POLICY BRIEF

Building Community Resilience through the Ecosystem-based Adaptation Approach in Rwanda

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CoEB

SUMMARY

Healthy, functioning ecosystems are essential for human wellbeing. They provide supporting, regulating, provisioning and cultural services humans rely on. Protecting ecosystems is an important strategy to build resilience to the adverse effects of climate change.

Climate change is currently causing negative impacts to people's livelihoods around the globe. The Ecosystem-based Adaptation (EbA) approach was developed as a solution to increase the resilience of communities to climate change impacts.

In Rwanda, the EbA approach has been applied to restore degraded wetlands, forests and savanna ecosystems using agroforestry, bamboo planting, fruit trees and indigenous tree species planting, providing cows, and building rainwater harvesting tanks, among other activities.

An assessment of the impacts of the EbA interventions at eight sites in the country indicate that these activities overall produced positive outcomes for communities through enhancement of direct ecosystem services and employment.

However, some challenges were identified such as the loss of access to restored ecosystems by local communities and the lack of technical assistance.

This policy brief provides a review of the EbA projects in Rwanda, and recommends collection of baseline data before EbA projects are initiated, increasing technical assistance to local communities, and more integration of local communities into the EbA planning process, among other suggestions, to improve EbA outcomes.

1. INTRODUCTION

Healthy, functioning ecosystems provide a wide range of services that support human livelihoods and adaptive capacity. However, climate change effects coupled with many other human activities such as land use change, deforestation, invasive species, and pollution, have put many ecosystems at risk, causing loss of biodiversity, and loss of ecosystem services and functions upon which humans rely. Adverse effects of climate change are observed worldwide, including droughts, floods, pest outbreaks, food shortages, heat waves, and unpredictable weather events.

These effects increase the vulnerability of many communities to poverty associated with food shortages, disease outbreaks, and decreases in provisioning of natural resources. Effects of climate change are particularly acute in countries with low and medium incomes that rely on natural resources. There is therefore a sense of urgency to increase actions to combat climate change and its impacts, and enhance the resilience and ability of people and ecosystems to withstand climate change.

Rwanda is highly vulnerable to climate change because of its topography and high population density. Recently, erratic and heavy rainfall has caused erosion and flooding in different areas of the country, with severe landslides particularly in northern and western regions. Extended dry periods in other parts of the country have caused water loss and food shortage. These environmental problems combined with the influence of the growing population exert pressure on already disturbed ecosystems and natural resources, notably water, forests, and biodiversity.

Climate change will likely exacerbate Rwanda's existing environmental, social and economic challenges with a predicted increase in mean precipitation of between 0-10%, a predicted increase in mean temperature of 2 to 4°C, and associated impacts on evapotranspiration rates. These changes may decrease yields of key crops such as maize, rice, wheat, sorghum, and soybean. Climate change is projected to have human and wildlife health effects, including increased respiratory and cardiovascular disease, malnutrition, exposure to new pathogens and diseases, and death and injury due to floods and landslides.

2. OVERVIEW OF THE ECOSYSTEM-BASED ADAPTATION APPROACH

Ecosystem-based adaptation (EbA) was first included in the Convention on Biological Diversity (CBD) in 2010. It is an approach based on the restoration and conservation of biodiversity and ecosystem functioning to enhance resilience of ecosystems to climate change impacts on biodiversity and on the well-being of communities.

EbA approaches include conservation, restoration, maintenance of biodiversity and ecosystem processes, and sustainable use of natural resources to enhance people's resilience to climate change.

In developing countries, the poor are most dependent on natural resources for food security and income. The poor are also more likely to live in degraded or marginal landscapes that increase their vulnerability to extreme climatic events such as floods, landslides, fires, and drought.

As a result, an important component of EbA is protection and enhancement of livelihood dimensions such as food security,

smallholder agricultural productivity, income diversification, and resiliency in the face of natural disasters.

From an ecological perspective, EbA safeguards and enhances fragile, degraded and protected ecosystems, which in turn results in enhanced ecosystem services underpinning every aspect of human life.

