BELA Biodiversity, Ecosystems, & Landscape Assessment

PROGREEN

THE WORLD BANK
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BELA CASE STUDY SERIES: BURUNDI

DIAGNOSING LAND DEGRADATION HOTSPOTS TO SCALE-UP LANDSCAPE RESTORATION

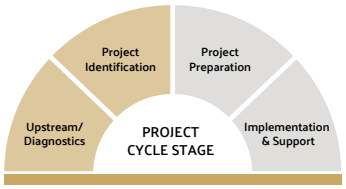
CASE STUDY PROFILE

WORLD BANK REGION

Sub-Saharan Africa

SCALE OF ANALYSIS: National

PROJECT CYCLE STAGE



ECOSYSTEM SERVICES

- Erosion & Sedimentation
- Flood Mitigation
- Landslide Mitigation
- Crop Production

SECTORS ENGAGED

- Agriculture
- Environment & Natural Resources
- Climate Change
- Fragility, Conflict, and Violence
- Poverty
- Disaster Risk Management

BANK PROCESS INFORMED

- Advisory Services and Analytics (ASA)
- Project Appraisal Document (PAD)

INSIGHTS

- Land condition & trends
- Landscape investment priority areas
- Climate change impacts

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BACKGROUND

The African country is one of the world's poorest nations. A staggering 83.4 percent of its population lives below the poverty line, a dire aftermath of the decade-long conflict between 1993-2003. The country's more than 2600 collines - sharply ridged hillsides where 90 percent of its population resides - reflect its extreme economic vulnerability. As per the Country Environment Analysis, Burundi is estimated to have lost 38 million tons of soil annually, due to soil degradation, unsustainable use of natural resources, and climate change, at a cost equivalent to 4 percent of GDP. Burundi is ranked 169th (out of 185) on the 2021 ND-GAIN Index and the collateral damage of climate change is forced displacement, driven by shrinking land area and productivity and frequent landslides and floods. With climate-induced rising temperatures and rainfall variability expected to intensify between 2030 - 2050, livelihood losses, conflict, and displacement within the collines' communities is likely to rise exponentially. The specter of a 200 percent increase in land degradation by 2050 looms large, with 118 collines identified as hotspots for soil erosion.

The World Bank executed an Advisory Services and Analytics (ASA) study aiming to diagnose drivers of climate and environmental fragility in Burundi. To execute this ASA study, the World Bank with the support of two global modelling teams - BELA and the Red Cross Red Crescent Climate Centre - conducted a robust analysis of current and future climate risk, socioeconomic vulnerability, and environmental fragility in Burundi's colline landscapes. The results will inform the pathways for scaling up landscape restoration and climate resilience activities to over 2500 collines in Burundi and make a case for mobilizing investment at a large scale for landscape restoration and climate resilience in Burundi.

WHAT IS BELA?

The **Biodiversity, Ecosystems, and Landscape Assessment (BELA) initiative** supports landscape assessments of biodiversity and ecosystem services in World Bank engagements. BELA provides Bank teams and clients with efficient, tailored, and in-house analytical services, offering **insights on land condition & trends, landscape investment priority areas, ecosystem services in macro economy, climate change impacts, carbon market potential, and support for natural capital accounting**. The BELA team works on a contract basis with World Bank teams, with funding for core operations provided by the PROGREEN Global Partnership for Sustainable and Resilient Landscapes.

Interested in learning more? Click here.


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WHAT WAS THE IMPACT OF BELA'S WORK?


