

DOCUMENT OF THE INTER-AMERICAN DEVELOPMENT BANK

HAITI

NATURAL DISASTER MITIGATION PROGRAM II

(HA-L1097 / HA-G1031)

PROPOSAL FOR OPERATION DEVELOPMENT (POD)

This document was prepared by the project team consisting of: Bruno Jacquet, Project Team Leader (RND/CHA); Gerard Alleng, Project Co-Team Leader (INE/CCS); Sergio Lacambra Ayuso, Gines Suarez Vasquez, Carmine Paolo De Salvo, Lisa Sofia Restrepo (INE/RND); Jennifer Doherty-Bigara, Sara Valero Freitag (INE/CCS); Sebastien Jean Gachot, Marie Bonnard, (RND/CHA); Marise Etienne Salnave, Romina Emanuela Kirkagacli (FMP/CHA); Taos Aliouat (LEG/SGO); and Régine Lafontant (CDH/CHA).

CONTENTS

PROJECT SUMMARY	1
I. DESCRIPTION AND RESULTS MONITORING	2
A. Background, Problem Addressed, Justification.....	2
B. Objective, Components and Cost	9
C. Key Results Indicators	11
II. FINANCING STRUCTURE AND MAIN RISKS.....	12
A. Financing Instruments	12
B. Environmental and Social Safeguard Risks	12
C. Fiduciary Risk	13
D. Other Key Issues and Risks.....	14
III. IMPLEMENTATION AND MANAGEMENT PLAN	14
A. Summary of Implementation Arrangements	14
B. Summary of Arrangements for Monitoring Results	16

ANNEXES	
Annex I	Development Effectiveness Matrix (DEM) – Summary
Annex II	Results Framework
Annex III	Fiduciary Arrangements
Annex IV	Safeguard Policy Filter (SPF) and Safeguard Screening Form (SSF)

ELECTRONIC LINKS	
REQUIRED	
1.	Development Effectiveness Matrix (DEM)
2.	Pluri-annual Execution Plan (PEP) / Annual Operation Plan (POA)
3.	Monitoring and Evaluation Arrangements
4.	Environmental and Social Management Report (ESMR)
5.	Procurement Plan
OPTIONAL	
1.	Technical Summary about watershed prioritization
2.	Deforestation and erosion in Haiti's watershed
3.	PPCR summary
4.	USAID. 2007. Environmental vulnerability in Haiti. Findings and recommendations.
5.	Project cost-benefit analysis (CBA)
6.	Ex-post CBA of downstream watershed protection infrastructure financed in the framework of 2187/GR-HA grant agreement (AECOM)
7.	Ex-post CBA of upstream watershed protection infrastructure financed in the framework of 2187/GR-HA grant agreement (IDB)
8.	Final evaluation of ATN/MD-13623-HA and analysis of Early Warning Systems in Haiti
9.	Identification and prioritization of watershed protection infrastructure for HA-L1097 operation (AECOM)
10.	Structural evaluation of the Faculty of Agronomics and Veterinary Medicine.
11.	Index of Governance and Public Policy in Disaster Risk Management (iGOPP): Haiti.
12.	Agriculture and Climate Change diagnosis of St Michel de l'Attalaye and St Raphaël
13.	Technical References
14.	Preliminary dimensioning of the Faculty of Agronomics and Veterinary Medicine
15.	Operations manual of the Natural Disaster Mitigation Program I (HA-L1041)
APPENDIX	
REQUIRED	
1.	Risk Analysis Matrix

ABBREVIATIONS

AOP	Annual Operations Plan
BRH	<i>Banque de la République d'Haïti</i>
CC	Climate Change
CIAT	Inter-Ministerial Land Planning Committee
CIF	Climate Investment Funds
CNIGS	National Geospatial Information Center
DPC	Civil Protection Directorate
DRM	Disaster Risk Management
EA	Executing Agency
ESMR	Environmental and Social Management Report
ESS	Environmental and Social Strategy
EWS	Early Warning System
FAMV	Faculty of Agronomy and Veterinary Medicine
FAO	Food and Agriculture Organization
GCI-9	Ninth General Increase in Resources of the IDB
GDP	Gross Domestic Product
GoH	Government of Haiti
IA	Implementing Agency
IDB	Inter-American Development Bank
IGOPP	Index of Governance and Public Policy for Disaster Risk Management
IHSI	<i>Institut Haïtien de Statistique et d'Informatique</i>
IPCC	Intergovernmental Panel on Climate Change
IRR	Internal Rate of Return
LAC	Latin America and the Caribbean
MARNDR	Ministry of Agriculture, Natural Resources and Rural Development
MDE	Ministry of Environment
MICT	Ministry of Interior and Territorial Collectivities
MOU	Memorandum of Understanding
NAPA	National Plan for Adaptation to Climate Change
ND-GAIN	University of Notre Dame Global Adaptation Index
NGO	Non-Governmental Organization
NPV	Net Present Value
OM	Operations Manual
O&M	Operations and Maintenance
PCR	Project Completion Report
PMDN	Natural Disaster Mitigation Program in Priority Watersheds
POD	Proposal for Operation Development
PPCR	Pilot Program for Climate Resilience
PR	Progress Report
SC	Steering Committee
SCX	IDB Strategic Climate Fund
SPCR	Strategic Program for Climate Resilience
SPF	Safeguard Policy Filter
SSF	Safeguard Screening Form

TORs	Terms of Reference
UCLBP	Unit for Construction of Housing and Public Building
UEP	Studies and Programming Unit of MARNDR
UNDP	United Nations Development Program
UNISDR	United Nations International Strategy for Disaster Reduction
UPMP	MARNDR's Procurement Unit
USAID	United States Agency for International Development
WB	World Bank

PROJECT SUMMARY
HAITI
NATURAL DISASTER MITIGATION PROGRAM II
(HA-L1097 / HA-G1031)

