Good Practices on Planning, Implementing and Monitoring & Evaluating Ecosystem-based Adaptation to climate change

A summary of GIZ project examples based on a submission to the UNFCCC SBSTA Nairobi Work Programme on recent work in the area of ecosystems and interrelated areas such as water resources and adaptation

Deutsche Gesellschaft
für Internationale
Zusammenarbeit (GIZ) GmbH

CONTENT

INTRODUCTION

Ecosystem-based adaptation (EbA), defined as the *use of biodiversity and ecosystem services within the framework of an overall climate change adaptation strategy* (CBD, 2009), is a nature-based solution to increase people's resilience in the face of climate change. Ecosystem-based adaptation can be cost-effective and generate social, economic and cultural co-benefits and contribute to the conservation of biodiversity.

EbA including 'green infrastructure' measures are a still neglected form of adaptation compared to 'grey' (engineering based) infrastructure measures. In practice, an adaptation strategy that integrates both 'green' (ecosystems), 'grey' (engineering) and 'blue' (water) elements holds great potential for effective climate risk-resilient development planning. Currently, however, very little consolidated experience and few suitable methodological approaches for systematically integrating EbA and water related measures into planning and decision-making processes exist at international, regional and national level. Furthermore, additional evidence on the benefits and co-benefits of EbA measures is needed. Consequently, good practices', including practical implementation examples of EbA measures but also methods and tools that assess ecological, economic and social benefits need to be collected, systematized and made available to a broad audience.

The BMUB-IKI funded global project 'Mainstreaming EbA - Strengthening ecosystem-based adaptation in planning and decision-making processes`, implemented by GIZ, develops instruments and methods geared to the mainstreaming and strengthening of EbA on a needs-oriented basis. This entails compiling and evaluating practical experiences gained with a view to improving and further developing EbA approaches and the establishment of knowledge networks based on practical tools and examples.

The case studies documented in this report are expected to provide exemplary insights about approaches, methods, best practices and lessons learnt from a larger portfolio of projects dealing with EbA and interrelated areas. A larger set of examples can be found at the online platform PANORAMA - Solutions for a Healthy Planet, a partnership initiative hosted by GIZ and IUCN to document and promote examples of field-proven, replicable solutions across a range of conservation, climate change and development topics.

A. ADAPTATION PLANNING PROCESSES ADDRESSING ECOSYSTEMS AND INTERRELATED AREAS

Example: Improved Management of Extreme Events through Ecosystem-based Adaption in Watersheds (ECOSWat) in Thailand

1. Activities

As a result of climate change, floods and droughts in Thailand will increase in frequency as well as intensity. Local water management institutions lack technical capacity and innovative concepts to address such extreme events. Thus, the population of Thailand is prone to face large economic losses due to crop failure and loss of production. Water resources in watersheds providing and regulating ecosystem services present untapped adaptation potential for cost effective and sustainable prevention measures.

The Ecosystem-based Adaptation in Watersheds (ECOSWat) project, together with international experts, specialists from the Department of Water Resources (DWR) and the Royal Irrigation Department (RID), conducted vulnerability and risk assessments in three selected pilot river basins: Huay Sai Bat (North-Eastern), Tha Di (South) and Lum Pa Chi (West).

Through the vulnerability assessment approach the most severe problems in these river basins can be identified. In this particular assessment, the approach is based on the Global International Water Assessment Methodology (GIWA) and the Hydropower Sustainability Assessment Protocol (HSAP), which follows the following six steps:

1) Geographical scaling (mapping of hot spots) is a means of defining the geographical boundaries of the pilot areas to be analysed; through this approach sub-regions are identified within each project area, major hydro systems are featured and economic activities are mapped out;
2) Scoping by assessing environmental and socio-economic impacts, and establishing priorities among identified main concerns and issues. Also by pinpointing the root causes behind the aforementioned issues and concerns;
3) Data collection;
4) Modeling for verification and quantification of root-cause linkages with either physically deterministic or conceptual models covering
    a) Hydrologic modeling with TalsimNG software,
    b) Erosion and sedimentation modeling with Modified Uniform Soil Loss Equation (MUSLE), and
    c) Water quality modeling with GISMO software;
5) Assessment to identify risks and uncertainties, and to prioritize vulnerabilities; and
6) Identification and ranking of potential EbA measures.

The abovementioned steps resulted in water-related problems and their causes being identified, and possible EbA solutions being listed. The conservation and rehabilitation of ecosystems such as wetlands were the most endorsed recommendations.

Moreover, the technical analyses were complemented by an economic evaluation of the proposed measures. After consulting with the public and the civil society, DWR commenced the implementation of the selected EbA measures.

2. Partner institution/s

The ECOSWat project is implemented by GIZ on behalf of the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB). It is working together with the DWR, the RID and the Office of Natural Resources and Environmental Policy and Planning (ONEP). ONEP is responsible for the Climate Change Adaption Master Plan, which is currently being developed.

Other partners:

- River Basin Committees (RBCs)
- Provincial Authorization Offices (PAOs)
- Walailak University
- Khon Kaen University

3. Key results

- The two most relevant water organizations in Thailand, the DWR and the RID, prioritize the EbA approach vis-á-vis conventional measures;
- The Department for Water Planning and Policy of DWR will consider possible EbA measures prior planning projects. Moreover, the RID is currently reviewing how to integrate EbA measure into several planned and existent water projects;

Living weir structure, Tha Di sub-river basin, Nakhon Si Thammarat, Thailand (Photo: Jaruwan Ngamsing)

- The ECOSWat project developed a tool for a rapid assessment of the ecological impact of measures. This tool is based on the photosynthesis as the core ecological activity. The input data consist of only four parameters: carbon emissions and absorption (carbon sequestration), water use, and water production. The benefit of this tool is twofold: it is easy to understand and only widely available and accepted data are fed into the tool. The outcome shows whether/how the EbA measure is influencing the carbon (absorption – emission) and water (production – use) balance;

- Key capacities for setting up a sustainable river management, namely hydrological modelling, vulnerability assessments on future floods and droughts, and economic valuation methods for identifying suitable EbA measures were built at the local and national level; and
- A series of trainings developed together with German research institutes and practitioners were conducted, containing both theoretical background and practical application in the river basins.

4. Description of lessons learned and good practices

The integration of EbA measures into the development plan requires the acceptance of the civil society. The local knowledge is an important factor, which should be supported and considered in the development of a plan or a planning process. For instance, the living weir, an environmentally friendly weir construction that acts as a flood buffer is a very well-known and accepted approach in Tha Di sub-river basin (South).

