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CASE STUDY

Upscaling community resilience through Ecosystem-based Disaster Risk Reduction in Haiti

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EXECUTIVE SUMMARY

Since 2019, the United Nations Environment Programme (UNEP) in-collaboration with Partners for Resilience (PfR) have developed and implemented scalable Ecosystem-based Disaster Risk Reduction (Eco-DRR) models, working alongside various governments and their respective communities in strengthening their capacity and shaping Eco-DRR policy interventions.

This case study highlights Eco-DRR interventions in Haiti focused on ecosystem restoration and protection in 3 municipalities: Chardonnieres, Les Anglais, and Tiburon in the South district of Haiti. The key risks being addressed within this context are flooding, landslides and food insecurity. To address this, the project aims to strengthen community resilience to disasters and climate change, through the adoption of demonstrated best practices by farmers and landowners in three municipalities. Specifically, the project seeks to strengthen integrated risk management and inclusive risk governance by supporting development and scaling up of Eco-DRR actions and citizen-based monitoring of disaster and climate resilient policies and practices and mainstreaming youth engagement and gender considerations.

A model for upscaling community resilience has been developed through three core components of Eco-DRR: Ecosystem Restoration/Protection, Disaster Risk Reduction, and Climate Smart Livelihoods. In Haiti, there is a greater emphasis on ecosystem restoration and climate smart livelihoods, by combining slope restoration and watershed protection with staple crop cultivation to address chronic food insecurity. The project further addresses flood, landslide and food insecurity risks through risk mapping, slope and watershed restoration and livelihoods diversification by upscaling Eco-DRR into humanitarian programmes of Red Cross Societies in Haiti.

Under capacity building, Community-based organisations were established and actively engaged in ecosystem restoration, women groups were trained and engaged in vegetable gardening for livelihood strengthening, among other activities. In terms of advocacy, local authorities actively participated in programme activities through training and implementation of community Vulnerability and Capacity Assessments. An estimated 9,211 beneficiaries were reached through the project of which 37 percent were women. A cost-benefit analysis performed by the University of Massachusetts Amherst demonstrated that the benefits of Eco-DRR and resilience enhancement interventions outweigh the value of their initial costs.

This case study lays the foundation for demonstrating the need for large-scale implementation of Eco-DRR in advancing the implementation of the Sendai Framework for Disaster Risk Reduction and the Sustainable Development Agenda. The content for this case study has been developed by the United Nations Environment Programme (UNEP) in collaboration with Partners for Resilience (PfR) – a global alliance between the Netherlands Red Cross, the Red Cross and Red Crescent Climate Center, Cordaid, Wetlands International, and CARE - along with their partner civil society organisations in the countries where they work.

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LIST OF ACRONYMS

ASEC	Assemblies of the Communal Sections
CASEC	The Boards of the Municipal Sections
CBO	Community-based Organisation
CBA	Cost-Benefit Analysis
DG-INTPA	Directorate General for International Partnerships
Eco-DRR	Ecosystem-based Disaster Risk Reduction
EVC	Environment Vulnerability and Capacity
HRC	Haitian Red Cross
Ha	Hectares
IPC	Integrated Food Security Phase Classification
PfR	Partners for Resilience
NLRC	The Netherlands Red Cross
OMB	US Office of Management and Budget
UNEP	United Nations Environment Programme
USDA	United States Department of Agriculture
VCA	Vulnerability and Capacity Assessment

INTRODUCTION

This case study documents the experiences, results, and lesson learned from the Eco-DRR project undertaken by the Netherlands Red Cross in collaboration with the Haitian Red Cross in Haiti with funding from the Directorate General for International Partnerships (DG-INTPA), European Commission. The objective is to upscale community resilience through Eco-DRR activities. The project was implemented from May 2019 to June 2022 in 3 municipalities: Chardonnieres, Les Anglais and Tiburon in the South District. These areas were selected based on the frequency of flooding and landslides exacerbated by acute food insecurity. Majority of the people here depend on farming for their livelihoods, as such much of the slopes are used as farmland. Unsustainable practices are often used that exacerbate soil erosion, degradation, and loss of arable land. Cutting trees for charcoal production and clearing land for farming has led to massive deforestation. Hence, soil is subject to increased runoff, leading to a reduced recharge of groundwater, insufficient replenishment of soil moisture, and diminishing crop yields. Exploitation and lack of management of the ravine systems trigger a chain of events, including flash floods and landslides.

Overall objective: The community of Chardonnier (70,000), arrondissement is more resilient to disasters (also related to climate change) due to the adoption of demonstrated best practices by farmers and landowners in the locality.

Specific objective: Strengthened integrated risk management and inclusive risk governance by supporting development and scaling up of Eco-DRR actions and citizen-based monitoring of disaster and climate resilient policies and practices and mainstreaming youth engagement and gender considerations.

The programme's expected target is divided in 4 outcomes:

1. Households, farmers and landowners adopt sustainable and improved risk-resilient livelihood activities;
2. Local governments adopt and scale-up land restoration and erosion prevention measures after partaking in the participatory demonstrations of agricultural land restoration, putting erosion prevention measures in place and managing land sustainably;
3. Haiti Red Cross and CSOs have improved capacity to scale-up local Early Warning, Early Action systems with community-led, gender sensitive contingency planning, organisation and implementation;
4. The PfR Haiti country team has demonstrated the effectiveness of Eco-DRR to Civil Society stakeholders and governments at local, national, regional and global level in a resource package that consolidates good practices and facilitates the replication and scaling up of the Eco-DRR approach.

Red Cross Youth committee involved in ecosystem restoration project in Tiburon, South Region in Haiti. Photo Credit: The Netherlands Red Cross

HAITI PROJECT LOCATION

The project takes place in 3 municipalities: Chardonnieres, Les Anglais and Tiburon in the South district of Haiti.

Table1: *Expected results/targets.*

Number of community-based / local level organizations that have been trained to implement Eco-DRR activities	20
Number of hectares of ecosystems restored or protected as a result of Eco-DRR field project implemented	100
Number of people who are benefiting (directly or indirectly) from community-based model of Eco-DRR field project	70,000

Key Implementing partners: The Netherlands Red Cross, Haitian Red Cross, the local and regional government authorities.

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Rationale

The South of Haiti is highly vulnerable to disasters and extreme climatic events. The population is exposed to different hazards, including hurricanes, flooding, droughts, and land erosion, which have a direct impact on human life and on the food and water security of the population.

1.1 Drivers of Risks

The South of Haiti is highly vulnerable to disasters and extreme climatic events. The population is exposed to different hazards, including hurricanes, flooding, droughts, and land erosion, which have a direct impact on human life and on the food and water security of the population. For instance, the Category-4 Hurricane Matthew struck the south district on 4 October 2016 resulting in the largest humanitarian emergency since the 7.0 magnitude earthquake which struck Haiti on 12 January 2010. The effects are still being felt today, as many ecosystems were destroyed and never recovered as a result of the high winds and floods. Furthermore, farmers felt the loss of forest-related biodiversity, particularly the production of mango, banana, coconut, coffee, and cacao declined and fertile lands were completely eroded. On August 14 2021, an earthquake of 7.2 magnitude struck near Petit-Trou-de-Nippes, approximately 150 km west of Port-au-Prince. This impact was felt at the commune of Chardonniers triggering landslides, destroying agricultural crops (corn and beans), livestock, and causing severe damage to infrastructure (roads).

The country has a national disaster risk management system organised from the national to the local levels and is led by the civil protection agency, with Haitian Red Cross as a permanent key member. However, in these three municipalities, the system is non-functional, and the key stakeholders of the system are inactive in terms of disaster preparedness and response, lack of technical training, equipment, and funds to prepare for and respond to disasters.

From an economic perspective, 70,000 people living in the three municipalities depend primarily on rainfed agriculture for their main source of livelihood. Further challenges arise as this fragile environment faces water scarcity, drought, and land degradation due to soil erosion, inefficient use of rainwater, and high population pressure. With little mechanization, the agricultural sector requires a lot of manpower. The land ownership regime that serves as a background to agricultural production can be put into two main categories: direct farming (which includes most of the land that is owned by farmers) and indirect farming (which includes land that is rented or sharecropped). This system of land tenure is called “two halves”. In this system, the landowner gives a part of his land to a poorer farmer for a certain period. In return, the poorer farmer supplies the required inputs to cultivate the parcel of land (seeds and labour). When it is time for the harvest, the crops are divided among the parties in previously agreed-upon proportions.

