Policy Paper

Ecosystems for resilience

Enabling community-led adaptation: Five key insights from Guatemala and India

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Cover image: Angha Wasnik, TMG Research

Executive Summary

Ecosystem-based Adaptation (EbA) is an integrated and strategic response to the challenges of sustainable development. It addresses climate targets, while also providing solutions around other issues such as food security and biodiversity conservation. Notwithstanding its increasing familiarity projects that could be characterised as "pure" EbA are still few and far between. Instead, the term is often used to describe a broad variety of interventions that seek to link climate adaptation and natural resource management.

In this paper, we distil lessons from four such longstanding programmes in Guatemala and India. While they had diverse starting points, ranging from watershed development and community empowerment to sustainable forest management, our analysis reveals that as these projects adapted to new challenges and sought to manage the inevitable trade-offs between nature conservation and human development, they became more closely aligned with the concept of EbA. By examining the different trajectories of these projects, this paper highlights some of the enabling (as well as hindering) conditions under which EbA can be effectively implemented, yielding multiple benefits beyond a specific project lifetime.

Based on this characterisation of EbA, we consider one of the case study sites – Pasabién in Guatemala – as an "emerging" EbA project. While the project did not initially place smallholder farmers at the heart of its interventions, it does offer insights on how to integrate local communities when (re)designing an EbA project. In this regard, the project's recent integration of agroforestry and silvo-pastoral systems within a broader suite of forest protection measures highlights the importance of community-based adaptation as a core component of EbA.

Even though Guatemala and India differ greatly in their socio-economic and political contexts, they do demonstrate striking similarities with respect to the underlying conditions that facilitate effective EbA. Taken together, the four case studies presented in this document help shed light on how EbA works in practice, as well as highlighting some critical elements that should be considered when transitioning to, or scaling up EbA approaches that build on pre-existing programmes.

List of acronyms

ADIMI	Asociación de Desarrollo Integral MITIJ IXOQ
ASOCUCH	Asociación de Organizaciones de Los Cuchumatanes
CBD	Convention on Biological Diversity
CSO	Civil Society Organisation
CSR	Corporate Social Responsibility
EbA	Ecosystem-based Adaptation
FDN	Fundación Defensores de la Naturaleza
ICUZONDEHUE	Asociación de Desarrollo Integral Comunitario de la Región Norte de Huehuetenango
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IPCC	Intergovernmental Panel on Climate Change
MGNREGS	Mahatma Gandhi National Rural Guarantee Scheme
NABARD	National Bank for Agricultural and Rural Development
NbS	Nature-based Solutions
UNEP	United Nations Environment Programme
SDG	Sustainable Development Goals
WOTR	Watershed Organisation Trust
WWF	World Wildlife Fund

The Climate-SDG Integration Project

The Climate-SDG Integration project: Supporting the implementation of the Paris Agreement and the 2030 Agenda through Ecosystem-based Adaptation (2015–2021) is implemented by a consortium of partners, namely: TMG Research gGmbH (Berlin, Germany); WWF Mesoamerica and ADIMI (Guatemala City, Guatemala); and WOTR (Pune, India). Funded by the International Climate Initiative (IKI) of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), the project's core objective is to develop roadmaps for scaling up EbA in India and Guatemala. Key project activities include research on the effectiveness of EbA and its enabling conditions, building political and societal support, capacity development for local communities, and knowledge exchange and dissemination.

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1. Introduction

As global warming continues unabated, the impacts of the climate crisis are increasingly felt around the world. The latest report of the Intergovernmental Panel on Climate Change (IPCC) finds that every region around the globe is already affected by extreme weather events related to anthropogenic climate change (IPCC, 2021). In the month that this report was finalised, southern Europe and parts of Asia were grappling with the effects of the worst bush fires in living memory while the 2020 Adaptation GAP Report (UNEP, 2021) estimates that more than 50 million people were directly affected by floods, droughts and storms in 2020. The crisis is worst for the poorest: of the ten countries most affected by extreme weather events in 2019, eight are classified as low- and lower-middle income (Eckstein et al., 2021).

Ecosystem-based adaptation: a systemic approach to climate adaptation

Alongside serious decarbonisation efforts, nature plays a vital role in the climate equation. Healthy ecosystems absorb greenhouse gas emissions and "[reduce] vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters" (IPBES, 2019). The conservation, restoration, and sustainable use of ecosystems to withstand climatic shocks is therefore crucial to help societies adapt to changing climates. Such integrated approaches, also referred to as Ecosystem-based Adaptation (EbA), are rapidly gaining momentum as an essential instrument in global climate action.[1] Examples of EbA are wide ranging. Depending on specific landscapes and needs, they include wetland management as a means of storing water for domestic and agricultural use, communal mangrove conservation for flood protection and sustainable wood and fish stock use, or watershed development to control soil erosion and promote water harvesting. The substantive participation of affected communities in designing and implementing these measures is another important element of the concept of EbA (Figure 1).

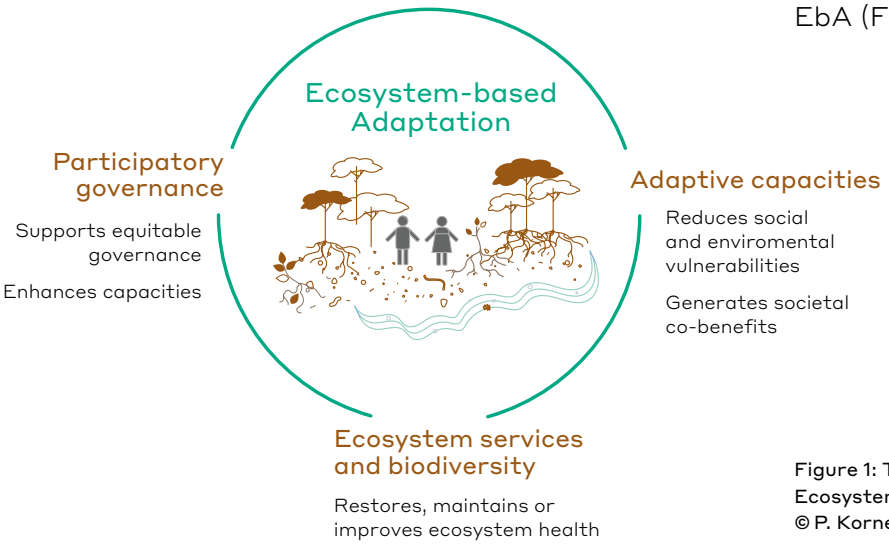


Figure 1: The three elements that constitute Ecosystem-based Adaptation, based on FEBA (2017). © P. Korneeva/TMG Research