Financial Terms and Conditions				
Beneficiary: Republic of Haiti			Amortization Period:	N/A
Executing Agency: Ministry of Agriculture, Natural Resources and Rural Development (MARNDR)			Disbursement Period:	60 months
Source	Amount (US\$ million)	%	Grace Period:	N/A
IDB Grant Facility (HA-L1097):	42.00	88	Supervision and Inspection Fee:	N/A
IDB Strategic Climate Fund (SCX) Grant HA-G1031:	4.50	10	Interest rate:	N/A
Local:	0.75	2	Credit Fee:	N/A
Total:	47.25	100	Currency of Approval:	US Dollars
Project at a Glance				
<p>Project Objective/Description: The project objective is to reduce rural economic losses through the improvement of climate risk management in selected watersheds. The specific objectives are to: (i) increase capacities for adaptation to climate change and disaster risk management (DRM) in the agriculture sector; (ii) improve water and sediment conservation in selected gullies of priority watersheds; (iii) reduce the risk of rural economic losses due to floods in targeted watersheds; and (iv) restore the educational capacity of the Faculty of Agronomy and Veterinary Medicine (FAMV) campus.</p>				
<p>Special Contractual Clauses prior to first disbursement: the Executing Agency (EA) shall, to the satisfaction of the Bank: (i) adopt an operations manual of the project which shall include, among others: (i) the role of each participant and collaborating institution for the implementation of the project; (ii) a code of ethics section; (iii) an annex describing the procedure and timeframe applicable to the MARNDR's internal and external approval process for procurement contracts; (iv) the Environmental and Social Management Plan for works; (v) the Monitoring and Evaluation Plan; (vi) procedures for the administration of goods and fixed assets and the safeguard of financial information; and (vii) a chart of accounts. (¶3.8); and (ii) hire or appoint the coordinator and an administrator assigned to the project (¶3.2).</p>				
<p>Special Execution Clauses to be fulfilled by the Beneficiary (unless specified otherwise): the EA shall, to the satisfaction of the Bank: (i) present, prior to the execution of activity (ii) of Component 2, a copy of a valid Memorandum of Understanding (MOU) between MARNDR and the Ministry of Interior and Territorial Collectivities (MICT), establishing the terms of collaboration between MARNDR and the Civil Protection Directorate of MICT for the execution of said activity (¶3.45); (ii) present, before launching the procurement processes of the works of Component 3 (FAMV campus), a copy of a valid MOU between MARNDR, FAMV and the Unit for Construction of Housing and Public Building (UCLBP) establishing the terms of the collaboration of UCLBP in the reconstruction phase of the FAMV campus (¶3.67); (iii) present, prior to beginning the works of Component 3, a compensation and action plan for the displaced on-campus students during the reconstruction of the residencies (¶2.2).</p>				
<p>Environmental and Social Clauses: The beneficiary shall comply with the environmental, social, health and safety and labor requirements set forth in the Environmental and Social Management Report (ESMR), and provide evidence of such compliance (¶2.2).</p>				
<p>Special disbursement: To enable the EA to fulfill the conditions prior to first disbursement an initial disbursement of up to US\$150,000 will be made to the extent the Beneficiary fulfills, to the Bank's satisfaction, all the standard general conditions prior to first disbursement set forth in the grant agreement (see ¶4.8 of Annex III).(¶3.12)</p>				
Exceptions to Bank Policies: None.				
<p>The project qualifies for: SV <input checked="" type="checkbox"/> PE <input checked="" type="checkbox"/> CC <input checked="" type="checkbox"/> CI <input type="checkbox"/></p>				

I. DESCRIPTION AND RESULTS MONITORING

A. Background, Problem Addressed, Justification

- 1.1 Haiti is one of the countries with the highest natural disaster risk index in the world¹ (WB, 2005; UNDP, 2004), including climate hazards (Kreft et al., 2015), and with the [lowest adaptation capacity](#). This high climate related risk is the result of its geographic location (hurricane belt of the Caribbean basin), physical features and its economic reliance on activities closely linked to climate factors.
- 1.2 Agriculture plays a critical role in Haiti's economy and concentrates the risk of losses associated with climate hazards. This sector contributes 25% of Gross Domestic Product (GDP), 5.9% of total exports value (BRH, 2014), 47% of overall employment, 71% of employment in rural areas, and 75% of employment in low income rural households (WB/IHSI, 2012). In addition, 52% of the population lives in rural areas (WB/IHSI, 2012), with an average monthly income of US\$49, 69% of this rural population are considered chronically poor, suffering from revenue instability mainly due to climate variability and its impacts on agricultural production (Herrera et al., 2014; WB/IHSI, 2012). Rural women are particularly affected since 37.8% of rural households are female-headed. In the last 50 years, the country has suffered over 40 harmful climatic events, one internationally-recognized catastrophe every two years, and a major catastrophe every four to six years (UNDP, 2004). In 2008 two storms and two hurricanes left at least 1,100 casualties and an estimated damage of more than US\$900 million (15% of GDP), being the agriculture sector the most affected (US\$200 million)². In August 2012, two hurricanes (Isaac and Sandy) ravaged the agricultural sector, affecting production in more than 80,000 ha of agricultural land and causing losses of over US\$104 million, while leaving 19 dead and more than 18,000 damaged houses³ in the South. The country, and especially the agricultural sector, is also affected by droughts. Bayard (2011) and Bellande (2012) observe that more than a third of the agricultural land is affected by drought every five to seven years and that planting is regularly delayed due to lack of rainfall at the beginning of the rainy season. In this setting there exists persistent and high pressure on land and natural resources to produce staple foods, which itself contributes to deforestation and to local effects of hydro-meteorological borne disasters (MARNDR/FAO, 2009).
- 1.3 The high risk of natural disasters in the agriculture sector will be exacerbated by climate change in two ways: first, through the likely increase in weather and climate hazardous events, and secondly through increases in the vulnerability of communities to natural hazards (IPCC, 2014). Climate change projections for the Caribbean region, including Haiti, indicate a rise in temperature from 1.2°C to 2.3°C and an annual precipitation decrease of 5 – 6% by the end of the 21st century (Nurse et al., 2014). As a result, it is estimated that physical yields of

¹ "Natural disaster risk" refers to "the probability of harmful consequences or expected losses resulting from interactions between natural or human-induced hazards and vulnerable conditions" (GN-2354-11). "Climate risk" refers to the part of natural disaster risk associated with existing and future climate hazards, including those deriving from climate change.

² Post-disaster needs assessment. 2008, Gov. of Haiti, World Bank, United Nations System and European Commission.

³ MARNDR (2012) and United Nations Office for the Coordination of Humanitarian Affairs, 2012.

important crops may fall by up to 70% (Eitzinger et al., 2013),⁴ and economic and human losses in rural areas of Haiti may increase (IPCC, 2014).

