

National Ecosystems and Landscapes Restoration Program of El Salvador

Rationale/Background

Ecosystem restoration and degraded lands rehabilitation are necessary measures to reverse the high degree of environmental deterioration, maintain biodiversity and recover critical ecosystem services to ensure water supply, reduce disaster risks and adapt to climate change. In this context, El Salvador is implementing the National Ecosystems and Landscapes Restoration Program as one of the key instruments of the National Environmental Policy to reduce the country's high vulnerability to the climate threat. The Restoration Program is organized in three strategic areas:

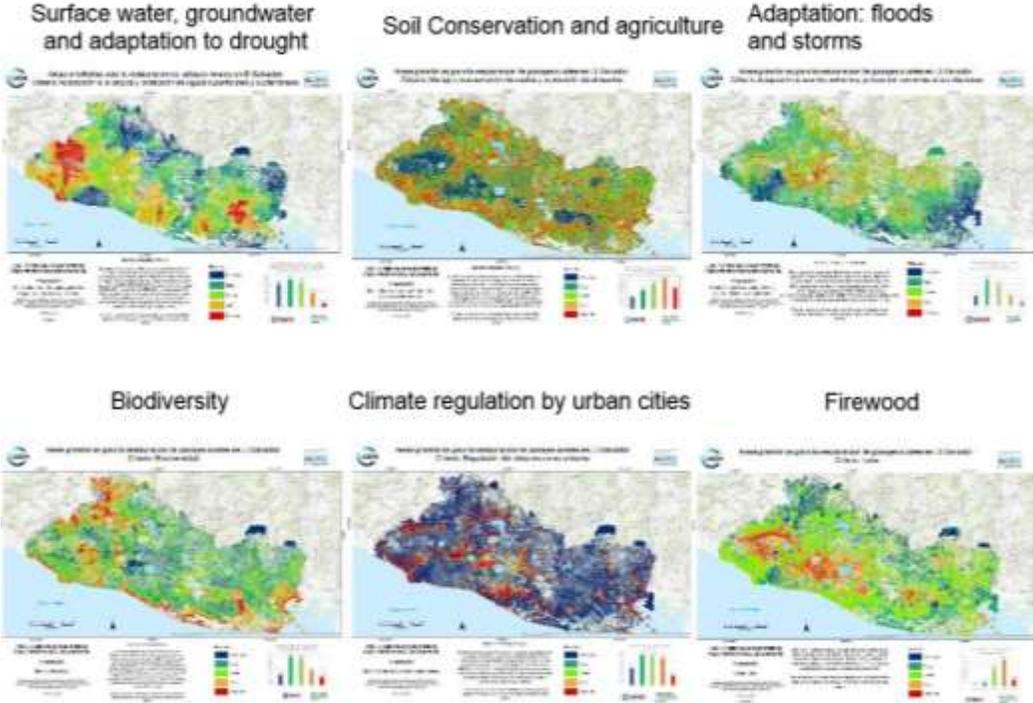
1. Restore critical ecosystems through socially inclusive processes to recover key ecosystem services;
2. Restore highly degraded lands, through establishing a climate resilient agro-forestry system, and the adoption of a sustainable agriculture resilient to climate change and friendly to biodiversity;
3. The synergic development of physical infrastructure and natural infrastructure.

With a restoration goal of one million hectares, the Restoration Program adopts an intervention model at the Landscape scale, under an integral and synergistic approach for restoration of the territory, prioritizing the recovery of ecosystem functions through the intervention in critical areas, such as water recharge areas, riparian ecosystems, areas susceptible to landslides, fragile and sensitive habitats, and sites of ecological connectivity. It seeks to establish sustainable multifunctional landscapes that are resilient to climate change, recovering their structural complexity and functional diversity, with the coexistence and interdependence of different types of land use, ecosystems and agroecosystems.

