



DPSIR Framework Handbook BELIZE

Driver-Pressure-State-Impact-Response (DPSIR) Framework for Belize



OVERVIEW



This handbook summarizes the Driver-Pressure-State-Impact-Response (DPSIR) Framework conducted for Belize, under the CSIDS-SOILCARE Phase 1 Project. It provides an overview of the methodology, assessments, and description of the two (2) intervention sites selected for Belize. Importantly, the DPSIR results of each intervention site were highlighted along with the recommended interventions to address the land degradation issues. The intervention actions in Belize will be concentrated in the northern districts known as the Northern Sugar Belt of Belize. The project aims to restore 29,000 hectares of land and have 26,000 hectares of landscapes under improved practices. Consequently, for Belize, the project will target 8000 hectares of land under Component 4.

The recommended interventions will be further discussed with stakeholders to determine the most effective interventions for each selected site. Additional information on the DPSIR Framework for Belize and the other participating countries can be found in the detailed DPSIR report and the country-specific reports.

INTRODUCTION

*The Partnership Initiative for Sustainable Land Management (PISLM) is implementing **the Caribbean Small Island Developing States (SIDS) Multicountry Soil Management Initiative for Integrated Landscape Restoration and Sustainable Food Systems: Phase 1, referred to as the PISLM CSIDS-SOILCARE Phase 1 Project.** This project is being implemented in eight (8) participating countries, Antigua and Barbuda, Barbados, Belize, Grenada, Guyana, Haiti, Jamaica, and St. Lucia. The project's primary objective is to "strengthen Caribbean SIDS with the necessary tools for adopting policies, measures, and reforming legal and institutional frameworks to achieve Land Degradation Neutrality (LDN) and Climate Resilience".*

In this regard, five (5) components were established under the project to address and reverse land degradation in CSIDS. Furthermore, the Driver-Pressure-State-Impact-Response (DPSIR) Framework is one such intervention. This was coupled with the National Soil Surveys, Climate Risk Assessment, and Land Suitability Analysis conducted in participating countries. This handbook, however, will focus on the results of the DPSIR framework for Belize intervention sites as highlighted by the DPSIR report.

The DPSIR framework is considered valuable for assessing soil degradation in CSIDS given its cause-effect approach which can determine appropriate management responses (Francis, 2023).

Under the CSIDS- SOILCARE Phase 1 Project, one (1) component will be addressed in Belize as follows:

Component 4: *Enhancement of Food Systems and Alternative Livelihoods through the promotion of innovations in agriculture and livestock production systems and mobilization of the Private Sector in Support of LDN Special Climate Change Fund (SCCF).* **This component would be executed Patchakan and Libertad.**



METHODOLOGY

The research was conducted in four (4) stages as follows:

1. Comprehensive review of the Land Degradation Neutrality-Target Setting Process for Belize.
2. Identification of hot spots affected by land degradation.
3. Participatory qualitative analysis was conducted within the locations identified as Intervention Sites.
4. Evaluation of the drivers, pressures, state, impacts, and possible responses (DPSIR) to land degradation of the Intervention sites.

NB. A land capability survey and a visual soil analysis were conducted based on the Protocol for the Assessment of Sustainable Soil Management. However, the findings are captured briefly in this handbook but details can be found in the DPSIR report.

A GIS analysis was conducted for each location to ascertain the nature of the land use and vegetation health through the Normalized Difference Vegetation Index (NDVI).

SOILCARE INTERVENTION SITES

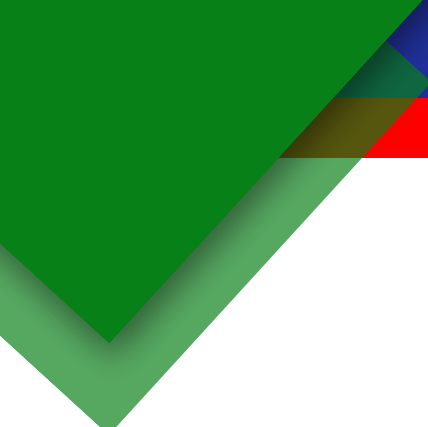


An aerial photograph of a rural landscape, likely in a tropical region, showing a mix of green fields, brown patches of cleared land, and some small structures. A black line outlines a specific area of interest. Several red dots are placed on the map, marking specific locations. The map is framed by a thick black border. The background of the slide features large, overlapping geometric shapes in red, green, and blue.

