs in different ecosystems, and for furthering its institutionalization of climate change adaptation in its institutional framework and programs. The Government has so far been able to secure steady funding from a variety of sources. Though the Government has expressed a desire for a follow up project there is no specific Bank operation that will provide continued financial and technical assistance for the activities the Project put in place. Colombia continues to receive strong support for its efforts to both mitigate and adapt to climate change from other donors. Related activities such as a recently approved US\$10 million Additional Financing for the Sustainable Development Investment Project, will support broad improvements to promote environmental sustainability. The Inter-American Development Bank is providing a strong program of assistance in support of Colombia's climate change adaptation efforts. This program includes a series of policy-based loans in support of a *Programa de Reformas de la Gestión del Riesgo de Desastres y Adaptación al Cambio Climático*, and several smaller grants, studies and agreements for technical cooperation for: Sustainability of Marine Ecosystems in San Andrés Archipelago (US\$3 million grant, ongoing); Adaptation to Climate Impacts in Water Regulation and Supply Area of Chingaza (US\$0.9 million grant, that will provide continuity to activities financed under Component B of the Project, under preparation); Pacific Coast Sustainable Development Program (US\$40.0 million loan, ongoing, co financed by US\$7.0 million from the Nordic Development Bank and US\$10.0 million from the Nordic Investment Fund); Environmental Conservation Based on Pira-Parana's Traditional Knowledge (Technical

Cooperation, financed by the Finnish Technical Assistance Program); Support to the Institutional Strengthening of the MAVDT in Climate Change (Technical Cooperation); Support to the Colombian Adaptation Agenda, through IDEAM (Technical Cooperation); Integrated and Adaptive Management of Water Resources in Colombia (Technical Cooperation); Design of the new Ministry of Environment and Sustainable Development (Technical Cooperation). Several other donors, including bilateral have also committed to supporting Colombia's adaptation agenda. In addition, the GOC recently allocated \$29 million to strengthen the hydro meteorological network and early warning system in the country, based on the successful results gained from IDEAM. During implementation, the Government began discussing with the Swiss Government an additional financing in the amount of US\$5 million to expand the identified adaptation measures in high mountain ecosystems given their importance in terms of water regulation and biodiversity.

3. Assessment of Outcomes

3.1 Relevance of Objectives, Design and Implementation

The Project and its objectives, its design and the implementation arrangements that it put in place remain relevant to the Government's, the Bank's and GEF's assistance strategies and priorities.

The Government's NC2 provides greater details on Colombia's vulnerabilities to climate change and potential impacts for the period 2011-2040, based on a detailed vulnerability assessment made possible, in part, by the Project. In Section 5, of its NC2, the Government states: "Given the progress that Colombia has made in its environmental and sector policies and regulation, the actions for adaptation proposed are largely addressed to the strengthening of actions already taken, but which require consideration of climatic variable in planning and execution". NC2 highlights the Project, among two others, as one of the Government's initial pilot activities in the area of adaptation to climate change⁶. The Project and its outputs and its implementation experience have also contributed to the Government's adaptation approach in national, regional and local programs and projects in several policy documents, including the *Plan Nacional de Desarrollo 2010-2014*, the *Plan de Acción Ambiental 2010-2014*, the *Política Hídrica Nacional (2010)*, the *Política Nacional de Cambio Climático*, under preparation, among others.

The Project is also consistent with the Bank's Country Partnership Strategy for Colombia 2011-2016, which continues to embrace Colombia's environmental agenda as central to its assistance priorities. The second of three strategic priority focuses on promoting sustainable growth with greater climate change resilience, through improvements in urban development, enhanced disaster risk management, and improved environmental management. Finally, the Project is consistent with GEF's Strategy on Adaptation to Climate Change. The goal of GEF's Adaptation Strategy in 2010-2014 is to support developing countries to increase resilience to climate change through both immediate and longer-term adaptation measures in development policies, plans, programs, project and actions. Among the expected outcomes of GEF's strategy, the following are particularly relevant to those of the Project: (a) adaptation objectives and budget allocations

⁶ The other projects are: Definition of Vulnerability in the Bio-Geophysical and Socio-Economic Systems due to a Change in Sea Levels in the Coastal Areas of Colombia, financed by the Dutch Assistance Program for Studies on Climate Change, and Integration of Ecosystems and Adaptation to Climate Change in the Colombian Massif, financed by the UNDP and IDEAM.

incorporated in broader development frameworks; (b) risk analysis and vulnerability assessment incorporated as part of development programs and project planning; (c) adaptation practices developed and implemented to respond to climate change-induced stresses in development sectors and vulnerable ecosystems; (d) climate change and variability-induced disaster planning mechanisms developed and applied; (e) awareness raised and communities involved in disaster planning, preparedness and prevention; and (f) strengthened institutional adaptive capacity to implement adaptation measures.

The Project's design, and its implementation arrangements were at the time of Appraisal and continue to be highly relevant to the Government. Although its scope was wide and complex, and it may be argued that it contained an excessive number of small components, it responded and continues to respond to the Government's stated adaptation priorities and continuing adaptation challenges, and, most importantly, to the Government's existing institutional framework and realities through which it will continue to embrace adaptation in the design and implementation of development programs. Moreover it helped bring several agencies around the same table to tackle a common problem.

3.2 Achievement of Project and Global Environmental Objectives

The Project met its Development Objective that was to support Colombia's efforts to define and implement specific pilot adaptation measures and policy options to meet the anticipated impacts to climate change. In several cases, the Project exceeded the targets established for each of the Key Indicators used to measure progress. The Project also made progress towards its implicit Global Environmental Objectives⁷. Although in retrospect those Key Indicators may not have been the most appropriate (see Section 2.1), they were the indicators defined in the PAD and the evaluation of achievement of PDOs and GEOs follows progress towards targets for those indicators presented in the PAD. The Project outputs, by component, are presented in the Annex. The contribution of these outputs, towards the achievement of the Project and Global Environmental Objectives are described below.

The Project succeeded in providing continuous, reliable climate information to monitor major climate change vulnerabilities in health, mountain ecosystems and insular areas. IDEAM's capabilities for climate modeling and forecasting, and weather forecasting were upgraded, with information widely disseminated to interested parties. Weather data and climate change projections are published as a matter of routine on IDEAM's website. The information from IDEAM's 157 stations produces are currently used to generate forecasts and alerts for the National System for Disaster Prevention, the Office of the President, and other Governmental Departments and Municipalities, in charge of power and water generation. In addition, the detailed scenarios produced by IDEAM on climate change are frequently requested by the National Planning Department, Ministries research centers such as CIAT, and National Universities.

⁷ The PAD did not include explicit Global Environment Objectives. It mentioned that the Project would include (i) activities within natural resources management context that generate global environmental benefits, and (ii) adaptation measures that provide other major development benefits (e.g., WEHAB, i.e. water, energy, health, agriculture, biodiversity). It further stated that project activities aim at preventing degradation of global commons, and that the health component protects the global commons by addressing the increase in exposure to tropical vector diseases associated with a warming climate, and therefore mitigates the social and economic consequences of climate change.

The Project also succeeded in implementing and monitoring multiple pilot activities in a high mountain ecosystem and in Caribbean insular areas, in incorporating adaptation programs in the design of land-use plans in two municipalities, and in strengthening performance, monitoring and protecting of key marine ecosystems. Guidelines on land-use planning in high mountain ecosystems were prepared. The Project was less successful in incorporating management measures to meet increased threats from dengue and malaria induced by climate change in the public health programs, although significant progress was made in identifying the factors that lead to increases in transmission of malaria and dengue, defining priorities for action, and in bringing the INS on board to begin merging epidemiological and climate data together for purposes of early warning of possible outbreaks. Instead of creating a new SIVCMD, the Project supported a further strengthening of the Government's Sistema de Vigilancia en Salud Pública (SIVIGILA) by incorporating climate as a determining factor, both directly and indirectly in the transmission of malaria and dengue, at the central (INS) and local levels (through the secretarias locales de salud). The results have been included in regional health plans, which include a strategy for prevention and control of these diseases.