Identification of sites to be restore

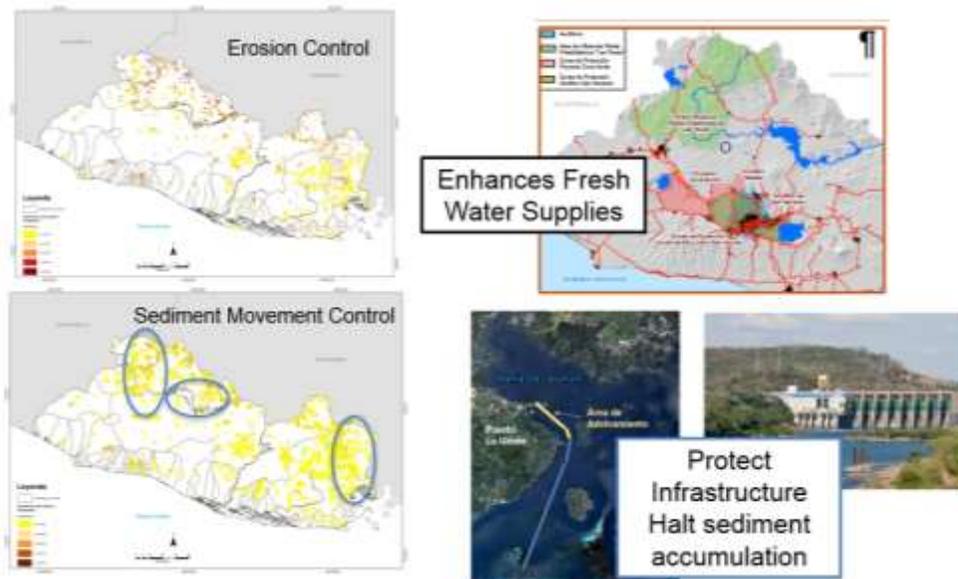
Identification of priority sites for restoration. An initial analysis showed that the country lacks tree coverage in 42% of the total areas prone to landslides and 67% at the shores of the main rivers (riparian forests loss). At the same time, a lack of tree coverage was observed in 64% of the main water recharge zones. In the case of Mangroves, it is estimated that between 15 and 20% is damaged and requires some kind of restoration. Based on the information from the updated Land Use Map, the specific restoration sites of the country have been identified and prioritized, which are particularly focused on areas with

agricultural land use. We have obtained a map with the priority restoration sites for each of following six criteria: soil conservation and food production; biodiversity and wildlife conservation; protection of ground water and adaptation to drought; adaptation to extreme events and protection against floods and storms; firewood supply and climate regulation in urban centers.



This analysis has allowed obtaining information on restoration opportunities at municipality level, providing local actors with information to plan their restoration actions in their territories. A General Map was created, identifying the sites that consolidate the six criteria, enabling the identification of national priorities for restoration.

In addition, in order to achieve engagement and participation of key sectoral institutions and the private sector, we have identified relevant areas to be restored that protects and increases the operational lifespan of infrastructure, especially strategic economic assets, such as hydroelectric dams, ports, water treatment plants and infrastructure for water capture and distribution to the cities. In the case of the Port of La Unión in the east of the country, economical and technical analysis showed that the ecosystem restoration, recovering the water regulation capacities and the erosion control, in the Goascorán and Sirama basins, would bring significant benefits on control of sediment movement and the consequent navigation channel siltation, allowing to significantly reduce the dredging costs of the Port access channel.



Economic and Financial Analysis and profitability of the restoration actions

Costs and Benefits of Restoration and Financial Analysis. Taking into account the different current uses of the soil, possible "transitions" to sustainable uses were identified, that allow recovering the functionality of ecosystems and agroecosystems, as well as the relevant environmental goods and services. Therefore, identifying potential areas for each type of transition – from current land use towards sustainable and more resilient systems - identifying a total of 1,001,405 hectares for the eleven proposed transitions, with an estimated cost of USD 9,147,143,380. The storage capacity of Carbon Dioxide for each transition has also been calculated (CO₂ equivalent Ton per hectare), evidencing mitigation capacities.