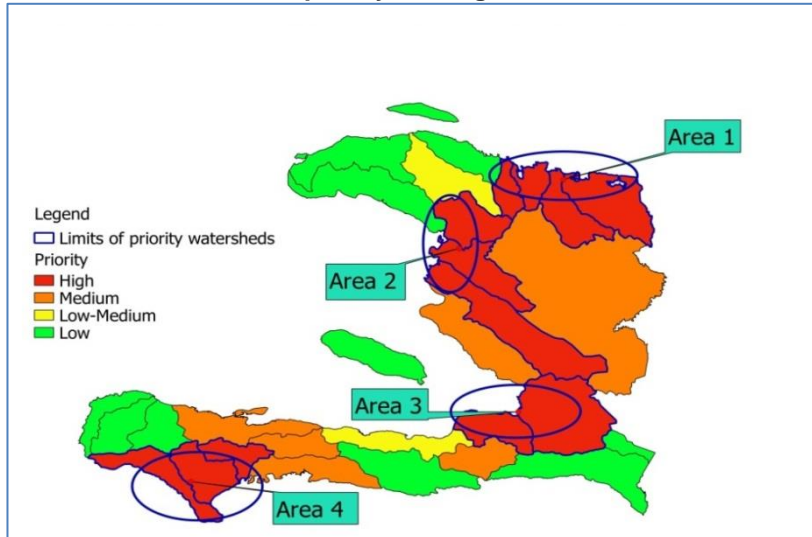
- 1.4 The high risk of disasters in Haiti's agriculture sector is therefore the result of the characteristics of the hazards, including projected effects of climate change (FAO, 2013), and the vulnerabilities, which increase the susceptibility to the impact of hazards.⁵ These vulnerabilities include: (i) physical vulnerabilities in priority watersheds; and (ii) institutional vulnerabilities, particularly low governance of disaster risk management (DRM) and lack of capacities for risk identification and agricultural innovation services.
- 1.5 **Physical vulnerabilities in priority watersheds.** The vulnerability to floods at watershed level is determined by Haiti's physical features: 80% of the country is mountainous, with 30 main watersheds and scarce arable land (only 28%) concentrated in irrigated valleys affected by recurrent floods (IDB, 2011). Haiti's watersheds are characterized by severe soil erosion risk and upper part lands deforested at an average of 50%. This deforestation, partly due to inadequate rural farming practices, can increase river flows by 25% and contribute to increase erosion rates by six times, producing river silting, which in turn intensifies overflows ([optional link 2](#)).
- 1.6 The [vulnerability analysis](#) carried out by USAID (2007) classifies Haiti's watersheds physical vulnerabilities based on factors like topography, climate, ecological importance, productive infrastructure, and settlement location and density. This study identifies twelve highly vulnerable watersheds which can be grouped in four homogeneous areas: Area 1 (A1): the Northern Corridor, which includes Grande Rivière du Nord; Area 2 (A2), which includes the lower part of Artibonite watershed; Area 3 (A3), which includes Port Au Prince; and Area 4 (A4), which includes Les Cayes city. The aggregation in homogeneous areas was carried out considering groups of watersheds with high vulnerability that drain to the same floodplains ([optional link 1](#)). A [technical analysis](#) was carried out to identify which of those highly vulnerable watersheds concentrate most of the flood risk for agriculture and opportunities to invest in risk mitigation. The qualitative and quantitative criteria applied for the analysis were: (i) focus on predominantly agricultural and rural areas; (ii) level of exposure to floods; and (iii) synergies with existing programs. Through the combination of these criteria, Grande Rivière du Nord (in Area 1), Artibonite (in Area 2), and Cavillon and Les Cayes (which include the sub-basins of Acul Dubreuil and Ravine du Sud, (in Area 4) were identified.
- 1.7 All these priority watersheds present a common problematic with soils with [severe risk of erosion, deforestation around 50% in the upper part](#), which increases floods, and significant concentration of flood risk in the lower part, with a total estimated value of [annual expected losses for the five watersheds at US\\$28 million](#). In addition to flood vulnerability in the lower part of the watersheds, as a result of deforestation and inappropriate farming techniques, farmers upstream are exposed to superficial landslides, loss of soil fertility due to

⁴ For example, given the rise in temperatures, the common bean could lose 70% of its production in Haiti by 2050 if no adaptation measures are implemented.

⁵ GN-2354-11: Disaster Risk Management Policy Guidelines.

water-driven erosion, and their production is particularly affected during extended and seasonal drought periods because soils have lost their capacity to retain humidity for extended periods of time ([optional link 7](#)).

**Figure1. Composite Map of Vulnerability from USAID (2007)
Grouped by Homogenous Areas**



- 1.8 **Low DRM governance.** DRM governance is critical to reduce vulnerability of local populations and the economy to climate risks (UNISDR, 2015). The Bank developed the Index of Governance and Public Policy for Disaster Risk Management (IGOPP) to assess the level of countries DRM governance⁶. Its application in 2013 ranked Haiti as having the lowest DRM governance of 13 countries in Latin America and the Caribbean (LAC), with a score of 7%. In the same sense, Haiti's ND-GAIN (University of Notre Dame Global Adaptation Index) Governance Readiness sub-index score is very low (0.283), which overall places it as one of the globally least ready countries to respond to climate change and climate-related disasters. Some of the variables of the IGOPP related to the agriculture sector identify weaknesses in the legal and institutional framework for planning post-disaster recovery, for which responsibilities have not been explicitly established. In addition, this sector does not have financial protection mechanisms based on loss exceedance curves, which is considered an international best practice (IDB, 2015).
- 1.9 **Lack of risk identification and agriculture research and innovation services.** According to the IGOPP, the governance conditions in Haiti for risk identification and knowledge are extremely low, with a rating of 9%, while LAC average is 32%. Another recent study of the Inter-Ministerial Land Planning Committee (CIAT) and World Bank (Fontaine and Bertil, 2015) observed that, although some government or non-governmental organization (NGO) led initiatives exist, investment in climate risk analysis is very low and related methodologies need to be improved. For instance, the study highlights that the MARNDR, which by mandate is in charge of mitigating climate related risk in the agriculture sector, does not prioritize investments according to risk study and cost-benefit analysis.

⁶ The IGOPP assesses the existing legal, institutional and budgetary conditions for a comprehensive DRM public policy in a country.

In the same sense, [a diagnosis](#) of the flood early warning system in Haiti, which is a key tool for climate risk analysis and response, showed that there are still important limitations related to system maintenance, forecast accuracy and organization of the evacuation.