Agricultural activities usually take place on steep slopes without sufficient measures for soil conservation and erosion prevention. In addition to the modification of the natural environment by agricultural activities, watersheds are currently subject to excessive exploitation of their wood resources by farmers whose farming land have become unproductive. Thus, farmers are clearing out land by cutting down trees and shrubs to make charcoal to offset their unproductive land. Poor rural households tend to use charcoal production as a quick revenue-generating strategy that can be expanded during crises, major devastating events, or annual difficult moments despite the long-term ecological consequences of deforestation. Farmers experience a continuous decrease in agriculture productivity due to land degradation from strong winds and water erosion, loss of soil fertility, depletion of soil nutrients, diminution and deterioration of vegetation cover, as well as loss of biodiversity.

According to the latest report from the Integrated Food Security Phase Classification (IPC), between March and June 2022, 45% of the analysed population nationally (around 4.6 million people) are facing high acute food insecurity and are in the need of urgent actions[1]. The population of the target area faces food insecurity, classified in IPC3 (crisis) and IPC4 (emergency). This means they are on the edge of famine since the highest classification is IPC5 (Catastrophe/famine).

1. https://www.ipcinfo.org/ipc-country-analysis/details-map/en/c/1155488/?iso3=HTI

1.2. Strategies for Addressing Drivers of Risk

The project activities have been organised in work packages to address the above drivers of risks and respond to south district population needs.

1. **Enhancing the disaster risk management capacities of the Haitian Red Cross volunteers, municipality authorities, and communities living in disaster-prone areas.**

The project has made good use of the experience and technical capacity of Haitian Red Cross (HRC) and the Civil Protection Agency staff and trainers. The project continues developing the Disaster Risk Management expertise of key stakeholders depending on their level of ability and actions to prevent, prepare and respond to disasters.

The project selected and trained local HRC volunteers in the disaster preparedness and response systems and all the different actions to prevent, prepare for and respond to disasters. These volunteers have been mobilized to lead the awareness campaigns targeting the general population on disaster preparedness for the start of the yearly hurricane seasons and disaster prevention through Eco-DRR measures. The project also built the competencies of municipality disaster preparedness and response committees on their roles and responsibilities to prepare for and respond to disasters following the national disaster preparedness and response system and plan. All trained beneficiaries have participated in the Community Plan of Development of Les Anglais and are key figures for advocacy ruling and management in emergency situations.

The project has enhanced the capacities on disaster risk management and climate change of 6 HRC structures, 3 Council and local authorities in these regions, as well as sensitizations the youth population and schools about climate change and the impact of disasters in the community through the *J'adapte* methodology. *J'adapte* (*Jeunesse Adapte*) programme-is an interactive curriculum on integrated risk management, inspiring youth-led community action.

2. **Strengthening the capacities of communities in agricultural land restoration, erosion prevention measures are in place and sustainably managed by the community.**

The Netherlands Red Cross (NLRC) technical team is approaching restoration as a long-term objective to be led, achieved, and sustained by the local communities, comprising two main steps. First, the programme aims at changing the mindset of local farmer groups (re-greening their minds). Second, building their knowledge and technical capacities towards the restoration of lands, protection of ecosystems, sustainable use of natural resources, and sustainable agriculture crops and techniques. The local farmers and communities enhanced their knowledge on the benefits of trees and ecosystems on soil quality, protection of fertile soil runoff, and improvement of harvest quality and quantity.

The local farmers and communities are leading the establishment and management of community-owned seedling nurseries, where seeds are grown into seedlings - ready to be planted under the responsibility of the farmers, women, and youth groups, who will choose in dialogue who and where to undertake the restoration activities.

NLRC has integrated, through a training and best practice package, farmer groups that experience soil fertility and erosion issues and who understand the negative consequences of their past and current agriculture practice. They have been trained to integrate ecosystem restoration into their agricultural techniques. For example, the NLRC team has trained farmers to combine the plantation of beans (Haitian staple food) with soil conservation techniques and the planting of trees.

3. Sustaining, increasing, and improving disaster and climate-resilient livelihood activities.

NLRC also takes into account that one of the main factors contributing to population vulnerabilities and degradation of ecosystems is a lack of livelihood opportunities and unsustainable livelihood practices in the community. NLRC agronomists identified and proposed to farmers and women, the various resilient and sustainable livelihood activities that are contributing to ecosystem restoration, such as agroforestry and vegetable gardening (*Jaden lakou*).

An assessment of local markets showed the low diversity of sold products, as most of the farmers only focused on the production of different varieties of beans, corn, and bananas, which are sold at daily market prices to wholesalers coming from the nearest city. Supporting women to increase vegetable production improve food security, and the surplus of vegetables being sold in the local market would raise additional household income. NLRC technical teams have also provided trainings to enhance farmers techniques to improve quality and quantity of harvests, especially in growing different variety of beans.

Red Cross Youth committee involved in ecosystem restoration project in Tiburon, South Region in Haiti. Photo Credit: The Netherlands Red Cross

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Success Story

"The ramped, vegetated and healthy slopes enable us to grow our food and protect our village from landslides and flooding"

In 2020, a community assessment conducted by the Haitian Red Cross together with community members identified that families in food insecure situations are usually using detrimental and irreversible coping mechanisms. The reversible coping mechanisms included selling their stock of seeds and livestock in the market, while the non-easily reversible ones involved cutting trees to produce charcoal for sale . The charcoal production has become a keylivelihood source to compensate for the decrease in income from agriculture in the whole country and specially in the South Region that records 41 percent of the total charcoal supplied to the capita[2].

However, the local communities and farmers are aware of the negative effects and degradation of their environment and the consequences of their unsustainable livelihood practices. More specifically, farmers are aware of the loss of soil fertility, which results in lower quality and quantity harvests and the drying of water sources. Some community members welcome the project approach with a very high level of interest and are eagerly engaged in restoring degraded ecosystems to enhance community resilience.

Odes Eliassaint is a farmer who has lived for more than 30 years in Tiburon, the very last rural municipality located at the Southwest tip of Haiti. Odes and his family live in a mountainous landscape named Galette, 3 hours' walk from the coastal area and municipality centre. Odes is 48 years old. He has a small woodlot along with a little house on the slope of Galette, where he lives with 5 members of his family (himself, his wife, an elderly person to take care of, and his two children). The family primarily depends on agriculture for their livelihood. Rain-fed agriculture has been traditionally practiced following a rotation technique with slash-and-burn techniques for land preparation. The second source of income comes from his three goats, which he would sell in case of emergencies. The third source of income is charcoal production during the dry season to earn some money to pay for the school tuitions of his children, debts, and buying essentials.

Jacmel Bay - Haiti.
Photo Credit: Unsplash/Claudia Altamimi

2. https://documents1.worldbank.org/curated/en/697221548446232632/pdf/-134058CharcoalHaitiWeb.pdf

Odes Eliassaint is using his donkey to transport seedlings from the community nursery to be planted on his land. Photo Credit: Joesmy Louis. Haitian Red Cross /Netherlands Red Cross.

The Red Cross project has made my family's agriculture practice sustainable, this year I did not lose crops during the cyclone season. Soil conservation has helped me harvest three- or four-times more beans' than ever before. I am really happy because my family and I will not be hungry; we will be able to eat the whole season and save some seeds for the next harvest

Odes Eliassaint, Rain crops farmer from Galette village, Tiburon, South Haiti

Odes Eliassaint is a farmer who has lived for more than 30 years in Tiburon, the very last rural municipality located at the Southwest tip of Haiti. Odes and his family live in a mountainous landscape named Galette, 3 hours' walk from the coastal area and municipality centre. Odes is 48 years old. He has a small woodlot along with a little house on the slope of Galette, where he lives with 5 members of his family (himself, his wife, an elderly person to take care of, and his two children). The family primarily depends on agriculture for their livelihood. Rain-fed agriculture has been traditionally practiced following a rotation technique with slash-and-burn techniques for land preparation. The second source of income comes from his three goats, which he would sell in case of emergencies. The third source of income is charcoal production during the dry season to earn some money to pay for the school tuitions of his children, debts, and buying essentials.