What the Project's PDO did not capture, was the positive institutional impact that it would have in bringing the Government together towards embracing the challenge of climate change by introducing adaptation as an almost cross-cutting theme across government programs (Section 3.5 (b)). The Project became the Government's flagship adaptation program and was used to inform a wider effort at formulating adaptation policy and was highlighted in global forum. The Project's preliminary results were the basis of the section on adaptation in the Government's NC2. Results and experience obtained in project implementation have been used for the drafting of the CONPES note on climate change policy, and the Government's National Development Plan 2010-2014 embraces adaptation as a central theme. In this sense, this first, cross-sectoral and broad adaptation project went far beyond what were defined as its PDOs. As one example, the experiences generated from INAP have been incorporated in a current project by the UNDP entitled: "Strengthening of institutional capacities for integrated risk management in the Caribbean", which looks to generate similar initiatives.

3.3 Efficiency

The PAD presented a preliminary economic analysis of selected adaptation measures in each component that was carried out during preparation to illustrate the economic efficiency of the type of adaptation measures covered by the Project. The analysis assessed direct economic benefits and costs associated with the adaptation measures applying standard economic methodology. Through this analysis, the cost-benefit ratio was calculated for each adaptation measure resulting in higher economic benefits than cost in all cases: 1.93 for measures in the High Mountain Ecosystems (Component B); 2.44 for measures in the Caribbean Insular Area (Component C); and 3.7 for measures under the Health Component (Component D).

During implementation, CI updated this cost-benefit analysis of the various adaptation measures (by Component) supported by the Project using more reliable data generated based on implementation experience. This was one of the first cost-benefit analyses of adaptation measures carried out in the country. The analysis categorized adaptation measures as those that have a direct impact on the areas affected by climate change, and those that ensure the sustainability of the former. To estimate the economic benefits of adaptation measures under Components A, B and C, the analysis estimated the loss in economic benefits expected to result from climate change in the regions where the pilots were implemented, and the reduction in this loss that could be expected to result with the implementation of the pilots. These were estimated for agricultural

markets, energy, tourism, fisheries, and water supply over the 2011-2050 period for the following departments in Colombia: Cundinamarca, Bolivar, San Andrés, and Bogotá D.C. The analysis confirmed the positive impact of the adaptation measures carried out under the Project, in terms of the net present value of their costs and benefits. Although the results differ by sector and department, the results vary from 0.5 to 3.4 percent for the period 2010-2050. These updated results were very similar to those that had been calculated during project preparation.

A similar exercise carried out for estimating the cost-benefit of health-related activities under Component D. The exercise estimated, by municipality, the number of cases of malaria and dengue that would be avoided, under various climate change scenarios, and the treatment and other indirect costs, such as lost productivity, which would be avoided. The results revealed that the cost-benefit varied by municipality, mostly as a function of the number of cases of malaria and dengue that could be avoided. A large portion of the costs needed to treat malaria and dengue in view of climate change, varied greatly in each of the municipalities, but the costs associated with treating malaria showed significant reductions in some municipalities. On the basis of the municipal-level findings, the exercise then estimated potential cost-benefit of implementing health activities at the national level. In the pessimistic climate scenarios (A2), the costs associated with mitigation of malaria are extremely high given the marked impact of an increase in precipitation on the number of malaria cases. Under scenario B2, the costs to contain transmission of malaria and dengue are still significant, but lower ranging from 0.1 to 1.7 percent of GDP (in 2010), depending on the strain of each disease.

Based on these findings, the analysis then estimated the cost of a national climate change adaptation strategy focused on ecosystems, analyzing several scenarios in which a portion of the social costs would be reduced. The general finding is one of positive net benefits, but there are caveats discussed below that need to be considered in interpreting these results. These exercises are illuminating but the results should be treated as tentative since the economic analysis of future outcomes that are uncertain is complex and difficult. Uncertainties abound not only in terms of the future climate impacts but also the type endogenous adaptation that might occur, as well as the evolution of the future economy. If there is diversification away from climate sensitive sectors, then impacts would diminish and vice-versa. In sum these estimates are to be viewed as contingent upon implicit and explicit future scenarios.

Project costs, by component, are presented in Annex 1. With limited resources, the Project succeeded in putting in motion a process, that has been embraced by the Government at all levels. While one could argue that the Project does not have resources to sustain the implementation of the various individual pilots it put in practice, the use of those resources across diverse activities and ecosystems served to promote broader recognition of the challenges and urgency for internalizing climate change in development programs, and to mobilize and secure continued funding for project-implemented initiatives from diverse sources of funding, including the Government.

3.4 Justification of Overall Outcome Rating

Rating: *Satisfactory*

The Project's Overall Outcome Rating for its Development Objectives is Satisfactory. The Project continues to be relevant to the Government, to the country, and to the broader international community, despite the plethora of new adaptation projects that have emerged and benefited from the pioneers. The Project has largely met its Key Performance Indicators, which as formulated represented outputs that could be used to inform policy makers or provide models that could be implemented, adjusted and replicated in similar ecosystems. More importantly, the

Project had an important impact over and above original expectations in that it provided a catalytic force to inform Government policy on adaptation, on the definition and strengthening of institutional responsibilities at all levels of Government, and on definition and modeling of successful working arrangements with external stakeholders and beneficiaries of adaptation initiatives, on a subject that by definition requires successful, long-term and fluid engagement among multiple actors. Initial estimates point to positive net benefits, and a leveraging of limited Grant resources through broader international and Government financial support for the initiatives the Project implemented. On a broader level, Colombia has shared its experience under the Project in several fora throughout the region, and elsewhere and the Project helped reinforce the country's reputation.

At the time of finalizing this Implementation Completion and Results Report (ICR), the Independent Evaluation Group had prepared a draft assessment of the Project, as part of a broader review that the group is conducting of climate change adaptation projects financed by the GEF and the Bank. The findings of the assessment have not been incorporated or cited directly in this ICR since the assessment has been sent to the Government for comment and the Government has provided extensive and important comments on its findings. The assessment is still in draft as a result.

3.5 Overarching Themes, Other Outcomes and Impacts

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

There were no explicit poverty related objectives though it is anticipated that by reducing vulnerability the project might have improved resilience of climate sensitive livelihoods where pilots were undertaken. The pilots in high mountain ecosystems benefited more than 90 families directly; water supply pilots under Component C benefitted around 230 persons. However, the Project did not collect data on net assets, income or consumption patterns before and after interventions, which would provide the most robust evidence of resilience to diverse shocks.

(b) Institutional Change/Strengthening

The Project's greatest, perhaps unexpected, impact was institutional in creating a new framework for embracing adaptation to climate change in Government. (Institutions were strengthened through the process of implementing the activities for which they were responsible under the Project, as opposed to through the allocation of technical assistance or other direct funding aimed at their strengthening.) The Project also provided a new model of working together synergistically across institutions at all levels, and with stakeholders and beneficiaries. More than the specific pilots that it financed, it developed a working model for incorporating adaptation as a central element of sustainable development throughout the country, the implementation of which is now being financed by other sources (Section 2.5). By promoting this institutional capacity and testing these working arrangements the pilot activities should not be considered one-off models that financed only discrete activities in diverse ecosystems, but rather as a process that served as a catalyst for a new way of embracing adaptation to climate change in Government policies and programs.