1 The urgent need to protect the Earth's ecosystems has gained increasing political attention since the publication of the first Millennium Ecosystem Assessment in 2005. However, the concept of Ecosystem-based Adaptation is fairly new in science and policy. EbA was first mentioned during the 14th meeting of the Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC COP 14) in 2008. It was subsequently formally integrated into the texts of the UN Convention of Biological Diversity (CBD) during COP 9 in 2009. Today, around two third of signatory countries to the Paris Agreement have nature-based climate solutions in their Nationally Determined Contributions (NDCs) and out of 168 submitted NDCs 104 refer to ecosystems in their adaptation planning. See also: https://www.nbspolicyplatform.org/adaptation-planning/adaptation-action-types/nature-based-actions/

Ecosystem-based Adaptation
The UN Convention on Biological Diversity (2009) defines EbA as "the use of biodiversity and ecosystem services as part of an overall adaptation strategy to help people to adapt to the adverse effects of climate change."

Enabling Environment for EbA
In the context of this paper, we refer to an *enabling environment* as the conditions that support local communities in overcoming structural barriers – such as limited access to funding and knowledge, or insecure land tenure – that prevent them from adopting, and sustaining, EbA practices. The absence of an enabling environment often undermines such long-term investments in ecosystem restoration, and must thus be created, or strengthened, if EbA is to succeed in the long run.

While the enormous potential of EbA has been demonstrated by numerous successful pilots around the globe, achieving widespread impact remains a challenge (Reid et al., 2019). The enabling environments which will allow EbA to be scaled up, and to flourish therefore require further scrutiny.

Purpose and structure of the paper

This paper discusses what it takes to build an enabling environment for implementing and scaling up EbA. It draws on field research conducted in India and Guatemala in 2019–2020, in the context of the Climate-SDG Integration Project. With a focus on ecosystem-based agriculture and sustainable forest management as examples of land-based EbA initiatives, the four case studies investigated a broad range of socio-cultural, economic, institutional and governance conditions that support or inhibit the effective application of EbA.

The paper begins with a brief overview of the case studies outlining the key findings from the interventions carried out. This is followed by a section synthesising five key insights gained across the four project sites, focusing on community participation, the role of civil society organisations, livelihood improvements achieved, how trade-offs were managed, and the ways in which funding sources are made accessible to local actors. The paper concludes with eight key messages which draw on the lessons of the research to make recommendations for the design, implementation and scaling up of EbA, with the aim of informing sub-national, national and international level governance processes.

2. Contextualising EbA: Four case studies from Guatemala and India

The objective of the EbA research was two-fold: (1) to assess the effects of EbA action on ecosystem health, livelihoods, and adaptive capacities; and (2) to analyse the conditions under which EbA can generate benefits for natural resource-dependent communities. The next section provides a brief overview of findings under the first research objective. However, the key messages highlighted in this paper focus on the second research objective.

Two study sites in each country were selected. In Guatemala, the studies were conducted in the eastern and western highlands respectively, while in India the study sites were in the Western Ghats of Maharashtra (central west India). Despite their many differences, the two countries make for an interesting comparative analysis. Both are highly vulnerable to climate change, while also being confronted with development challenges such as high malnutrition, socioeconomic inequality, and poverty (see Table 1).

Methodological considerations

While none of the studied interventions were originally framed as EbA they provide valuable insights for designing, implementing, and scaling up such integrated approaches. In all four study sites, interventions were implemented at the watershed level as a response to climatic vulnerabilities faced by communities. In all but one case (Pasabién) smallholder farming played a central role. Agricultural practices in the context of EbA, referred to as ecosystem-based agriculture in this paper, are practices that enhance the climate resilience of the farming system through the preservation of ecosystem services and biodiversity (Vignola et al., 2015). Thus, agriculture and nature conservation do not compete with, but reinforce each other.

The sustained uptake of EbA measures, as well as the effects of the underlying enabling conditions, can only be observed over time. Thus, the research looked at initiatives that had been implemented for at least five years. Where data on the baseline situation was unavailable, participatory rural appraisal methods helped to reconstruct this information. Perceptions of project implementers and beneficiaries, documented through focus group and key informant interviews, as well as a review of project documents and satellite images, provided data on the outcomes of EbA action (e. g., changes in forest cover) and enabling factors (e.g., the role of village-level committees in groundwater management). A total of 315 people in Guatemala, and 121 in India, participated in discussions and interviews between November 2019 and August 2020. The lower number in India was due to Covid-19 related restrictions.

Table 1: Overview of climatic risks and impacts in India and Guatemala.