Like Odes, there are other families in his village who depend on rain-fed agriculture. Harvest sold at markets serves as a primary source of income for families seeking to pay school tuition fees, household necessities, and for other basic needs. Unfortunately, the need to solely depend on harvests from beans and maize does not serve as a sufficient means of livelihood. There is a clear need for income diversification to support a sustainable livelihood. Like Odes, other families seek an alternative source of income by raising cows and goats to be sold later in the market for meat or resorting to producing charcoal.

Land degradation is caused by two main forces: first, the impact of unsustainable practices through human-induced large-scale deforestation to cover the needs of an overpopulated society. Second, climate change exacerbates natural phenomena which increases the frequency and intensity of hazards (hurricane season, seasonality of rain-dry periods).

Galette village, like many rural villages in Haiti, has been impacted by low yields from harvests and amplified food insecurity. Odes is one of many good examples of closely engaged farmers from Galette Village who have understood the importance of the Ecosystem-based Disaster Risk Reduction (Eco-DRR) approach. Odes has implemented the right agriculture techniques on his own land while sharing the learnings in his own community. His most notable accomplishment is the reduction of landslides on his agricultural land during the rainy season. This is primarily due to his implementation of live barriers and slope terraces.

I am really happy. The project has helped me because earlier the soil got washed to the sea

- Odes

The Haitian Red Cross, supported by the Netherlands Red Cross, aims to build long-term resilient communities using an integrated community-driven approach to mobilize community groups and local authorities. Traditional practices such as collective work (called kombit in Creole Language) are further utilized for maintaining solidarity bonds and community relations. These factors are key for developing ecosystem restoration work, enhancing agriculture techniques, and increasing/diversifying livelihood sources by addressing food insecure households' current needs. This was done by enhancing their coping mechanisms to withstand shocks. Overall, the whole community, including youth, will gain higher capacities to be less dependent on external support for future crises.

The project has trained Community-based Organisations (CBOs) including farmer groups from the local communities. Within these farmer groups, you have members like Odes who are able to showcase and implement sustainable agricultural practices within the community. These sustainable agricultural practices include soil conservation techniques in slope terrain, the establishment and management of nurseries, collection, and reproduction of seeds in seedling nurseries, planting live barriers in slopes, improved bean planting techniques, and harvest management. As a result of the project's technical support and seeds distribution, Odes has tripled his yield of black beans and maize on his farmland. Odes is a clear example of how transforming and discontinuing practices like slash-and-burn to practices like spacing between plants and seed treatment can result in a greater harvest with less investment. Odes has been able to store part of the harvested beans for the next planting season and for food consumption while still being able to buy some cattle (few heads) and pay for school fee of his two children, instead of selling everything in the market.

I will continue implementing the Eco-DRR approach and I would like others to continue as well

- Odes

Community-based Organisation members are working on preparing a tree nursery. Photo Credit: Joesmy Louis. Haitian Red Cross/Netherlands Red Cross.

Cassia seedlings are growing in the community nursery that will be planted later on the farmer lands. Photo Credit: Joesmy Louis. Haitian Red Cross/Netherlands Red Cross.

3

Main components and model

Addressing flood, landslide, and food insecurity risks through risk mapping, slope and watershed restoration, and livelihood diversification by upscaling Eco-DRR into humanitarian programmes of Red Cross Societies.

3.1. Eco-DRR Components

Capacity Building

As the project is using a community-based approach, NLRC built the capacities of stakeholders that are directly involved and mobilized in the project activities, such as Haitian Red Cross committees and youth volunteers, Community-based Organisations (CBOs), and women groups. Raising awareness, building, and strengthening capacities in Disaster Risk Reduction (DRR), Ecosystem Restoration and livelihood diversification are key to successful community mobilisation. The trainings are based on a community approach where the beneficiaries are selected. This is further based on the project selection criteria, in which every activity was then consulted with the local committees. These committees consisted of volunteers, the local authorities, and civil society organisations. This methodology was implemented and later replicated within the community.

The project demonstrated the following results

- 15 community-based organisations established and actively engaged in ecosystem restoration and good agriculture practices including crop production and prevention of soil erosion.
- 6 women groups trained and engaged in vegetable gardening for livelihood strengthening
- 6 Red Cross committees involved in Eco-DRR actions and disaster preparedness.
- 3 Civil Protection Local Committees trained in emergency management and establishing a coordination centre for emergencies.
- 3 local builders groups trained on building Eco-DRR infrastructures and maintenance.
- 2 Community-based Organisations trained and engaged in beekeeping.

Field Implementation

A major focus of the project is on practical field practice and the implementation of Eco-DRR activities, since the project teams work with vulnerable populations (mostly with primary education) that understand practice quicker than theoretical concepts. NLRC has been supporting CBOs and their members in taking the lead on ecosystem restoration/protection through community-based and community-owned nurseries, prioritising women and youth such as in Tiburon.

The adopted strategy has been to undertake numerous small-scale restorations on CBO members' and farmer's land. Acquiring the specific farming and agroforestry techniques on their lands was followed-up by protecting the re-forestated area. An advantage is gaining direct ownership by nurturing the seedlings at the individual level, which will later benefit from the tree's productivity. The key success of the Haitian Red Cross and Netherlands Red Cross teams has been based on applying community mobilisation and engagement to communicate the value of introducing native and fruit tree species on their farming land. The traditional Haitian solidarity technique named *kombit*[3] for community group work on land parcels and reforestation strengthened these actions.

3. *Kombit* is the creole word for community gathering and collective effort which is used in Haiti to develop workforce labour specially in agriculture, it was a system used during the slavery period which continues in place. The interested person (owner of the land) calls the community to work in exchange of food and sometime kleren (a local sugar cane alcohol beverage). Then next time this same person will work into someone other's land, construction of house or any other community work.

The project demonstrated the following results:

- 9,211 beneficiaries reached, of which 37 percent are women.
- 10 community-based seedling nurseries managed by local farmer groups . Each having a capacity of 3,000 to 10,000 seedlings.
- 29 ha degraded mountain land restored with native tree species through the reinforcement of agroforestry system and woodlot.
- Creation of natural zones for additional protection by landowners and communities, 56 earthen walls constructed and 27 retaining walls built to reduce erosion, mitigate flood and landslide hazards. These were combined with vegetation such as: pineapple and bamboo to strengthen the structures and provide livelihoods benefits.
- 8 vegetable model gardens (*jaden lakou*) were established with women groups to practice new techniques and showcase results.

Advocacy with Government

From the inception of the project, NLRC has been involving the relevant authorities, especially at the local level. The lowest level of elected government representatives: Assemblies of the Communal Sections (*Le Conseil d'Administration Communal*/CASEC) and the Boards of the Municipal Sections (*L'Assemblé de la Section Communale*/ASEC) have been mobilised in the project activities. NLRC is building the knowledge and awareness of these local leaders, who lack resources to undertake actions but are positive influencers in their area of responsibility. Many of them participated or witnessed the implementation of ecosystem restoration activities with the CBOs and the local communities' members. The approach on working with the direct beneficiaries and the local authorities enables the NLRC to sensitize the community indirectly by amplifying the Eco-DRR model on the target communities. NLRC will look on how to further reinforce their capacities to continue influencing people in protecting the environment and restoring ecosystems, as well as to engage them for the protection and mitigation measures based on Nature-based Solutions as continuing the reforestation, good agricultural practices and the maintenance of the selected areas.