NO. 1: PATCHAKAN

Patchakan is comprised of a dispersed settlement type with approximately 1700 residents. The area's main land use is agriculture, which constitutes sugar cane farming, vegetable production, grains, and livestock production. Fishing, hunting, sugar cane farming, and construction work are Patchakan's primary livelihood activities. The area's main land degradation challenges are biodiversity decline, reduced water availability and quality, soil erosion, vegetation loss, and water contamination.

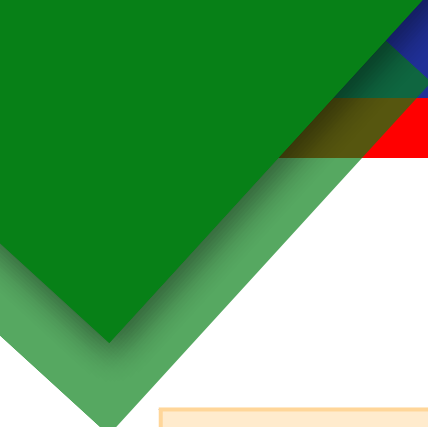
Soil erosion is intensified by land clearing for livestock grazing. Another concern is diminished water availability. Soil erosion is attributed to various factors including agriculture, overgrazing, housing development, construction, and deforestation.



PATCHAKAN DPSIR FRAMEWORK

Table 1: Driver-Pressure-State-Impact-Response (DPSIR) Framework

Framework	Indicator
Driving Forces	Monoculture (Sugarcane Plantations)
	Climate change
Pressures	Poorly managed land use practice, burning before harvesting.
	Decreased rainfall amount, increased length dry periods
	Increase demand on water supply for sugarcane growth on cultivated farm plots.



PATCHAKAN DPSIR FRAMEWORK

Framework	Indicator
State	Reduction in vegetation cover and biodiversity
	Increase in occurrence of stem borer (Chilo tumidicostali) disease in sugarcane.
	Decline in sugarcane productivity and decline in yields.
	Soil erosion
Impacts	Household economic decline and poverty
	Increase risk of exploitation of labour force below minimum wage

RECOMMENDED INTERVENTIONS FOR PATCHAKAN

Table 2: Recommended interventions for Patchakan

Agronomic measures	Organic matter/soil fertility, conservation agriculture, production and application of composts and green manures, soil surface treatment; minimum tillage, subsurface treatment; breaking compacted subsoil, deep ripping.
Structural measures	Dams for irrigation, harvesting water in ponds.
Management measures	Change in management/intensity level, farm enterprise selection, fertilization management, major change in timing of activities, land preparation, plant, cutting of sugarcane.

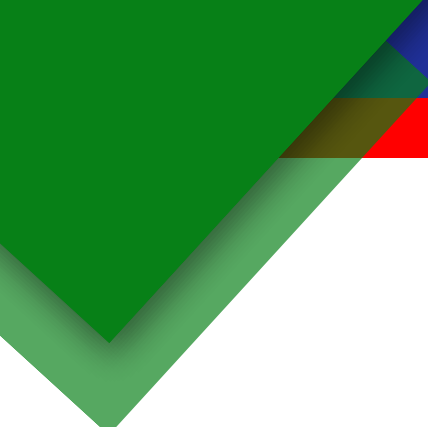
NO. 2: LIBERTAD



Libertad is the second intervention site selected for Belize. It comprises a small dispersed settlement with approximately 1600 residents. The primary use of the land is for sugar cane production and residential purposes. Libertad's main livelihood activities are fishing, cleaning sugar cane cultivation, and land preparation.

Fuelwood is the most common natural resource use in the area. Furthermore, the main land degradation issues are soil contamination, vegetation reduction, and water contamination. The land degradation can be attributed to overuse of chemicals, clearing of farmland, and chemical runoff from farmland.

This results in plants dying, reduced shade causing increased surface temperatures, and fish kills in rivers and lagoons.