Category	India	Guatemala
Global Climate Risk Index 2000–2019[2]	20th most affected	16th most affected
Extreme weather events and climate risks	Flooding, sea-level rise, tropical cyclones, heatwaves and droughts[3]	Droughts, heavy rains, frosts, tropical cyclones, forest fires[4] (SGCCC, 2019)
People displaced due to extreme weather events in 2019[5]	5 million people in the year 2019 (highest number worldwide)	21,000 people in 2019 (26,000 people in the first half of 2020, due to tropical cyclones)
Climate impacts on agriculture by 2050	Up to 15 % decrease in yields of cereals[6]	35–40 % decrease in coffee and sugarcane yields, 15% decrease in maize and bean yields[7]
Employment in agriculture in 2019 according to ILO[8]	43 % of total employment	31 % of total employment
Human Development Index in 2019[9] (n=189 countries)	131st	127th
Prevalence of undernourishment in the total population 2017–19	14.0 %	16.1 %[10]

2 See Eckstein et al. 2021; 180 countries included in the Global Climate Risk Index 2000–2019 **3** See Krishnan et al. 2020 **4** SGCCC, 2019. Primer reporte de evaluación del conocimiento sobre cambio climático en Guatemala: resumen para tomadores de decisión. Sistema Guatemalteco de Ciencias del Cambio Climatico (SGCCC). **5** IDMC, 'Global Report on Internal Displacement' (Geneva, Switzerland: Internal Displacement Monitoring Centre, 2020). **6** See: Agricultural Model Intercomparison and Improvement Project (AgMIP). **7** See Castellanos et al. 2018 **8** International Labour Organization, ILOSTAT database, World Bank. **9** See UNDP 2020 **10** See FAO (2020)

Guatemala

▶ Case 1: "Milpa+Potato+Sheep+Forest" System in San Francisco, Huehuetenango region

The first study site was in the watershed of San Francisco, located in the western highlands close to the Mexican border. The area is characterised by high poverty rates and changing climate patterns, including extreme and unpredictable weather events (alternating between drought and excessive rains), pests, hail, and frosts.

Description of EbA interventions

We focused on 10 integrated rural development interventions that were launched in 1997 in the aftermath of the Guatemalan civil war. Carried out by national farmer organisation ASOCUCH[11] and its local member ICUZONDEHUE[12], the aim was to enhance farmers' production, income and empowerment, while also promoting social inclusion and institutional capacities. The programmes were later expanded to include forest, soil, and water resource conservation, referred to as *Sistema Milpa*[13]*+Papa+Ovinos+Bosque* (SMPOB; English: *milpa+potato+sheep+forest system*).

Outcomes of EbA

According to ASOCUCH monitoring data covering the period 2009-2020, the adoption of new agroforestry practices by 69 % of households has contributed to crop diversification and more frequent harvests. In conjunction with other EbA measures adopted, this has led to a significant improvement in yields of staple foods such as maize, potatoes and beans, with improved food and nutrition security for 87 % of families. Farmers also enjoy improved market access and income opportunities, which has helped reduce seasonal distress migration to coastal plantations, with around one-third of respondents saying they do not migrate anymore. Additional income sources have been generated through payments for community-managed conservation and restoration activities introduced by the national forest incentive programme. As a result, forest cover increased by close to 50% between 2001 and 2016.

Supplementary information about the case study of San Francisco (in Spanish) can be found here: https://doi.org/10.35435/1.2021.1

11 Asociación de Organizaciones de los Cuchumatanes (engl : Association of organisation of the Cuchumatanes) 12 Asociación de Desarrollo Integral Comunitario de la Región Norte de Huehuetenango (engl : Association of integrated community development of the northern Huehuetenango region) 13 "Milpa" is a polyculture system where corn is associated with for example, squash, pumpkins, chili, beans, tomatoes edible and medicinal herbs, edible flowers. The exact combination will vary from place to place.

Case 2: Watershed Management Plan in Pasabién, Zacapa region

The second study took place in the Biosphere Reserve Sierra de las Minas, a mountainous area in the Zacapa region. Due to significant deforestation, frequent heat waves and unregulated water extraction, the area is susceptible to forest fires, landslides, and household water insecurity. Smallholder agricultural activity has been largely abandoned due to, among other reasons, climate stress and alternative employment opportunities in a growing agribusiness, mining and tourism industry.

Description of EbA interventions

The Fundación Defensores de la Naturaleza (FDN) has implemented nature conservation activities in the study area over the past two decades. The EbA study focused on measures implemented under the Watershed Management Plan for the Pasabién River Basin (PMP) between 2015 and 2020. A joint initiative of FDN and the World Wildlife Fund (WWF), the PMP aimed to reduce community vulnerabilities to natural disasters by introducing a range of integrated land management approaches, improvement of agricultural value chains, and the development of agroforestry systems.

Outcomes of EbA

Under the PMP, forest regeneration has improved. However, absolute forest cover, and water availability and accessibility have continued to decrease due to forest fires during prolonged dry periods, as well as the continuation of logging and extractive industrial activities. Given the PMP´s relatively late start in 2015, many of the planned activities, such as those related to agriculture, have not yet, or only recently, been launched. Thus, clear socio-economic benefits – apart from firefighting brigades that provide up to 23 temporary jobs – were difficult to identify at the point of research.

Supplementary information about the case study of Pasabién (in Spanish) can be found here: https://doi.org/10.35435/1.2021.2

India

Case 3: Watershed development in Bhojdari, Ahmednagar district

The village of Bhojdari is located approximately 170 km inland from Mumbai. It lies in a semi-arid region that is prone to climate variations, such as unseasonal and extreme rainfall events, delayed monsoon onset, and severe droughts.

Description of EbA interventions

The study focused on initiatives spearheaded by the Watershed Organisation Trust (WOTR), which was launched in 1996 as part of the Indo-German Watershed Development Programme. We analysed a range of integrated water and land management activities undertaken during the project's later phases (between 2009 and 2017) that sought to promote, inter alia, climate-resilient agriculture practices, participatory groundwater management, improved livestock raising, and biodiversity protection and reforestation.