The living weir concept is an EbA measure, which is based on the knowledge of the local communities in the river basin and in line with the King of Thailand's Sufficiency Economy Philosophy to apply technologies based on local resources and know-how. The concept of flood protection by means of living weirs originated from the local riparian communities and leaders with innovative ideas and the willingness to experiment with different approaches for flood and drought prevention and protection. By combining traditional knowledge with hydrological data from local universities, the administrative capacity from the regional governing institutions allows for a holistic water management approach.

In a first stage a bamboo grid construction is built in the river, it provides structure for degradable sand bags containing a mixture of sand, coconut coir and manure. Along the riverbanks a combination of Banyan trees (*Ficus bengalensis*) and other leguminous plants is planted to stabilize soils. The wide rooting banyan trees are planted on both side of the weir. The roots of these threes nurture from the manure and infiltrate the bamboo construction over the next decades forming a "living weir".

This technology entails several benefits such as: improvement of ground water recharge, which can increase crop yields or increasing biodiversity, inter alia increase in fish habitat and variety of plants. Through terraces the movement of fish upstream is not impeded. Even though these benefits of the technology can be observed, further scientific research and studies are needed to gather scientific evidence about the effects of the living weirs.

Lastly, it can also be a means of strengthening unity among related stakeholders. Maintenance costs and efforts for this methodology are low and can be easily conducted by the local communities.

The set-up of river basin committees, composed of representatives of the river basin population, academia, government and others is crucial for the success of river management. The connection between the local population and the water resources, especially in the Tha Di river basin, is very strong. Within the local communities, knowledge on changes in climate and natural disasters (flood and drought) has been passed down from generation to generation without much written documentation.

5. Description of key challenges

- In some cases, EbA measures lack proof of their effectiveness. Hence, conventional grey infrastructure, already known, is often favoured by decision-makers. Furthermore, there is an already established market-system for the construction and implementation of hard/grey infrastructure, while only few implementing agencies and constructing companies are engaged in EbA measures.
- Knowledge about the EbA approach, risks and impacts of climate change as well as the interaction of climate change and ecosystems needs to be disseminated among decision-makers and public administration technicians. In addition, the capacity building about the EbA concept must be fed with action and real implementation to demonstrate the effects of the measures.
- The EbA approach considers human beings as the focal point. Therefore, the involvement of the civil society and the acceptance of the EbA measures by the civil society are crucial for a successful implementation of EbA measures and for upscaling pilot measurements.

6. Planned next steps

The integration of the EbA approach in the water sector into the National Adaptation Plan (NAP) is a planned next step. The project has introduced the approach to the Working Group of the NAP. Meanwhile best practices from the sub-river basins will be up-scaled to bigger river basins

7. Further information

- Project website
- Project website ECOSWat Thailand (report on vulnerability assessments and economic evaluation of adaptation measures available for download)
- Panorama Solutions
- Treitler, R. (2016): Challenges and Opportunities in Asia: “Economic Benefits of EbA Measures to Assure Water Security. Case Study: EbA Sediment Trap versus Dredging”. Conference paper.

Contact
Jaruwan Ngamsing: jaruwan.ngamsing@giz.de

Example: The Open Standards-based framework for planning and implementing ecosystem-based adaptation projects in the high mountainous regions of Central Asia

1. Activities

In the regional project on ecosystem-based adaptation in the high mountainous regions of Central Asia, one of the main objectives is to make available innovative and cost-efficient measures and strategies for implementing EbA in the high mountain regions of Central Asia. The EbA approach aims to help people adapt to the adverse impacts of climate change by using services provided by nature and thus enhance the livelihood of the population depending on those resources.

In the framework of the project, a systematic planning framework for an EbA project starting from scoping of the planning process to the actual identification, implementation and monitoring of adaptation measures has been developed and applied based on the Open Standards for the Practice of Conservation. The Open Standards, successfully applied by many organizations and originally designed for conservation planning, provide a platform for a structured participatory planning process, flexible enough to more strongly incorporate the human perspective and climate information into the planning steps.

2. Partner institution/s

The regional project is implemented by GIZ on behalf of the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB). Besides the political partners in the countries, the project has six consortium partners, including local non-governmental institutions (CAMP Alataoo and CAMP Tabiat), international and regional research institutions (Mountain Societies Research Institute from the University of Central Asia, the Michael Succow Foundation, German Research Centre for Geosciences, Central Asian Institute for Applied Geoscience), as well as an international consultancy (UNIQUE Forestry and Land Use GmbH). In addition, close collaboration partners are WWF US and the Centre for Climate Systems Research from the Columbia University, as well as the World Bank and UNEP.

3. Key results

The elaborated framework consists of six main steps plus one upstream step, recommended to ensure a successful project implementation and to increase the dissemination potential of the whole approach.

0. ***Develop capacity of EbA facilitators implementing the project on the ground.*** Successful dissemination of the framework requires developing capacity of EbA facilitators. This initial stage consists of conducting a series of training workshops aimed at enabling participants to independently facilitate participatory planning processes for ecosystem-based climate change adaptation at the community level. These workshops are based on the EbA adapted Open Standards training curriculum.
1. ***Define the social, thematic and geographic scope of the EbA planning process.*** At the initial stage of the planning process, the scope has to be defined. Here, a systematic scoping approach can be applied or short cuts can be taken based on geographical and thematic interests (e.g. adapting pasture management). Scoping steps include (1) choosing a community, (2) identifying livelihood strategies, (3) identifying ecosystem

services which key livelihood strategies depend on, (4) finding out which ecosystems provide these services and (5) where they are located.

2. ***Analyse conventional vulnerabilities of people and ecosystems (not yet related to climate change).*** To complete the situation analysis started in step 1, a viability assessment for size, landscape context and conditions of ecosystems is conducted, and conventional threats with respective contributing factors are identified.

3. ***Identify climate change-related threats.*** At this stage of the planning process, the climate perspective will be integrated. Information from the situation analysis about predominant livelihood strategies is used to develop seasonal and annual climate projections for the near future. To consider inherent uncertainties in climate models, scenarios for future vulnerabilities are discussed and selected together with the community. Derived from the scenarios, climate change-related threats complete the picture of the situation analysis, and future vulnerabilities through rating of conventional and climate change-related threats can be prioritized.

   All three steps lead to a full-fledged analysis of people's and ecosystem's current conventional and future climate change-related vulnerabilities.

4. ***Brainstorm, select and test adaptation measures.*** Based on the information gathered, adaptation measures are identified and selected with the help of rating criteria and expert consultations. Prior to the implementation of selected measures, result chains for each measure are built to check feasibility and assumptions made to achieve the expected objective. If needed, additional interventions have to be selected. Another instrument to facilitate the decision-making process for or against a measure are cost-benefit analyses.