- 1.10 Agricultural research, innovation and extension services are limited, especially those that serve small hill-side farmers, limiting their capacity to adapt to climate related phenomena and disasters. With the decline of MARNDR budgetary resources in the late 1980s, agricultural research and innovation services have been severely weakened⁷, and therefore impeded the generation of cost-effective farming practices that could promote soil conservation and adaptation to climate change. According to the 2009 agricultural census, only 2.6% of farmers have received some technical and/or occasional agricultural training, 7% declared to have used some mechanical equipment, and 43% identify the lack of research and extension services as a constraint to their development. As a consequence, most farmers in Haiti are confined to stagnant technologies.
- 1.11 In this context, the Faculty of Agronomy and Veterinary Medicine (FAMV) is a central institution for the generation of innovation and capacities in Haiti in agriculture, natural resources management and rural engineering, which are key fields for natural disasters management and climate change adaptation. However, the 2010 earthquake severely affected its teaching, research and services capacities, after having destroyed 90% of its facilities. A recent structural evaluation of the remaining buildings warns on the high risk of collapsing in case of minor seism, which could provoke major casualties among Faculty's students and teachers. The FAMV trains an average of 85 agronomists each year (approx. 90% of the agronomists graduated each year in Haiti) and provides key scientific services for the sector, such as the only soil laboratory of the country which cannot cope with demand with diminished facilities. FAMV is also involved in several research projects related to climate risks and agriculture and dedicates around 16%⁸ of its annual budget to research in these matters. FAMV publishes an average of 25 scientific articles every year, of which a fourth are related to natural resources and watershed management. FAMV is also an important repository of knowledge through its library and national herbarium, which are currently hardly accessible to students and the public.
- 1.12 **Lessons learned.** With the Bank's support, the Government of Haiti (GoH) has implemented several projects in the field of natural disaster risk mitigation.⁹ The main lessons learned are presented in Table 1.
- 1.13 **Project conceptualization.** The proposed project builds on the lessons learned of past projects and has been designed as a continuation of the "Natural Disaster Mitigation Program in Priority Watersheds I (PMDN I, 2187/GR-HA), with comparable objectives and activities, which is scheduled to end in 2015. The PMDN I intervened in Grande Rivière du Nord, Artibonite, Ravine du Sud and

⁷ Lessons learned and studies include: (i) *Les centres de services régionaux : Etat des lieux, perspectives*. WB/ Damais, 2005; (ii) Ibid, USAID/ OFDA, 2010 ; and (iii) *Consortium de Recherche pour le Développement Agricole*, IICA, 2011

⁸ Approximately US\$250,000 per year.

⁹ Since 2005, the Bank approved six operations with watershed management and/or DRM components. Two Technical Cooperations (ATN/MD-11565-HA and ATN/MD-13623-HA) for US\$1.4 million; and four grants (2389/GR-HA, 2187/GR-HA, 2562/GR-HA, and 3093/GR-HA) for US\$100 million.

Cavaillon watersheds and included three components: (i) investments in upstream and downstream mitigation works; (ii) promotion of sustainable farming practices agriculture; and (iii) institutional strengthening for watershed management. Among other products, the PMDN I financed the construction of four major downstream river-bank protection works, two hundred upstream small-scale water and soil conservation infrastructures, and supported the increase of agroforestry practices of 7,125 farmers. The ex post cost-benefit analysis ([Link 6](#) and [Link 7](#)) confirmed the validity of the approach and showed that investments in downstream watershed protection infrastructure and water and soil conservation infrastructure generated a positive internal rate of return (IRR) and net present value (NPV). Crop diversification and intensification, as a result of increased capacity to store water and access to fertile silt in the upstream parts of check dams, are the main drivers of the positive results in the upper parts of the watersheds.

Table 1. Lessons Learned

Lessons learned	Reflected in the project design
Prioritization of downstream mitigation works should be based on rigorous flood risk analysis	A flood risk analysis has been developed to identify and prioritize the main downstream works to be constructed (Link 9). More advanced probabilistic modeling will be developed (Component 1), considering climate change scenarios, in order to improve the prioritization of future works and support the calibration of the early warning systems (EWS).
The ex post evaluation of HA-L1041 operation demonstrated that better results in upstream investments are obtained when combining infrastructure and improvement of farming practices (Brochet and Clossy, 2010), when the capacity to store water and fertile silts allows crop diversification and intensification.	The project will continue developing such approach related to watershed management, where producers should derive economic benefit in the short term from the improvement of cropping systems. Based on a multi-criterion analysis (hydro-morphology, land use, productive potential and severity of erosion) upstream investments were prioritized in the project. In addition, a complementary program financed by the Bank (Grant agreement 2562/GR-HA) will provide incentives to farmers to promote sustainable farming practices in selected watersheds.
In order to ensure sustainability and community empowerment, the EWS should be simple and community based rather than high-tech, and the Civil Protection Directorate (DPC) should be involved in the implementation of related activities ¹⁰ .	The EWS will be technologically simple and community-based. A memorandum of understanding (MOU) will be signed between MARNDR and DPC in order to ensure DPC involvement.
Investments have to be coupled with governance reforms in order to foster sustainability and increase public spending efficiency (IDB, 2011).	Part of present project design was based on a DRM governance diagnosis (IGOPP index) which allowed identifying key actions.
Disaster Risk Management policy reforms contribute to catalyze and improve public investment in risk reduction	Best practices of disaster risk management policy reforms (identified through iGOPP) will be promoted by the program

1.14 [The project also derives from Haiti's Strategic Plan for Climate Resilience \(SPCR\)](#), which identifies the Centre-Artibonite upper watershed as a priority area for the adaption of agriculture to climate change (CC) and which will be implemented through the Pilot Program for Climate Resilience (PPCR) with

¹⁰ 2389/GR-HA Project Completion Report (PCR).

financing from the Climate Investment Funds (CIF). The project design is also based on technical studies and diagnosis related to the prioritized watershed, DRM governance in Haiti, early warning systems and FAMV reconstruction. The [study of identification and prioritization of watershed protection infrastructure](#) used an innovative methodology in Haiti and included: (i) an estimation of economic and human losses due to floods, using international best practices of vulnerability functions and loss exceedance curves; (ii) identification of efficient flood control investments based on a cost benefit analysis; and (iii) multi-criteria prioritization of areas for the small-scale upstream investments.