The ecosystem services include increased biodiversity, climate regulation such as carbon sequestration and disaster risk reduction, pollination and cultural enrichment.

Economies are highly dependent on ecosystem services, especially in developing countries. Promoting healthy ecosystems helps both biodiversity and people to adjust to changes in climatic conditions, and the benefits that directly or indirectly depend on these services can be ensured.

With appropriate management practices of ecosystems, natural resources can be sustained.

Further, healthy ecosystems act as natural barriers in mitigating the impacts of extreme weather events such flooding, droughts, extreme temperatures, fires and landslides.

Implementing EbA is of particular importance for the people who are worst hit by climate change's adverse impacts and who are largely dependent on ecosystems and their services.

Despite the growing evidence that through EbA approaches, climate change adaptation and mitigation, socio-economic development, environmental protection and biodiversity conservation can be achieved, the potential of EbA is not fully exploited by many national governments.

In Rwanda, EbA has been implemented through the Rwanda Environment Management Authority in different wetlands, natural forests, and savanna ecosystems (Table 1, Figure 1).
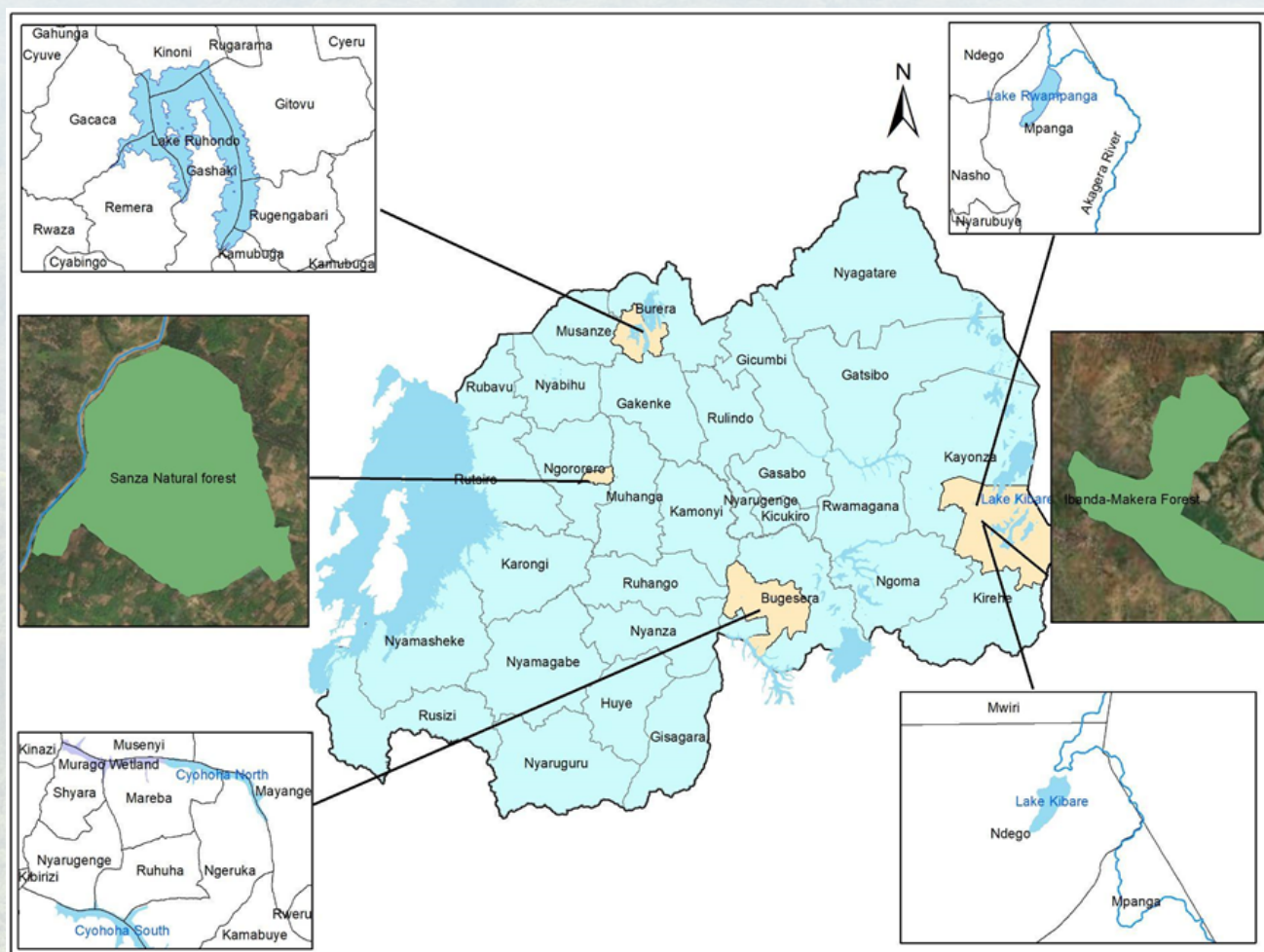
Emphasis was put on restoration activities to build people's resilience to climate change and to restore natural ecosystem functioning.