Several factors led to this impact. This was the first strict adaptation to climate change project in a country that is seen as extremely vulnerable to climate change, with a Government committed to the need for embracing adaptation. IDEAM, the Government's interlocutor on topics relating to climate change, is part of the national government and its relations with other departments and

ministries in Government are fluid. Not only was its capacity to provide critical information strengthened, but it played a central role in disseminating this information and the Project's experience, promoting greater focus to adaptation in projects, in diverse seminars, locally and abroad, and in government policy documents. It has provided input to NC2 and to the CONPES document that incorporates experience under the Project. The Project's Steering Committee that included representation of ministries not directly implementing activities under the Project was also influential. IDEAM, INVEMAR and Coralina's work on pilots, disseminating information on potential impacts of climate change to and directly engaging beneficiaries in the definition and implementation of adaptation pilots, has brought about a new consciousness among communities to the possible threats they face and the need to be proactive. Finally, the INS has embraced climate change as an important determinant of health surveillance, especially insofar as transmission of malaria and dengue are concerned. The incorporation of climate data in the SIGIVILA has been very successful in helping the Government address outbreaks of diseases as a consequence of the la Niña phenomena in 2010/11.

(c) Other Unintended Outcomes and Impacts

N/A

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

N/A

4. Assessment of Risk to Development Outcome

Rating: *Moderate*

The Risk to Development Outcome for this Project involves three considerations. The first, is the risk that the Government will not give continuity to the process that the Project assisted in putting in place, whereby adaptation has become an integral aspect of the country's development programs and projects, and that needed, reliable information provided by responsible Government agencies (e.g., IDEAM are provided in a timely fashion) will continue to be available as and when needed. This risk is considered small since the Government is aware of the risks of climate change. There is also the risk that initial results of processes put in place in the pilot projects included under the Project, could not be continued due to lack of funding, at least in the short-run. This risk is greater and high, although to-date continued funding has been made available (Section 2.5). Finally, there is the risk that individual implementing agencies under the Project, now that it is completed, may not continue to adopt adaptation as part of their normal work. This risk is small, especially since climate change concerns have now been fully incorporated in major policies in climate sensitive sectors such as water and agriculture. The Risk to Development Outcome is considered Moderate overall.

5. Assessment of Bank and Borrower Performance

5.1 Bank

(a) Bank Performance in Ensuring Quality at Entry

Rating: *Satisfactory*

Bank Performance in Ensuring Quality at Entry is rated Satisfactory. The Bank seized the opportunity to mobilize a new source of funding (SPA) to respond to a priority (adaptation to climate change) that had been identified by an engaged client that could provide to the broader

international community needed lessons in the implementation of innovative adaptation projects. In doing so, the Bank had few, if any, examples to follow with lessons from which to help frame a pioneering project, and there were very few staff in the Bank—and indeed worldwide—working on climate change (both mitigation and, especially adaptation), at the time. The Project, as designed, responded to the clients’ priorities as had been set forth in NC1. The Results Framework, as designed, was cautious, and limited to what a project that addressed a long-term challenge could reasonably accomplish in the near term with the exception of the framing of Component D that ambitiously targeted a 30 percent reduction in Malaria and Dengue Morbidity. However, in hindsight, when the Project was designed there was little information about the relationship between climate change and the outbreaks of tropical vectors. The Bank assisted in bringing consultants and external reviewers whose input was extremely productive in filling the information void that existed, and incorporating climate change in health monitoring systems.

(b) Quality of Supervision

Rating: *Satisfactory*

The Bank’s supervision was timely, proactive and engaged throughout implementation. In all, during implementation, the Bank mounted ten missions, in which all of the Project’s components were supervised, including in most cases at the local levels. It addressed the few implementation issues that arose proactively, in a manner that resulted in their rapid resolution. The Bank’s Project preparation team was extremely engaged, and anxious to show case the Project, its implementation and results in international events through seminars and other meetings that it organized, and to bring representatives from other countries to Colombia to learn about its experience and implementation first hand. There was undoubtedly Government ownership of the Project (see Section 5.2 (a) below). The Mid-Term Review, carried out on schedule, was structured as an opportunity for engagement, and for disseminating and engaging Government officials not directly involved in project implementation. The Project’s Implementation Status and Results Reports report that “early preparation for the MTR has proven very productive as all task teams are conducting a detailed review of their commitments, resources, execution times, coordination needs and potential synergies with other groups. During the MTR visit in June 23-27 2009, meetings with most line ministries (environment, energy, social affairs, agricultures, finance) are scheduled in order to explore further the synergies of the climate change adaptation activities supported by the project with sector policies.”

(c) Justification of Rating for Overall Bank Performance

Rating: *Satisfactory*

Overall Bank Performance is rated Satisfactory, based on the ratings for Bank Performance for Ensuring Quality at Entry and Quality of Supervision.

5.2 Borrower

(a) Government Performance

Rating: *Satisfactory*

The Government’s Performance is rated Satisfactory. The Government demonstrated unwavering commitment to the Project, and to adaptation to climate change in general. It internalized the Project’s outputs and results, and used and applied them eagerly in the preparation of not only official communications to the UNFCCC, but also in the Government’s policies, procedures and general modus operandi, as reflected in numerous policy documents, including its National Development Plan 2010-2014. It promoted two high-level national seminars on climate change; the focus of the second seminar in September 2011 was on adaptation to climate change. It

shared the findings of implementation experience with the broader international community through seminars, at the COPs, and by disseminating these in official Government communications.

(b) Implementing Agency or Agencies Performance

Rating: *Satisfactory*

The Implementing Agencies Performance is also rated Satisfactory. IDEAM readily assumed its role as overall coordinator of project implementation, and showed continued commitment to its objectives, implementation and dissemination of results, including incorporating its findings in relevant Government documents. Coralina, INVEMAR and INS carried out their activities in a timely and quality fashion, realizing that they needed to engage communities in their efforts to develop a mind-set geared towards viewing climate change as a reality, and adaptation as a mechanism to address for their sustainable development. CI-Colombia provided consistent, proficient support for the Project's administrative and technical processes, addressing the few emerging issues without hesitation, and as a result provided invaluable support to the Project's implementing agencies, that were able to concentrate efforts on implementation and not mostly administrative management. CI was also proficient in facilitating dialog among agencies and between the agencies and the Bank, and did an excellent job in coordination and project management. Finally, the role of the Steering Committee, through consultation with IDEAM ensure the coordination required (at the highest levels) for this institutionally complex project to meet its expected outcomes effectively and expeditiously, and for its accomplishments and institutional strengthening and coordination arrangements to be internalized.

(c) Justification of Rating for Overall Borrower Performance

Rating: *Satisfactory*

Overall Borrower Performance is rated Satisfactory based on the ratings for Borrower Performance and Implementing Agencies Performance.

6. Lessons Learned

The Project was prepared with the benefit of very few lessons, in a rapid manner to respond to the client's request. In hindsight, it might have been possible to formulate a more detailed, refined project, but it is not clear that the delay in preparation that this would have entailed would justify the more precise definition of components, research studies, and focus. While not necessarily in the research sense, the project provided on the ground, real life experiences that are of unquestionable value in the design of new programs. When moving into unknown territory, with innovative projects, it is probably best to accept taking measured risks and to spread these risks; hence, the approach of supporting disparate activities in an effort to promote understanding across a broad adaptation front. The Project's broad focus, spanning diverse adaptation challenges (as opposed to focusing on one only) had the benefit of acting as a catalyst for mobilizing multiple sources of funding for providing continuity to and expansion of the activities it piloted. But of course this comes at a cost of being too diverse and loss of focus.

The value of including pilot projects, or experiments, in a project that focuses on a new theme, lies not only in the value of the pilot projects themselves, or their sustainability. The value of including pilot projects, even if their outcome is not entirely positive, lies in their becoming catalysts or experiments to test new models of government cooperation, at all levels, with local organizations and beneficiaries. This type of project can provide a catalytic force in bringing

institutions that would ordinarily not coordinate routinely to work cooperatively on a topic that by definition requires cross-sectoral cooperation. While the pilots may not always be the best choices or entirely successful, the fact that their design and implementation require definition of new approaches and models of engagement among various actors, that can be replicated, adjusted and perfected with experience, in itself justifies the use of a variety of pilots.

Adaptation is at the center of sustainable development. For adaptation programs to be successful, information and inputs need to be top-down, bottom-up and sideways. The benefit of this Project, that incorporated all of these modalities, lie in the experience that it generated for internalizing adaptation in the Government's programs at all levels.