A 20-year financial and economic evaluation of the different current types of land use was carried out, as well as the land use "recommended under the criteria of restoration and sustainability" - proposals for transitions of land use – by calculating profitability and analyzing income (monetary benefits) and the environmental and social benefits generated (co-benefits) among the land uses. Additionally, the marginal Net Present Value (NPV) and Incremental Benefits were calculated, by determining the difference between the net benefit of each transition - difference between the net benefit of the "suggested" land use and the net benefit of the current land use.

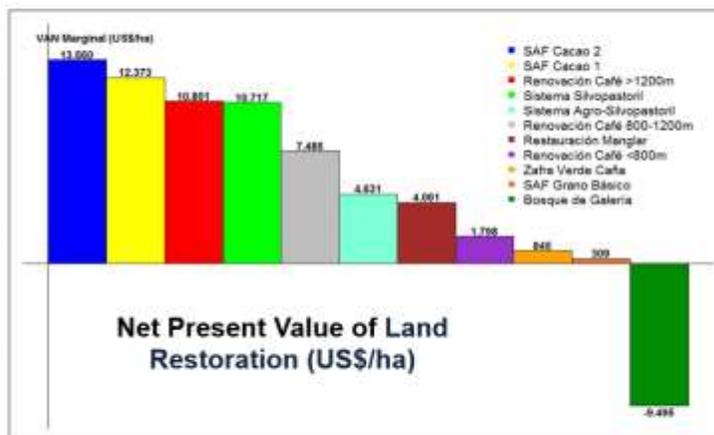
Current Land Use	Transitions – Land Use Proposal	Potential Area (ha)	Carbon Stock Capacity CO2 Ton eq. per Hectare	Total CO2 Ton eq. Per Transition	Cost Per Hectare	Difference in relation to the cost of current use	Total Cost per transition
1. Maize and Beans Crops	1. Agroforestry Systems intercropping maize/beans	359,208	84	30,173,472	17,632	9,203	3,305,791,224
2. Pastures	2. Silvopastoral System	195,590	10	1,955,900	24,543	7,647	1,495,676,730
3. Mosaic of Crops & pastures	3. Agro-silvopastoral System	84,536	37	3,127,832	19,802	2,906	245,661,616
4. Mosaic of Crops, pastures and vegetation < 900 m.s.n.m.	4. Agroforestry System of Cocoa (1)	82,716	94	7,775,304	20,148	16,529	1,367,212,764
5. Sugarcane with burning practices	5. Green cane harvesting	77,441	70	5,420,870	20,639	3,058	236,814,578
6. Coffee Growing <800 m.s.n.m.	6. Agroforestry System of Cocoa (2)	66,369	66	4,380,354	22,372	10,962	727,536,978
7. Coffee Growing <800 m.s.n.m.	7. Low Altitude Coffee Renovation	47,615	31	1,476,065	18,695	15,406	733,556,690
8. Coffee Gro.800-1200 m.s.n.m.	8. Medium Altitude Coffee Renovation	41,000	27	1,107,000	18,695	14,580	597,780,000
9. Coffee Gro. >1200 m.s.n.m.	9. High Altitude Coffee Renovation	26,000	27	702,000	18,695	11,869	308,594,000
10. Mosaic of Crops & pastures, Maize and Beans, vegetation and Sugarcane	10. Riparian Forest rehabilitation	18,930	127	2,404,110	5,160	5,160	97,678,800
11. Degraded Mangroves	11. Restored Mangroves	2,000	134	268,000	15,420	15,420	30,840,000
TOTAL		1,001,405	707	58,790,907	201,801	112,740	9,147,143,380

This analysis allowed demonstrating that the National Restoration Program complies with Cost-Benefit conditions, proving that the highest marginal values are reflected in the transitions from Coffee Growing <900 m.a.s.l. towards cocoa agroforestry systems; the transition Coffee Growing > 1200 m.a.s.l. towards a high altitude coffee renovation; and the transition from natural pasture to a silvopastoral system. Being the least profitable – in terms of monetary benefits - the transition of crops towards restoration of gallery forest because it is not associated with a productive use of soil, although it focuses on the conservation and protection of critical ecosystems for maintenance of river flows and other highly significant environmental benefits.