Outcomes of EbA

The study documented a broad range of positive socio-economic outcomes associated with ecosystem-based agriculture. Crop diversification, which increased from an average of 3 to 13 crops, was linked to a reduction in farmers' input costs, as well as strengthened access to markets. Farmers reported increases in their incomes from agriculture averaging around 37 %, while seasonal distress migration reduced slightly. Nutrition has also significantly improved, with the promotion of a diverse range of nutritious indigenous crops and kitchen gardens. The study estimates that households experiencing food shortage decreased by half, from 40 to 20 %.

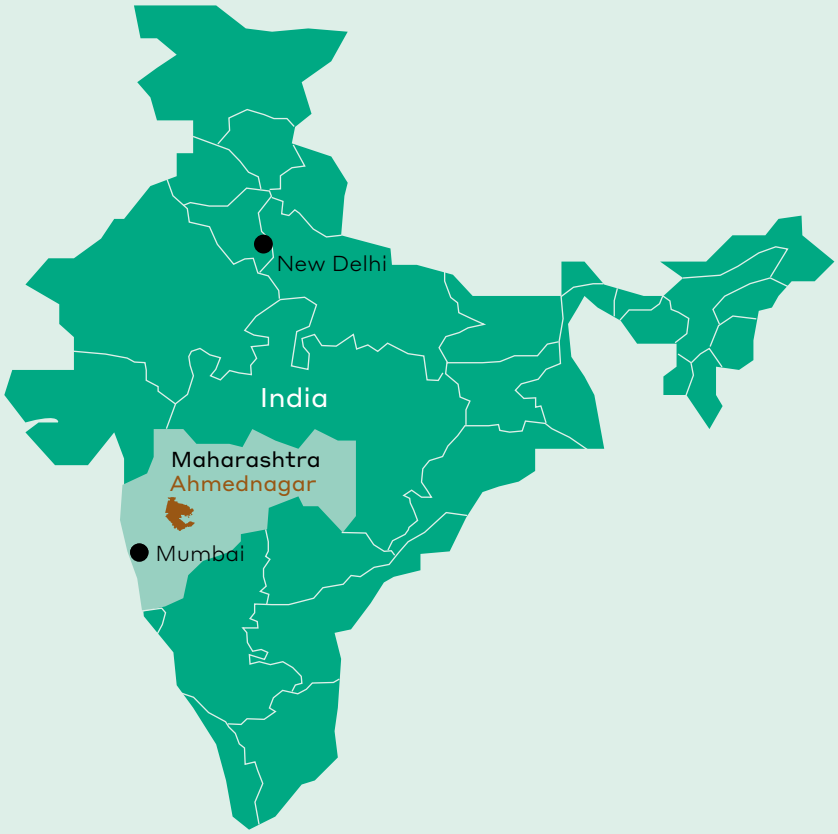
The interventions have also contributed to improved ecosystem health. Large-scale soil and water conservation has demonstrably improved water retention, reduced of barren lands by 20 %, and increased forest cover by 35 %. Moreover, there has been a slight increase in biodiversity due to an expansion of tree species, and a subsequent rise in numbers of some wildlife species, such as peacocks, deer, monkeys, jackals, foxes, leopards and birds.

Case 4: Watershed development and eco-tourism in Purushwadi, Ahmednagar district

The village of Purushwadi is endowed with significantly higher average rainfall than Bhojdari, and has a greater forested area. Nevertheless, the village is vulnerable to climate-related hazards, such as unseasonal and extreme rainfall, and extended droughts and frost that contribute to crop damage and food insecurity.

Description of EbA interventions

Similar to its interventions in Bhojdari, WOTR implemented a watershed development approach that started with a five-year Community-based Natural Resource Management (CBNRM) project in 2002. The project was gradually extended to include biodiversity conservation, climate-resilient agricultural practices, and community-managed ecotourism.



Outcomes of EbA

As a result of these measures, agriculture-based employment has increased by 40%. This has had a direct impact on outmigration, with only 30% of households (down from 80%) continuing to migrate on a seasonal basis. Food and nutrition security has also improved due to successful crop diversification, as well as the promotion of indigenous vegetables.

Given the village's scenic setting, eco-tourism provides an important additional source of income for approximately 65% of households, including marginalised households, women and youth. Additional income is generated from sales of locally sourced natural products, such as indigenous rice, honey, wild fruits, and handicrafts to visitors.

Diverse ecological benefits have also been documented. The study found a significant expansion of indigenous tree species (from just three in 2009 to around 35 species in 2017). Moreover, around 27 ha of degraded land has been converted into productive agricultural use. However, these improvements were undermined by land-use changes introduced under the Forest Rights Act, which contributed to the conversion of more than 40% of forested land for agricultural production. The resulting net loss in biodiversity is illustrated by an observed reduction in the number of leopards (*Panthera pardus fusca*) and barking deer (*Muntiacus muntjac*).

Supplementary material about the case studies in India can be found here: https://doi.org/10.35435/2.2021.1

3. Enabling EbA: Insights from Guatemala and India

The concept of Ecosystem-based Adaptation is relatively new. For this reason, many projects labelled as EbA build on a varied landscape of so-called integrated programmes and projects. These in turn have emerged from a broad variety of entry points, such as water conservation, sustainable agriculture, or biodiversity conservation. However, the fundamental need to address both socio-economic and environmental concerns when implementing such projects means that interventions that may not have originated as "pure EbA" projects can offer useful lessons on how to implement a systemic approach to climate adaptation.

The four case studies outlined above originated at least two decades ago. The broad span of context-specific experiences they represent therefore yields interesting insights for the further broadening and scaling up of EbA approaches.

In the next section, we present five insights emanating from this "place-based" analysis that help shed light on some of the overarching conditions for implementing EbA initiatives. We take this to mean that such initiatives contribute not only to equitable socio-economic development and environmental protection, but also help strengthen participatory governance at the community level, which is a critical element in sustaining and scaling up these initiatives. Each insight is substantiated by a brief overview of related empirical findings and culminates with messages for policy and practice (see Chapter 4).