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The BELA team's comprehensive assessment of Burundi's colline landscapes, as part of Tackling Climate Change, Land Degradation and Fragility: Diagnosing Drivers of Climate and Environmental Fragility in Burundi's Colline Landscapes - Towards a Multi-Sector Investment Plan to Scale up Climate activity, helped to elucidate the linkages between land management practices and the heightened risks of landslides and floods in Burundi. It clarified the key role of Nature-Based Solutions (NBS) in mitigating these hazards and provided a strategic roadmap for scaling up landscape restoration and climate resilience across all of Burundi's collines. The BELA team actively contributed to the development of a national spatial map pinpointing multi-risk hotspots, focusing on landslide, soil erosion, and land degradation risks, in collaboration with the client and country team. This collaborative effort presented a compelling argument for substantial investments in landscape restoration and climate resilience throughout Burundi, laying the groundwork for the development of a World Bank operation, the Burundi Climate Resilience Project (P180864). This project is focused on implementing landscape management strategies in the identified priority collines, to bolster resilience against climate-induced challenges.

KEY QUESTIONS

- Where are the hotspots of land degradation in Burundi, and how do these affect ecosystem services in productive lands?
- If current trends continue, where are the people of Burundi most at risk from climate change combined with natural hazards and displacement-related conflict?
- Where can investments in landscape management be prioritized to build climate resilience, alter the trajectory of land degradation, and provide positive economic benefits across sectors?

BELA APPROACH

Phase 1

PLANNING

- Meet with relevant stakeholders to align around common vision
- Define study objectives
- Identify and gather resources, data and experts

Phase 2

ECOSYSTEM SERVICES ANALYSIS

- Land condition & trends
- Landscape investment priority areas
- Climate change impacts

Phase 3

RESULTS > INSIGHTS

- Land degradation impacts
- Climate + disaster risk hotspots
- Opportunity-based priority areas for investment

STAKEHOLDER ENGAGEMENT AND CAPACITY DEVELOPMENT

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Phase 1 PLANNING

The BELA team collaborated with the multi-institutional ASA team to identify key drivers of hazards relating to ecosystem services in the country. Collaborating with the Red Cross/Red Crescent Climate Centre (on climate modelling, fragility analysis, and mapping multi-risk hotspots), the BELA team modeled land degradation risks and explored the potential for NBS implementation. Data compilation for the analysis of hazards and nature-based solutions potential included soils, land cover, land management, climate, population density, and roads from remote sensing, global data, sectoral teams, and local sources when available.

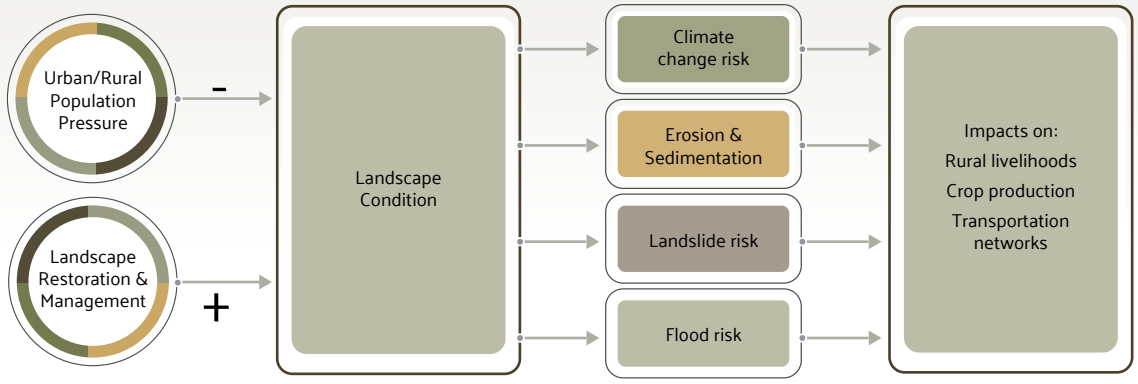
Phase 2 ECOSYSTEM SERVICES ANALYSIS

The BELA team:

Assessed land condition and trends to produce a multi-criteria hotspot risk map for climate risk, landslide, erosion, and land degradation hazard across Burundi's collines, highlighting potential impacts on food production, transportation networks, and risk to lives.