The results of this analysis also helps us engage the private sector and other key local actors in restoration actions and in adopting sustainable land use activities. This information also allows us to perform an analysis of existing incentive and compensation mechanisms, and orient the design of a system taking into account the profitability and cost-benefit criteria.

Type of transition on Restoration Program
1. Maize and Beans crops to Agroforestry Systems (Intercropping beans/maize)
2. Pasture to silvopastoral system
3. Mosaic of crops and pasture to agro-silvopastoral system
4. Mosaic of crops, pastures and vegetation <900 m.s.n.m. to Agroforestry systems of cocoa (1)
5. Sugarcane with burning practice towards the green harvest (Zafra)
6. Coffee Growing <800 m.a.s.l. towards Cocoa agroforestry systems
7. Coffee Growing <800 m.a.s.l. towards a low height coffee renovation
8. Coffee Growing 800 - 1200 m.a.s.l. towards renovate Coffee medium height plantation
9. Coffee Growing > 1200 m.a.s.l. towards renovate Coffee height plantation
10. Mosaic of Crops towards Riparian Forest
11. Degraded Mangrove towards Restored Mangrove

Economic and Financial Analysis



Participatory process to implement local restoration actions

Planning at the level of the territories. To control deforestation and to implement the restoration activities in the prioritized landscapes, Local Restoration and Sustainable Environmental Development Plans have been collectively elaborated with participation of local communities, private sector, NGO's, small farmers, local governments, and indigenous people. The process includes a participatory analysis of the dynamics of the environmental degradation and identification of vulnerabilities, prioritizing the sites to be restored,

selecting the corresponding restoration techniques, and establishing alliances and institutional agreements for their implementation and monitoring of actions and their impacts. Thus, there are seven Local Restoration and Sustainable Environmental Development Plans that cover the total area to be restored in the country. Each Plan includes voluntary restoration goals agreed by local actors to make territories more resilient, conserve biodiversity, maintain livelihoods and protect productive activities, in order to achieve a more sustainable local economy. To support restoration activities - reforestation and tree planting actions - MARN has established a Network of Nurseries distributed in different strategic points of the country with 1.2 million available plants, and will establish a Forest Seed Center.

The initial financing of the implementation of these Local Plans is supported, among others, by the Initiative for the Americas Fund of El Salvador (FIAES), which, together with the local stakeholders, select the key actions to be implemented in the territory.



Progress in the implementation of the Restoration program.

For the proper implementation, five priority areas have been identified whose area adds up to the total amount the country has committed to restore and, guided by the Local Restoration and Sustainable Environmental Development Plans, by December 2017, around 100 thousand hectares have been restored. The financing of the restoration actions has been done using available national funds, through local investment and funds coming from regional cooperation projects. A monitoring system for restoration actions has been established to identify specific restoration sites, information on the techniques used and

the type of restoration or transition made, as well as the local environmental impacts achieved for each site.