▶ Insight #1: Empowerment of local communities is a prerequisite for EbA action

The case studies highlighted in this paper demonstrate that EbA delivers for people where community organisation and participation have been historically high. In three of four cases studied, positive socio-economic outcomes, such as improved incomes and food security, have been achieved where initiatives had strong community "grounding."

To ensure that it addresses farmers' economic and social needs, Guatemalan farmer organisation ASOCUCH has focused on inclusive and participatory modes of governance since its inception. Decisions about which technologies to adopt, where to solicit funding, and other development questions, are taken jointly. Agricultural inputs and other productive assets are shared among members. The strong collaboration developed among the group members has strengthened community cohesion and led to high adoption rates of climate-smart agricultural techniques. Similarly, national NGO WOTR in India has a track record of participatory and pro-poor approaches in watershed development. At both study sites in India, WOTR facilitated the establishment of village-level committees to convene consultative processes and ensure broad ownership of decisions made. Moreover, each committee oversaw different aspects of natural resource management, such as water allocations, forest management, or biodiversity conversation.

In San Francisco, Guatemala, as well as both study sites in India, local networks served as platforms to pool labour. They also facilitated information exchange, and the dissemination of knowledge, technologies, and inputs. Community-run seed banks are one example of such a community-based knowledge resource. In so doing, these local institutions were instrumental in achieving the required leverage for ecosystem restoration at a larger scale. However, unlike in the San Francisco case, village-level committees in India that were specifically set up to manage EbA-related activities struggled to sustain their activities once the externally funded project came to an end.

Pasabién, where the focus has historically been on nature conservation, is the exception that helps reinforce this overall conclusion. With a more integrated approach introduced only recently, our analysis found relatively few tangible benefits for local communities. Unlike the other cases, much less effort has been directed towards strengthening community institutions so far, highlighting the importance of paying attention to the collaborative management of natural resources as part of EbA projects.

Our findings are in line with research by Woroniecki (2019), which underscores that where social organisation is strong, community members can become protagonists in EbA. Giving local actors the agency to take part in decision making about adaptation planning can also lead to better use of resources and avoid maladaptive solutions that do not fit the local context (Soanes et al., 2021). Other studies from Guatemala confirm the role that local participation plays in communities' acceptance of, and support to, conservation activities (Alejandro Iza, 2019).

Local maize varieties (left). A community-run seed bank in San Francisco (right) © TMG Research

Seed sovereignty through community-run seed banks

To mitigate climatic vulnerabilities and strengthen resilient productive systems, ASOCUCH and ICUZONDEHUE established community-run seed banks in San Francisco and in Todos Santos Cuchumatán. These store a broad range of maize, beans and potato varieties that are well adapted to local conditions as well as climatic risks. These include more drought tolerant native varieties. Through participatory seed breeding processes and post-harvest storage techniques, and building on the high levels of trust and collaboration that have been developed over time, farmers use the seed banks to store, exchange and distribute seeds. More than 75 % of the interviewed farmers confirmed that they achieve better yields when using these locally selected seeds. The seed reserve can thus help to increase resilience and food security in the face of climate hazards.

Insight #2: Civil society organisations can be catalysers of EbA action

In all four case studies, civil society organisations (CSOs) were crucial in amplifying and orchestrating EbA action. Two features stand out: their role as knowledge brokers and intermediaries.

In India, WOTR was instrumental in facilitating knowledge exchange and collaboration between village committees and decentralised government bodies. This, for example, led to the joint elaboration and implementation of water harvesting plans, and efficient use of groundwater resources. Through its longstanding presence in the area and reputation as a pioneer of watershed development in India, WOTR was able to bring these different stakeholders together. At state and national level, WOTR feeds its implementation experiences into the design of policies and programmes, such as the watershed development guidelines and the people's biodiversity register.

In San Francisco, farmer organisation ASOCUCH has established itself as a strong advocate for farmers' interests, for example through their participation in the departmental roundtable on climate change. The organisation also supports institutional strengthening by setting up municipal forest offices and developing local climate adaptation plans. Further, ASOCUCH has been key in fostering farmer-to-farmer knowledge transfer. Through such local peer networks, farmers have developed relevant EbA-related technologies and practices that build on traditional knowledge, supplemented by technical expertise provided by ASOCUCH to bridge identified knowledge gaps. In Pasabién, national NGO FDN has motivated community members to participate in conservation activities through awareness raising about ecosystem services.

Our findings show that, thanks to support provided by intermediary CSOs, communities can become true protagonists in the generation of locally applicable EbA practices. A review of low-carbon innovations in Kenya by Muok and Kingiri (2015) highlights the important role that locally embedded CSOs can play not only in knowledge transfer, but also in catalysing innovation and inclusive social change.

The case studies further highlight the fact that CSOs play an important role as convenors of participatory community processes, and "bridge builders" between diverse actors, albeit to varying degrees. In the case of Pasabién, for example, the role of FDN in fostering collaboration among the key stakeholders has been affected by ongoing disputes over the exploitation of natural resources by a hydroelectric power plant and other extractive industries (WWF, 2019). Work undertaken by the Friends of EbA network further underlines the importance of convening a broad range of stakeholders. Their effective collaboration is imperative to effective and sustainable EbA (FEBA, 2018).