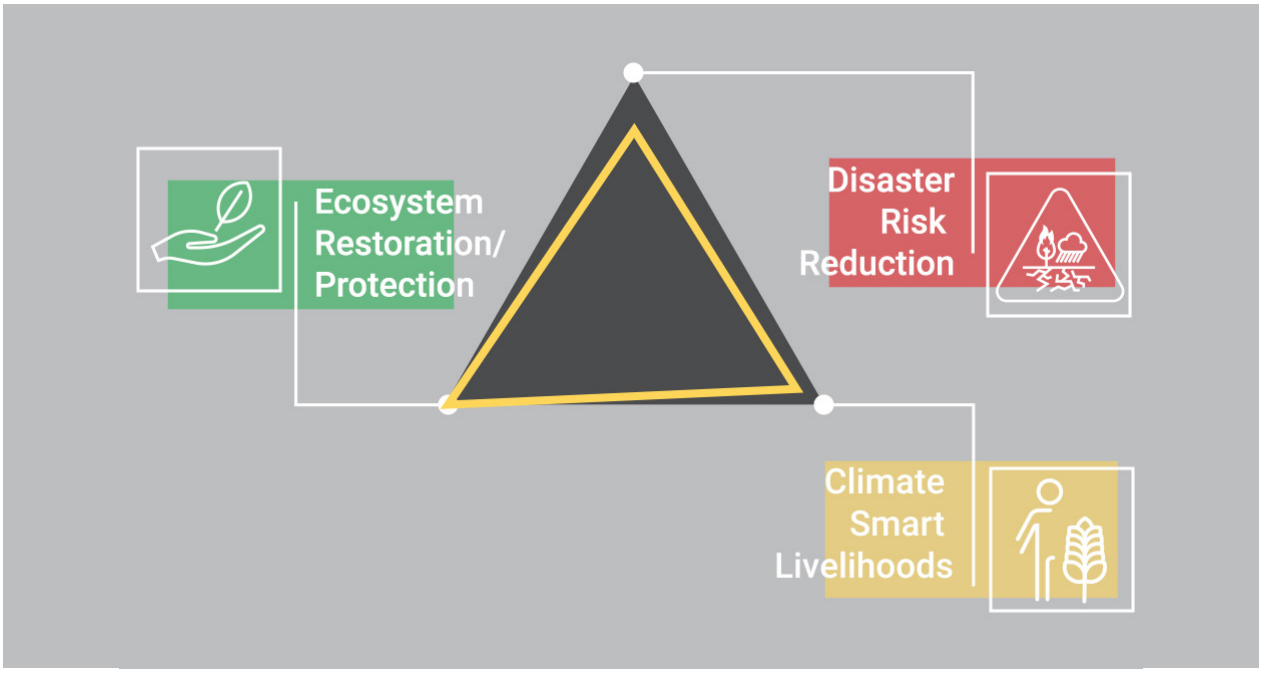
The project has demonstrated the following results

- Local authorities of 6 different sections actively participated in the project implementation through training and community Vulnerability and Capacity Assessment (VCA).
- 1 Red Cross Youth Committee presented and advocated its Eco-DRR action plan to the mayor of the city to implement nature-based mitigation actions in Tiburon.
- *Community Commitment Charter for the Protection of the Environment* – Community owned document which describes the process of an informal agreement with the objective to protect the restored land into private farmers land, followed by long-term protection of the restored land and its endorsement by local authorities.
- Advocacy with the Haitian Red Cross, to include and replicate the Eco-DRR training methodology into *J'adapte* programme and other relevant HRC training materials, increase the Youth Red Cross Committees actions related to Eco-DRR as common practise and include the vision of the Eco-DRR approach into the current 5 years Haitian Red Cross strategic planning document.

3.2. Haiti Upscaling Model

Addressing flood, landslide, and food insecurity risks through risk mapping, slope and watershed restoration, and livelihood diversification by upscaling Eco-DRR into humanitarian programmes of Red Cross Societies in Haiti.

The Red Cross is applying a community-based model of ecosystem restoration, sustainable livelihood, and disaster risk reduction. Central in this model is linking ecosystem protection and restoration with reducing the adverse impacts of hydro-meteorological hazards, flooding, and landslides.



Ecosystem Restoration/Protection

- Implemented digital risk assessment and mapping initiative with local authorities and civil society organisations to prioritize watersheds for restoration measures.
- Engaged and mobilized local community members for restoring and protecting degraded slopes and watersheds with native tree and fruit species.

Climate Smart Livelihoods

- Engaged CBOs to strengthen the link between poverty alleviation and environmental conservation by restoring land with valuable trees and food crops for livelihoods support.
- Catalyzed leadership and interest in re-greening landscapes for lasting change, rather than paying farmers to restore their own lands.

Disaster Risk Reduction

- Involved Red Cross volunteers and local authorities such as Civil Protection in training, implementation, and the dissemination of community contingency plans at the local and regional level
- Constructed hybrid earthen and retaining walls in combination with vegetation to prevent soil erosion and mitigate flood and landslide risks, while promoting sustainable livelihoods.

3.3. Common roles or key issues to be considered

It is essential to conduct a risk assessment to guide the identification of disaster-prone areas and prioritize the locations of intervention. In this project, ecosystem restoration and protection started with a digital risk assessment and mapping (performed by 510 – a NLRC data initiative). The digital study was developed and enriched with data related to the density of population and existing infrastructure to enable selecting intervention areas with the highest community impact. The result was presented to and discussed with the local authorities and civil society organisations to prioritise the watershed management, flood catchments for restoration measures with high impact on protecting communities and reducing the impacts of flooding in the downstream areas. The digital risk assessment should be combined with the field assessment and take into account all the gathered data along with community priorities and evaluation on what can be done in each area. The field study shall prioritize the zones with feasibility to undertake green or grey mitigation infrastructures.

Other key issues identified:

- Using local materials and workforces (providing revenues to the local beneficiaries) and improving local capacities to replicate this sustainable method within the community is indispensable.
- Sustainability of the constructed physical infrastructures such as earthen and retaining walls shall be calculated with longer life expectancy (e.g. 50 years).
- Tapping into ongoing work is a driver for success and efficiency: in this project, the local communities and CBOs are trained to implement a tested Netherlands Red Cross approach taken from a similar ongoing landscape restoration project (Green Pearl project) making available a tested version of the Haitian national mitigation structures.

Ecosystem restoration is a medium-to-long term process, and its implementation is co-dependent on the strong engagement and empowerment of local communities. Implementation of this process is fostered by the enthusiasm and pride of the trained farmers, women, and youth groups from the community-based groups, who clearly see the benefits of participating in the project activities - such as the acquired agriculture techniques to their neighbours, extended families, and members of other communities. Likewise, in the context of Haiti, especially in the South District, local and district authorities do not have sufficient resources to exercise their role and responsibility in ecosystem management. Engaging them, especially those living in the target areas, to monitor and participate in the project activities as the agent of change is effective in the mobilisation and participation of community members in ecosystem restoration activities.

3.4. Scalable feature

The project has operated mainly on the local community level with a strong community-based approach through the Haitian Red Cross and its net of volunteers including the youth groups to implement the Eco-DRR model. The model could be scaled up with the following actions:

- **Disaster Risk Reduction: Identification of flooding and landslide prone areas**

This action will guide the implementation of Nature-based Solutions for water management. First, assess the areas and problems through digital mapping, which prioritizes the intervention in terms of degradation, flooding, and impact on the maximum population. Subsequently facilitate Environment Vulnerability and Capacity (EVC) assessment, this evaluation is a participatory method within the communities to understand the impending risks and the required measures to protect the community. Eventually, develop DRR plans for each community in coordination with local authorities; organise training; engage the Civil Protection Office in building the capacities to respond to emergencies; and prepare the population.

- **Ecosystem Restoration/Protection: Develop a strong community-approach**

This is started by identifying and then engaging the CBOs in the targeted planting areas. Subsequently developing community-based nurseries with 70% fruit and 30% forest trees that are operated and maintained by the trained farmers. This approach emphasized on the greater possibility of achieving sustainability since it began with strong local ownership and planting of trees in the rainy season. Similarly, Nature-based Solutions implemented by trained CBOs on mountain gullies to protect community land parcels, accompanied by close technical monitoring, enable a mental shift as a result of more productive and sustainable livelihoods.

- **Climate Smart Livelihoods: Understand the link between environment and livelihood**

This action is critical in order to implement productive agricultural practices and prevent soil fertility loss. It includes apiculture and the development of vegetable gardening for women. The techniques are based on recovering soil fertility for agricultural crops and household-level vegetable gardens that facilitate the multiplication of harvest and revenue by three or four times and have a healthier and more resilient ecosystem.

Community- and farmer-managed nurseries has been fundamental for the ecosystem restoration approach in Haiti as it is:

- Inevitable for the continuity of the restoration activities
- Low-cost since the seedlings are produced locally instead of purchased externally.
- Increases technical capacities of local community in collecting and reproducing seedling for both restoration and livelihood activities.
- Secures collective ownership from local communities by placing nurseries in community land that is accessible to all members.