Restoration Actions Monitoring System National Landscape and Ecosystem Restoration Program



<http://apps2.marn.gob.sv/geocumplimiento/restauracion/mapa.php>

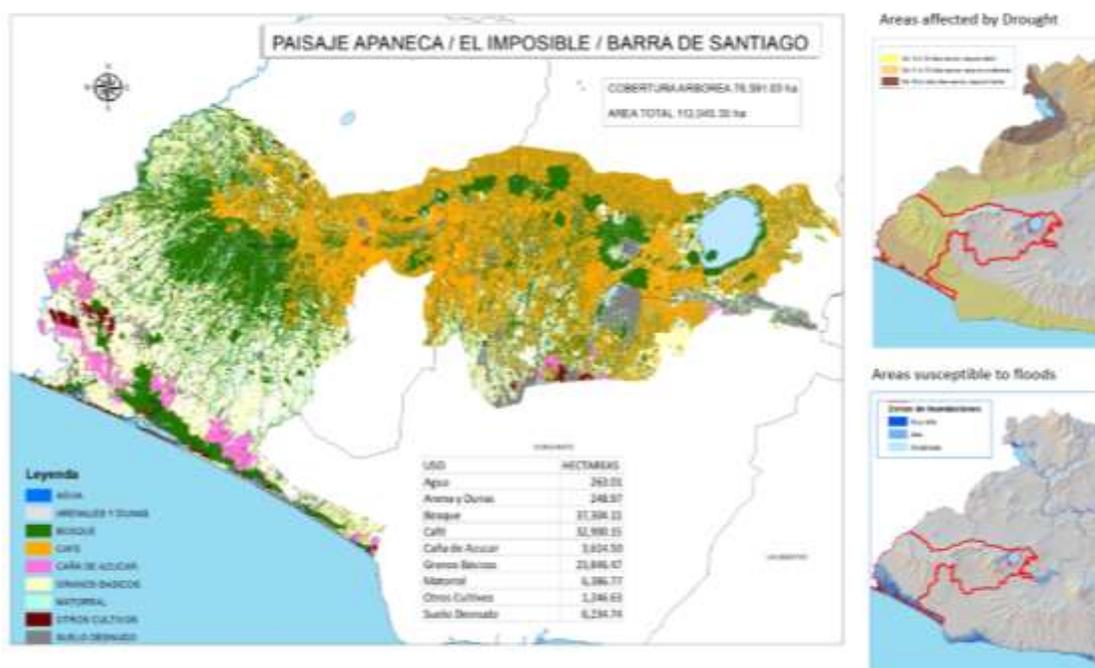
Restoration at the landscape level - Landscape of Apaneca El Imposible Barra de Santiago

As mentioned above, we need large-scale financing for the implementation of the Restoration Program. So, we have adopted a more feasible process, adopting a step by step strategy for the landscape restoration – with the goal of achieving a Sustainable Landscape. Using the information on local vulnerabilities, we identified the ecologically key areas to be restored to have a significant impact on the landscape, recovering critical ecosystem services – ex. water regulation to reduce risk to flooding, or water provision – for productive activities like agriculture and food production.

Consequently, progress has been made in the restoration of the "Landscape of Apaneca El Imposible Barra de Santiago" to reduce vulnerability and face the environmental degradation of the territory. This Landscape has a total area of 112,045 hectares and has 68% tree coverage, distributed among 33% Forest, 29% Shaded coffee and 6% shrubs. It also has a 26% of agricultural area, mainly cultivation of staple grains (maize and beans), that require a transformation towards sustainable agricultural practices. The Landscape presents strategic natural assets for the country, such as El Imposible National Park, the Apaneca Ilamatepec Biosphere Reserve, and the RAMSAR site Barra de Santiago; in which an extraordinary biological diversity is observed in terms of ecosystems, species and genes, and their conservation deserve special attention. During the last eight years, this Landscape has suffered the adverse impacts of extreme hydro-meteorological events, in some years it

experienced Tropical Depressions and Hurricanes, and in other years it suffered meteorological drought, with significant damages, depending on the event, on infrastructure, agriculture and crops, functioning of ecosystems, and livelihoods.

The loss of coverage and inadequate agricultural practices on slopes, have caused a decrease in water regulation capacities with increased runoff, which in turn led to a severe increase in soil erosion rates in the high and middle parts of the basins, an increased risk of landslides and floods; and a decrease in infiltration capacities and aquifer recharge with a decrease in the water supply for different uses. All this has been reflected in large damages to infrastructure and crop losses.