Participatory planning process (Photo: GIZ)

   EbA should be considered as part of an overall adaptation strategy and works best when combined with other adaptation measures, which are valid for implementation since they also went through the whole selection process and are ecosystem friendly,.

5. ***Implement and monitor selected adaptation measures.*** The implementation of selected and feasible adaptation measures will be monitored based on indicators and monitoring plans developed with the help of result chains and Open Standards generic guidance.

6. ***Learn, adapt and communicate.*** Based on the monitoring plan with respective identified indicators as well as constant communication with the community, it can be checked if intermediate results and assumed impacts can be achieved or measures have to be adapted. From the beginning of the project a strong focus should be placed on enabling the community and local institutions to continue the process, because adaptation is a process, not a project.

4. Description of lessons learned, good practices and key challenges

Central Asia has had experience in applying measures of this approach in practice, but the identification process has not been systematic and the integration of climate information has often been neglected. However, for projects with the claim to help people to adapt to climate change it is inevitable to integrate climate projections into the planning process, taking into consideration the knowledge and perception of the local communities, in order to avoid

maladaptation. In addition, traditional approaches focusing on conservation and restoration of important natural ecosystems might have to be reconsidered in the context of a changing climate.

- ***Step 0****:* Trained and qualified facilitators are essential for successful dissemination of the EbA framework since they will be responsible for transferring and translating expert knowledge to the local partners.
- ***Step 1***: It is important to consider the degree of dependency on ecosystems and their services during the community selection phase since some areas might be geographically and economically detached from them.
- ***Step 2***: A stand-alone vulnerability assessment conducted by external experts not participating in the further planning processes should be avoided as a lot of information cannot be retrieved only from reports. In the developed EbA framework, a full-fledged vulnerability assessment is integrated in the planning process.
- ***Step 3***: The integration of climate information into the process should be considered as key to any adaptation project. Building the bridge between science and local development planning due to integrating local perception into the projection modelling and doing scenario planning in a participatory way with the community has been very successful. When introducing the idea of climate change during community workshops or elsewhere, it is important to keep in mind that there might be a danger of presenting climate change as the cause of all environmental problems. Therefore, careful explanation and definition of climate change is essential to avoid this tendency. It must be highlighted that in most cases unsustainable and irrational use of natural resources is the main cause of most immediate problems.
- ***Step 4***: It might be challenging to identify “pure” EbA measures as opposed to ecosystem-friendly adaptation measures. However, it is important to remember that EbA is part of an overall adaptation strategy. Furthermore, the advantages of using “green” ecosystem-based solutions for adaptation need to be shown in comparison to conventional “grey” methods. This can be done through cost-benefit analysis or similar methods of selected measures of each type and demonstration of cost-effectiveness of the “green” measure.
- ***Step 6***: It is important to take into consideration the existing traditional adaptation methods within communities and try to build on them. If such practices can be identified, it is much easier to connect them with the EbA approach. In addition, making use of existing village institutions increases the chance of mainstreaming into development process planning and coming from project to process.

5. Planned next steps

- Identified adaptation measures are implemented in the pilot region and will be monitored based on elaborated monitoring plans.
- The elaborated framework will be disseminated and tested in other parts of the region.
- Further facilitators are trained in applying this elaborated framework in other adaptation projects in the region.
- The framework and all lessons learned will be documented in target group oriented products and will be available online.
- It will be tested and discussed whether the elaborated framework is specific for the high mountainous regions of Central Asia or also transferable to other regions.

- The process of integrating the EbA approach into national adaptation strategies of the project countries as well as strategies of international partner organizations will be initiated.

6. Further information

- Project Website
- Natural Resources: Central Asia
- Panorama Solutions

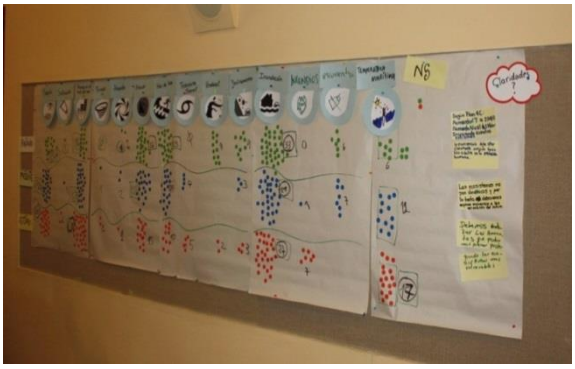
Contact
Paul Schumacher: paul.schumacher@giz.de

Example: Pilots for the restoration of mangrove ecosystems in Ciénaga de la Virgen, Cartagena de Indias, Colombia

1. Activities

The general framework for adaptation to climate change in Cartagena de Indias – Colombia's most vulnerable city in the Caribbean - is the "Plan 4C: Cartagena: Competitive and Climate Change Compatible" (2014). It is a long-term vision and framework of planning and action to achieve climate compatible development by 2040. EbA is one of its five strategies.

Urban mangroves have been exposed to high levels of pollution, deforestation and degradation, affecting their resilience and ability to provide quality ecosystem services to local communities in Cartagena. The GIZ's EbA Project ond Ecosystem-based adaptation strategies in Colombia and Ecuador programme is implementing pilot projects for the restoration of mangroves in particularly vulnerable areas of the coastal lake of Ciénaga de la Virgen. This is the result of a planning process among approximately 40 institutions. A 4-step approach was applied during an expert workshop to identify and prioritize EbA measures:



Participatory planning process (Photo: GIZ Colombia)

- Step 1: Identification of priority ecosystems and ecosystem services
- Step 2: Identification of major climate threats
- Step 3: Assessment of exposure and localization of priority threats
- Step 4: Prioritization of measures

2. Partner institution/s

The project "Ecosystem-based adaptation strategies in Colombia and Ecuador" is implemented by GIZ in Colombia on behalf of the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB).

GIZ's EbA programme is working together with:

- Ministry of Environment and Sustainable Development of Colombia / Ministerio de Ambiente y Desarrollo Sostenible (MADS) of Colombia
- Marine and Coastal Research Institute / Instituto de Investigaciones Marinas y Costeras (INVEMAR)
- Mayor of Cartagena de Indias/ Alcaldía de Cartagena de Indias
- Environmental Public Establishment / Establecimiento Público Ambiental - EPA Cartagena
- Investment Promotion Agency of Cartagena de Indias y Bolívar (INVEST in Cartagena)
- Botanical Gardens of Cartagena / Jardín Botánico Guillermo Piñeres
- Social Foundation / Fundación Social

3. Key results

- The experts agreed on the recovery of canals and channels and mangroves as a priority measure considering the social, economic, environmental and climate change benefits of implementation which will begin early in 2017.

- Courses on disaster risk management, EbA and climate change have been given to local authorities, NGOs, university students and local community members.

