



ECOSYSTEM- BASED ADAPTATION BENEFITING HUMANITY AND NATURE TOGETHER



WHAT'S HAPPENING?

Climate change is altering the face of the Earth. This shift in the physical characteristics of our planet will present itself in the form of higher sea levels; increased seasonal variability; changes in the location, strength and number of storms, droughts, floods and heat waves; and ecosystem failures that will negatively impact human well-being. We must adapt to these climatic changes. A sustainable path for human development must take full advantage of nature's resources and services in a more efficient, effective and holistic manner.

Conservation International (CI) has been working for the past 25 years to develop methods and best practices that influence global policy decisions and local resource management using an ecosystem-based approach. While many of these efforts have likely reduced vulnerability to climate change, this was not their original intent. In the last five years, CI has learned from these experiences and combined them with climate science to more explicitly target adaptation outcomes.

A healthy, natural environment provides humanity with vital ecosystem services, such as sustainable water production, soil enrichment and stabilization, disaster risk reduction and food security. For example, marshlands and wetlands provide water purification services and disaster risk reduction simultaneously, endowing coastal communities with an outlet for a clean, sustainable water supply and in many areas, providing protection from storm surges.

Healthy, functional wetlands can act as fish nurseries and feeding grounds for many wildlife species. Enhancing understanding of the importance of natural environments is an imperative task for human adaptation because existing ecosystem services are not often fully recognized until they are damaged or destroyed.

Adapting to climate change is on the forefront of global, national and regional agendas. Existing adaptation strategies largely rely on technological advancements and infrastructure projects to reduce human vulnerability to climate change and variability, but the selection of these options often disregards the pre-existing advantages presented by healthy, functioning ecosystems. Ecosystem-based approaches to adaptation emphasize and recognize the importance of diverse ecosystems and their ability to provide direct and indirect services for the betterment of humanity.



A shirtless fisherman with a beard and a watch on his left wrist is shown from the chest up, holding several large fish. The fish are of various species, including a large orange fish and several dark blue/black fish. He is standing on a boat with a yellow and blue painted hull. The background shows a vast blue ocean under a cloudy sky.

**A HEALTHY, NATURAL
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**PROTECTING
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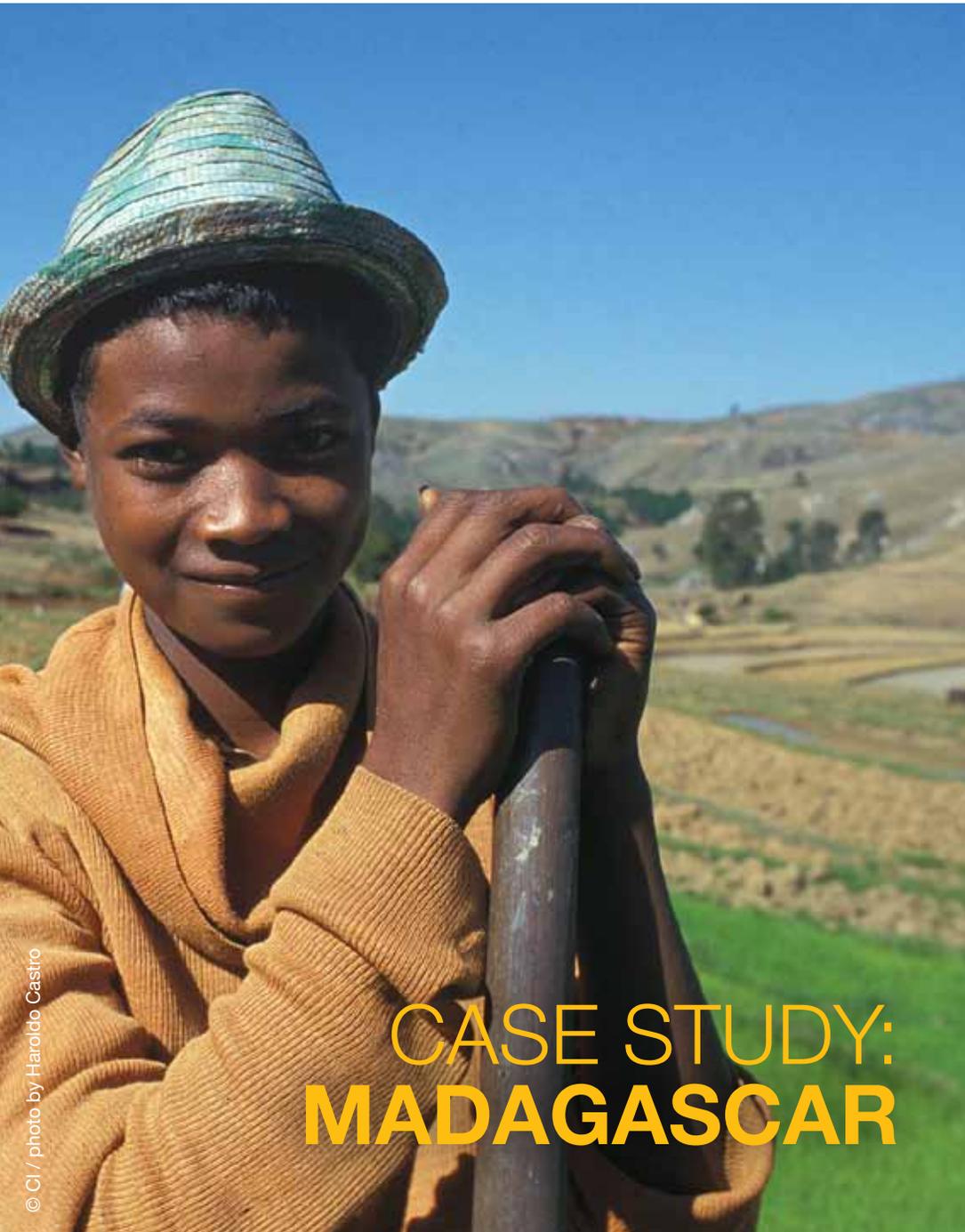
WHAT IS ECOSYSTEM-BASED ADAPTATION?