(Left): Representatives from the community-run forest monitoring brigades, in the El Rancho community of San Francisco. (Right): Representative of a local women's credit group. © TMG Research

Network of community-led organisations ASOCUCH – a farmers' advocate

ASOCUCH was founded in the 1990s as a post-conflict response to structural poverty in the Cuchumatanes highland region of Guatemala. It coordinates a network of 19 community-level associations, with more than 10,000 affiliated families. Its mandate is to increase farmers' income through improved agricultural practices, and promote social inclusion, organisation, and empowerment. Farmers hold rotating leadership positions across all levels of the ASOCUCH structure. Decisions about technologies, funding, collaboration, and other development questions are taken jointly and from a demand-driven perspective, addressing farmers' needs. Activities are implemented in a decentralised manner, through community-based antenna organisations that function mostly at watershed level. ICOZUNDEHUE is one such local organisation. ASOCUCH has established itself as an effective bridging actor in sustainable natural resource management and smallholder agriculture, empowering its members to represent community interests through such activities as advocacy and leadership training. In this regard, the organisation has formed strong connections with the regional and national governmental departments. Among its achievements, the network has been instrumental in pushing for the reform of the Forest Incentive Law to include small landowners, resulting in the adoption of the Incentive Programme for Small Holders of Lands for Forestry and Agroforestry (PINPEP) legislative framework.

Insight #3: EbA initiatives need to offer economic incentives to local communities

Another important insight from the case studies is that where EbA interventions provide adequate economic incentives, they are more likely to contribute to greater uptake and longevity. Such incentives ranged from measures that promoted higher farm productivity to those that introduced new, or more diversified sources of income.

In San Francisco, as well as both study sites in India, our analysis reveals that farmers can be encouraged to maintain, or transition to farming practices that help preserve ecosystem services through, inter alia, the promotion of agroforestry, as well as water- and soil-conserving practices. This requires demonstrating how such sustainable production models lead to reduced costs and/or increased yields, allowing farmers to sell a surplus. In San Francisco, for example, community-run seed banks enabled farmers to access a broader range of resilient native varieties of maize, beans and potato. In India, village committees contributed to improved livelihoods through facilitating farmers' access to markets.

Additional income for local communities can be generated through payments for community-managed tree nurseries and other biodiversity conservation initiatives, such as in the case of the national forest incentive programme in Guatemala. In India, new economic opportunities emerged through local actions to preserve the beautiful

Ecotourism in Purushwadi, India

Taking advantage of a scenic environment and unique local biodiversity, WOTR promoted community-led ecotourism as an ecosystem-based livelihood option in Purushwadi. According to the village tourism committee, ecotourism has contributed to improved incomes for 65% of the households, including marginalised households, women and youth. In addition to income generated from hosting tourists, visitors buy locally sourced natural products, such as indigenous rice, honey, wild fruits, and handicrafts. The development of an ecotourism sector has been supported by the social enterprise Grassroutes, which trains young people to become tourist guides and explore

Ecotourism in Purushwadi. © WOTR

marketing opportunities that can attract tourists. Inspired by these positive experiences, Grassroutes now promotes ecotourism in other parts of India.

Purushwadi ecosystem, which in turn enabled the introduction of ecotourism activities. In Pasabién, some community members found new employment opportunities as forest firefighters. As mentioned earlier, EbA measures focussing on social and economic outcomes only recently been introduced.

In San Francisco, and at both study sites in India, we found that EbA activities that generate significant economic returns at community level are more likely to be maintained by communities beyond the initial project phase, hence also benefitting the next generation of farmers. In addition, such activities have helped reduce seasonal economic migration. Other studies have made a similar connection between initiatives that provide and/or enhance ecosystem-based livelihoods and the sustainability of EbA actions (cf. Nalau et al., 2018; Vignola et al., 2015).

Finally, and crucially, the case studies reveal that secure land tenure is an important pre-condition for smallholder farmers to bear the initial investment costs associated with EbA measures. This is because associated practices, such as agroforestry, may only provide benefits in the medium or long term. The close link between secure land tenure and land-based investments has been proven by a wealth of scholarly work (cf. Antwi-Agyei et al., 2015; Harvey et al., 2017). In their study of 300 smallholder farms across Central America, for example, Harvey and colleagues found that farmers with secure access to land were more likely to practice contour planting, agroforestry and terracing.

Firefighters and forest protection in Pasabién, Guatemala

In response to the increased vulnerability to forest fires, FDN facilitates capacity building for community fire brigades to enhance fire prevention and control activities. Through such efforts, as well as collaboration with the municipality and other actors, the areas affected by fires have been reduced by around half, from 670 ha in 2015 to 362 ha in 2018. Additional benefits that have been realised include improved water and biodiversity protection, better air quality, and an increase in regenerated forest cover. The study also found evidence of increased community awareness about nature protection and fire prevention. While some of the firefighting positions opened up by the FDN project are temporary, other community members have attained a new source of income following the mainstreaming of fire protection activities within local government structures.