Expected impacts:

- Healthy mangrove ecosystems provide protection from gales, heat waves and coastal erosion, and provide habitat for a diverse number of animals which are used by local communities as sources of food and nourishment.
- Through cleaning campaigns and increased awareness of the importance of coastal ecosystems, pollution is expected to decrease.
- Local communities will provide goods and services for the enrichment of mangrove ecosystems through planting activities, but also sell substrates and will be the workforce necessary for the planting of trees, creating jobs at the local level.
- The recovery of mangrove ecosystems is expected to have a fiscal impact for the district, reducing the amount of resources necessary for disaster attention and recovery and the ecological restoration for mangroves.

4. Description of lessons learned and good practices

- The participatory planning process, based on a combination of tested methods for the identification of adaptation needs and options and a multi-criteria analysis to identify priority measures, was a success factor in terms of ownership. The Plan 4C was an important and helpful framework for the process.
- A study on the biotic characteristics of the pilot area helped underpin the outcome of the participatory planning and provided recommendations for implementation.
- A strategy for capacity development in the area of EbA for project partners and the support of effective communication of EbA benefits are important complementary fields of action in order to ensure the involvement of the community.
- Lessons learned from the EbA pilot measures in Cartagena de Indias and other project areas will give feedback to national plans and policies. Furthermore, the project is encouraging private sector involvement.

Recovery of canals and channels and mangroves – a reasonable measure. (Photo: Felipe Gómez, GIZ Colombia)

- The education sector incorporates into the school environmental programs (PRAES) the EbA approach for the restoration of mangroves and the recovery of canals and channels.
- Creation of the Climate, Ecosystems and Communities Knowledge Network for advancing in the search of EbA solutions for the recovery of the Virgen Coastal Lake and its channel system in Cartagena.

5. Description of key challenges

- One of the major challenges with regard to EbA is that many of the measures have only long-term effects. It is therefore necessary to include measures with short-term success, in order to gain institutional, private and public support for EbA measures.

- There is a lack of development of financial instruments either private or public that can guarantee the economic sustainability of EbA measures in the long run.
- Monitoring and evaluating EbA measures is still difficult given the complexity of risk models and the lack of unified impact indicators at the global or national level
- Strengthening local capacities in EbA so that authorities, the private sector, academia and communities make better decisions to protect ecosystems and reduce vulnerability to floods, droughts and coastal erosion.
- Scaling up actions and recovering hydrologic dynamics of la Virgen Coastal Lake will require the coordinated action of government institutions, local communities and the private sector, and the development of appropriate incentives.

6. Planned next steps

- Implementation, monitoring and evaluation of the pilot EbA measures.
- Developing local capacities within government officials, community leaders, academia and other stakeholders in the implementation of restoration measures, disaster management and monitoring and evaluation.
- Developing a financial instrument with local institutions in order to give the restoration of mangrove ecosystems the economic sustainability they need to be implemented long term.
- Effectively communicating good practices and lessons learned from the implementation of EbA measures in Cartagena.

7. Further information

- Project website
- Panorama solutions
- Plan 4C
- SEMARNAT, GIZ (2015): Metodología para la Priorización de Medidas de Adaptación frente al Cambio Climático. Guía de uso y difusión:

Contact
Andrea Zapata: yaklan.zapata@giz.de
and Felipe Gomez Villota: felipe.gomez@giz.de

Example: Tungurahua, Ecuador - Conservation and sustainable use of páramo ecosystems as a response to climate change

1. Activities

Tungurahua, a province in central Ecuador, is one of the regions where the GIZ project "Biodiversity, climate change and sustainable development" provides advisory services to its partners and supports EbA approaches.
The páramo – the typical moorland of the high Andes – is an important ecosystem in the area as it provides key ecosystem services, especially with respect to water regulation. Nevertheless, this ecosystem is under severe threats mainly due to overuse and climate change. Thus, its conservation and sustainable use are important elements of the participatory governance model being implemented in Tungurahua. With a projected reduction in annual precipitation in Tungurahua, it is ever more important to conserve the páramo ecosystem in order to ensure long-term water availability.

Páramo ecosystem in the province of Tungurahua depicting its hydrological richness and scenic beauty (Photo: Nadia Manasfi, GIZ Ecuador)

Various approaches were undertaken over the last years by local stakeholders with support from GIZ in order to bring climate change on to the province's political agenda and to also move from policy to practice, e.g.:

- Integrating climate change in the revision of local development plans;
- Participative risk and vulnerability assessments to elaborate adaptive management strategies using the MARISCO (adaptive management of vulnerability and risk at conservation sites) method;
- Empirical studies, such as a characterization of the páramos of Tungurahua, including a chapter on possible climate change impacts.

2. Partner institution/s

The project is implemented by GIZ in Ecuador on behalf of the German Federal Ministry for Economic Development and Cooperation (BMZ). Its main partners are:

- Ministry of Environment of Ecuador
- Ministry of Agriculture, Livestock, Aquaculture and Fisheries of Ecuador
- Selected decentralised governments (gobiernos autónomos descentralizados)

In Tungurahua in particular, the main cooperating institutions are:

- Provincial Government of Tungurahua
- Local governments at the municipal and parish levels
- Decentralised divisions of the Ministries of Environment and Agricultura, as well as the National Water Secretary
- Local community leaders
- Local livestock associations

3. Key results

Local stakeholders in Tungurahua conducting a participatory risk and vulnerability assessment using the MARISCO method (Photo: Nadia Manasfi, GIZ Ecuador))

- The institutional integration of climate change has strengthened its legitimacy and has allowed economic and human resources to be allocated to it.
- Among other capacity development activities, a programme for environmental leadership at the community level in the páramo area was supported.
- Technical assessments, hydrological models and a hydro-meteorological monitoring system provide decision-makers with hard facts on which to base policy.
- Participatory assessments have allowed stakeholders to understand how climate and non-climate risks can reinforce each other. The results are clear and holistic strategies, theories of change and a monitoring system.
- Priority measures for the conservation and sustainable use of the ecosystems have been identified and are being implemented. These include improved inter-institutional coordination with the aim of developing a common vision and priorities for the region, the restoration of some degraded páramo areas and the creation of a local forest management association “Páramo Andino” that will also manage and monitor the mentioned restored areas, among others.

4. Description of lessons learned and good practices

Local parish government of Pilahuín and community members set to work in their forest management association with newly acquired tools. (Photo: Lucas Espín)

Key recommendations:

- When possible, focus on first addressing short-term priorities of the population and its policy-makers and use those as a starting point for integrating climate change. In Tungurahua the starting point was securing water availability in the present and future for human consumption and irrigation.
- Reduce potential resistance to climate change by inviting different stakeholders to participate in capacity development measures. The multi-pronged approach adopted in Tungurahua encouraged the participation of policy-makers, the private sector, farmers, civil society, universities, etc. in trainings on climate change.
- Build up ownership and empower communities by involving them in every step of the process, from identifying the problem to proposing solutions and implementing them.