How to scale up a community-managed nursery:

- Local community-led site selection of nurseries - close to a reliable water source.
- The trained community group is in charge of nurturing and maintaining the seedlings.
- Assign a lead person/nursery manager who lives close to the nursery.
- Select and produce high-value species (around 75% of total seedling) such as fruit trees, to gain interest from the local community and to improve livelihoods.
- Select and sensitize people with land access to restore and protect, as well as fundamental measures for tree planting and seeds collection.
- Secure commitment and support from local government from the start, e.g., by engaging them in site selection and organise field visits with them.
- Propose the endorsement for protecting the areas which have been planted by community and the development of regulations by local authorities.
- Share the results with other partners in the area to provide continuity on the monitoring and replication of actions.

The community-managed nursery could only be done with robust grassroot organisations and strong community group engagement. This is possible with a very strong presence and extensive network of Haitian Red Cross volunteers to facilitate the process. Similarly, it requires sufficient technical knowledge and hands-on skills in agricultural production. This could be done by assigning the agronomists to train and guide community groups from the beginning.

Community-based ecosystem restoration project in Sevré village on Tiburon borough, South Region in Haiti. Photo Credit: The Netherlands Red Cross

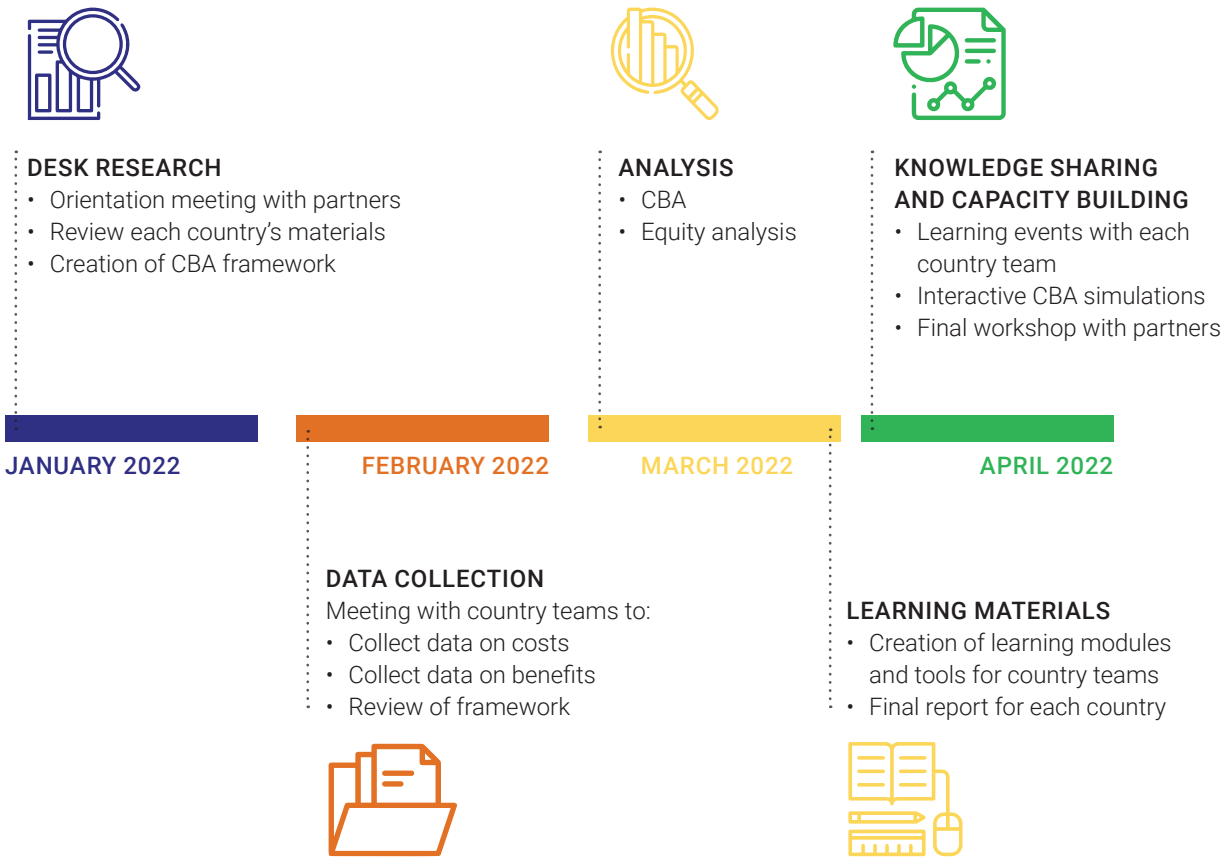
4

Eco-DRR Cost-benefit Analysis (CBA) Study

This study was conducted when the project was still ongoing. The Eco-DRR interventions analyzed in this study, including the size of the target population and the extent of the ecosystems protected and restored have been evolved since then. The study presented the estimated economic net benefits of applying Eco-DRR approach.

4.1. CBA Methodology

The methodological approach adopted in this study includes five components: desk research, data collection, cost benefit and equity analysis, creation of learning materials, and knowledge sharing.



Overall project timeline and methodological approach for efficiency analysis (which includes a cost benefit analysis) and equity analysis.

4.2. Strength, Limitations and Recommendations

The economic efficiency assessment of the project through a quantitative Cost- Benefit Analysis (CBA) and a qualitative analysis includes a vast array of non-monetary benefits too. The quantitative estimates show that the benefits of the Eco-DRR and resilience building interventions outweigh their implementation costs. The qualitative analysis complements these findings presenting a rich bouquet of long-lasting benefits associated with the three Eco DRR three core components: DRR strategies, Ecosystem Management, and Sustainable Livelihood Practices. **This economic efficiency assessment is corroborated with an equity analysis providing a comprehensive overview of the distributional impacts of the intervention on different socio-economic groups.** The large amount of qualitative data and preliminary quantitative data provided by the country team contributes to the strength and relevance of our analyses. Despite the tight time constraints, the country team assisted the research team to the best of their abilities, often collecting new data from the field, thus laying the groundwork for possible future data collection efforts and analysis.

The analysis presented in this report is based on an approximation of the frequency and magnitude of weather hazards (such as hurricanes, storms, floods) in the region. More precisely, the key figure relevant for our CBA is the yearly average of the economic impact of the damage due to weather extremes. Our analyses assume a 2% yearly loss in properties and GDP per capita in the project area. This assumption is based on a conservative approximation of historical trends estimated in the existing literature (UNDRR, 2020; Centre

for Research on the Epidemiology of Disasters and UNISDR, 2018) and based on the data provided by the country team. Weather extremes are expected to worsen with climate change; therefore, our CBA could be underestimating the benefits of ecosystem restoration. This would make an even stronger case in support of the Eco-DRR intervention. We performed robustness checks applying a 5% yearly loss in properties and GDP per capita in the project area and found similar results available as supplementary materials. The estimation assumes that the Eco-DRR intervention will be able to reduce this risk and mitigate losses.

Ideally the CBA estimation performed in this study should consider:

1. Historical frequency (i.e., probability of occurrence) and magnitude of climatic extremes (i.e., El Nino and Climate Change) that may induce floods and landslides in the project region, at least over 30 years.
2. Observed correlation between intensity of extremes (e.g., dry conditions) and damages to properties.
3. Observed correlation between intensity of extremes (e.g., dry conditions) and income losses.

Such data would allow us to better ground the value of the yearly economic damages due to climatic extremes into a robust statistical framework. Due to limited data availability the above components were not included in the analysis. Moreover, the short time available to complete the analysis did not allow us to collect primary data about these components.

Another variable that would need to be better estimated in order to increase the robustness of our CBA is the percentage of damage avoided due to the Eco-DRR intervention. Since the project is in its early stages, there is growing but not ample empirical evidence of the protective power of the nature-based solutions implemented in the project area. The estimations assume that, starting in year 6 after the end of the project implementation, the Eco-DRR intervention is able to completely prevent the 2% annual damage to properties and loss in GDP per capita. The study adopts a conservative approach in assuming that until the 5th year after the end of the project implementation (included), while the ecosystem is maturing, there is progressive increase in benefits (i.e., 10% of benefits the first year, 20% the second year, 30% the 3rd year, 40% the 4th year and 50% the 5th year). This may lead to an underestimation of the benefits.