- 1.15 In this framework, the project aims to reduce economic losses and increase agricultural production through the improvement of climate risk management in selected watersheds through: (i) capacity-building and governance strengthening in disaster risk management considering climate change scenarios in agriculture through technical studies, applied research, development of decision-making tools and training; and (ii) investments in climate related disaster risk reduction for agriculture and rural areas in selected watersheds, including the combination of downstream flood mitigation works and upstream small-scale water and soil conservation infrastructures, together with community-based flood EWS. The project also includes rebuilding the Faculty of Agronomics and Veterinary Medicine, which is the main tertiary education institution that trains agronomists and rural engineers in the country and conducts research in the fields of natural resources management, agriculture and CC. Since natural disaster management is closely linked to climate change adaptation, the project includes co-financing from the CIF through the PPCR window, which will be channeled through the IDB Strategic Climate Fund (SCX) Grant, for activities related to the adaption of agriculture to CC in the Boucle Centre-Artibonite. The project maintains the integrated approach of watershed management promoted in HA-L1041 operation, with the combination of infrastructure and promotion of sustainable farming practices. However the latest will be covered by a complementary program financed by the Bank (Grant agreement 2562/GR-HA) which will provide incentives to farmers to adopt sustainable cropping practices in the selected watersheds, promoting reforestation.
- 1.16 Project conceptual design is aligned with the “Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation” (IPCC 2012), which establishes that climate related disaster risk is the principal expression of climate change at local level. International agreements, including the recently approved [Senday Framework for Disaster Risk Reduction \(2015-2030\)](#), and empirical evidence establish that: (i) “policies and practices for disaster risk management should be based on an understanding of disaster risk” (UNISDR, 2015); (ii) “probabilistic risk models are a rigorous methodology for assessing potential losses for adverse events before they occur and provide information for an effective decision making on DRM” (Yamin & al 2013); (iii) “generating and disseminating information of disaster risk shows benefit-cost ratios above 15” (WB, 2010), (iv) investing in risk mitigation and prevention is much more efficient than doing so in disaster response (Moench, et al., 2007) with average benefit/cost ratios for flood mitigation works around four (Godschalk, et al., 2009) and with benefits exceeding 10 times the cost for EWS (Rogers and Tsirkunov, 2010). Regarding the impact of improving disaster risk governance, an [analysis](#) carried out in Colombia showed that national policy

reforms, guided by IGOPP, contributed to local reforms in Bogotá which generated risk reduction investments in EWS, mitigation works and improved land use planning with a NPV of US\$150 million.

1.17 Consistency with Government sector strategy and donors' coordination.

The proposed project is consistent with the different policies and initiatives developed by the GoH to address natural disaster risks, agriculture and CC issues at different levels, including: (i) the National Disaster Risk Management Plan; (ii) the 2011-2016 National Agricultural Investment Plan and 2013-2016 Three-Year Agricultural Recovery Program; (iii) the 2006 National Plan for Adaptation to Climate Change (NAPA); (iv) the 2012 Strategic Plan for Climate Resilience (SPCR) and (v) the Disaster Risk Management Program financed by the World Bank, among others. The project was prepared in close coordination with other donors (World Bank, UNDP, and the European Commission) and stakeholders involved in DRM in the agriculture sector. Active donor coordination will be ensured during project implementation through both sectorial round-tables of agriculture and DRM.

1.18 Consistency with the Country Strategy, Sector Strategy and GCI-9¹¹.

The project is aligned with the Bank's Country Strategy with Haiti for 2011-2015 (GN-2646), which sets agriculture as a priority sector of intervention, and is included in the 2015 Country Program Document (GN-2805). The program will contribute to the lending program priorities of the Ninth General Increase in the Resources of the Inter-American Development Bank (AB-2764) (GCI-9): (i) support to small and vulnerable countries, since the beneficiary is Haiti; (ii) poverty reduction and equity enhancement, as beneficiaries will be low income rural households; and (iii) lending to support climate change initiatives, sustainable energy, and environmental sustainability, as the project will promote adaptation to CC and improve management of natural resources. It will also contribute to the Regional Development Goals "Protecting the environment, responding to climate change, promoting renewable energy, and enhancing food security, and particularly the indicators "Annual growth rate of agricultural GDP," "Annual economic losses from natural disasters," as well as "Countries with planning capacity in mitigation and adaptation of climate change". The project will contribute to the product "Farmers given access to improved agricultural services and investments", as defined in the Results Framework. The project is consistent with the "Agriculture and Natural Resources Management Sector Framework Document" (GN-2709-2), the "Sustainable Infrastructure for Competitiveness and Inclusive Growth. IDB Infrastructure Strategy" (GN-2710-5), the Bank's Integrated Strategy for Climate Change Adaptation and Mitigation and Sustainable Renewable Energy (GN-2609-1) and Action Plan (GN-2609-3), as well as the Bank's Disaster Risk Management Policy (OP-704). The project will have and develop synergies with several other Bank interventions in the country related to natural resources management and productive development¹², particularly the Agricultural Technology Transfer Program (2562/GR-HA), as well as the Land Tenure Security Program in Rural Areas (2720/GR-HA).

¹¹ GCI-9: Ninth General Increase in the Resources of the Inter-American Development Bank (AB-2764)

¹² In the North Corridor: operations 2562/GR-HA, 3132/GR-HA; in Artibonite watershed: operations 3089/GR-HA, 1296/OP-HA, 2349/GR-HA; in the South Corridor: operations GRT/FM-11803-HA, GRT/HR-13930-HA, 2720/GR-HA.

B. Objective, Components and Cost

1.19 **Objective.** The project objective is to reduce rural economic losses through the improvement of climate risk management in selected watersheds. The specific objectives are to: (i) increase capacities for adaptation to climate change and disaster risk management (DRM) in the agriculture sector; (ii) improve water and sediment conservation in selected gullies of priority watersheds; (iii) reduce the risk of rural economic losses due to floods and erosion in targeted watersheds; and (iv) restore the educational capacity of the FAMV campus. The project will benefit approximately 72,702 households, 910 from the applied research activities in agriculture, 567 from the upstream soil and water conservation small-scale infrastructure (109 of whom will also benefit from the applied research program in agriculture), 45,255 from the downstream river-bank protection, 25,829 from the EWS and 250 from the reconstruction of the FAMV. It is projected that approximately 52% of the households in the target area are poor and 38% women-headed.

1.20 **Component 1: Capacity building to reduce climate risk (US\$ 5.3 million).** This component aims at strengthening capacities to manage natural disasters and climate change risks in the agriculture sector. The following activities will be financed: **(i) Studies based on probabilistic assessments of natural disasters risks and watershed modelling methodologies.** These studies will increase the knowledge of climate related risk and support the identification of investments to reduce climate risk of agricultural activities and rural communities in targeted watersheds,¹³ taking into consideration CC scenarios for Haiti. These studies will improve the capacity of MARNDR and other stakeholders to prioritize risk mitigation measures (particularly flood mitigation infrastructure) according to detailed risk and cost-benefit analysis. The activities will be developed by MARNDR in cooperation with the National Geospatial Information Center (CNIGS), CIAT, private firms and universities such as FAMV. **(ii) Research programs in agriculture, climate change and watershed management.** In particular, the project will continue financing the sole research initiative implemented in Haiti related to watershed dynamics and management (Cavaillon watershed),¹⁴ as well as a research program on CC resilient agricultural crop systems in the Centre-Artibonite upper watershed (§1.14 and 1.15). This research program will systematize existing CC adaptation practices developed by farmers, as well as develop new techniques (improvement of agroforestry systems, CC resilient crops, sustainable farming practices, etc.), that will be integrated in and disseminated through MARNDR's technological transfer program (such as 2562/GR-HA). The activities will be developed by international and national research centers, including FAMV. The research programs will pay special attention to farming practices developed by rural female-headed households. **(iii) Training and knowledge dissemination.** In order to strengthen capacities to analyze and manage natural disasters and climate change risks in the agriculture sector, two training programs will be developed together with the stakeholders involved in activities (i) and (ii) of the present

¹³ In particular, the CNIGS, with support of World Bank, recently developed high-resolution maps and a digital elevation model for the whole country, which represents a significant input for watershed and flood modeling.