Evaluated the potential for NBS to mitigate hazards and improve ecosystem services. NBS encompass diverse land management practices aimed at preserving and restoring natural ecosystems and implementing best practices on crop and grazing lands. These include conservation agriculture, agroforestry, sustainable forestry, silvopasture, revegetation, rotational grazing, etc. In this study, erosion, water balance, food production, and landslide risk models assessed the impact of NBS on mitigating or exacerbating hazards influenced by slope, soil properties, geology, and climate.

Identified landscape investment priority areas to promote climate resilience in Burundi's collines, using ecosystem services models along with data on multi-hotspot risk areas, potential benefits of NBS, poverty, food production, and infrastructure.



Phase 3 RESULTS --> INSIGHTS

BELA results informed a synthesis report, pinpointing priority collines in Burundi for NBS implementation, aimed to effectively mitigate climate and natural hazards risks, while concurrently addressing fragility and conflict in rural populations. Shared through government workshops and country team-organized dialogues, the results steered discussions on a new landscape investment operation that is currently in negotiation with the government.

BELA INSIGHTS

Where are the hotspots of land degradation in Burundi, and how do these affect ecosystem services in productive lands?

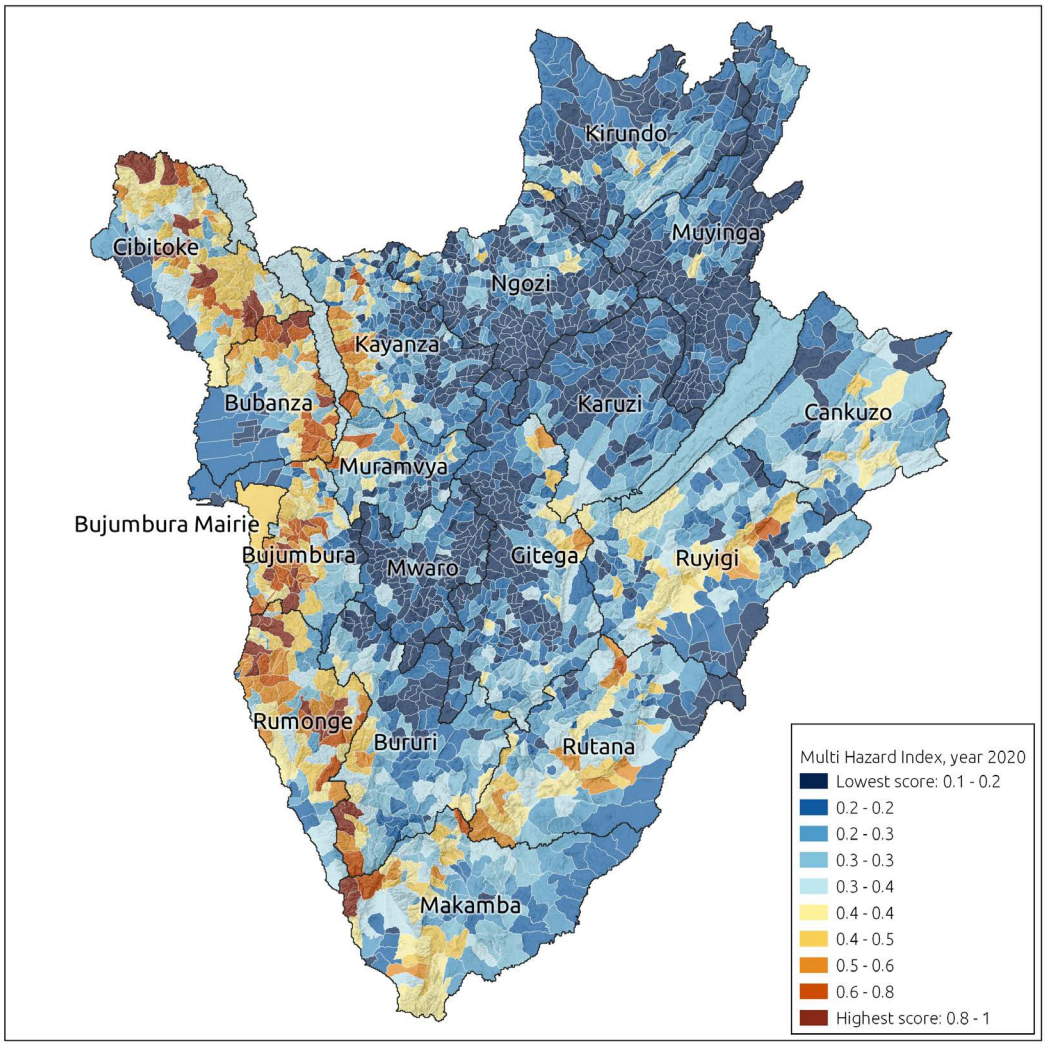