Communities that have been made aware of potential consequences of climate change have become totally receptive to adaptation programs, and have become proactive in changing and adapting their systems in order to improve their livelihoods and reduce their vulnerabilities.

Communities that perceive that Government institutions address their concerns and suggestions become motivated and participate in the development and design of projects that produce sustainable initiatives. For projects to be successful, community involvement from the outset is important.

By definition, adaptation to climate change is a medium- to long-term commitment. In this sense, teams should be careful in defining projects' results framework to avoid including, as indicators to measure progress, those that represent outcomes (e.g., 30 percent reduction in incidence of malaria and dengue), for which it would be unreasonable to expect noticeable impact during five years of project implementation. The ultimate measure is resilience to shocks and this calls for incorporation of climate-sensitive assets, or income as indicators of immunity to climate shocks and variations.

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

(a) Borrower/implementing agencies

NONE

(b) Cofinanciers

(c) Other partners and stakeholders

(e.g. NGOs/private sector/civil society)

Annex 1. Project Costs and Financing

(a) Project Cost by Component (in USD Million equivalent)

Components	Appraisal Estimate (USD millions)	Actual/Latest Estimate (USD millions)	Percentage of Appraisal
Total Baseline Cost			
Physical Contingencies	0.00		
Price Contingencies	0.00		
Total Project Costs			
Project Preparation Facility (PPF)	0.00		
Front-end fee IBRD	0.00		
Total Financing Required			

(b) Financing

Source of Funds	Type of Cofinancing	Appraisal Estimate (USD millions)	Actual/Latest Estimate (USD millions)	Percentage of Appraisal
Borrower		7.20	0.00	.00
Global Environment Facility (GEF)		5.40	0.00	.00
Foreign Private Commercial Sources (unidentified)		2.30	0.00	.00

Annex 2. Outputs by Component

PDO	Project Outcome Indicators ⁸	Status
<p>The Project Development Objective is to support Colombia's efforts to define and implement pilot adaptation measures and policy options to meet the expected impacts from climate change</p>	<p>➤ Strengthened IDEAM capability to produce and disseminate relevant climate change information through availability of continuous, accurate and reliable climate data for adaptation initiatives of relevance to health, mountain ecosystems and insular areas</p>	<p>All 157 weather stations updated, upgraded and operating, providing accurate and reliable data. These stations are already integrated to the Hydrometeorological Network of IDEAM and the Weather Reference Network</p>
	<p>➤ Six pilot adaptation activities have been implemented and monitored in pilot areas</p>	<p>Three communal water supply systems implemented for the benefit of 227 people. Actions to reduce vulnerability of four farming systems in 8 localities identified and under implementation. Guidelines have been completed in 2 municipalities, including updated information and maps on forest fires and landslide threats</p>
	<p>➤ Guidelines to incorporate climate variability and climate change designed and integrated into regional development plans in Chingaza Massif</p>	<p>Communities have developed 9 Adaptive Land Use Plans in their territories to reduce vulnerabilities to CC. Land Use Plans of 2 municipalities, La Calera and Chocahi, incorporate reduction of vulnerability to CC and adaptation measures.</p>

⁸ This table reflects the Project restructuring that changed the area in which Component B of the Project was implemented from Las Herosas Massif to Chingaza Massif Páramo (Sections 1.6 and 1.7)

		Results of both activities are being integrated into guidelines for land use planning in High Mountain Ecosystems of Colombia
	<p>➤ Adaptation pilots designed and implemented with corresponding monitoring systems in place, for the Colombian Caribbean insular areas including increased management performance of key marine ecosystems and reduced vulnerability in water supply to local communities</p>	<p>The marine monitoring stations are installed and operating. Ecological assessments of marine protected areas executed. Guidelines for MPA management developed. Research program for CC impacts on corals underway (coral sensitivity to CC and coral reefs connectivity). Three rainwater communal systems (SMIAs) in 3 pilot areas operating benefiting 227 low-income people in San Andres Island. Performance is being monitored. Capacity building workshops implemented in other areas of San Andres Island Groundwater management plan for San Andres Island implemented. 39% increase in piezometric network to measure groundwater level and the effects of saline intrusion and its impact on water availability</p>
	<p>➤ Strengthened public health program able to meet the increased threats from dengue and malaria induced by climate change</p>	<p>Accurate climate models to forecast dengue and malaria outbreaks (75% of predictability). Models were used to predict transmission dynamics in municipalities affected by floods during La Niña in 2010-11</p>

Intermediate Outcomes	Intermediate Outcome Indicators	Status
<p>Component A: Making climate, climate variability, and climate change information available for adoption of adaptation measures and policies:</p> <ul style="list-style-type: none"> - Relevant climate change information gathered to support adaptation decision in pilot areas - Specific scenarios on climate change available for pilot areas 	<ul style="list-style-type: none"> ➤ Climate change forecast models operative and providing climate variability information in selected hydro meteorological areas 	<p>CC and CV models are available at national level, including the influence of ENSO</p>
	<ul style="list-style-type: none"> ➤ Relevant climate information supporting decisions in pilot areas implementing adaptation measures 	<p>Daily weather forecasts and climate forecasts at the national level 20X20 km operational. It includes the 24 climatic regions of the country. Weather forecasts for the Sabana of Bogota are now in place with a 5X5 km resolution. Weather forecasts for 41 main cities in the country, including rainfall and maximum temperatures, are now available every 6 hours.</p>
	<ul style="list-style-type: none"> ➤ Local climate change scenarios available in pilot areas 	<p>See above</p>
	<ul style="list-style-type: none"> ➤ Reliable and accurate data reporting from 157 key upgraded stations 	<p>Improved reference network for CC: 157 meteorological stations operating and providing data</p>
	<ul style="list-style-type: none"> ➤ 10 professionals with MS in meteorology trained 	<p>8 professionals graduated with MSC degrees, all of them currently working at IDEAM</p>
<p>Component B: Pilot adaptation measures in the Chingaza Massif:</p> <ul style="list-style-type: none"> - Improved understanding of the behavior of high tropical moorlands. - Exploration of suitable agro-forestry systems 	<ul style="list-style-type: none"> ➤ Detailed description of the water and carbon cycles in high mountain moorlands 	<p>Carbon and water cycles models (including ecological, hydrological and social variables) developed and implemented in high mountain ecosystems. Water (8) and carbon (8) monitoring networks installed</p>
	<ul style="list-style-type: none"> ➤ One agro-forest system suitable for the Rio Blanco watershed in Chingaza shows financial 	<p>Socioeconomic evaluation of an agro forestry system in High Mountain</p>

<p>that are resilient to climate change, promote environmental services and are financially viable.</p> <p>- Mainstreaming climate change issues in planning processes in project areas.</p>	<p>viability (income analysis)</p>	<p>Ecosystem finalized.</p>
	<p>➤ Guidelines for incorporating GCC issues in planning processes in the Chingaza Massif</p>	<p>Two municipal territorial plans; 8 “adaptative life plans” in 8 communities in the Chingaza area. Guidelines for land use planning in High Mountain Ecosystems developed.</p>
	<p>➤ Agro-productive systems exhibiting reduced income variability in pilot areas in comparison to control areas</p>	<p>100 agro forestry systems in 210 ha.; 24,800 kms of live fences with native species; 103 participatory ecological restoration processes; 7.1 ha restored in watersheds, landslides</p>
<p>Component C: Adaptation measures in the Caribbean insular areas:</p> <p>➤ Three sustainable communal water supply pilots built and operating</p> <p>➤ Implementation of a management plan for at least one remote atoll and keys that aim at preventing further impoverishment of coral species</p> <p>➤ Demarcation completed and implemented for no take and no entry zones in two sectors of the SF-MPA; Demarcation for no take zone in one sector of the</p>	<p>➤ Design and implementation of rain-fed communal water supply systems</p>	<p>3 rainwater communal systems (SMIA) designed and implemented in 3 pilot areas;</p>
	<p>➤ Development of guidelines and implementation of pilot management plans for atolls, keys and corals, accordingly with established MPA Guidelines (SF-MPA and CRSBeIF-MPA)</p> <p>➤ Demarcation plan for coral conservation areas in SF-MPA and CRSBeIF-MPA implemented</p>	<p>Demarcation plan for coral conservation areas in SF-MPA (100%) and CRSBeIF-MPA (20%) defined</p>
	<p>➤ Define and implement participatory enforcement strategy for SF-MPA and CRESBeIF-MPA</p>	<p>80% of “no take” areas demarcated. Marine and coastal resources guidelines developed and management plans in 20% of the area; A management plan prepared for the Cayo Bolivar and Cayo Albuquerque that contemplates five strategies: (a) productivity; (b) biodiversity; (c) studies of natural habitats and responses to natural phenomena; (d) a communication program and (e) administration and participatory evaluation.</p>
	<p>➤ Pilot guidelines designed for</p>	<p>Guidelines for housing</p>