¹⁴ CariWatNet: Strengthening the Caribbean Scientific Community in Natural Resources Management and Developing Integrated Watershed Management, financed by the European Commission from 2011 to 2013. This research project has been thereafter financed by operation 2187/GR-HA after 2013.

component (including FAMV, CNIGS and universities, etc.); one for students in agriculture, natural resources management and rural engineering of national universities, and the other for public officials and academia with activities are related to DRM and climate change adaptation in the agriculture sector and rural areas. The training program will contribute to mainstream these subjects in FAMV and other universities' curricula. Additionally, all the knowledge generated will be systematized in a risk web-based information system accessible to the public and oriented to agricultural and disaster risk specialists. **(iv) Strengthening DRM governance.** Following IGOPP diagnosis, the project will also contribute to strengthen DRM governance in the sector, by developing the national emergency and recovery plan for extreme climate events in the agricultural sector, together with a training program on damage assessment in agriculture. The project will also contribute to strengthen local governance through the establishment and/or strengthening of watershed management committees.

- 1.21 **Component 2: Climate risk reduction (US\$26.2 million).** This component aims at reducing rural households exposure to risks related to climate events. On the basis of previous (MARNDR/AECOM, 2015) and future studies,¹⁵ the following activities will be financed: **(i) Construction of mitigation works** (downstream river-bank protection and upstream soil and water conservation small-scale infrastructure) in targeted watersheds, in order to reduce the exposure to disaster risk of agricultural areas, economic infrastructure and rural population, as well as to increase agricultural productivity. On the basis of [cost-benefit analysis](#) (MARNDR/AECOM, 2015), the MARNDR has already prioritized a series of down and upstream infrastructure to be built in the framework of the present component. In the Centre-Artibonite upper watershed (PPCR priority area), such works will be financed by the CIF resources. The modeling tools and studies of Component 1 will provide further analysis and develop the capacity to make more informed decisions for future investments. The component also includes the costs of the environmental and social impact mitigation measures related to the construction works. **(ii) Development of simple community-based early warning-systems** in watersheds most threatened by recurrent flooding. These systems, to be developed with the Civil Protection Directorate, will target the areas and population most vulnerable to flood in the selected watersheds (cf. optional Annex II), and [will be based on community involvement and low-cost technologies](#). The risks study to be carried out in Component 1 will contribute to target the beneficiaries and fine-tune the systems' technical features (levels of alert, evacuation paths, etc.)
- 1.22 **Component 3: Reconstruction of FAMV campus (US\$10 million)** This component will finance the supervision and execution of reconstruction costs of FAMV campus, including class rooms, laboratories, administration offices, cafeteria, residencies and other complementary elements, enabling to increase the hosting capacity from 440 to 635 students (optional annex 14). The component also includes financial compensation for the on-campus students that will be temporary displaced during the reconstruction of the residencies (¶2.3).

¹⁵ Studies based on probabilistic assessments of natural disasters risks and modern watershed modelling methodologies, to be developed in Component 1.

The detailed technical design will be available during the first semester 2016 and is financed with resources the French Development Agency and IDB.

- 1.23 **Other project costs (US\$5.75 million).** Other activities to be financed include: (i) project management (consultants, travel, equipment, operational costs, audits, etc.); (ii) evaluation, and (iii) contingencies.

C. Key Results Indicators

- 1.24 Table 2 lists the key indicators, measurement periods and selection rationale (see results matrix).

Table 2. Key Indicators, Measurement Periods and Selection Rationale

KEY INDICATOR	PERIOD	SELECTION RATIONALE
Impact		
Difference in average annual gross value-added per plot in selected gullies between beneficiaries of check-dams and control group	Y5	Measures the impact on agricultural productivity
Difference in average annual gross value-added per farm in selected areas between beneficiaries of research program and control group	Y5	
Reduction of losses caused by a one year return period flood event in the targeted watersheds	Y5	Measures the reduction of economic losses
Selected Outcome Indicators		
Component 1: Share of MARNDR mitigation works design based on climate risk analysis information system in the selected watersheds	Y5	Measures the increased capacity for climate risk management in the targeted watersheds
Component 1: Climate-proof agricultural techniques adoption rate among farmers	Y5	Measures the increased capacity of farmers to manage climate risk
Component 1: IGOPP-Recovery Planning sub-index	Y5	Measures the capacity of MARNDR to cope with natural disasters in the sector
Component 2: Total volume of water contained by check-dams that is available during the dry season	Y5	Measures the reduction of climate risks in the targeted watersheds
Component 2: Reduction of expected average annual economic losses due to floods and erosion in targeted watersheds (two indicators)	Y5	
Component 2: Community based early warning systems functioning in targeted watersheds	Y5	
Component 3: Annual number of research papers published by FAMV on disaster risk management, and climate-proof agriculture.	Y5	Measures the recovery of the educational and research capacity of FAMV

- 1.25 A cost-benefit analysis was conducted to assess project's economic viability. The main economic benefits were: (i) increase in value added obtained by beneficiary farmers due the construction of upstream soil and water conservation infrastructure and the application of climate-resilient agricultural practices; (ii) decrease in expected losses due to the construction of flood and erosion mitigation works and the establishment of early warning systems; and (iii) benefits obtained from the reconstruction of FAMV. Project's costs

considered in the analysis include both investment and recurring costs. The analysis envisions a time horizon that depends on the different benefits quantified, but applies a 12% discount rate. The project is considered economically viable as its estimated IRR is 39.2% and NPV is US\$86 million. Despite the fact that the economic analysis is based on reasonably conservative assumptions, a broad sensitivity analysis was conducted to confirm results reliability.

II. FINANCING STRUCTURE AND MAIN RISKS

A. Financing Instruments

- 2.1 The total project amount is estimated at US\$47,250,000; financed by the IDB Grant Facility for up to the amount of US\$42,000,000; the CIF resources channeled through the IDB Strategic Climate Fund (SCX) Grant for up to the amount of US\$4,500,000; and the national counterpart for up to the amount of US\$750,000. The disbursement period will be 60 months. Table 3 provides the budget by investment categories and components (see also the detailed budget per output). The local counterpart will finance part of recurring costs.