5. Description of key challenges

- The legal and institutional framework for climate change at the national level is well-developed. However, translating these into concrete measures at the subnational level remains a challenge.
- The time required to implement and evaluate the results of adaptation measures is often incompatible with both political cycle and the lifespan of development projects.
- More experience is required to increase the leverage of public and private resources for implementing adaptation measures and safeguarding the fragile páramo ecosystem that is so important for ensuring long-term water supply.

6. Planned next steps

In December 2016 a monitoring workshop was held where advances were reviewed and priorities revised for the short- and medium-term. As such, the planned next steps include the following:

- Continue strengthening inter-institutional coordination, bringing on board additional local stakeholders that have not been involved sufficiently to date.
- Continue implementing various conservation and climate change adaptation measures, with defined roles for different stakeholders. All measures aim to directly or indirectly reduce climate- and human-induced stress factors in the fragile páramo ecosystem.
- Scale-up the conservation and sustainable management of the páramo to adjacent provinces on the basis of the participatory governance model being implemented in Tungurahua. This will be done with the support of a new cooperation programme between Germany and Ecuador.

7. Further information

- Project website
- Website Provincial Government of Tungurahua
- MARISCO methodology

Contact
Nadia Manasfi: nadia.manasfi@giz.de
and Carlos Sánchez: carlos.sanchez@tungurahua.gob.ec

Example: Springshed development (Dhara Vikas) in Tendong Hills, India

1. Activities

In recent years, water has become a matter of concern in the Tendong Hill Region in the Southern part of Sikkim, North East India. The temporal spread of rainfall has declined and is now concentrated in fewer months, winters are becoming increasingly drier, monsoon rain which used to come as a drizzle now comes mostly as heavy downpours thereby reducing natural infiltration. While the Tendong Hills are home to multiple springs and streams, most of the water sources dry out completely or have drastically reduced flows during the long, dry winter season. The local communities then face an acute shortage of water.

Dhara Vikas initiative is a programme run by the Rural Management and Development Department of Sikkim, which aims at revitalising natural springs across the state. The GIZ project "Climate Change Adaptation – North Eastern Region of India" has contributed to the Dhara Vikas initiative by introducing hydrogeological assessments for identifying spring recharge zones. The programme has prepared an in-depth hydro-geological survey of the region, mapping springs and their respective recharge zones. The survey yielded comprehensive information on the hydrological potential of the watersheds and the base flow of perennial streams. Alongside this baseline study a vulnerability study in one of the most drought-affected blocks had been done.

2. Partner institutions

The project is implemented by GIZ on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ). Its main partners are:

- Ministry of Development of North Eastern Region, Government of India
- Rural Management and Development Department, Government of Sikkim
- The hydrological mapping and the vulnerability study were conducted with the participation of the local population.

3. Key results

On the basis of the results of the hydrological assessments, the national flagship programme MGNREGA (Mahatma Gandhi National rural employment guarantee act) now implements targeted springshed development in the recharge area of 72 hectares, thus ensuring optimal usage of funds available to the programme. Soil and water conservation measures at the right points have led to an improvement in spring water recharge. Local government officials have received training on scientific methods and technical skills for hydrogeological surveying and monitoring of key springs in the area. 23 springs of the area are regularly monitored in order to quantify the results of the targeted interventions.

Hydrological mapping (Photo: GIZ, India)

To consolidate the experiences gained in springshed development, the project has also facilitated the development of a handbook on springshed development – the Dhara Vikas

Handbook. The cadre of trained RMDD officials are currently using the manual as a practical teaching aid to replicate springshed development within and outside Sikkim.

The project has also facilitated exposure visits of officials from other states in North Eastern India like Meghalaya, Nagaland, Mizoram to Sikkim to witness the success story of springshed development works in Sikkim. Officials from the Governments of Bhutan and Nepal have also visited springshed development works in Sikkim.

With the support from the project, similar activities have been initiated in other project partner states, viz. Meghalaya and Mizoram.

Springshed Development (Dhara Vikas)

An eight-step landscape-based approach is targeting all water resources in the local communities.

- Step 1: Resource mapping of village water resources (springs, streams and lakes), their location, land tenure, dependency of water users, recharge area, measurement of discharge etc.
- Step 2: Baseline study of the springs to measure the discharge, understand the geo-hydrology, type of spring
- Step 3: Prepare the Springshed Development Plan showing the spring, aquifer, recharge area (including mapping)
- Step 4: Prepare the lake revival plan
- Step 5: Prepare the plan to enhance the ground water recharge contribution of hill top forests
- Step 6: Estimation, technical and financial sanctions
- Step 7: Follow best practices in implementation
- Step 8: Monitoring and evaluation

4. Lessons learned and good practices

The project, through partnerships with several institutions and technical experts, brings an innovative scientific approach to the identification and resolution of water management issues. It also links these new methodologies with government schemes such as MGNREGA and the National Rural Drinking Water Program for kicking off a structured implementation of water sector reforms. These endeavours have opened up people's perceptions of power over their local natural resources. It has mobilized communities to address their local governments, seeking resources to carry out interventions on their own.

Percolation pit (Photo: GIZ India)

As far as the technical measures are concerned, the challenge is to harvest maximum surface runoff by making least number of trenches and ponds in order to optimize the costs. Hence, micro-placement of the trenches and ponds within the recharge area is of utmost importance to enhance the efficiency of this initiative.

Some common mistakes that need to be avoided are:

- Digging trenches on terraced fields

- Location of the trenches and ponds on ridge tops without understanding their purpose
- Forestry and horticulture plantations alone with no trenches/ ponds
- Lack of baseline information on discharge
- Concretizing of hill-top lakes to store water
- Pine (Dhoopi) plantations in upper catchments of drought prone areas

5. Key challenges

- The major challenge was to transform the highly technical hydrogeological concept into simple understandable language for the use of non-technical stakeholders.
- Dhara Vikas is a new concept for recharging springs which had not been applied before. Convincing farmers about this new technology and its benefits was a challenge for both the Government as well as for the Project.
- Due to the very limited availability of literature on the complex hydrogeological setting in the mountain region, identifying the recharge area of springs, streams or lakes was a very demanding task.