<p>CRSBeIF</p> <ul style="list-style-type: none"> ➤ Agreements with marine resource users for MPA enforcement leading to co-management ➤ Guidelines for housing development incorporating GCC effects ➤ Population policies developed and action plan defined in SAI ➤ Center of Data Administration (CDA) and related monitoring stations established, for the analysis and dissemination of information for decision making related to climate change effects on islands 	<p>incorporating CC in housing in SAI</p>	<p>developed and discussed</p>
	<ul style="list-style-type: none"> ➤ Development of population policies incorporating GCC effects in the coastal zone for SAI 	<p>Population policy finalized and under discussion by the national government</p>
	<ul style="list-style-type: none"> ➤ Operation and maintenance of ocean automatic monitoring stations system 	<p>Increase in the piezometric network in 39% to measure groundwater level and the effects of saline intrusion and its impact of water availability in San Andres Island</p>
<p>Component D: Responses to the increased exposure to tropical vector-borne diseases induced by climate change:</p> <ul style="list-style-type: none"> • Costs of PAPs incorporated into the Basic Attention Plans • Models developed and implemented for each pilot 	<ul style="list-style-type: none"> • Implementation of IDMSCS in 24 municipalities to attain a 30% reduction in the rate of infection in the intervened areas 	<p>Early warning systems to improve malaria and dengue surveillance and control designed and implemented in 8 municipalities. Institutional capacity strengthened to diagnose and provide training in quality control to local staff in pilot areas.</p>
	<ul style="list-style-type: none"> • Develop reliable and accurate climate models to forecast dengue and malaria outbreaks 	<p>Malaria: Models have been developed in 5 pilot municipalities. There is a relation between climatic</p>

<p>municipality with epidemic potentials, entomological threshold and climate thresholds determined</p> <ul style="list-style-type: none"> • Verified entomological events generate immediate vector control response and intensifies epidemiological surveillance 		<p>data and occurrence of the disease, especially in 2 pilot areas.</p> <p>Dengue: Models have been developed in 5 municipalities. Validation process to be finalized in August 2011.</p> <p>General: Effectiveness of the methodology has been tested and priority areas for intervention have been determined.</p> <p>The impact of water storage systems has been evaluated. An additional evaluation of the indirect impacts of climate change is being carried out, including human behavior.</p>
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Project outputs, by component, were as follows:

Component (A): Making climate, climate variability, and climate change information available for adoption of adaptation measures and policies

This objective of this component, implemented by IDEAM, was to strengthen Colombia's capabilities to produce and disseminate climate information (useful for resource allocation and operational decision making), in support of adaptation to climate change measures and programs. This component had four sub-components that would strengthen IDEAM's capabilities to provide: (i) forecasts to improve resource management and biodiversity conservation decisions in high mountain ecosystems; (ii) climate scenarios to develop ecosystem management plans, land conservation and adaptation options in Páramo, insular and coastal areas; and (iii) warnings for malaria and dengue. Outputs for each of the sub-components were as follows: (i) improvements in technical and scientific capabilities at IDEAM to produce information relevant to climate change; (ii) development of local climate change scenarios in support of selection of adaptation measures; (iii) strengthening the existing climate data network of relevance to climate change by supporting equipment renovation of 157 key climate stations (out of 3100 operated by IDEAM) with at least 20 years of high quality data (for 1961 to 1990), including quality control and assurance; and (iv) strengthening scientific and technical personnel to ensure long term sustainability of the project activities.

Component A (i): Improvements in technical and scientific capabilities at IDEAM to produce information relevant to climate change

Under this subcomponent, IDEAM upgraded its computer facilities by upgrading to high capacity processors capable of handling climate modeling using CAM (Community Atmosphere Model) and climate forecasting using WRF (Weather Research and Forecast Model). The improved capability, offered by these systems, has allowed IDEAM to reduce simulation times from seven to nine hours to less than one hour. Through partnerships with MRI (Meteorological Institute of Japan), the Hadley Center (UK) and the Community Climate System Model (US), IDEAM was able to recreate and record more detailed historic climate change data. Climate change data by month was compiled for the period 1971-2000 for rain, temperature and relative humidity.

Component A (ii): Development of local climate change scenarios in support of selection of adaptation measures

Using the improvements under subcomponent A (i), IDEAM produced climate models and made climate predictions that generated a series of maps at the national level, with several resolutions and time frames. Using the PRECIS (Providing Regional Climates for Impact Studies) and ERA40 of the ECMWF (European Center for Medium-Range Weather Forecasts), IDEAM generated 25km/25km models for the 1971-2000 period, and using MRI's GSM (Global Forecast System) generated 20km/20km models for the 1979-1998 period, with rain, temperature and relative humidity data.

IDEAM produced six climate change projections under four scenarios at a resolution of 4km/4km for the period 2011-2100 using the WRF model and the results of the global CAM.⁹ The results of this modeling revealed that against an average increase in temperature of 0.13° C/decade from 1971-2000, the average temperature is expected to increase by 1.4° C from 2011-2040, by 2.4° C from 2041-2070 and by 3.2° C from 2071-2100; these increase would cause reduced rainfall in large areas of the Caribbean and Andean regions, and increased rainfall in the Pacific region, together with reduced relative humidity in certain areas of the country.

Using PRECIS, IDEAM also produced models for scenarios A2 and B2, and the produced and analyzed information for Colombia's 24 regions with respect to changes in temperature and precipitation. These models show that for the A2 (pessimistic) scenario, average temperatures could increase between 2° C and 4° C, in relation to average temperatures between 1961 and 1990.

IDEAM's climate modeling has produced different scenarios for regional and more localized areas, all of which are available on its website. Also available are the following studies prepared to document its findings:

- *Evidencias de Cambio Climático en Colombia* (2007) that presents the analysis of 1800 historical series of precipitation, and extreme high and low temperatures from 1970 to 2008;
- *Resumen Ejecutivo Sobre Escenarios de Cambio Climático* (2010)
- *Escenarios de Cambio Climático en Colombia* (2010)
- *Nota Técnica Cambio Climático en Temperatura, Precipitación y Humedad Relativa para Colombia usando Modelos Meteorológicos de Alta Resolución (Panorama 2011-2100)* (2010)

Component A (iii): Strengthening the existing climate data network of relevance to climate change by supporting equipment renovation of 157 key climate stations (out of 3100 operated by IDEAM) with at least 20 years of high quality data (for 1961 to 1990), including quality control and assurance

IDEAM upgraded its climate data network, including 157 climate stations (11 of which are new), 102 higrathermographs, 28 raingauges, 12 heliographs, 12 anemometers and 12 psicrometers, all of which were integrated in the climate stations. All of the stations have been incorporated in IDEAM's network and count on continued maintenance in accordance with the institution's maintenance program. This has produced a significant improvement in providing higher precision, longer forecast periods, and real time weather forecasts.

Component A (iv): Strengthening scientific and technical personnel to ensure long-term sustainability of the project activities

IDEAM staff, through implementation of the Project that involved partnerships with international partners (MRI, IRI, and others), had numerous occasions to benefit from their experience and the assistance they provided as input to the implementation of subcomponent A(i), A(ii) and A(iii).