Forest firefighters in Pasabien. © TMG Research

Insight #4: EbA entails managing trade-offs among different interests

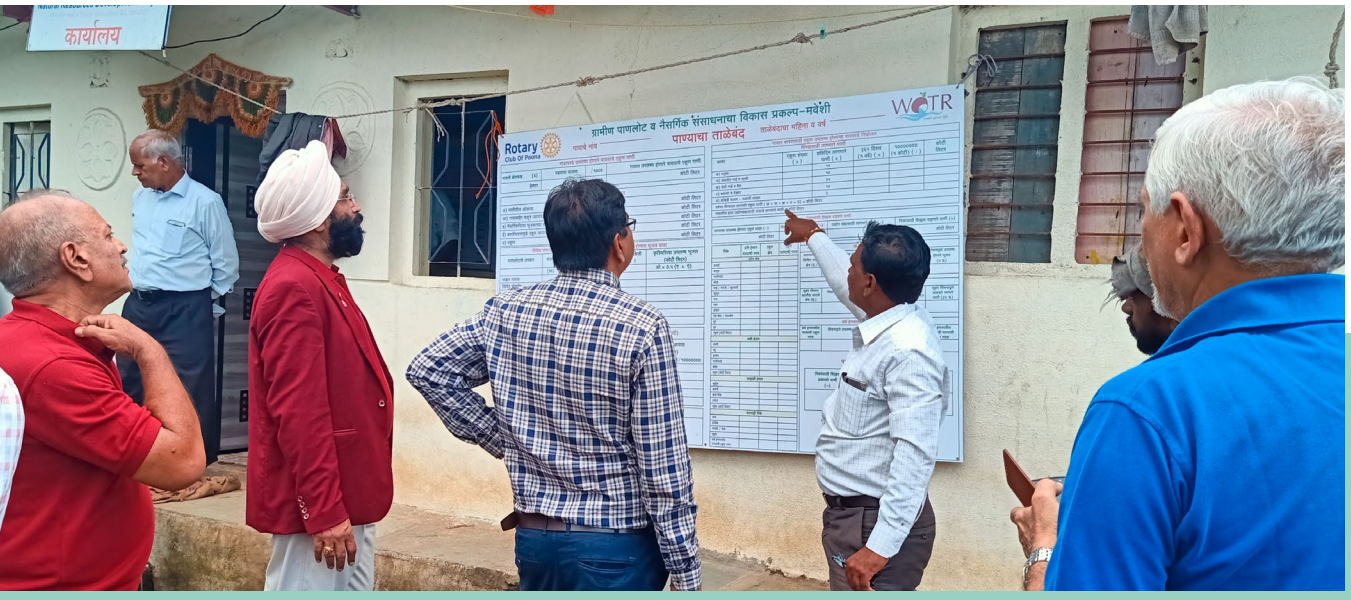
By their very definition, EbA approaches must balance among (sometimes) competing economic, social, and environmental imperatives. In all four case studies, we analysed how these diverging interests were negotiated at the community or ecosystem level.

Before WOTR's interventions, both villages saw frequent conflict over forest resource use between the communities and the local forest authority. WOTR facilitated a community dialogue process that agreed to establish by-laws for sustainable forest management, including a ban on poaching and stronger regulation of the extraction and sale of forest products. In addition to strengthening overall acceptance and compliance, another concrete outcome was the increased implementation of large-scale soil and water conservation measures on communally owned land. These actions further helped to address the unintended consequences that emerged from the introduction of farm ponds and borewells as a climate adaptation measure, leading to an increased demand for groundwater. This issue prompted the Water Stewardship Initiative, developed by WOTR, to promote community-led sustainable water management (see text box).

In Pasabién, the absence of strong community resource management structures has led to a disconnect between strong environmental protection in the sparsely populated upstream areas, and increased degradation of the more populous downstream areas, due to the conversion of land for export-oriented agricultural production. These trends have been exacerbated by a longstanding conflict between local communities and a hydroelectric power generation company. Our findings reveal that the conflict is a major limitation for any coordinated and collaborative effort regarding natural resource management and EbA.

With its established participatory governance structures, the community of San Francisco underscores the importance of local agency in finding a balance between socio-economic and environmental priorities. Forest protection and restoration activities are led by community-based institutions, which also undertake regular stocktaking of illegal activities and enforce pre-agreed timber rations for each household. Community members also receive economic compensation for their conservation activities as well as support for setting up plantations that cultivate endangered species such as the Guatemalan fir (Abies guatemalensis. Rehder).

Ecosystem management spans across landscapes, involving actors with different and diverging interests. The socio-ecological system, and dynamics within it, need to be understood to design and implement EbA measures that are systemic, responsive and sustainable (Seddon et al., 2020). Our findings support existing evidence suggesting that failure to consider socio-economic and cultural factors can erode the effectiveness of climate change adaptation measures (Adger et al., 2009; Jones and Boyd, 2011).



Water Stewardship training sessions. © WOTR

Balancing water use through Water Stewardship in India

To counteract depletion of common groundwater resources for domestic and agricultural use, WOTR developed the Water Stewardship Initiative and initially rolled it out in 100 villages across Ahmednagar district, Maharashtra state. Today it is being implemented in 251 villages in three states. The premise is that while weather fluctuations cannot be controlled, communities can be empowered to utilise water resources more sustainably. Through a series of training sessions, community members learn how to use a water budgeting tool to calculate the total amount of rainwater stored underground, as well as how much water is available for farming and household use. The tool enables farmers to make choices among a mix of crops, and other decisions that allow for fairer allocation of available water resources among all users, while also minimising the depletion of groundwater. The initiative has further built the capacity of local communities to incorporate weather data in such water budgeting activities.

Insight #5: EbA funds must be made accessible to local actors

Ecosystem services are public goods. Their benefits extend beyond the local community to broader society. The case studies in India and Guatemala present diverse opportunities for channelling public and private funding mechanisms to support the expansion of these common goods.

Financing schemes that compensate local resource users for the protection of ecosystems have become increasingly popular since the economic valuation of ecosystem services started in the 1990s. In Guatemala, the national forest incentive programme compensates local communities for forest protection, restoration and sustainable use. In Francisco, the farmer organisation ASOCUCH channels the programme's funds to their members for community-led monitoring and tree nurseries for

The National Forest Incentive Programme in Guatemala

Set up in 2007, Guatemala's Forest Incentive Programme promotes sustainable forest management for economic development and forest restoration. In San Francisco, over 191 hectares have been incorporated in the programme since 2010 (14% of the micro-watershed). Participating households are compensated for reforestation, sustainable use and conservation activities such as communal forest monitoring. Depending on land size, interviewed participants reported annual compensation between 642 and 7,700 USD. The programme also stimulates the creation of alternative employment, such as the establishment of tree nurseries for the Guatemalan fir (Abies Guatemalensis) used in Christmas season. As a technical and administrative facilitator, farmer organisation ASOCUCH and its antenna organisations can access funds through the incentive programme and supports smallholders in registering with the programme. This has enabled these community-based organisations to become less dependent on donor funding, hence achieving greater autonomy in their decision-making and project planning.