Figure 1. Multi-hazard index for Burundi's collines. The index is calculated as a function of Erosion and Landslide risk, Transportation infrastructure risk, Food production and livelihoods risk, and Population settlements risk. In this map, the dark brown areas are those where most of the contributing hazards are high and increasing. (Source: BELA Initiative, World Bank).

Land degradation in Burundi was assessed by tracking changes in vegetation phenology over time. Areas with consistent declines in vegetation health were identified as degradation hotspots. In Burundi, these hotspots were found to be concentrated along the mountain ranges in the western part of the country, characterized by higher precipitation rates and population densities than the country average. This combination of factors poses a significant threat to the agricultural landscape, leading to increased soil erosion and susceptibility to landslides and floods, triggered by extreme rainfall events.

An assessment using a Multi-Hazard Index, considering factors like soil erosion in agricultural landscapes, rural population residing in landslide-prone areas, and the extent of transportation infrastructure in unstable slopes, shows the provinces of Cibitoke, Bubanza, Bujumbura, and Rumonge as having the highest concentration of hazards due to land degradation. The findings underscore the interconnected challenges faced by these landscapes, emphasizing the critical need for targeted interventions to enhance resilience against the adverse impacts of land degradation.

If current trends continue, where are the people of Burundi most at risk from climate change combined with natural hazards and displacement-related conflict?