⁹ These scenarios included A1B, A2, B2, A1B with sulfates, A2 with sulfates and B2 with sulfates. The scenarios with sulfates consider the presence of aerosols (SO₂, SO₄) that imply less warming of the land mass.

In addition, 10 persons obtained their Masters' Degrees in Meteorology at the Universidad Nacional de Colombia. Of these, nine have been incorporated at IDEAM assigned to monitoring, processing information and analysis and interpretation of climate change in Colombia, for work on different projects.

Component (B): Design and implementation of an adaptation program that supports maintenance of environmental service (including hydropower potential) in the Las Hermosas Massif in the central range of the Andes

The objective of this component was to implement, monitor and address vulnerabilities to climate change in a high mountain ecosystem. Massif is the most humid high altitude moorland in the planet. Hence, it is considered a highly diverse biotope of particular concern for climate change impacts. It is also important for potential hydropower generation. The selection of Massif was made on the basis of the significant biodiversity in the ecosystem, including endangered or threatened species. The selection of Las Hermosas would provide synergies between the Project and the Amoya River Project, which sought to reduce greenhouse gas emissions from the power sector. This component, implemented by IDEAM, was to support the following activities: (i) ecosystem planning and management in Las Hermosas Massif, to maintain its high biodiversity assets; (ii) maintenance of potential for hydropower generation through adoption of measures to protect the Amoya watershed; (iii) adaptive land-use planning model that sought to reduce impacts from climate change on land degradation; (iv) improvement of productive agro-ecosystems and reduction of their socioeconomic vulnerability to GCC impacts. The Project sought to maintain the existing level of access to environmental services. For practical reasons responding to security concerns in accessing the Las Hermosas area, activities under this component were implemented in the Chingaza area, following a project restructuring (Section 1.7).

Component B (i): Ecosystem planning and management in Chingaza, to maintain its high biodiversity assets

IDEAM identified, early on, a need for greater information on and modeling of water and carbon cycling to understand the potential impacts of climate change in a high mountain ecosystem. IDEAM established eight watershed monitoring stations to record flows in the Rio Claro basin in the Parque Nacional Natural los Nevados and in the Chingaza Massif, and eight carbon monitoring stations in the same areas. The Government of Japan provided support for the implementation, validation and modeling of this water and carbon cycling.

For water cycling, IDEAM adopted the SWAT (Soil and Water Assessment Tool of USDA, 2002), that monitors water storage, streamflows, drainage, etc. The results conclude that flows are influenced directly by the conditions of the ecosystems in which the rivers are located, which corroborates the need to conserve and manage high mountain ecosystems to guarantee water levels. IDEAM also monitored glaciers to determine their potential effect on the hydrological cycle in high mountain ecosystems. Following work it had begun in 2005, IDEAM established a monitoring station in the area of the Glaciar Conejeras to research the effects in changes. The research revealed that in glacial areas there is an inverse relationship between precipitation and an increase in water levels.

For carbon cycling, IDEAM developed a protocol for monitoring in association with the International Center for Tropical Agriculture (CIAT), on the basis of which it selected locations for monitoring, determined methodology and analyzed data. Several documents were prepared to record this initiative, including: (a) *Instructivo para el monitoreo e evaluación del ciclo del*

carbono en la vegetación y suelos de ecosistemas de alta montaña (IDEAM, 2009); (b) *Caracterización preliminary del ciclo del carbono* (IDEAM, 2009); and (c) *Metodología para la captura de información de carbono en los sistemas productivos ky su integración en el monitoreo del ciclo ce carbono* (IDEAM, 2009). The carbon modeling included the construction of a database of the information monitored over the three year period, including: species growth, biomass, decomposition, etc., in each of the sites. Preliminary results show that the greatest concentrations of carbon are found in densely forested ecosystems, due principally to the slow and continuous decomposition in those systems.

Component B (ii): Maintenance of potential for hydropower generation through adoption of measures to protect the Rio Claro watershed¹⁰

Under this subcomponent, IDEAM worked with local communities to implement activities aimed at restoring degraded areas and adopting sustainable production systems. The activities implemented benefitted about 850 people in different rural communities that were directly involved, and indirectly about 15,000 people that reside in the river basin. Following a detailed study to understand land use that included mapping of land cover, that was provided in a detailed study, *Formulación e Implementación de una Estrategia de Restauración Ecológica del Paisaje*, IDEAM prepared a detailed proposal on how to structure this activity: *Memoria técnica y cartográfica y documento de criterios para la formulación del plan de restauración, conservación y manejo de las coberturas de la tierra*. The proposal prioritized different areas for ecological restoration, based on existing practices and perceived threats. The areas selected included: (a) *páramo* areas that have been threatened or lost natural cover due to fires, cattle raising or agriculture; (b) forest areas not appropriate for agriculture that have been threatened by fires or other unsuitable practices; (c) forests and river banks that have been threatened by deforestation; (d) river banks that have lost vegetal cover; (e) forest reserves or national parks that show signs of deterioration in cover; and (f) areas that have suffered from superficial water erosion.

IDEAM worked with local communities, involving them through learning sessions aimed at exchanging ideas and proposals. The communities provided input with respect to plant species that should be used for restoration and definition and input of traditional their traditional practices, thereby securing their involvement and commitment. The communities were responsible for 198 individual proposals in areas that were considered of importance to maintain water levels, and for establishing 24.8 kilometers of living fences. In order to promote sustainability, an experimental center for germination and propagation of species native to the high mountain ecosystems in the Andes was constructed.

Component B (iii): Adaptive land-use planning model that sought to reduce impacts from climate change on land degradation

IDEAM worked with two municipalities, La Calera and Choachi, in adapting their land use plans in a manner that would reduce the impacts from climate change. Providing technical assistance

¹⁰ The area was changed to Chingaza and Río Blanco Watershed.

directly to the municipal governments, IDEAM provided training to the *Juntas de Acción Comunal*, and other local actors involved in territorial planning. To support this process, IDEAM defined the *Estructura Ecológica Territorial Adaptativa* (ETTA), which includes mapping of land use and productive systems, vulnerability and threats by activities such as mining and fires, among others. The initiative was prepared at a scale of 1:25,000 which was considered sufficient for decision-making. The ETTA was used as the principal instrument through which these municipalities could incorporate climate change and protection of ecosystems in land-use planning decisions. IDEAM also worked with eight communities in developing *Planes de Vida de Adaptación*, a process for disseminating to and involving local communities in adaptation to climate change through explicit agreements with the communities.

Component B (iv): Improvement of productive agro-ecosystems and reduction of their socioeconomic vulnerability to GCC impacts

Under this subcomponent, IDEAM promoted agro-forestry systems to build resilience and reduce vulnerability of high mountain productive systems to the effects of climate change. Following a detailed analysis of land-use and of the local communities, IDEAM classified different areas according different environmental, socio-cultural and economic categories, and established four production systems for the area of the Rio Blanco basin, in Chingaza. Over 200 farms have been categorized, and 90 productive units have land management plans formulated, based on sustainable and economically viable activities, benefitting about 280 persons. Several other activities were implemented including, 74 organic orchards, 10 stables, and other initiatives that will reduce the socio economic vulnerability of beneficiary families.

Component (C): Adaptation measures in Caribbean Insular areas
(Total Cost US\$2.9 million; GEF funding US\$1.3 million)

The objective of this component, implemented by the Instituto de Investigaciones Marinas y Costeras (INVEMAR) and the Corporación para el Desarrollo Sostenible del Archipiélago de San Andrés, Old Providence y Santa Catalina (Coralina), was to support the implementation of physical adaptation measures in order to reduce the vulnerability of the Caribbean Insular area, especially with regard to changes in rainfall and temperature and sea-level rise. The activities under the component were to include: (i) implementation of Global Ocean Observing System-based monitoring stations in the Western Caribbean (complementing the regional network under CPACC); (ii) integrated water resources management to enhance the availability of fresh water in the Caribbean Insular areas (San Andrés Island); (iii) implementation of the marine-protected areas system in the Seaflower Reserve and the *Corales del Rosario, San Bernardo e Isla Fuerte* (CRSBeIF) in order to contribute to the conservation of marine ecosystems in the face of climate impacts; and (iv) Integrated Coastal Management to reduce the vulnerability of ecosystems, infrastructure and populations living near the coast. The Project sought to maintain resilience of insular areas to climate impacts.