6. Planned next steps

- Study on environmental isotope fingerprinting of Sikkim springs in collaboration with the Bhabha Atomic Research Centre (BARC) to further deepen the understanding of mountain aquifers, improve our ability to identify the recharge areas with greater precision and develop the capacity of local human resources.
- Implementing more landscape level initiatives following an integrated strategy of reviving springs, streams and lakes.
- Preparation of Village Water Security Plans at gram panchayat level by documenting the village water budget, recharge areas and enhancing water use efficiency.
- Further build the capacity of the budding para-hydrogeologists by conducting more trainings and exposure visits.
- Better monitoring and evaluation of this initiative by partnering with institutes of excellence and Government of India agencies.
- Sharing and dissemination of the lessons learned in reviving Himalayan springs with other mountain states and countries and evolving into a centre of excellence.

7. Further information

- Project website
- Partner website
- Springshed Development Handbook
- Project brochures
- Film

Contact
Klaus-Peter Gross: klaus-peter.gross@giz.de

B. MONITORING AND EVALUATING THE IMPLEMENTATION OF ECOSYSTEM-BASED ADAPTATION

Example: UVA-based monitoring of EbA pilot measures in Thailand

1. Description of relevant activities

The GIZ project on improved management of extreme events through ecosystem-based adaptation in watersheds (ECOSWat) operates in two pilot watersheds threatened by the impact of climate change. To monitor the watershed and improve modelling of future risks the project introduced drone technology.

2. Partner institution/s

Local universities and officials from regional partner institutions cooperate to assess the impacts and benefits of the EbA measures.

- Department of Water Resources
- Royal Irrigation Department
- Walailak University
- Khon Kaen University
- Provincial Authorization Offices (PAOs)
- River Basin Committees (RBCs)

3. Key results

The monitoring concept contains traditional approaches such as hydrologic and morphological data to evaluate the effectiveness of the measures. In addition, an UAV approach contributes to demonstrating the effects of the measures. Periodically, a local university will generate data with the help of a drone.

Integration of Drone into the water sector, Lum Pa Chi sub-river basin, Ratchaburi, Thailand (Photo: Jaruwan Ngamsing)

4. Lessons learned and good practices

A profound understanding of the technical approach of the EbA measure design is needed. The project created a 3D model to demonstrate water problems and discuss possible solutions. This contributed to a better understanding among technicians and decision-makers.

5. Key challenges

- Introducing a new approach and technology is challenging. While it was rather difficult to introduce and get acceptance for EbA, it was much easier to introduce the drone

technology into the monitoring system. Interestingly, hands-on approaches such as drones are accepted easily. Even the civil society was involved in this approach.
- Still, a core challenge is not to neglect the traditional evaluation and monitoring approaches and to keep hydrologic and morphological data recording.

6. Planned next steps

The Walalailak University, Nakhon Si Tammarat province, developed a curriculum for the drone application in the water sector and the monitoring. This curriculum will be lectured in the next semesters.

7. Further information

- Project website
- ECOSWat Thailand
- Walailak
- Tha Di River Virtual Tour
- Conference Paper: UAV Based Monitoring of a Living Weir in Thailand

Contact
Jaruwan Ngamsing: jaruwan.ngamsing@giz.de

C. TOOLS FOR ASSESSING THE BENEFITS OF MITIGATION AND ADAPTATION TO ENHANCING RESILIENCE AND EMISSIONS REDUCTIONS THAT ECOSYSTEM-BASED ADAPTATION PROVIDES

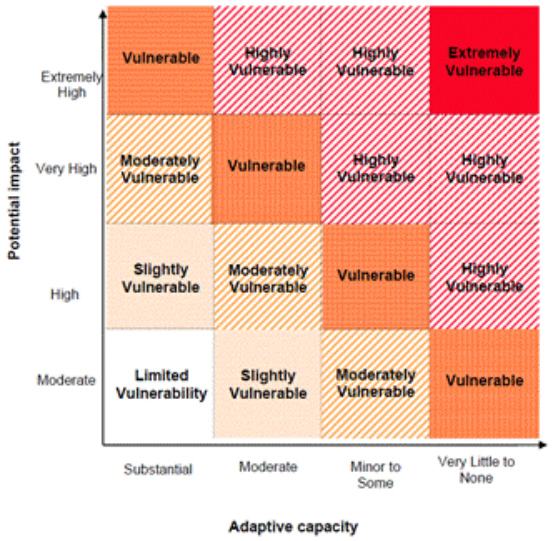
Example: Vulnerability assessment for socio-ecological systems in Vietnam

1. Activities

The GIZ project on Strategic Mainstreaming of Ecosystem based Adaptation has developed a structured approach to designing and implementing multi-scalar vulnerability assessments of complex systems for EbA. The "Vulnerability Assessment for Socio- Ecological Systems" approach recognizes that social, economic and ecological systems are inextricably linked, providing practical guidance for identifying all relevant factors affecting the coupled systems when conducting a vulnerability assessment. It has been successfully tested in two provinces in Vietnam – Quang Binh and Ha Tinh.

The aim of the approach is to deliver in-depth information about climate change and its impacts on society, economy and ecology – both at provincial and at community level/ local scale. It provides practical guidance on how to identify and delineate a socio-ecological system on the ground with clear geographical boundaries. For this purpose, vulnerability assessments are conducted first at the province-wide level, and then subsequently at the community level or local-scale in selected areas.

The results of the province level assessment are used to identify priority climate change adaptation issues and suitable province-wide EbA measures. The assessment is "top down", and uses existing information on the province's ecological, social and economic assets; its history of climate-related hazards, as well as development trends and down-scaled climate change projections. Stakeholder consultation with provincial government agencies is important to obtain information and data on future or planned development activities in the province.



Vulnerability matrix (Source: GIZ Vietnam)

The province-wide assessment provides the basis for identifying a short list of specific sites for a local level assessment.

The local level assessment then focuses on a selected area and repeats the analysis of ecological, social and economic factors at the local level. It applies bottom-up methods such as field work, local data collection and stakeholder participation. The results provide the basis for identifying specific EbA measures and contribute to a better understanding of locally important climate change issues.

The approach consists of four main components. These are essentially the same at the provincial and the local/community levels:

1. Scoping the context for climate change vulnerability assessment and EbA
   - Baseline and trends in ecology, society and economy

- Identification of major climate-related hazards and their trends

2. Identification and prioritisation of socio-ecological systems and key economic assets
3. Vulnerability assessment for priority socio-ecological systems and key economic assets
   - Climate change impact assessment
   - Adaptive capacity assessment
4. Identification of EbA and other adaptation options and measures

Spatial data collected from various national and provincial institutions, and processed with a Geographic Information System (GIS) are the backbone of these steps.

2. Partner institution/s

The project "Strategic Mainstreaming of Ecosystem based Adaptation" is implemented by GIZ on behalf of the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB).