Table 1. Types of Ecosystem-based Adaptation (EbA) approaches applied in Rwanda (initiated in 2017)

Ecosystem type	Location	Eba Activities
Wetlands	Kibare Lakeshores (80 ha), Kayonza District	• Agroforestry (32 Km contour) • Bamboo (32 Km contour) • Supply and installation of solar powered small scale irrigation system (15 ha) • Supply and installation of solar powered water supply for 790 cows • Selling point relocated for 420 people • Supply and installation of 100 rainwater harvesting tanks (ongoing) • Excavation of buffer zone demarcation trench (16 Km contour)
	Murago wetland (52 ha), Bugesera District	• Agroforestry (34 ha contour) • Bamboo (13 Km contour) • Supply and installation of solar powered small scale irrigation system on 10 ha • Excavation of buffer zone demarcation trench (26 Km contour) • Supply and installation of 63 rain water harvesting tanks
	Lake Cyohoha North (115 ha), Bugesera District	• Invasive aquatic species/weeds removed over 115 ha
	Rwampanga Lakeshores on (50 ha), Kirehe District	• Agroforestry (50 ha) • Bamboo (10 Km contour) • Excavation of buffer zone demarcation trench (10 Km contour)
	Nyiramuhondi watershed (117 ha), Ngororero District	• Radical terraces (100 ha) • Agroforestry (100 ha) • Bamboo (10 Km contour) • Woodlot (7 ha) • 45 cows given to project beneficiaries
	Ruhondo islands/Gacaca green village, Musanze District	• 12 houses (4 in 1 and 2 in 1) constructed for 46 households • 46 cows provided to 46 households
	Nyandungu Urban Wetland, Gasabo District	• Landscape restoration (121 ha)
Natural forest	Ibanda-Makera natural forest, Kirehe District	• Indigenous tree species (68 ha) • Agroforestry (250 ha) • Supply and installation of 60 modern beehives • 1 honey collection centre constructed
	Sanza natural forest (22 ha), Ngororero District	• Indigenous trees species (22 ha) • Supply and provision of 60 modern beehives (ongoing) • Constructing 1 honey bee collection centre (ongoing)
Savannah	Rwinkwavu hill (200 ha), Kayonza District	• Indigenous tree species (200 ha)

3. RESTORATION IMPACTS ON LOCAL PEOPLE AROUND RESTORED ECOSYSTEMS

The impacts of the EbA interventions on communities living around restored ecosystems were assessed via studies conducted by Master's students from University of Rwanda in a partnership between Rwanda Environment Management Authority and the Center of Excellence in Biodiversity and Natural Resource Management at University of Rwanda (Table 2).

These eight studies assessed the impact of EbA on the livelihoods of local people and ecosystems using a combination of household surveys, interviews, focus groups, or direct observation.