This quantitative analysis lays the foundation for a possible future broader CBA of the Eco-DRR intervention in this region. Recommendations for future research, if a longer time frame for data collection and analysis is possible, include the following: collecting data related to the three components highlighted above and reproducing the CBA estimation; planning a rigorous data collection schedule in the project area to measure the observed efficacy of the local Eco-DRR interventions in limiting disaster risk. In five to ten years, the collected data could be used to perform a broad and empirically rigorous project evaluation.

4.3. Scenario

SCENARIO 1: Eco-DRR intervention

Benefits include a reduction in property damage and income losses

Benefits **do not** include carbon capture and pollution reduction

SCENARIO 2:

Benefits include a reduction in property damage and income losses

Benefits include carbon capture and pollution reduction

4.4. Results

SCENARIO 1: **After 5 years** (at a 0.07 discount rate) – when benefits do not include carbon capture and pollution reduction, but do include reduction in property damage, and income losses – the present value of net benefits is negative **$1,696,404.45 USD**

After **10 years** the present value of net benefits is positive and equal to **$5,145,686.35 USD**

SCENARIO 2: After **5 years** (at a 0.07 discount rate) – when benefits include carbon capture and pollution reduction, reduction in property damage, and income losses – the present value of net benefits is **$1,722,610.02 USD**

After **10 years** the present value of net benefits is **$5,453,427.33 USD**

Assumptions

The Cost-Benefit Analysis framework adopts the following assumptions and specifications:

- The present value of net benefits (i.e., Net Present Value, NPV) is estimated over a time horizon of 10 years from the end of the project implementation
- The full costs of the project implementation are paid only once in year 0, which corresponds to the end of the implementation
- The ecosystem associated with the eco-DRR intervention (i.e., forest) reaches maturity after 5 years
- There is a 2% yearly loss in properties and GDP per capita in the project area (we also perform robustness check with a 5% yearly loss)
- Until year 5 included, while the ecosystem is maturing, there is a progressive increase in benefits (i.e., 10% of benefits the first year, 20% the second year, 30% the 3rd year, 40% the 4th year and 50% the 5th year)
- The ecosystem restored/protected by the eco-DRR intervention reaches maturity after 5 years, and starting in year 6 it provides full benefits

Discount rates

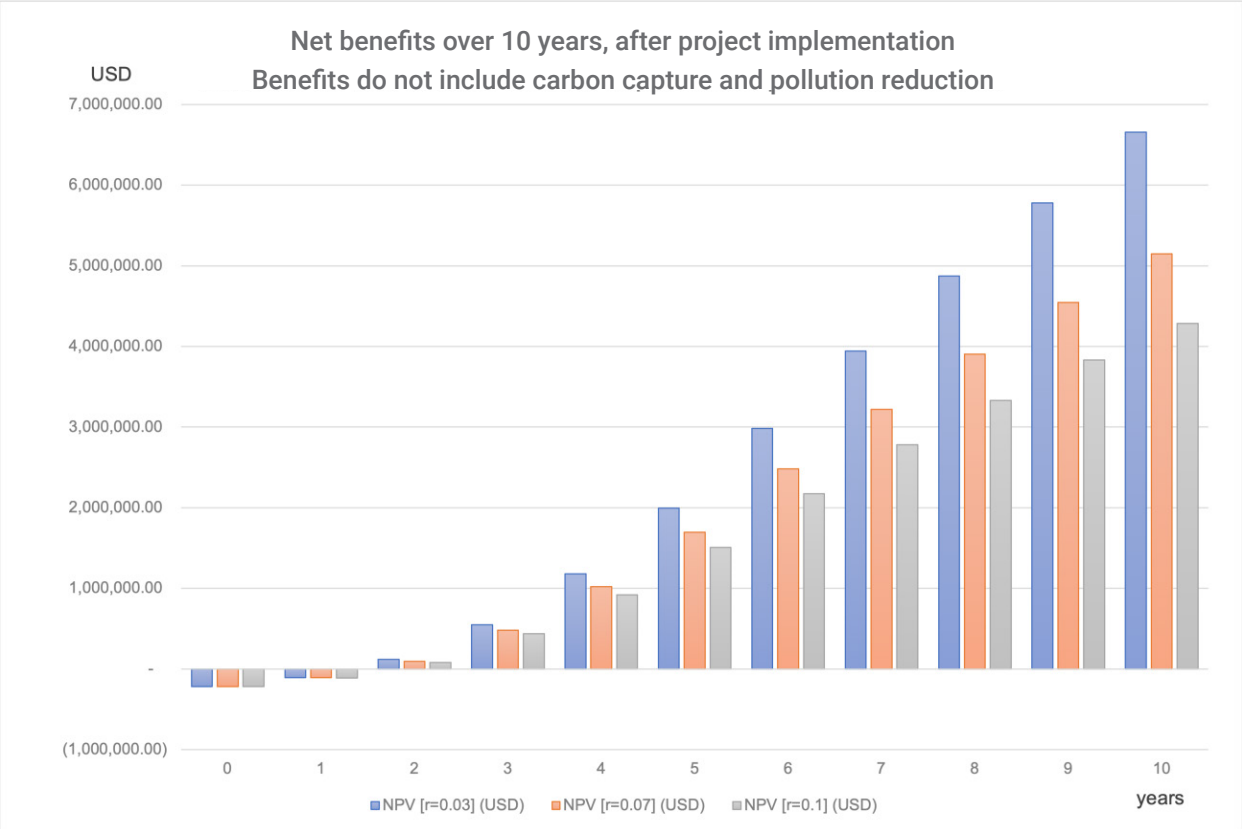
The CBA estimations are performed using three discount rates (i.e., 3%, 7%, and 10%) to allow comparisons across outcomes and robustness checks. Higher discount rate values lead to a lower weight of future benefits and costs in the CBA estimation. Ecosystem-based interventions may generate long-term benefits that might be underestimated with high discount rates. For this reason, it is important to adopt a range of discount rates and perform sensitivity tests. Three percent and seven percent are the discount rates generally recommended by the US Office of Management and Budget (OMB) (Congressional Research Service, 2016; Li, Q. and Pizer, W.A., 2021).

It is worth emphasizing that these estimates are very conservative and net benefits might be much higher than these calculations indicate. There are two main reasons:

- The CBA assumes a 2% yearly loss in properties and GDP per capita in the project area, however historical data shows higher losses, and weather risk is expected to increase in relation to climate change.
- The CBA assessment considers only socio-economic benefits associated with reduced property damage and reduced GDP per capita losses. Because of lack of data, we could not include other important benefits related to health improvements and agricultural productivity (discussed in Section 4.2).