Component C (i): Implementation of Global Ocean Observing System-based monitoring stations in the Western Caribbean (complementing the regional network under CPACC)

INVEMAR established two additional water and atmospheric stations near Parque Nacional Nuestra Señora del Rosario y San Bernardo and in Johnny Cay in San Andrés Island. These meteoceanographic stations provide data that is stored and analyzed in a central database, CAD (Centro Administrador de Datos), developed by the Project and established in Santa Marta. Each

station provides real time updates of fifteen land and water parameters, via satellite on an hourly basis. The parameters include: wind velocity and direction, solar radiation, air temperature and humidity, atmospheric pressure and precipitation, as well as chlorophyll, salinity, conductivity, free oxygen, pH, TSM, turbidity and water level. The information is automatically connected to a Caribbean wide database. This subcomponent has also provided capacity strengthening to INVEMAR in analyzing oceanographic and marine meteorological data through formal and on-the-job training, and well as on maintenance of equipment at the water and atmospheric stations. INVEMAR has used the data generated from these and other stations to analyze the effects of climate change on marine corals.

Component C (ii): Integrated water resources management to enhance the availability of fresh water in the Caribbean Insular areas (San Andrés Island)

The Project worked with local communities on the island San Andrés in the design and development of management tools that respond to local conditions, and that will permit regulating the use of the limited resources to which they have access. This effort was especially important since it brought attention to these communities regarding the need to put in place measures geared towards adaptation to climate change. One of the adaptation strategies involves programs designed to make efficient the use of water (rain and residual). The Project designed pilot projects in marginal areas of the San Andrés Island where provision of water is an issue. From among eleven prescreened investments, the Project financed the implementation of three: Ciudad Paraíso, Tom Hooker and Schooner Bighth where “integrated water management systems” were constructed. These three systems benefitted around 228 persons (48 families). The infrastructure involved the construction of canals to capture rainwater, tanks for storage and piping for distribution; for sewage the systems rely on channeling residual water to a simple treatment facility. These works were complemented with training for the beneficiaries in operating, maintaining and monitoring these simple systems, and distribution of water filters.

The Project financed a simulation model of the San Andrés aquifer. The model permits analyzing the behavior of the aquifer under different climate change scenarios. This is an important tool for decision-making regarding the management of water resources. As part of this, the Project financed the construction of nine observation wells, which brought the number of total piezometers to 32, as part of the management plan of underground water resources.

Component C (iii): Implementation of the marine-protected areas system in the Seaflower Reserve and the Corales del Rosario, San Bernardo e Isla Fuerte (CRSBeIF) in order to contribute to the conservation of marine ecosystems in the face of climate impacts

Coralina and INVEMAR established and marked Marine Protected Areas (MPAs) in two locations: Corales del Rosario, San Bernardo e Isla del Fuerte (CRSBeIF) (INVEMAR implemented) and in the Archipiélago de San Andrés, Providencia y Santa Catalina in the SEAFLOWER biosphere reserve (Coralina implemented).

In CRSBeIF, INVEMAR implemented a No Take entry strategy, through the physical demarcation of the area. In the SEAFLOWER reserve, Coralina implemented three No Take zones and five No Entry zones. For both of these areas, the Project financed control and protection strategy to enforce the No Take/No Entry areas.

The Project financed a management plan for the Cayo Bolivar and Cayo Albuquerque that contemplates five strategies: (a) productivity; (b) biodiversity; (c) studies of natural habitats and

responses to natural phenomena; (d) a communication program and (e) administration and participatory evaluation.

INVEMAR and Coralina also carried out research under this subcomponent, including on: the tolerance of coral to the increase temperatures and light intensity, research on different coral species, understanding the connectivity between coral ecosystems in the Caribbean in Colombia to identify resilient reefs as a climate change adaptation strategy. The results of these research and findings of the following studies re published in the Climate Change portal and web-page of INVEMAR. The studies include: *Siguiendo la dinámica de los arrecifes coralinos en los mares colombianos*; *Resultados del taller sobre monitoreo de arrecifes coralinos en áreas marinas protegidas*; *Resultados del primer curso sobre genética de poblaciones y los resúmenes: “Instrumentos par la formulación e implementación de medidas de adaptación de arrecifes coralinos ante el cambio climático en el AMP-Corales del Rosario, San Bernardo e Isla Fuerte, Caribe Colombiano”* y *“Dinámica de arrecifes coralinos de dos niveles de profundidad en areas marinas protegidas el caribe colombiano: San Andrés, Tayrona, Rosario y San Bernardo”*.

Component C (iv): Integrated Coastal Management to reduce the vulnerability of ecosystems, infrastructure and populations living near the coast

Complementing the water and atmospheric stations under subcomponent (i) above, INVEMAR strengthened its network that monitors marine biology for the coral ecosystem, by adding three additional monitoring stations in San Bernardo (Mangie, Ceycen, Minalta and Tiosolda) to the Sistema Nacional de Monitoreo de Arrecifes Coralinos en Colombia (SIMAC). These will allow the institution to monitor with greater resolution the health and dynamics of the coral ecosystem in the Archipiæelago del Rosario, San Bernardo e Isla Fuerte (CRSBeIF). The information generated by this monitoring has been used to work with local communities, for decision-making by those responsible for the Marine Protected Areas (MPAs), and the design and implementation of strategies that will promote ecosystem adaptation to the effects of climate change. All of the information generated from this monitoring has been published in bulletins on climate change, and scientific articles both of which are posted on INVEMAR’s webpage. Studies posted include: *Parámetros Precipitación, salinidad y pH en la estación Tesoro*, *Los efectos del huracán Tomas en el nivel del mar*, and *Respuesta del ambiente marino a algunos eventos meteorológicos sinópticos medidos sobre los arrecifes de San Andrés y de las islas del Rosario, Caribe Colombiano*. Under the Project, INVEMAR recognized the need to formulate and implement integrated management plans that promote sensitive ecosystems’ adaptive capacity to climate change. The management plans for the coral reefs in CRSBeIF respond to a series of proposed actions defined on the basis of detailed environmental diagnostics, and aimed at preventing, mitigating, correcting, compensating or adapting to the negative environmental impacts that climate change causes.

The Project financed a management plan for the Cayo Bolivar and Cayo Albuquerque that contemplates five strategies: (a) productivity; (b) biodiversity; (c) studies of natural habitats and responses to natural phenomena; (d) a communication program and (e) administration and participatory evaluation.

The Project also financed initiatives aimed at improving agriculture and livestock production. This activity included carrying out a diagnosis of these activities in Providencia, identify priority areas for action, the carrying out of the first phase of three pilot projects on sustainable agricultural production, and implementing a demonstrative pig housing study in San Andrés

Island. The purpose of this activity is to address pollution caused by drainage of pig waste and related odors.

The Project financed the preparation of a document on population policy and the formulation of an action plan and guidance in response to expected climate changes in the coastal zones. This policy was prepared with active participation of about 200 people representing local communities and public and private institutions and organizations, in about 40 workshops.

The Project developed guidelines to incorporate alternatives responsive to climate change in housing design in potentially affected coastal areas. The housing model proposed, that includes architectural blueprints and designs--addresses the possibility of alternative energy sources, recommendations of appropriate building materials, and instruments for land-use planning.

The Project also financed a study of beach and coastal erosion. The study carried out a census of coastal infrastructure in Sound Bay, Punta Hansa and Jenny Bay; a diagnostic of erosion on the west coast of San Andrés Island, a monitoring and training plan for beach monitoring and the reforestation of the Spratt Bight Beach.

