Flood risk reduction nature-based solutions: potential forest restoration and agricultural land use in Búzi, Mozambique

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Introduction

Mozambique's district of Búzi is highly prone to fluvial and coastal floods, cyclones and other types of natural hazards. These extreme events have not been extensively profiled and a potential to reduce the risk is yet to be discovered.

In contrast to the conventional grey solutions to combat the risk of flooding, the application of nature-based solutions (NbS) is increasingly being explored and appropriate interventions made.

• The present work aimed at analysing the potential of the implementation of the restoration of natural forests and riparian woodland creation, a measure under the *umbrella* concept of NbS, as a way to reduce flood risk in the district of Búzi, Mozambique.

Methodology

Field research: September 2022.

Stakeholders: 109 local villagers (incl. farmers, fishers), and 7 government officials and experts (*Fig. 1*).

Figure 1: Focal groups in Búzi, River Búzi, and Subsistence farming.

Assessment of the measure:

Semi-structured interviews: Focal groups' and experts' evaluations through the application of the subsequent tools.

TOPHEE feasilibity: Technical, Organisational, Political, Human, Environmental, and Economic criteria.

SWOT analysis: Stengths, Weaknesses, Opportunities, and Threats.

Processing of satellite imagery: Land cover (see *Table 1*).

Results

• The restoration of natural forests and riparian woodland creation is a strategy of landscape restoration that presents opportunities that lead to the reduction of the intrinsic risks of floods.

• The applicability of the intervention depends particularly on social organisation and participation, a "sense of ownership" of the locals.

• The reduction of the risk is achieved through resulting benefits from the application of the measure.

• Among the several co-benefits that result from ecosystem functions and services provided by the measure include those in *Fig. 2*.
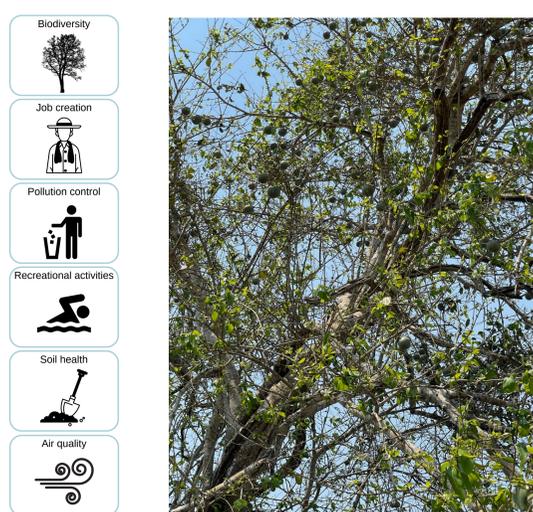

Figure 2: Co-benefits identified by stakeholders, incl. the production of forest and non-timber forest products (NTFP), such as the *massala*, or monkey orange, a local fruit species.

• From a total extension in Búzi of 7,479.22 km^2, presumed usable land extends to up to 1.293,79 km^2, or ∼20% (*Fig. 3*).

• Potential area dedicated to production: 323.45 km^2, resulting in a growth of 76.62% from the original extension.

• Local species are prioritised also for production (e.g., *Fig. 2*).

• Costs of implementation include purchase, transaction, and monitoring costs.

• Benefits of implementation include environmental goods and services, such as carbon sequestration, potential for ecotourism, contribution to food security, and climate change adaptation.

Table 1, Figure 3: Land cover, district of Búzi and allocation for the measure.

Type	Area km^2
Forests	4,853.93
Grasslands	1,010.93
Shrublands	747.24
Croplands	422.13
Wetlands	215.33
Urban areas	2.28
Bare/sparse vegetation	0.86

Total extension 7,479.2 km²
Usable land 6,496.9 km²
Reforestation and riparian woodland creation 1.293,8 km²
Production 323.4 km²

• Better farming techniques are necessary to ensure the sustainability of the project.

• The resulting increase in production results in economic opportunities in the localities and the region.

Conclusions || Discussion

• The restoration of natural forests and riparian woodland creation has proven effects of reducing flood risk by providing regulating ecosystem services for flow regulation, runoff control, and water storage.

• The measure can be combined with other NbS to increase the potential of risk reduction and the provision of social-ecological benefits.

• The time consuming and high investment nature of the intervention, along long-term commitment needed might reflect on a lack of "OPH" feasibility.

• Nevertheless, the intervention displays a great appeal because of the agricultural land expansion to up to 70% of the total usable land.

• In addition, sustainable land use practices will be promoted (e.g., agroforestry, avoid uncontrolled burning).

• The evaluation of results with stakeholders is necessary to validate results.

• With a reduced risk of flooding, environmental and economic factors will further contribute to the overall resilience in the district of Búzi.

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