Its main partners are:

- MoNRE | Ministry of Natural Resources and Environment
- ISPONRE | Institute of Strategy and Policy on Natural Resources
- ICEM / International Centre for Environmental Management
- Quang Binh Province
- Ha Tinh Province

3. Key results if the tool has been tested and challenges

Key results

- In both provinces, main vulnerabilities and a set of suitable (ecosystem-based) adaptation options and measures have been identified for priority socio-ecological systems. In addition, knowledge gaps and issues for further assessment could be identified.
- Recommendations about ecosystem-based adaptation measures have been integrated in the provincial Climate Change Response Action Plans for 2016 – 2020 of Quang Binh and Ha Tinh.
- All collected basic data are now also available to the provincial authorities as GIS files and can thus be easily updated in the future.
- The approach is innovative in attempting to identify specific socio-ecological systems at province level and then use them as the entry point for the assessment.
- The approach is understandable and replicable by provincial authorities despite the high level of complexity in assessing the coupled socio-ecological system.

Challenges and lessons learned

- It is considered extremely important that local government stakeholders engage in the process productively. Their participation is absolutely necessary to provide access to provincial data and information as well as to include their knowledge and experience in the assessment process.
- Building on local innovation and sharing approaches and experience between communities, organizations and provinces, as well as supporting the development of capacity at all levels were important success factors.
- Due to the complex interactions between societies, economies and ecosystems, it is recommended to work in mixed teams with expertise and experience in social, economic

and ecological aspects.

- One main advantage of using the socio-ecological systems as entry points for vulnerability assessments and identification of EbA interventions is that it facilitates thinking outside of traditional silos of purely social, ecological or economic issues. Furthermore, it enhances mainstreaming of EbA through the identification of interventions which require the collaboration between multiple agencies.
- In many cases successful adaptation cannot be achieved without addressing governance issues – including access to and tenure of resources.

4. Planned next steps

The approach is supposed to be included in the national adaptation strategy in the near future.

5. Further information

- Project website
- Vulnerability Assessment Vietnam Website:
- ICEM, ISPONRE & GIZ (2016): Report 1: Overall Approach: Vulnerability Assessment for Socio-Ecological Systems
- Vulnerability Assessment in Quang Binh Province
- Vulnerability Assessment Ha Tinh Province

Contact
Michael Wahl: michael.wahl@giz.de

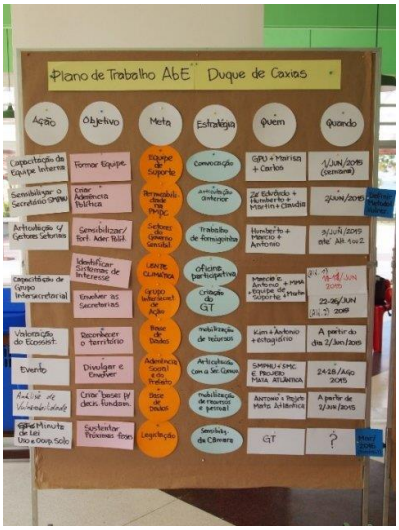
Example: Consideration of climate change vulnerability and ecosystem services in Duque de Caxias' municipal master plan, Brazil

1. Activities

In the process of revising its municipal master plan, the city of Duque de Caxias decided to include both climate change vulnerability as well as an ecosystem services mapping in its diagnosis. Both assessments used a participative approach, in order to compensate for missing quantitative data.

In recent years the municipality of Duque de Caxias has been experiencing clean water scarcity, intense urban heat waves, and severe floods and landslides. The municipality lies within the state of Rio de Janeiro and borders the metropolitan area of the city of Rio de Janeiro. It has an area of approximately 470 km² and nearly 900.000 inhabitants.

- After initial capacity development activities, a detailed road-map to consider climate change and ecosystem services in municipal planning was elaborated during a coaching event.
- 2015 the Department of Planning hosted a workshop with several other of the city's Departments – Infrastructure, Risk Management, Health, Finance, Culture and Education – to introduce the concepts of ecosystem services and adaptation to climate change and launch a study with the objective
- To identify ecosystem-based measures securing the sustained provision of ecosystem services for the municipality's population and their productive activities, contributing to reduce vulnerability to climate change. A prioritization list of the nine most important ecosystem services was undertaken in an online survey with the meeting's participants
- Experts in-charge of steering the initiative assessed ecosystem services conditions, trends and trade-offs via 27 interviews with local citizens, experts and decision-makers. The result was the creation of nine thematic maps where each ecosystem service's supply and demand was represented for different kinds of land uses and land cover.
- After that, a vulnerability assessment, focusing on key interest sectors and climate change impacts, was carried out during a workshop. Adaptation measures (with focus on EbA) to be considered in future municipal territorial planning where identified.
- Finally, the terms of reference for the review of the Municipal Master Plan were prepared on this basis.



Work plan for Duque de Caxias (Photo: GIZ Brazil)

2. Partner institution/s

The projects "Biodiversity and climate change in the Mata Atlântica" and "Conserving biodiversity by integrating ecosystem services into public policy and business action – TEEB" are implemented by GIZ on behalf of the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB). Its main partners are:

- Ministry of Environment (Ministério do Meio Ambiente, MMA)
- Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio)

- Serviço Florestal Brasileiro
- National Confederation of Industry (CNI)
- PACTO (Pacto pela Restauração da Mata Atlântica)

3. Key results if the tool has been tested and challenges

Key results:

- The municipal master plan shall consider vulnerability to climate change and the provision of ecosystem services in its revision process. By these means, we expect that more ecosystem-based adaptation measures shall be included in the plan. These may include more efforts to conserve the Atlantic Forest, wetlands, and mangroves in order to e.g. enhance the provision of drinking water and reduce coastal erosion due to sea-level rise. Forest restoration and conservation on mountain slopes shall act as a natural barrier to reduce increasing landslide risk.
- The process of discussing climate change vulnerability and ecosystem services also proved to be the first topic in years to gather participants from different municipal secretariats: as climate change is impacting different sectors, and knowledge about how to deal with this issue is not existent, a climate change working group of different secretariats was established, pursuing to plan common action.