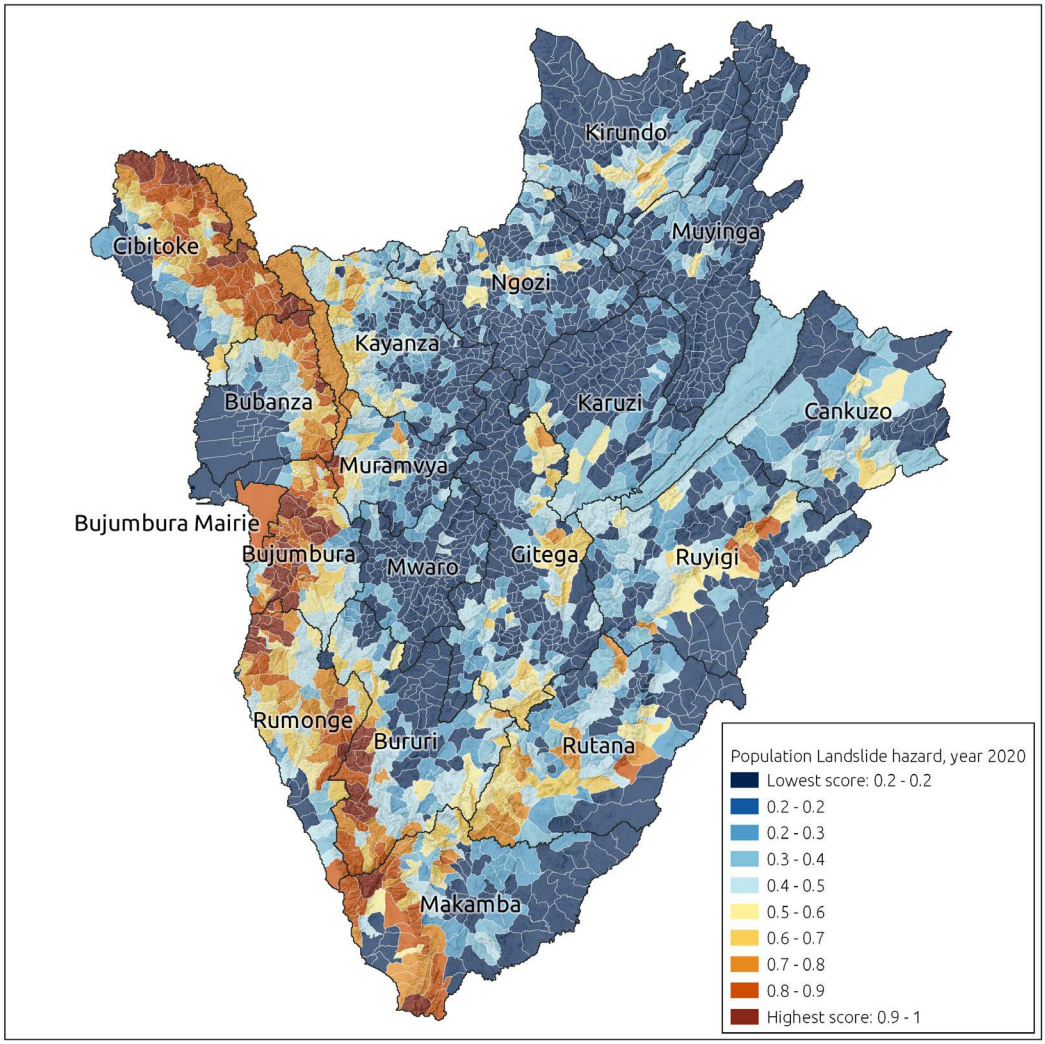


Figure 2. Index of exposure of population to landslide hazard. Higher scores indicated collines where more people are exposed to landslide risk. (Source: BELA Initiative, World Bank).

In Burundi, the greatest risks from natural hazards coupled with climate change are concentrated in the western and north-western provinces. These areas witness a confluence of increasing population density and an anticipated rise in the intensity of extreme events. Further analysis at the colline level reveals a third aggravating factor - steep terrains with incompatible agricultural practices leading to vegetation loss, heightening overall vulnerability. The rural and peri-urban population living in these areas are the most at-risk group. This pattern is consistent across collines with a significant rural population density in high-risk areas, with the Cibitoke and Bujumbura provinces having the highest proportion of collines in this high-risk condition.

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Where can investments in landscape management be prioritized to build climate resilience, alter the trajectory of land degradation, and provide positive economic benefits across sectors?