LIBERTAD DPSIR FRAMEWORK

Table 3: Driver-Pressure-State-Impact-Response (DPSIR) Framework

Framework	Indicator
Driving Forces	Monoculture (Sugarcane)
	Climate change
Pressures	Framing practices: poorly managed land use practice, burning before harvesting.
	Decreased rainfall amount, increased length dry periods.
	Increase demand on water supply for sugarcane growth on cultivated farm plots.

LIBERTAD

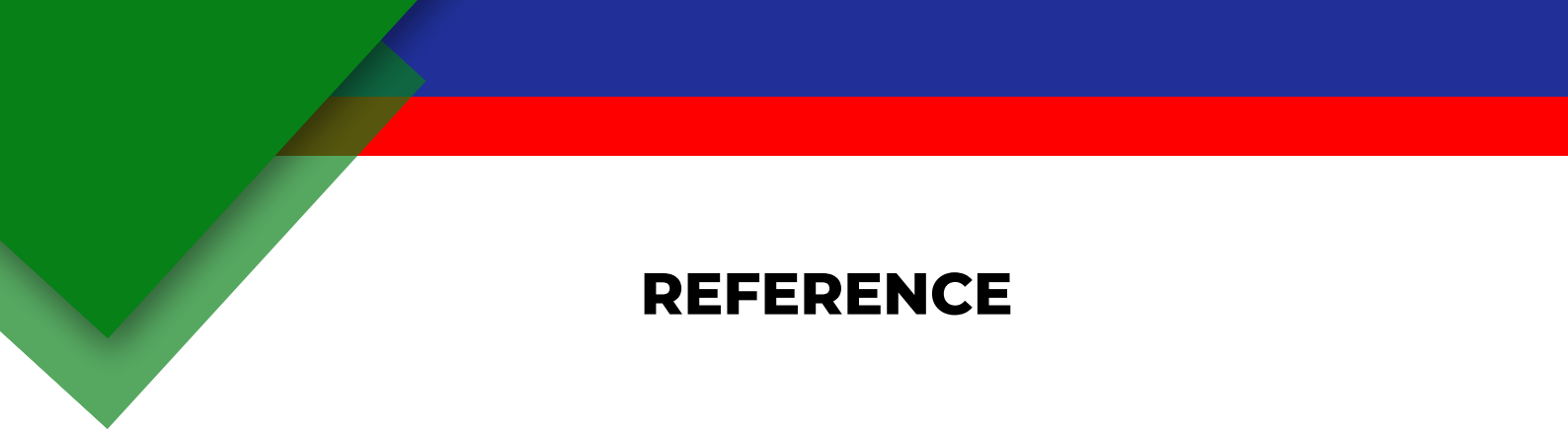
DPSIR FRAMEWORK

Framework	Indicator
State	Reduction in vegetation cover and biodiversity.
	Increase in occurrence of stem borer (<i>Chilo tumidicostali</i>) disease in sugarcane.
	Decline in agriculture output, loss of sugarcane productivity, decline in yields.
	Wind erosion due to exposed soil surface, desiccation of soil surface due to burning.
Impacts	Household economic decline and poverty.
	Increase risk exploitation and lack of viable employment.

RECOMMENDED INTERVENTIONS FOR LIBERTAD

Table 4: Recommended interventions for Libertad

Agronomic measures	organic matter/soil fertility; conservation agriculture, production and application of composts and green manures, Soil surface treatment; minimum tillage, Subsurface treatment; breaking compacted subsoil, deep ripping.
Structural measures	Dams for irrigation, harvesting water in ponds.
Management measures	Change in land use type; area change from cropland to grazing, from sugarcane to agroforestry, change in management/intensity level; farm enterprise selection, fertilization management. Major change in timing of activities; land preparation, plant, cutting of sugarcane.



REFERENCE

Francis, R. (2024). DPSIR Framework Analysis

Francis, R. (2024). DPSIR Framework Analysis, Belize

PISLM (2021). Caribbean Small Island Developing States (SIDS) Multicounty Soil Management Initiative for Integrated Landscape Restoration and Climate-Resilient Food Systems- Phase 1.

PISLM (2023). Project Implementation Report