Table 2: Ecosystem-based Adaptation (EbA) research topics and area studied

	Title of the research project	Studied area
1	Importance of forest restoration on local people livelihoods and environmental conservation	Ibanda Makera, Kirehe district
2	Role of agroforestry on ecosystem complex restoration to enhance resilience of riparian communities to climate change effects	Akanyaru, Murago and Cyohoha wetland complex, Bugesera district
3	Contribution of aquatic invasive plants management to the surrounding community of lakes	Cyohoha Lake, Bugesera district
4	Contribution of Integrated Development Program model green village to the livelihoods of people and water ecosystem conservation	Ruhondo Lake, Musanze district
5	Farmer's perception and adoption of agroforestry technologies	Kirehe district
6	The role of the riparian zone ecosystem in climate change resilience of communities around Lakes	Kibare Lake, Kayonza district
7	Remnant natural forests management: an approach to climate change resilience	Sanza, Ngororero district
8	Wetland ecosystem and its role to enhance climate resilient to local community around wetlands	Murago, Bugesera district

Results show that local communities were generally supportive of EbA interventions in their communities, and of conservation in general. They also perceived that the EbA projects in their communities provided tangible benefits to local residents through the provision of ecosystem services and/or employment. For instance, forest restoration around Ibanda-Makera and Sanza forests enhanced important ecosystem services such as improved water quality and quantity, improved soil fertility, and provision of habitat for bees.

Local community members indicated that one of the most important benefits from forest restoration was the employment opportunities provided by the restoration activities.

Local communities around wetland and riparian areas indicated that EbA enhanced water-based ecosystem services, the most important being water provision,

the enhancement of water quality, fish production, and flood attenuation. Further, the most important perceived benefits from agroforestry activities carried out within EbA projects were fruit production, firewood, timber, fodder, and enhanced soil quality.

However, local communities also indicated that there were significant livelihood challenges from the EbA projects implemented. For instance, community members expressed difficulty in finding replacements for forest products such as firewood, timber, bean stakes, fodder, and medicinal plants

after losing access to the restored forests or buffer zones.

They also identified the destruction of crops by wildlife and tree-crop competition as problems. Some local community members also expressed a desire to have permission to farm around trees planted in riparian areas that became restricted after EbA project interventions, and for greater irrigation opportunities.

Finally, they reported that there were challenges to the adoption of agroforestry such as lack of quality seedlings, high mortality of planted trees, damage by termites, and insufficient technical knowledge.

4. KEY RECOMMENDATIONS

Based on the findings from the evaluations of EbA projects in Rwanda, several knowledge gaps and recommendations have emerged and are summarized below.

4.1. Baseline data

TThe current studies assess local livelihoods as a snapshot in time. Thus, even though some studies asked respondents relevant questions about their livelihoods before and after restoration, generally there are few quantitative data available to assess how livelihoods changed in response to restoration and/or conservation activities. It is important that as new EbA projects are implemented, data collection on livelihoods (goods and services received from ecosystems, income, agricultural production, etc.) be collected at the

start of the project (baseline data) and throughout to produce useful information on how the local population is being impacted. Furthermore, baseline data should be archived in a manner that enables easy access for assessment and monitoring studies.

4.2. Livelihood indicators

Related to the above point, specific indicators should be developed and used to measure the livelihood outcomes of EbA projects in a consistent manner. Previous projects implemented around the world have included indicators such as income, food security, agricultural productivity, and income diversification. It's important that these indicators focus on outcomes (e.g. food security) instead of just outputs (e.g. hectares restored). Having consistent indicators for livelihood impacts across projects would facilitate comparison of different projects and common understanding of best practices.

4.3. Sociodemographic influence

There is a lack of information regarding how socio-demographics influence the benefits and challenges people experience as a result of EbA projects. Future studies regarding the livelihood impacts of EbA in Rwanda should explicitly investigate how variables such as gender, education level, age, and landholding size influence livelihood impacts. Such studies will typically require larger sample sizes, but the information gained would be useful in targeting and tailoring incentives, assistance, and education outreach to specific segments of the population that can most benefit from such interventions.