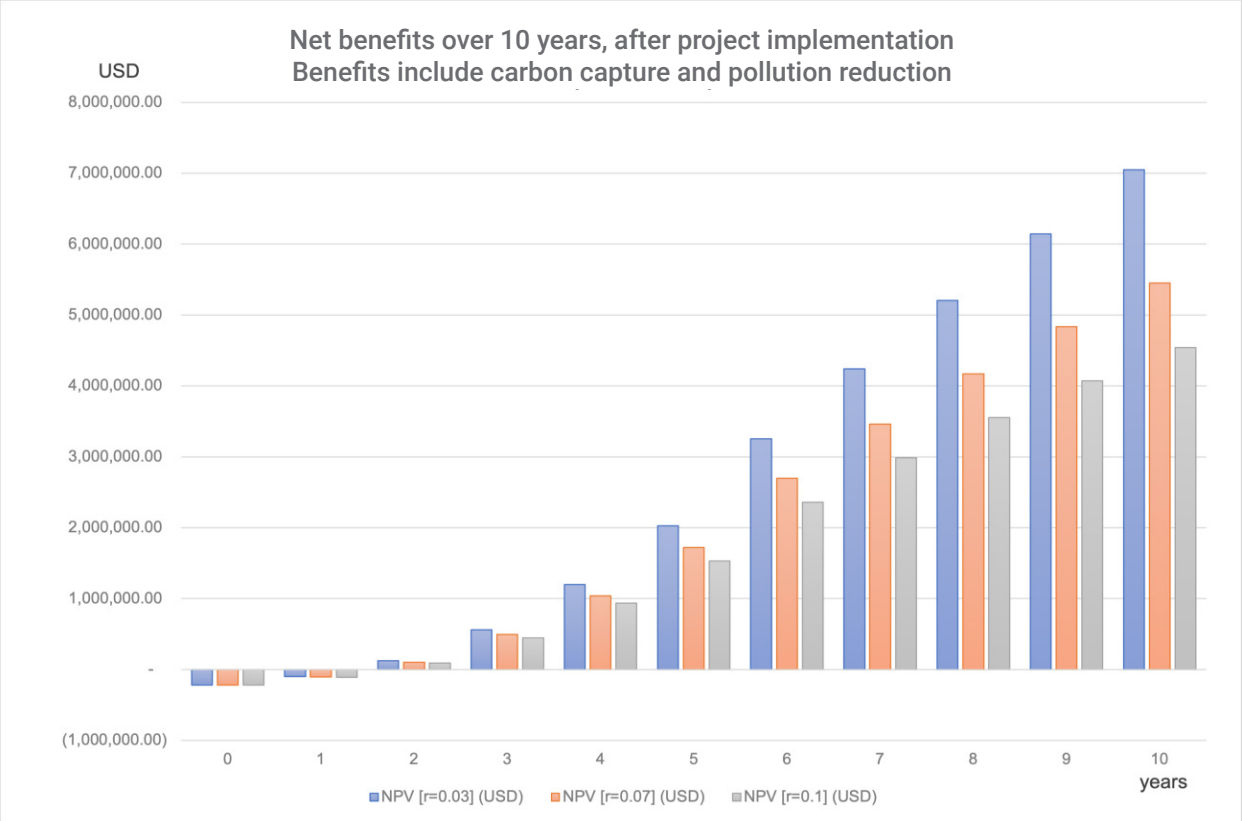
This means that the interventions could be even more beneficial to local communities than estimated in the quantitative analysis.

Scenario 1



SCENARIO 1 - Present Value of Net Benefits			
Benefits do not include carbon capture and pollution reduction			
Discount rates	r=0.03	r=0.07	r=0.1
year	**NPV (USD)**	**NPV (USD)**	**NPV (USD)**
0	-$218,316.00	-$218,316.00	-$218,316.00
1	-$103,763.23	-$108,045.58	-$111,052.95
5	$1,993,798.46	$1,696,404.45	$1,508,186.05
10	$6,654,962.59	$5,145,686.35	$4,285,396.17

Scenario 2



SCENARIO 2 - Present Value of Net Benefits			
Benefits include carbon capture and pollution reduction			
Discount rates	r=0.03	r=0.07	r=0.1
year	**NPV (USD)**	**NPV (USD)**	**NPV (USD)**
0	-$218,316.00	-$218,316.00	-$218,316.00
1	-$102,195.42	-$106,536.38	-$109,584.91
5	$2,024,074.27	$1,722,610.02	$1,531,815.60
10	$7,050,236.37	$5,453,427.33	$4,542,567.90

4.5. Details about benefits used in the calculations

BENEFITS					
			SCENARIO 1	SCENARIO 2	
Year		Maximum Loss	USD (3/29/22)	USD (3/29/22)	source
1	**Reduction in property damages** from avoided hazards (annually)	37,220,000.00	744,400.00	744,400.00	information about property values was collected by country team
2	**Avoided income losses** reduction of losses from business interruption (annually)	21,774,675.00	435,493.50	435,493.50	GDP per capita (World Bank, 2020)
3	**Carbon stored in trees** (this benefit is not an annual rate)			245,392.00	benefits are estimated using program iTree
4	**Carbon Capture** and sequestration (annually)			18,760.00	benefits are estimated using program iTree
5	**Other pollution** reduction (annually)			21,611.14	benefits are estimated using program iTree
		58,994,675.00	**1,465,656.64**	**1,179,893.50**	

The cost-benefit analysis includes all ecosystem restoration implementation costs (218,316 USD)[4] and the following benefits:

- **Reduction in property damages from avoided hazards**

  Future benefits include a reduction in property damage. The following estimates were communicated by the country team:

  - Number of individuals in the project area: 22,333
  - Number of properties exposed to hazards in the project area: 3,722
  - Property price (approximately): 10,000 USD
  - Total property value in the project area = 10,000 USD*22,333 = 37,220,000 USD

- **Reduction in income losses from avoided damages**

In 2020, Haiti GDP per capita was 2,925 USD (World Bank data in 2020). The total population in the project area is 22,333 people. We assume that 1/3 of local residents work, the remainder are retired, too young or unemployed.

Estimated total annual GDP in the project area = 2,925*(22,333/3) = 21,774,675 USD

The major natural hazards that threaten Haiti are cyclones, floods, droughts, and landslides, with floods leading as the greatest threat and contributor to vulnerability (World Bank, 2022). Haiti's economic losses from natural hazards as % of GDP between 2000 and 2019 correspond to 8%. These losses account also for the large 2015 earthquake (UNDRR, 2020). The analyses conservatively assume a 2% yearly loss in properties and GDP per capita in the project area. Climate conditions are expected to worsen with climate change; therefore, the analyses include robustness checks applying a 5% yearly loss in properties and GDP per capita in the project area (available upon request). The underlying assumption is that the Eco-DRR intervention will be able to reduce flood risk and mitigate losses.

4. Budget documents provided by the country teams show that the cost of the intervention associated with *Community-based Eco-DRR Planning and Ecosystem Restoration and Protection* activities amount to 365,594 USD. We assume no maintenance after the end of the project implementation (June 2022).

Carbon sequestration and pollution mitigation are also included as benefits in the estimation. The software iTree Canopy is a global forestry analysis and benefits assessment tool from the United States Department of Agriculture's (USDA) Forest Service. iTree allows to calculate carbon sequestration and storage as well as pollution reduction of a given vegetation area, selected via Google Map. The 56 ha of land reforested in Haiti is estimated to sequester roughly 223.65 tons of carbon annually, and the overall carbon storage capacity for the same area is estimated at 2,928.81 tons (Appendix 3). iTree provides estimates of the corresponding monetary values too, and we used them in the CBA calculations (Table 1).

- **Carbon stored in trees**

  2,928.81 tons. The carbon stored in the reforested area (56 ha) is not an annual benefit, it is a one-time benefit reached at maturity of the forest, after 5 years.

- **Carbon sequestered thanks to Eco-DRR reforestation e□orts.**

  223.65 tons per year. The surface currently reforested is 56 ha.

- **Pollution reduction thanks to Eco-DRR reforestation e□orts.**

  4,436.57 kg of pollutants are reduced every year thanks to the surface currently reforested (56 ha). Pollutants reduced correspond to Carbon Monoxide, Nitrogen Dioxide, Ozone, Sulfur Dioxide, Particulate Matter less than 2.5 microns, Particulate Matter greater than 2.5 microns and less than 10 microns.

4.6 Equity analysis

In addition to the benefits described above, these vulnerability-reduction and resilience-enhancing interventions promote socio-economic equity, gender sensitivity, and cultural heritage protection in the target communities. Vulnerable groups including women and children have benefited, and will continue to benefit, from improvements to their economic, social, and health status. This equity assessment examines the equity implications of the interventions along four dimensions: inclusivity, economic equality, participation, and capacity building.

Inclusivity

The interventions have been developed and implemented in an inclusive manner that aligned with the project's goal of capacity building. Local communities were central to the planning and implementation process, with stakeholders including women, youth, and farmers playing a key role. Staff from civil society and local government organizations including the Haitian Red Cross and Civil Protection Agency were also included as key participants due to their long standing technical and cultural expertise with the target area. Additionally, the promotion of *jaden lakou* promotes inclusivity by facilitating community involvement in land stewardship, at the individual and household level, with a particular emphasis on women. Inclusion and participation are key to promoting risk reduction, sustainable ecosystem management practices, and sustainable livelihoods.

Economic Equality

The interventions in Haiti help to fulfill basic human needs and promote economic equity by improving socio-economic outcomes for the local communities and in particular between women and men. As a result of the disaster-risk reduction achieved through reforestation, soil stabilization, disaster preparedness, and engineering-based infrastructure, communities will be more resilient to natural hazards and less likely to suffer economic losses via property damage and interruptions to business, protecting beneficiaries' needs to a home and livelihood. Reduction in vulnerability to natural hazards, combined with the numerous sustainable livelihood initiatives introduced in these communities (e.g., sustainable agricultural practices and apicultural activities) will also decrease the risk of poverty traps. This includes farmers and commercial beekeepers

benefiting from increased yields due to the introduction of more sustainable practices. The poorest and most marginalized individuals are likely to benefit the most from vulnerability reduction initiatives.