Table 3. Budget (US\$ in millions)

Investment categories	IDB	SCX	Local	Total
I. Components				
Capacity building to reduce climate risk	2.3	2.4	0.60	5.30
Climate risk reduction	24.1	2.1	-	26.20
Reconstruction of FAMV	10.0	-	-	10.00
II. Other project costs				
Administration	4.2	-	0.15	4.35
Audit	0.3	-	-	0.30
Monitoring – Evaluation	0.6	-	-	0.60
Contingencies	0.5	-	-	0.50
TOTAL	42.0	4.5	0.75	47.25

B. Environmental and Social Safeguard Risks

- 2.2 According to OP-703, the project was classified as Category B. The expected negative impacts are considered to be minor to moderate and likely to be mostly local and short term. During project preparation, an Environmental Assessment and a generic Environmental and Social Management Plan (ESMP) were prepared. Mitigation measures have been integrated and budgeted in project activities. Key project impacts and risks include: (i) social and environmental impacts of civil works, such as river turbidity increase, extraction of raw materials, safety risk in construction sites and potential minor households displacements and/or land loss.¹⁶ These will be mitigated through the implementation of site-specific ESMP for each construction works, including compensation for displacements and loss of livelihood. (ii) False perception by the population to be fully protected from flooding after works execution. To mitigate this risk, local flood early warning systems will be developed to keep the population prepared with regards to the existing risk. (iii) Temporary displacement of FAMV

¹⁶ Minor displacements mean less than five households per major downstream watershed protection infrastructure (four are foreseen to be built). Such displacements will depend on the sites and may not be necessary. If they appear to be necessary, the Involuntary Resettlement Policy (OP-710) will apply and the Bank will supervise its adequate application.

on-campus students before launching the reconstruction works. Since damages to FAMV results from a natural disaster and displacement will be temporary, OP-710 does not apply, however individual financial compensation for alternative housing will be provided to the students residing on campus during the reconstruction of the residencies, which are too severely damaged and will not be able to host students during the works. **Prior to beginning the works of Component 3, the Executing Agency (EA) shall present a compensation and an action plan for the temporary displaced on-campus students during the reconstruction of the residencies.** The beneficiary shall comply with the environmental, social, health and safety and labor requirements set forth in the Environmental and Social Management Report ([ESMR](#)), and in particular Section 6 (i), and provide evidence of such compliance.

C. Fiduciary Risk

- 2.3 The financial risk of the proposed project is evaluated as medium since the Executing Unit of the Natural Disaster Mitigation Program (PMDN), which will be responsible for project implementation, has demonstrated satisfactory administrative and financial management capacities, according to the latest assessment performed by the Bank in July 2015. Risk rating can be further improved with: (i) the updating and implementation of an OM (¶3.9) to include activities foreseen in the present project, as well as a section on a code of ethics; (ii) the updating of the current accounting system to include a module for budget preparation and monitoring; (iii) the preparation of procedures for the administration of goods and fixed assets and the safeguard of financial information; and (iv) a chart of accounts. During the first year of the project, the Bank's fiduciary staff will conduct inspection visits every four months and on a semi-annual basis the following years (Annex III) to review the execution of the financial plan, the preparation of financial reports and to review project expenses and documentation. All costs associated with mitigation measures are included in project budget.
- 2.4 The procurement risk is evaluated as being medium to low, based on the findings of supervision visits conducted by the Bank's Procurement Team. The MARNDR's Procurement Unit (UPMP) is operational since early 2014 and has proved to possess a strong technical capacity in procurement and to be a reliable structure. However, the increased number of projects that are being handled by this unit as well as the Ministry's lengthy procedure for contract approval may have an impact on procurement timing. The following mitigation measures are recommended: (i) hiring or appointment of a procurement specialist to support the additional workload; (ii) submission by the EA of an annex describing the procedure and timeframe applicable to the MARNDR's internal and external approval process for procurement contracts; and (iii) consolidation by the UPMP of all procurement plans executed by the MARNDR in order to improve its planning capacity. The ex-ante review method will apply to major procurement activities. Ex post review will be conducted over specific low risk activities as detailed under Annex III. During the project's disbursement period, the Bank will conduct at least one procurement inspection visit per year.

D. Other Key Issues and Risks

- 2.5 The general risk classification is medium. Key risks include: (i) delays or interruption of execution of some activities due to lack of dialogue with involved institutions and stakeholders. Both risks will be mitigated by socio-environmental management plans for each investment, as well as by the creation of a Steering Committee; (ii) poor sustainability of infrastructure and public services developed. This risk will be mitigated by the mobilization of local counterpart resources, the design of low maintenance cost infrastructure and services, and the elaboration of operation and maintenance plan; (iii) delays or interruption of the execution of works due to extreme climate events, which will be mitigated by planning works according to cyclone seasons; and (iv) difficulties to monitor and evaluate program results due to the lack of primary meteorological data. This risk will be mitigated by contributing to promote the modernization of hydro-meteorological services, currently supported by the World Meteorology Organization and World Bank in the framework of SPCR.

III. IMPLEMENTATION AND MANAGEMENT PLAN

A. Summary of Implementation Arrangements

- 3.1 The beneficiary of the project will be the Republic of Haiti, and the Executing Agency will be the MARNDR through: (i) the technical and administrative team of PMDN; and (ii) the Procurement Unit of MARNDR (UPMP). The EA will be responsible for the overall administration of the project, including: planning and reporting technical and fiduciary aspects; execution of procurement activities; supervision of firms and service providers; financial and accounting management; risk management; monitoring and evaluation; supervision and execution of the environmental and social management plan.
- 3.2 The technical team will consist of, at least, a coordinator, a rural engineer, a natural resources specialist as well as a monitoring and evaluation specialist from the Ministry of Environment (MDE), since the MDE has been involved in the 2187/GR-HA project to monitor environmental aspects and will continue to do so. The fiduciary teams will consist of, at least, an administrator, an accountant and an administrative assistant, as well as a procurement specialist. **Prior to the first disbursement, the EA shall, to the satisfaction of the Bank hire or appoint the coordinator and an administrator assigned to the project.** MARNDR and the MDE will sign a MOU to establish the terms of their collaboration for the monitoring and evaluation of the project.
- 3.3 A Steering Committee (SC) will be created after project start-up workshop to ensure strategic overall guidance and coordination among the different institutions involved in project implementation. The SC will meet at least once a year in order to discuss strategic issues, as well as to approve the multi-year execution plan, annual operation plans and progress reports. This committee will be chaired by MARNDR's General Director and will include a representative of MDE, CIAT, FAMV and DPC.