Interventions and restoration actions in the landscape seek adaptation and the construction of resilience to the adverse impacts of climate change. Actions, such as the protection of existing ecosystems and the rehabilitation and conservation of the mosaic of interdependent land uses, promoting the recovery of ecosystem functions through the intervention of critical areas, such as water recharge areas, riparian ecosystems, areas susceptible to landslides, ecological connectivity sites, promoting the transitioning to sustainable agricultural systems and the expansion of agroforestry systems like shaded coffee. In order to achieve the sustainability of the interventions, the pressures on biodiversity must be addressed, reducing contamination of ecosystems, ordering the territory and rationalizing changes in land use for agricultural, tourism and urban activities to reduce and control deforestation and degradation of ecosystems in the landscape.

The National Restoration Program prioritizes the recovery of ecosystem functions through the intervention of critical areas, in the case of the Apaneca El Imposible Barra de Santiago Landscape we have that:

General Objective:

Establish a resilient and sustainable landscape, recovering its structural complexity, functional diversity and productivity, maintaining the coexistence and interdependence of different types of land use, ecosystems and agroecosystems.

Specific Objectives:

- a. To achieve a permanent provision of water for different uses within the landscape, through restoration actions that increases the capacity for infiltration and recharge of aquifers, and recover riparian forests by returning their structure and natural function to rivers and maintaining their ecological flow;
- b. To establish more resilient agricultural systems, through the promotion of agricultural diversification, the adoption of tolerant varieties to scarce water and temperature variations, the adoption of agricultural practices that increase soil moisture and enhance tree coverage in the maize and beans crops;
- c. To increase the capacity to generate climate information and monitor drought;
- d. To restore ecosystems in areas susceptible to landslides, fragile and sensitive habitats, and sites of ecological connectivity;
- e. Develop a risk reduction strategy, including the establishment of early warning systems.

Even though the established goal is to make that 100% of the area being used for agriculture (28,708 hectares) transitions to a land use under sustainable practices, reducing negative externalities and increasing positive externalities, we have adopted a step by step strategy, estimating that an intervention in 10,000 hectares– critical areas – can result in a significant progress towards sustainability of the whole Landscape, and that the amount required to achieve these outcomes and land use transition would be around 30 million US dollars.

Governance in the Restoration.

The Government of El Salvador has established the Environmental Sustainability and Vulnerability Cabinet as a platform for a high-level political advocacy and inter-ministerial coordination that will allow for better monitoring and follow-up of the national agenda on Climate Change and Risk Management, and to seek synergies in the actions to reduce social and environmental vulnerability and build resilience and adaptation. The Cabinet coordinates the implementation of the National Plan of Climate Change and promotes the National Ecosystems and Landscapes Restoration Program. Under the coordination of the Minister of Environment and Natural Resources, the Cabinet is integrated by the Heads of

key ministries such as the Ministry of Agriculture and Livestock, Ministry of Tourism, Ministry of Public Works, Ministry of the Interior, the Secretary of Vulnerability, President of the National Association of Water Aqueducts and Sewers, and the Director of Civil Protection. Also The Government of El Salvador has established the National Council for Environmental Sustainability and Vulnerability (CONASAV) as a consultative instance, to promote coordination between different institutions and actors at different scales, ensuring full participation and support. CONASAV is conformed of leaders and representatives of different sectors, such as political parties, academia, private sector, municipalities, NGO, experts and specialists in the area of sustainability and environmental issues. Representatives of the Central Government, from international Cooperation Organizations and Donors, participate as well. In order to develop its work, CONASAV has established Working Groups, among them, the Restoration of Ecosystems and Landscapes Working Group, which supports the implementation of the National Restoration Program. At local level, CONASAV has established local tables with stakeholders to plan and implement these restoration actions to enhance effectiveness.