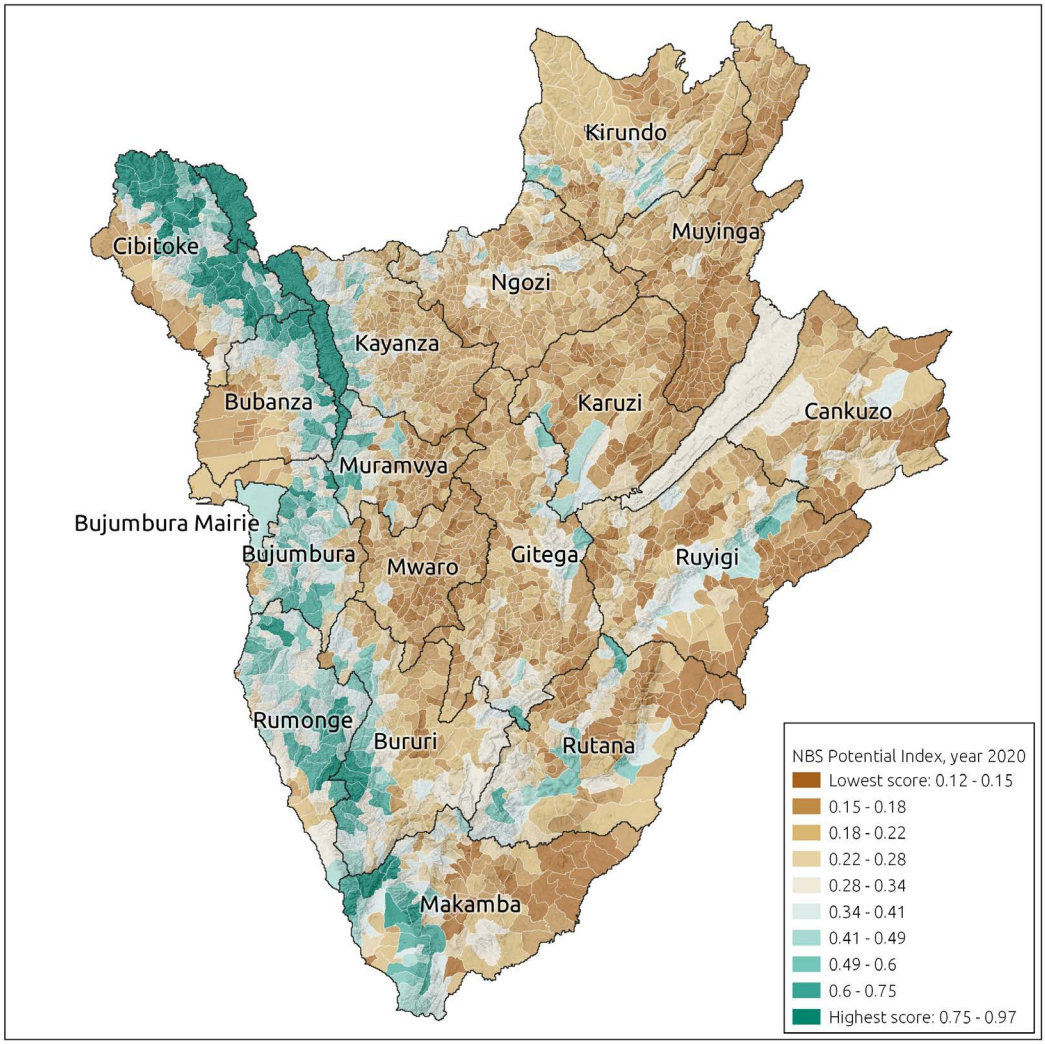

Figure 3. Composite index of Nature-based Solutions Potential, showing in green shades collines where investments in improving vegetation cover and management have the greatest impact on mitigating risk contributing factors (erosion, landslides, livelihoods, transportation, and populated settlements). (Source: BELA Initiative, World Bank).

The potential of landscape management to enhance resilience in Burundi was evaluated using ecosystem services modeling, simulating the benefits of implementing sustainable agricultural practices and restoring degraded areas across all agricultural landscapes in the country. Using this approach, opportunity hotspots, where potential benefits align with improved ecosystem services yields, were identified.

The results reveal significant overlap in Burundi, particularly in communes experiencing high rates of erosion and landslides, and also posing high risks to people, food and livelihood security, and transportation networks. For instance, Bujumbura Mairie, Bujumbura Rural, Cibitoke, and Rumonge have both high Multi-hazard Index and high NBS Potential Index. These results help to pinpoint the priority collines where land management practices - including regenerative food production systems, protected area management, revegetating denuded slopes and riparian areas, and safeguarding existing natural ecosystems- can effectively alleviate these hazards.

FURTHER READING

- Burundi Synthesis Report
- E-Book I Diagnosing Drivers of Climate and Environmental Fragility of Burundi's Colline Landscapes (English version).
- E-Book I Diagnostic des Facteurs de Fragilité Climatique et Environnementale dans les Paysages Co. (French version).
- Data Viewer I Burundi Knowledge Resources Platform
- Storymap I Burundi Hotspots Mapping: Climate and Conflict

THE BELA TEAM

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FUNDING FOR THIS WORK

PROGREEN

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Roots Advertising

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