By definition, “Adaptation is adjustment in natural or human systems in response to actual or expected climate stimuli or their effects, which moderates harm or exploits beneficial opportunities associated with climate change” (IPCC TAR /AR4 2001/2007). The subset of multi-sectoral and multi-scale practices that “use biodiversity and ecosystem services to help people adapt to the adverse effects of climate change” are known as ecosystem-based adaptation (EbA).

Ecosystem-based approaches to adaptation may include sustainable management, conservation and restoration of ecosystems as part of an overall adaptation strategy. Such a strategy takes into account the multiple social, economic and cultural benefits for governments and local communities. EbA approaches begin by assessing current and projected climate change impacts and vulnerabilities.

The focus then shifts to conserving, restoring and maintaining critical ecosystems while simultaneously maximizing the services those ecosystems provide. One example of reducing human vulnerability to climate change and promoting human adaptation is the integration of agroforestry for shade-grown coffee, which impacts the microclimate by lowering local temperatures.

EbA is underpinned by the healthy, sustainably managed functionality of an ecosystem. People are not the only life form threatened by climate change—every ecosystem on Earth is vulnerable to some degree, especially ecosystems that are already threatened by deforestation and fragmentation. A large part of the adaptation process is ensuring the conservation and sustainable management of critical ecosystems, thus increasing the capacity of those ecosystems to provide the enormous range of benefits upon which people depend.



CASE STUDY: MADAGASCAR

CLIMATE ADAPTATION FOR BIODIVERSITY, ECOSYSTEM SERVICES AND LIVELIHOODS IN RURAL MADAGASCAR

Conservation International (CI) has been working in Madagascar for more than 20 years, supporting the creation and management of protected areas as well as informing national environmental and development policy.

Madagascar is the oldest and third-largest island in the world and contains some of the most unique endemic species on Earth. Unfortunately, over time the island has undergone deforestation and is currently losing 50,000 hectares (123,553 acres) of forest per year. The loss and degradation of forests and marine and coastal ecosystems jeopardize the availability of ecosystem services such as water and food provision, flood regulation and erosion control. The adverse impacts of climate change will further diminish the capacity of these ecosystems to provide the services needed to sustain local communities.

In 2007, CI and WWF conducted a vulnerability assessment (VA) and initiated a preliminary planning process. The VA provided climate change scenarios through 2080, which predicted warming across the island and regional changes to rainfall regimes. Based on the VA, recommendations included increasing the adaptive capacities of communities and species to climate change and supporting ecosystem management in protected areas. The vulnerability assessment culminated in a technical workshop attended by a wide array of stakeholders.