Challenges and lessons learned:

- Stakeholder ecosystem services mapping will be further embedded in the process of updating the urban zoning scheme, increasing public inputs to urban planning (and acceptance of the future zoning proposal), as well as improving understanding of stakeholder dependencies on ecosystems and addressing land use conflicts (industrial expansion vs. local demands for flood protection/water supply/air quality);
- Ecosystem services assessments added valuable information to the territorial diagnostic in a language that allowed a good understanding of all sectors of the government regarding the importance of each ecosystem;
- Climate change as well as the ecosystem services approach proved to be excellent topics to bring together experts and different visions from stakeholders, enabling them to work together on common challenges.
- Designing together with local technicians, on when to consider vulnerability to climate change and ecosystem services in planning processes, and in which intensity, lowers the stress of planning teams.
- Introducing vulnerability to climate change as a cross-cutting, rather than an additional topic, increased the likelihood for it to be considered a topic of high-value.
- A systematic approach of human capacity development and identification of vulnerability proved to be right.
- A detailed stakeholder mapping as well as a proper engagement of actors and their awareness regarding ecosystem services aspects (and the efforts to translate the ecosystem services in a more accessible language to the local stakeholders) is key to the quality of the data gathered by the participative ecosystem services mapping;
- Ludic methodologies to focus people's experiences to determine climate change vulnerability, linked with capacity-building, revealed insights that quantitative desk-studies would not have produced.
- A clear and user-friendly presentation of outcomes (maps, impact chains) is important to get attention and acceptance of key stakeholders for the main study and workshop results.
- The language used to perform vulnerability assessments and ecosystem services mapping showed key increases of acceptance and involvement, on participative processes.

- The availability of high-quality quantitative data, including climate modelling, simplifies the process of the vulnerability assessments and increases the acceptance of the result among decision makers, technicians, and the population.
- The difficulty to make key actors join the process can still be seen as a challenge.

4. Planned next steps

- During 2017, the revised Municipal Master Plan of Duque de Caxias is expected to be launched.

5. Further information

- Project Website "Biodiversity and climate change in the Mata Atlântica" and "Conserving biodiversity by integrating ecosystem services into public policy and business action"
- Project website (in portuguese): "Biodiversity and climate change in the Mata Atlântica" and "Conserving biodiversity by integrating ecosystem services into public policy and business action"
- Project video
- Panorama solutions
- Viezzer et al (2017): Climate Change Vulnerability Analysis at the Local Level: Lessons learnt from Brazil on how to conduct Participative Processes. In: Leal Filho et al (eds.): Climate Change Adaptation in Latin America: managing vulnerability, fostering resilience. Springer (submitted for publication).

Contact
Martin Becher: martin.becher@giz.de
and Raquel Agra: raquel.agra@giz.de

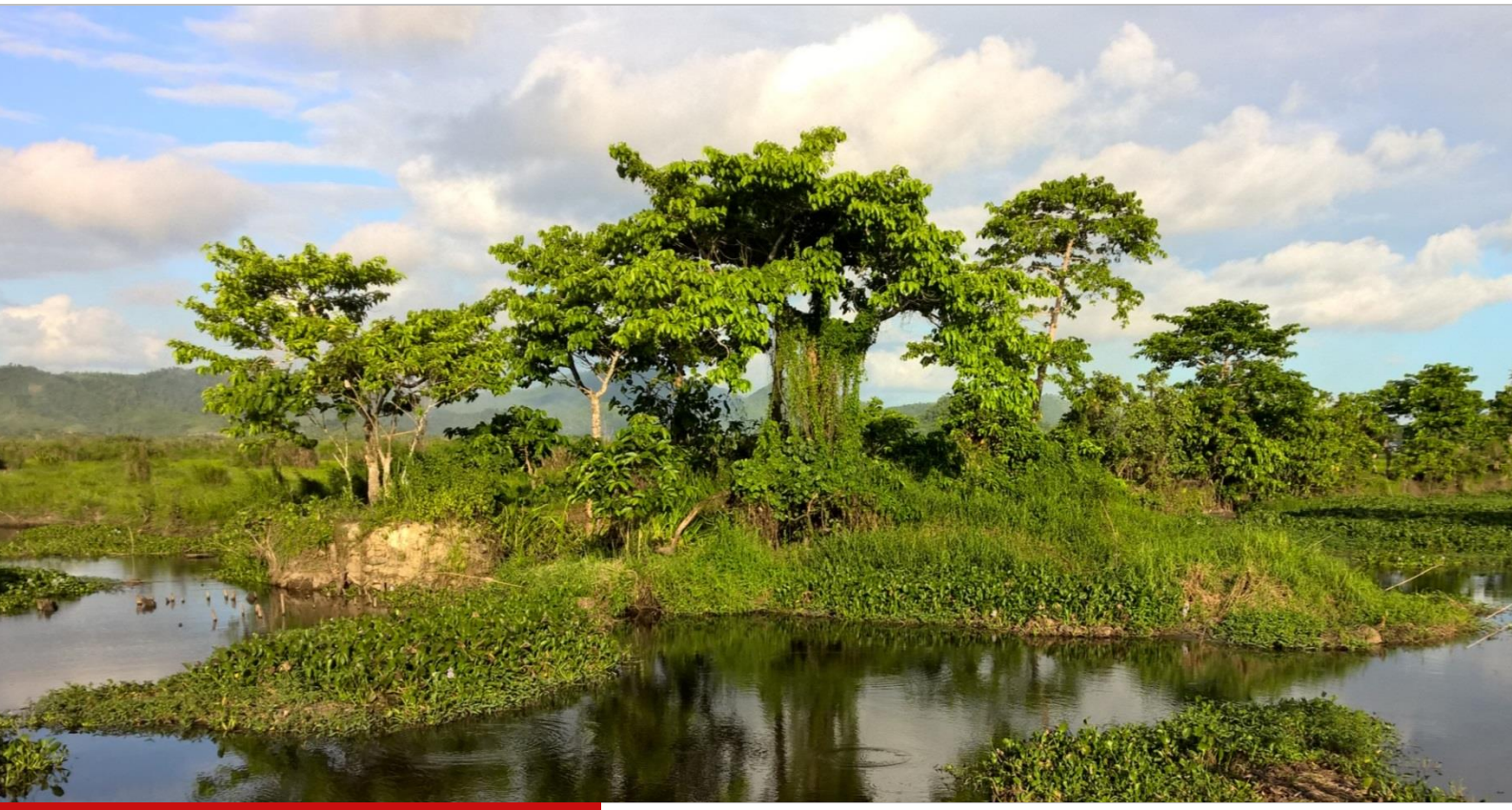
Contact us

Global Project “Mainstreaming Ecosystem-based Adaptation (EbA)”, Heinrich-von-Stephan-Str. 7-9, 53175 Bonn, Germany
Arno Sckeyde: arno.sckeyde@giz.de

Unit Climate and Climate Policy, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, Friedrich-Ebert-Allee 36 + 40, 53113 Bonn, Germany

www.adaptationcommunity.net

www.panorama.solutions



Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH

Registered offices
Bonn and Eschborn

Friedrich-Ebert-Allee 36 + 40
53113 Bonn, Germany
T +49 228 44 60-0
F +49 228 44 60-17 66

Dag-Hammarskjöld-Weg 1-5
65760 Eschborn, Germany
T +49 61 96 79-0
F +49 61 96 79-11 15

E info@giz.de
I www.giz.de