Component (D): Responses to the increased exposure to tropical vector-borne diseases (malaria and dengue) induced by climate change

(Total Cost US\$4.7 million; GEF funding US\$1.0 million)

The objective of this component, implemented by the Instituto Nacional de Salud (INS), was to address the increase exposure to tropical vector-borne diseases (malaria and dengue) induced by climate change through the implementation of an Integrated Dengue and Malaria Surveillance and Control System (IDMSCS), including an Early Warning System for Malaria and Dengue Surveillance and Control (DMEWS). The Project sought a 30 percent reduction in both malaria and dengue morbidities in pilot areas as a result of improvements in health management and prevention of additional exposure caused by climate change. Under the Project, the IDMSCS was to be implemented in approximately 12 pilot municipalities for both malaria and dengue, selected on the basis of perceived climate threats. The Project was to support the design, implementation and operation of the IDMSCS by developing a framework that permits the continuous evaluation of the local risk of dengue and malaria transmission in the face of GCC and the determination of the most appropriated actions to prevent epidemics before they began. The Project sought to contribute to the strengthening of the institutional capabilities through the evaluation and strengthening of local (municipal) health agencies and through the strengthening the National Health Surveillance System. The Project aimed to change the existing reactive institutional organization into a proactive public health system for addressing malaria and dengue.

The design of the IDMSCS took into consideration health determinants such as climatic variables, demographics and socio-economic indicators. The Project financed an epidemiological analysis of transmission of malaria and dengue in six pilot areas of four municipalities.¹¹

The findings found that four factors determine the geographic impact of climate change on dengue: (a) lack of security in access to water (that lead people to store water); (b) population

¹¹ For malaria, the municipalities were Montelibano, Puertilibertador, Buenaventura, and San José del Guaviare. For dengue, the municipalities were Barranquilla, Bucaramanga, Floridablanca and Armenia.

density and movements (higher incidence in areas with greater population and movements); (c) size of housing and rainfall (smaller housing results in greater incidence and less seasonal variations); and (d) variations in altitude and temperature (temperature and altitude at certain ranges promotes the growth of larvae). Based on these findings, the Project prepared a action plan for prioritizing the Government's efforts, including those of the municipal governments that are responsible for prevention program, to guide its efforts to reduce the incidence of dengue.

The findings resulted in the following for malaria: (a) the effects of rainfall and temperature on the transmission of malaria vary depending on the geographic location of the municipality, and do not offer generalizations that apply to the entire country; (b) it is necessary to improve the quality control of diagnostic instruments in order to ensure that the reality in the field is reflected in diagnostic reporting; (c) entomological surveillance should focus mainly on factors that will produce reliable information for decision making and planning, including a reliable assessment of the presence or lack thereof of vectors and their resistance to insecticides; and (d) the projections of malaria cases were carried out on the basis of short-, medium- and long-term forecasts of temperature and precipitation. In the medium-term, the model forecast an increase of 6 to 15 malaria cases per thousand population assuming similar socioeconomic and entomological factors as is the base case.

The Project financed the development of an early warning system, DMEWS, based on nine platforms that permit continuous simulation of transmission dynamics based on epidemiological and climatic information. This system was designed to eventually be monitored by health authorities at the central, departmental and local levels. Epidemiological information is provided by the Instituto Nacional de Salud (INS), and climatic information by IDEAM on a daily basis.

Component (E): Project Management

(Total Cost US\$0.73 million; GEF funding US\$0.53 million)

This component, implemented by IDEAM and Conservation International Colombia (CI-Colombia)¹², supported the overall technical coordination of the Project's activities (including the implementation of a technical monitoring system), as well as the administrative and financial management of the Project. It financed goods, consultants' services, travel and operational and incremental costs of the Project, including staffing (the Project Coordinator, a Procurement Specialist and others, and the Project's external audits).

¹² CI-Colombia is a recognized NGO with broad environmental experience in high mountains and insular ecosystems. CI-Colombia did not implement the Project, per se, but rather acted as a coordinator for its required administrative and financial management processes.

Annex 3. Economic and Financial Analysis

See Section 3.3 of the Main Report.

Annex 4. Bank Lending and Implementation Support/Supervision Processes

(a) Task Team members

Names	Title	Unit	Responsibility/ Specialty
Lending			
Supervision/ICR			
Carlos Marcelo Bortman	Sr Public Health Spec.	ECSH1	
Franka Braun	Carbon Finance Specialist	ENVCF	
Alejandro M. Deeb	Consultant	GFDRR	
Amanda Gonzalez Sosa	Consultant	LCFSM	
Seraphine Marie Haeussling	Consultant	LCSEN	
Jose M. Martinez	Senior Procurement Specialist	ECSO2	
Daniel Mira-Salama	Environmental Specialist	LCSEN	
Adriana M. Valencia	Consultant	LCSEN	
Alonso Zarzar Casis	Sr Social Scientist	LCSSO	

(b) Staff Time and Cost

Stage of Project Cycle	Staff Time and Cost (Bank Budget Only)	
	No. of staff weeks	USD Thousands (including travel and consultant costs)
Lending		
FY04		0.31
FY05		82.48
FY06		102.14
FY07		0.00
FY08		0.00
Total:		184.93
Supervision/ICR		
FY04		0.00
FY05		0.00
FY06		0.20
FY07		66.96
FY08		74.67
Total:		141.83

Annex 5. Beneficiary Survey Results

N/A

Annex 6. Stakeholder Workshop Report and Results
N/A

Annex 7. Summary of Borrower's ICR and/or Comments on Draft ICR

The GoM through IDEAM delivered the following comments: It was noted that the project accurately reflects and highlights the achievements and what the GoC has been trying to do. A correction was made about the Swiss contribution which has been incorporated. The government also noted its satisfaction with the project.

Annex 8. Comments of Cofinanciers and Other Partners/Stakeholders

Annex 9. List of Supporting Documents

Conservación Internacional, Presentación Resultados Del Proyecto INAP (Donación TF 056350), Informe Final Julio de 2011

World Bank, Project Appraisal Document on a Proposed Grant from the Global Environment Facility Trust Fund, Integrated National Adaptation Project, Report No. 34058-CO, March 13, 2006

World Bank, Integrated National Adaptation Project, Project Paper on a Restructuring, December 17, 2009

República de Colombia, Segunda Comunicación Nacional ante la Convención Marco de las Naciones Unidas sobre Cambio Climático, Junio 2010

World Bank, Integrated National Adaptation Project, Implementation Status and Results Reports and mission Aide Memoires

República de Colombia, Ministerio de Ambiente, Vivienda y Desarrollo Territorial, Principales Logros Componente B (presentación)

República de Colombia, Ministerio de Ambiente, Vivienda y Desarrollo Territorial, Instituto de Hidrología, Meteorología y Estudios Ambientales, Componente A” Producción de Información sobre Cambio Climático y Variabilidad Climática, September 2011 (presentación)

República de Colombia, Instituto Nacional de Salud, Sistema Integrado de Vigilancia y Control para Malaria y Dengue (presentación)

República de Colombia, Instituto de Investigaciones Marinas y Costeras, Sistema de Observación Global de los Océanos Caribe Occidental como medida de adaptación al Cambio Climático (presentación)

República de Colombia, Instituto de Investigaciones Marinas y Costeras, Áreas Marinas Protegidas como medida de adaptación al Cambio Climático (presentación)

CORALINA, Proyecto Cambio Climático INAP, Componente Insular Oceaánico, Experiencias y Resultados, 2006-2011 (presentación)

Conservación Internacional Colombia, Misión de Cierre Proyecto INAP (presentación), September 2011

República de Colombia, Consejo Nacional de Política Económica y Social, Departamento Nacional de Planeación, Documento Conpes 3700, Estrategia Institucional para la Articulación de Políticas y Acciones en Materia de Cambio Climático en Colombia, July 2011

MAP