- 3.4 The Ministry of Interior and Territorial Collectivities, through the Civil Protection Directorate (MICT/DPC), is the national entity in charge of developing and managing part of natural disaster mitigation measures, particularly flood early-warning system. It will collaborate with MARNDR to implement the activities related to the development of flood early warning systems (activity (ii) of Component 2). **The EA shall, to the satisfaction of the Bank, present, prior to the execution of activity (ii) of Component 2, a copy of a valid MOU between MARNDR and MICT, establishing the terms of the collaboration between MARNDR and the Civil Protection Directorate of MICT for the execution of said activity.**
- 3.5 Agreements will be signed between the different participants (including universities, CNIGS) involved in the implementation of activities (i) and (ii) of Component 1. CNIGS is the national public office in charge of managing and providing geospatial information on the country, in several topics such as geography and natural resources.
- 3.6 The Unit for Construction of Housing and Public Building (UCLBP), which is the national public office in charge of supervising public buildings construction, will collaborate in the reconstruction phase of the FAMV campus. **The EA shall, to the satisfaction of the Bank, present, before launching the procurement processes of the works of Component 3 (FAMV campus), a copy of a valid MOU between MARNDR, FAMV and UCLBP establishing the terms of the collaboration of UCLBP in the reconstruction phase of the FAMV campus.**
- 3.7 The CIAT, which is an inter-ministerial committee in charge of land planning management, will be responsible for the monitoring and evaluation of PPCR related activities of the project (¶1.20 and 1.21) in collaboration with MARNDR, in accordance with its role as PPCR focal point. CIAT will monitor and report on the progress of the core mandatory indicators of PPCR Results Framework (see monitoring and evaluation plan).
- 3.8 In addition to the general conditions **prior to the first disbursement, the EA shall adopt, to the satisfaction of the Bank, an operations manual (OM)**¹⁷ of the project which shall include, among others: (i) the role of each participant and collaborating institution for the implementation of the project; (ii) a code of ethics section; (iii) an annex describing the procedure and timeframe applicable to the MARNDR's internal and external approval process for procurement contracts; (iv) the ESMP for works; (v) the Monitoring and Evaluation Plan; (vi) procedures for the administration of goods and fixed assets and the safeguard of financial information; and (vii) a chart of accounts (see Annex III).
- 3.9 Procurement activities will be conducted as detailed in Annex III. The UPMP will manage all procurement processes for works, goods and services. All procurement activities will be performed in accordance with Bank rules and procedures, with no exceptions to the application of the Policies for the Procurement of Goods and Works (GN-2349-9) and the Policies for the Selection and Recruitment of Consulting Services (GN-2350-9). The project will also be

¹⁷ The operations manual of HA-L1041 in optional annex 15 will be used as a basis to be updated as condition prior to first disbursement.

subject to the special provisions for procurement activities in Haiti (GN-2654), for as long as such provisions are in effect.

- 3.10 Project financial management will be conducted as detailed in Annex III. Advance of funds methodology will be used for the disbursement of project funds and for an amount equivalent to four-month funding needs.
- 3.11 **Special disbursement.** To enable the EA to fulfill the conditions prior to first disbursement an initial disbursement of up to US\$150,000 will be made to the extent the Beneficiary fulfills, to the Bank's satisfaction, all the standard general conditions prior to first disbursement set forth in the grant agreement (see ¶4.8 of annex III).
- 3.12 **Special audit and financial reporting requirements.** PMDN will be responsible for the recruitment of external auditors eligible to the Bank to perform the audit of the program as follows: (i) annual financial audit of the program to be submitted within 120 days after the closure of each Haitian fiscal year; and (ii) a final financial audit of the program to be submitted within 120 days after the date of the last disbursement. Audit may include audit of procurement processes under ex post modality (to be confirmed in the TORs of the audit firm).

B. Summary of Arrangements for Monitoring Results

- 3.13 **Planning and Monitoring.** As specified in the Monitoring and Evaluation Plan, during the grant disbursement period, the EA will submit AOPs no later than 30 days before the end of the each calendar year; and semiannual PRs no later than 30 days after the end of the calendar semester. The AOPs and PRs will be prepared following a template agreed upon with the Bank, and consistent with the Bank's "Project Monitoring Report." The AOPs will include target indicators, an annual work plan for the calendar year, updated procurement and risk mitigation plans, a disbursement forecast, and a maintenance plan for the infrastructures and equipment financed by the project. The PRs will indicate, among others, the level of fulfillment of project's output and outcome indicators planned in the AOPs; explanations of execution gaps and problems encountered; and indicate corrective measures. The PRs will also include a section related to the maintenance of infrastructures and equipment. At the end of the project, the EA will prepare a final report that will summarize all the PRs prepared during the project life. The PMDN will also receive the support of MARNDR's Studies and Programming Unit (UEP) to prepare the AOPs and PRs, as well as to supervise the implementation of the evaluation plan.
- 3.14 **Evaluation.** The EA will submit to the Bank a midterm independent evaluation report within 90 days after the date on which 50% of the grant proceeds have been committed; and a final independent evaluation report within 90 days after the date on which 90% of the grant proceeds have been disbursed. The final evaluation report will include the results of the project's impact evaluation (see below). The project's outputs and outcomes will be monitored and reported on a regular basis, according to the monitoring and evaluation plan. The reporting will include key PPCR core indicators.

3.15 **Impact Evaluation Plan.** The monitoring and evaluation plan presents the methodology, data collection plan, indicators to be measured, sample design and budget allocated to each activity of the impact evaluation plan. The project's impact on the reduction of economic losses caused by floods will be measured using a reflexive approach (before-after). MARNDR/Artelia (2013) and [AECOM \(2015\)](#) will provide baseline data. At the end of the project, follow up surveys will be administered to the same 1,500 households surveyed by Artelia and AECOM at baseline. For a flood event with a given return period, the difference between observed post-intervention economic losses and baseline levels will represent the project's impact. On the other hand, an experimental approach will be used to measure the project's impact on agricultural productivity. This approach will consider two treatment groups: (i) farmers who benefit from the construction of small-scale water and soil conservation infrastructures (Component 2); and (ii) farmers who benefit from the construction of small-scale water and soil conservation infrastructures as well as from the applied research program (Component 1). A pool of 417 pre-selected eligible farmers will be randomly assigned to the first treatment group, the second treatment group or the control group. Such a methodology will help measure the differential impact, if any, between these two treatments. Three rounds of surveys will be administered (one baseline and two follow up surveys) and the total number of household surveys for all three rounds is 1,251.