4.4. Monetize benefits and costs

Future studies regarding EbA should attempt to monetize the benefits and costs associated with EbA projects. This should include non-market ecosystem services such as prevention of soil erosion, pollination, etc. This information is necessary for benefit-cost analysis and identifying the most cost-effective projects and strategies. This would be particularly important in identifying gender-differentiated

benefits and costs for men and women, as their socially constructed gender roles based on labor contributions are often environmentally dependent.

4.5. Technical Support

Extension services to local communities should be enhanced as part of EbA projects. The lack of technical knowledge was explicitly identified as a significant challenge in the current studies, particularly for agroforestry adoption.

In addition, other identified challenges such as the difficulty in finding replacements for forest products and other natural resources that communities lost access to after EbA project implementation, and adjustments to changing growing seasons and precipitation patterns resulting from climate change could likely be improved if local residents had ready access to the best information and support.

4.6. Controlled access to restored ecosystems

Options for controlled access for local communities to conserved areas (e.g. forests, buffer zones, riparian areas) should be explored. Controlled access to forests for collection of medicinal plants and beekeeping or ecologically appropriate cultivation in riparian areas could be example options to investigate.

Such access, when carefully managed, could increase local support for EbA and reduce the incentive to illegally harvest resources from protected areas, and could promote stewardship of EbA restoration sites.

4.7. Long term employment

Focus should be given to increasing long-term off-farm employment through EbA. Several of the studies found that employment through forest restoration or removal of invasive species was an important benefit for local residents. However, there is a challenge in sustaining such employment opportunities once restoration is completed. Identifying employment opportunities through management activities or sustainable use of restored ecosystems could thus be beneficial.

4.8. Participation

Participation occurs along a continuum from simply informing communities of planned activities, to involving communities fully in the selection of activities, and the development and implementation of those inclusive activities (true participation).

Research has shown that true participation increases the sustainability and stewardship of project activities. Degree of participation thus stands to have a significant positive outcome for EbA projects, and investment in methods to ensure true participation by community members should be integrated into all future EbA projects to build a foundation for long-lasting outcomes.

This includes the most vulnerable community members, such as unmarried women, orphans and vulnerable children, and those with disabilities, who are often left out of development decisions.

4.9 Gender Policy

The Rwandan Ministry of Gender and Family Promotion's 2021 "Revised National Gender Policy" emphasizes three key areas for transformation of gender equality in the country - economic relations, social dynamics, and governance - which also foster improved EbA.

EbA and poverty alleviation are mutually reinforcing in climate change resiliency. Economic deprivation often drives women, caretakers and providers for rural families to engage in unsustainable environmental practices as a means of meeting their families' basic needs.

Such examples include poaching, overfishing, clearcutting, and slash-and-burn farming which often increases as a result of climate change. On the other hand, women's roles as stewards of environmental resources for their families and communities positions them to be powerful agents in maintaining nature-based solutions for long-term biodiversity management.

They are poised to be stewards of payment for ecosystem services (PES) arrangements, conservation managers, and marketplace leaders in the sale, purchase, and trade of environmental resources at the local level.

Enhanced social and governance equality for Rwandan women in the coming decade calls for more research and programmatic focus on the gender dynamics of EbA at the national and community level. Rwanda's female-majority parliament has the potential to place gender-transformative climate policy at the fore. Rural women's expanding access to formal banking, alternative finance, and entrepreneurship opportunities means they will become small business owners in increasing numbers, roles that allow for their private sector power influence in EbA.

A meaningful tool for environmental and gender governance lies in "imihigo", or local-level priority activities to be used as a performance measure for community leaders' governance. This traditional form of auditing local leadership could be a profound conduit for realizing gender-transformative EbA goals. Together, the economic, social, and governance dimensions of Eba and climate change resiliency undergird comprehensive research, planning, and implementation.

Further Reading

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