As a result of the reforestation and hazard mitigation interventions, children's education is less likely to be interrupted by inaccessible roads preventing them from getting to school. This is particularly significant for girls whose ability to complete their education will lead to future economic empowerment and will have positive effects for generations to come. Additionally, as a result of more accessible roads people will be more reliably able to access key markets and employment centers, creating economic opportunity and promoting economic equality.

Some components of the vulnerability reduction interventions promote basic human needs to clean air and food security. As a result of the reforestation initiative (and the associated reduction in charcoal production), communities are already benefitting from cleaner air due to the increase in number of trees and reduction in CO2 emissions. Moreover, thanks to sustainable agricultural practices and *jaden lakou,* communities have already started benefitting from greater food security and access to nutritious foods. All this will lead to healthier communities and promote human capital accumulation. An additional example of economic empowerment is associated with women's engagement in new sustainable livelihood activities and promotion of *jaden lakou*. Women in Haiti traditionally participate in markets via petit commerce, selling community-produced or imported goods generally on a small scale. As a result of the interventions, women can now sell their vegetables, increasing their access to markets and giving them more economic opportunity.

Participation

The participation of affected local communities is central to the interventions in Haiti. Participation of Community-based Organisations was key, with 30 local volunteers from the Haitian Red Cross being trained on disaster preparedness and response systems and mobilized to lead community-wide awareness raising campaigns on disaster preparedness and prevention through eco-DRR.

The restoration components of the project were specifically intended to be led, implemented, and sustained by the local communities. This included local communities identifying restoration sites, growing seedlings in community nurseries, implementing soil conservation techniques, adopting agroforestry techniques in bean planting fields, and setting up natural protected zones. Community members have also agreed to restore these protected zones and preserve them from future exploitation. Additionally, individual community members were capacitated via formal training and awareness raising to participate in the Eco- DRR and sustainable livelihoods interventions. This includes participation in agricultural land restoration, erosion prevention, disaster response and preparedness, and sustainable agricultural practices.

Capacity building

The interventions in Haiti focused on building the capacity of local organizations, municipal authorities, and communities to manage the disaster risks of the target area. The project leveraged existing capacities and expertise, for example of the Haitian Red Cross and Civil Protection Agency, while providing additional training and resources to increase their capacities. Moreover, the interventions have increased the capacity of local communities and local organizations through economic and environmental benefits. The transfer of knowledge perpetuated through the interventions is currently uplifting communities through sustainable economic growth, women empowerment, enhanced health and safety, and disaster risk reduction. The centrality of training and community participation to the interventions ensures that stakeholders have the necessary knowledge, skills, processes, and resources to continue these sustainable practices in the future, as well as adapt to future challenges that may arise.[1]

1. Vicarelli, Marta, Anamaria Georgescu, Kerry Judge, Asiel Arroyo, Htike Htike Aung, Jennifer Nelson, Jessica Mooring, Nujhat Purnata, Yin Yin Win. *"Ecosystem-based Disaster Risk Reduction and Community Resilience in Haiti: a Cost-Benefit and Equity Analysis"*. (2022) School of Public Policy, University of Massachusetts Amherst, MA, USA

5

Lesson learned

Reduce unsustainable tree cutting practices for charcoal production by providing alternative livelihoods and energy-saving cookers.

5.1. Project lessons learned

- The initial project design - to work towards an upscaling model with the sub national government stakeholders and to influence policy at the sub national level has proven challenging due to a lack of governmental capacity and coordination, specifically in the absence of a functioning government, a lack of relevant DRR policies, and political instability. These can be regarded as key enabling factors in upscaling Eco-DRR within a government programme.
- Making use of the strong local presence of the Red Cross was instrumental in mobilizing communities. The bottom-up approach is the best practice to engage local communities and to start working towards a change in mentalities. This approach could be combined with initiatives to involve local authorities and advocacy on the regional discussion platforms to bring forward the Eco-DRR agenda, communicate the achieved results, and to link up with locally engaged people who are willing to continue and replicate the approach.
- Capitalizing on the local community's collaborative way of working (*kombit*) improves the traditional community strategies in rural areas without endangering solidarity bonds and community practices. The approach is very successful, and the bond created with the local community through continuous technical monitoring and support enhances the trust in the process.
- Securing the local community commitment is challenging while other organisations working in the same areas provided direct financial incentive to local community in implementing their projects.
- The impact of the earthquake (date) resulted in shifting priorities of the project beneficiaries who had to cope with the aftermath. It requires a long-term process and advocacy with the affected population, humanitarian actors, government agencies, and other actors in the field to step beyond emergency response, towards prevention-related activities.
- Combination of grey (check dams, retaining walls, and contour bunds) and green solutions (life barriers/ trees) has demonstrated tangible results and convinced the local communities of their effectiveness in water management, especially in mitigating flood and landslide hazards. This could be attributed to the fact that during the recent hurricane season (Grace storm in August 2021), the community reported the complete absence of inundation.

5.2 Gender Mainstreaming

Supporting and developing women's resilience by reinforcing their engagement in livelihood activities so that they become empowered. This approach has a positive impact on their self-confidence and the recentering of women's position in society. The training on a new and profitable income generation activity was developed through a group approach which enabled women to improve the income of their households, develop new investments, and participate actively in the household decision-making process. Bolstering the women's training is really important to ameliorate their capacities, sensitization to problems, and abilities to identify solutions and take the required actions. The exit strategy for these women's groups is to develop the group bond and continue with credit group activities in the future to be able to increase their revenues and to empower their decision-making abilities.

5.3. Recommendations for upscaling

- For countries like Haiti, which face political instability and the absence of a functioning government, the institutional upscaling could be focused on the humanitarian actors, in this case through the Haitian Red Cross (HRC). This could be done by enriching training materials, including the Eco-DRR curricula, developed nationally. The Red Cross and Red Crescent National Societies count on and empower their extensive network of DRR trained volunteers in every community of the country. The HRC has established a youth-oriented environment awareness training module, called *J'adapte* (Youth adaptation to climate change) which is being infused with Eco-DRR, and to be replicated nationally.
- The community resilience model on Disaster Risk Reduction has been included in the revision of the Haitian Red Cross 5-year strategy plan (2021-2025). The NLRC will continue advocating the inclusion of Eco-DRR solutions and lessons learned in the 5-year plan to prevent flooding and landslides in risk-prone areas, based on the project results.
- Advocating and presenting the Eco-DRR model and results to national and international actors. This includes the global Red Cross systems and events, including Planet Red, national, and the local government of Haiti and humanitarian actors in the country.
- Influencing the relevant environmental conservation programme and resources. This could be done by developing project proposals with an Eco-DRR approach, for example: The Green Pearl Program and the Caribbean Biodiversity Fund. This follows the "reef to ridge" approach of continuing the management of Nature-based Solutions from the mountain to the coastal area.

5.4. Recommendations for future Eco-DRR projects

- Modify traditional agricultural techniques to modern practices, combining lower agriculture inputs with higher yields and diversified livelihoods by means of improved agriculture production techniques such as soil conservation, self-production and reproduction of seedlings and bean planting, and harvest management.
- Reduce unsustainable tree cutting practices for charcoal production by providing alternative livelihoods and energy-saving cookers. This could be coupled with supporting activities such as awareness-raising on the adverse impacts of cutting down of trees on the ecosystem and introducing high-value trees for income generation.
- Eco-DRR is an integrated and holistic approach, which requires ideally a longer than 3 years implementation period to fully demonstrate the results and upscale the model. Especially in the challenging security and economic context of Haiti, realistic targets, selection of easily accessible project locations, and a reasonable timeline for project implementation are of importance.

This case study documents the experiences, results, and lesson learned from the Ecosystem-based Disaster Risk Reduction (Eco-DRR) project undertaken by the Netherlands Red Cross in collaboration with the Haitian Red Cross in Haiti with funding from the Directorate General for International Partnerships (DG-INTPA), European Commission. The objective is to upscale community resilience through Eco-DRR activities.