Plantation and tree nursery of endangered tree species (Abies Guatemalensis) in San Fransisco. © TMG Research

endangered species, as outlined previously. In Pasabién, the disbursement of the forest incentives is minimal. Hindering factors include land tenure insecurity, increasing land concentration, and low awareness regarding the requirements for entering the programme.

In both study sites in India, the EbA interventions were funded through public and private sources. In Purushwadi, the public biodiversity board continues to financially support the local biodiversity committees, given their success in protecting biodiversity. In both villages, government funding is provided through various schemes such as the Mahatma Gandhi National Rural Guarantee Scheme[14] that provides work opportunities to repair watershed structures. In addition, private sector contributions to rural development interventions are quite common due to a government requirement that registered companies dedicate at least 2% of their net profit to corporate social responsibility activities.[15] Further, local networks, such as credit cooperatives, village development committees and women's self-help groups, provide access to local funding schemes, notably agricultural seed loans, or community funds for the maintenance of water and soil conservation infrastructure. Notwithstanding, community initiatives continue to struggle to access sufficient funding, especially for the maintenance of infrastructure on communally owned land.

The case studies show that in most cases local organisations are able to tap some funding, although sufficient long-term funding remains a challenge (Soanes et al., 2021). Providing local actors with access to funding for investments in ecosystem restoration also offers opportunities to "redress power imbalances that fuel inequality and exclusion" (Colenbrander et al., 2018, p. 2). However, mobilising funding for climate action, and particularly adaptation, remains a challenge (Chong, 2014; Reid et al., 2019). Globally, only 5% of global climate finance is dedicated to adaptation (UNEP, 2021), even though the Paris Agreement on Climate Change stipulates a balance in adaptation and mitigation funding.

Watershed maintenance funds in India

In India, village development committees have been institutionalised as official sub-units of the Gram Panchayat (village councils) and registered as village trusts. Besides administering funds for local projects, they manage a community fund to which each household contributes INR 100 (1,35 USD) per year, to maintain soil and water conservation infrastructure. An added benefit of this formalised structure is that community members are able to access other forms of support, such as agricultural seed loans.

14 The Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) is a governmental scheme which pays up to 100 days of unskilled manual labour per year on public works projects. The scheme has been widely used for watershed development works in India over the past 25 years. **15** In the fiscal year of 2017/12, rural development received 12% (320 million USD) and nature conservation 8% (210 million USD) respectively of India's total CSR funding, based on information retrieved from https://www.csr.gov.in [accessed on 16th of January, 2021].

4. Key messages

Message 1: Recognise communities as lead actors in EbA initiatives.

As highlighted above, it is critical to build EbA projects around established community-led and inclusive sustainable development initiatives in order to enhance the chance of community uptake, and sustainability of such actions. This requires giving communities a genuine voice and strengthening their capacity to negotiate among competing interests when planning and implementing EbA.

Message 2: Foster social organisation and collective action.

To successfully scale up EbA from farm to ecosystem level, it is crucial to strengthen collective action. Investments in social capital, such as the creation of strong, cohesive social networks and alliances, as well as constant co-development of knowledge and know-how are key in this regard.

Message 3: Acknowledge the vital intermediary role of local support organisations.

Given their longstanding experience in working with communities, as well as their familiarity with local resource-use dynamics, locally embedded CSOs are important actors in EbA actions. They can, for example, provide support in developing context specific EbA measures that take account of local socio-economic needs. Their proximity to local communities also makes them valuable partners in fostering genuine multi-stakeholder alliances that are critical in sustaining EbA initiatives.

Message 4: Local knowledge must be complemented by ecosystem-level knowledge.

Successful EbA requires an understanding of broader geographical perspectives beyond actions required at the farm level. This includes knowledge on the complicated dynamics between upstream and downstream resource use. It also requires an ability to link scientific approaches with local and traditional know-how on the responsible management soils, water, flora and fauna, as well as the related services that they provide.

Message 5: Enhance ecosystem-based livelihoods.

Investments in EbA action must pay off for communities. This requires integrating initiatives to strengthen ecosystem-based livelihoods with measures to facilitate access to markets and build more sustainable value chains. It also involves strengthening associations of local small-scale producer organisations, especially for the most marginalised groups, in order to enhance their negotiating power. Most crucially, secure access to land and other productive resources is a prerequisite for encouraging long-term investments by resource users.

Message 6: Include conflict resolution in EbA and ensure compliance with safeguards.

Before rolling out EbA interventions, it is advisable to investigate any factors that could spur or are already causing conflicts around the use of natural resources. An important first step in this regard is to safeguard or enhance people's legitimate tenure rights. Multi-stakeholder EbA platforms provide an additional avenue for articulating such diverging interests and promoting inclusive governance in the long term. Such platforms can draw on existing guidelines and principles, such as the Nature-based Solutions Initiative or the IUCN Global Standard for NbS.

Message 7: Make funding available to local organisations.

It takes time before communities can fully harness the benefits of investing in EbA measures. Incentive mechanisms that compensate for any short-term transaction costs can therefore go a long way in boosting the confidence of smallholder farmers and other local resource users to make such investments. It also helps to facilitate access to a range of funding options, including social protection schemes, payments for ecosystem-based services, or capacity-building initiatives by higher-level NGOs and civil society actors. This can further open up new funding options for chronically underfunded grassroots organisations, and hence strengthen social capital for the inclusive governance of natural resources at the local level.

Message 8: Consider the history of pre-existing initiatives.

As is the case with any new development approach, EbA projects build on a pre-existing landscape of programmes, projects and governance structures. Therefore, history matters when introducing, as well as upscaling EbA. Successful EbA projects will be designed with an understanding of both the strengths and shortcomings of existing initiatives, harnessing and adapting the former, while integrating them into EbA's systemic approach.

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