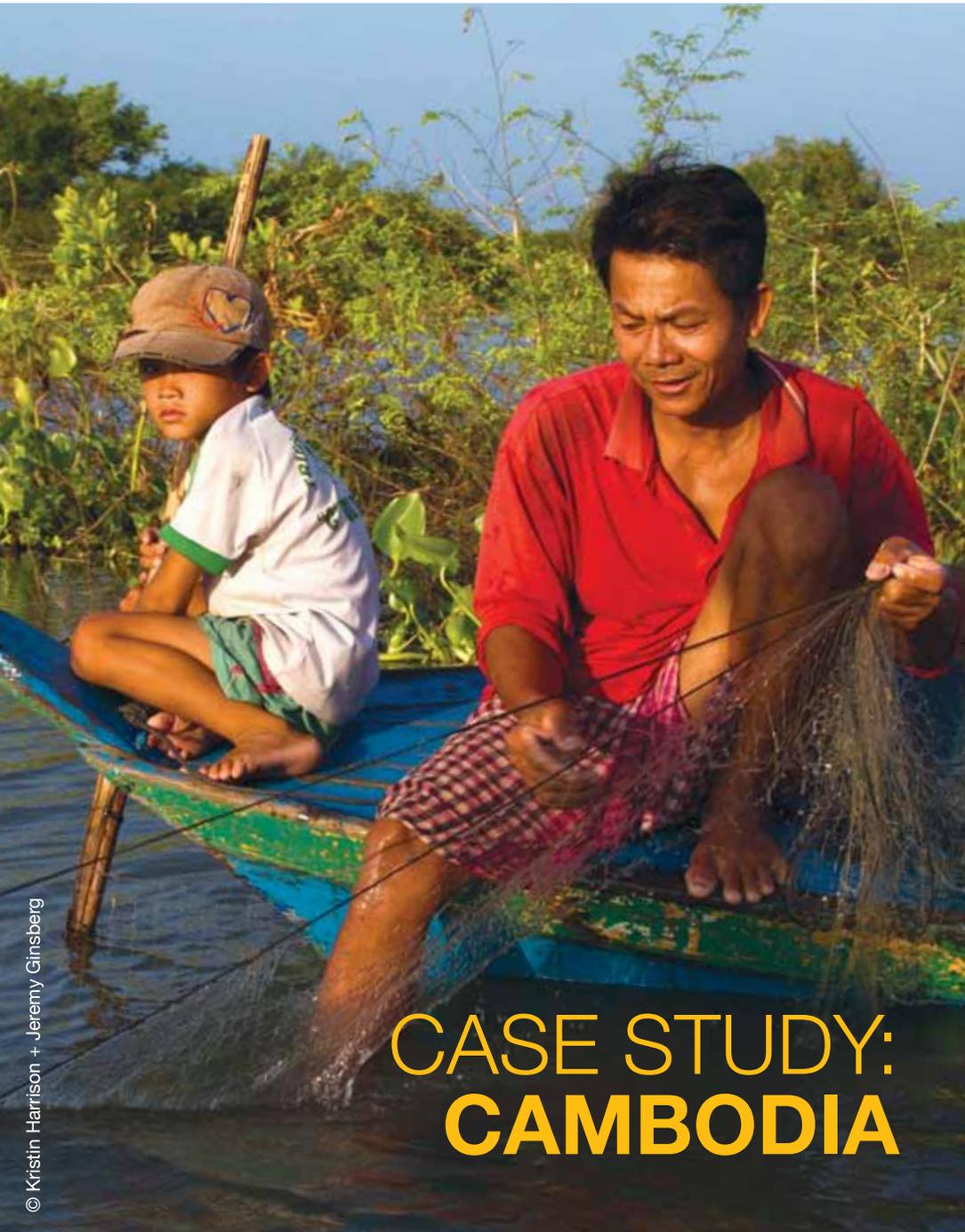
With preliminary knowledge in hand, CI proceeded to conduct multiple surveys to assess the feasibility of different ecosystem-based adaptation responses. The first focused on forest restoration in 18 locations of Madagascar's southern spiny forest, western dry forest and rainforest, including a demonstration project in Andasibe. Riverine forest corridors were assessed based on 2005 Landsat satellite images, and CI identified the Mangoky River as a priority site for restoration.

Agricultural practices also affect the adaptability of communities to climate change. In Madagascar, slash-and-burn agriculture is a primary driver of deforestation. This unsustainable practice reduces the ability of natural ecosystems to provide essential services and causes affected areas to be highly vulnerable to climate change.

To address this, CI promoted sustainable livelihood activities, including permanent vegetation cover and Intensive Rice System techniques, identification of alternative staple crops (i.e., yams, manioc), and highlighting financing as a key constraint to farmers' adoption of alternative methods. From an analysis of crop vulnerability, CI discovered that Malagasy farmers are already experiencing changing seasonal patterns and that crop vulnerability is limited to specific zones and crop species.

To increase understanding of the impacts of climate change on marine ecosystems, CI's Rapid Assessment Program conducted a marine assessment off the northeastern coast of Madagascar, revealing the following key findings:

- 1 overall positive marine health
- 2 impacts on species from urban pollution and highly dissolved nutrient levels
- 3 widespread coral bleaching, but at a low rate of less than 5 percent
- 4 prevalent overfishing, which inspired several technical and policy recommendations to guide follow-up work



VULNERABILITY ASSESSMENT, ADAPTATION PLANNING AND PILOT ACTIVITIES IN CAMBODIA'S TONLE SAP LAKE REGION

Since 2001, CI has supported local communities and government agencies to conduct conservation work in Cambodia and Vietnam. This region boasts the Tonle Sap Lake—Southeast Asia's largest lake and an extremely important freshwater ecosystem. In 2002, CI supported the creation of the Central Cardamoms Protected Forest (CCPF)—home to the Cardamom Mountains, a vital watershed in Cambodia that receives the heaviest regional monsoon rains and feeds the Tonle Sap Lake.

The CCPF also provides high quality drinking water to the provincial capital and many of the country's poorest citizens. It supplies year-round irrigation flows to lowland agricultural lands and essential nutrients and water to support rice fields and fisheries. In partnership,

**CASE STUDY:
CAMBODIA**

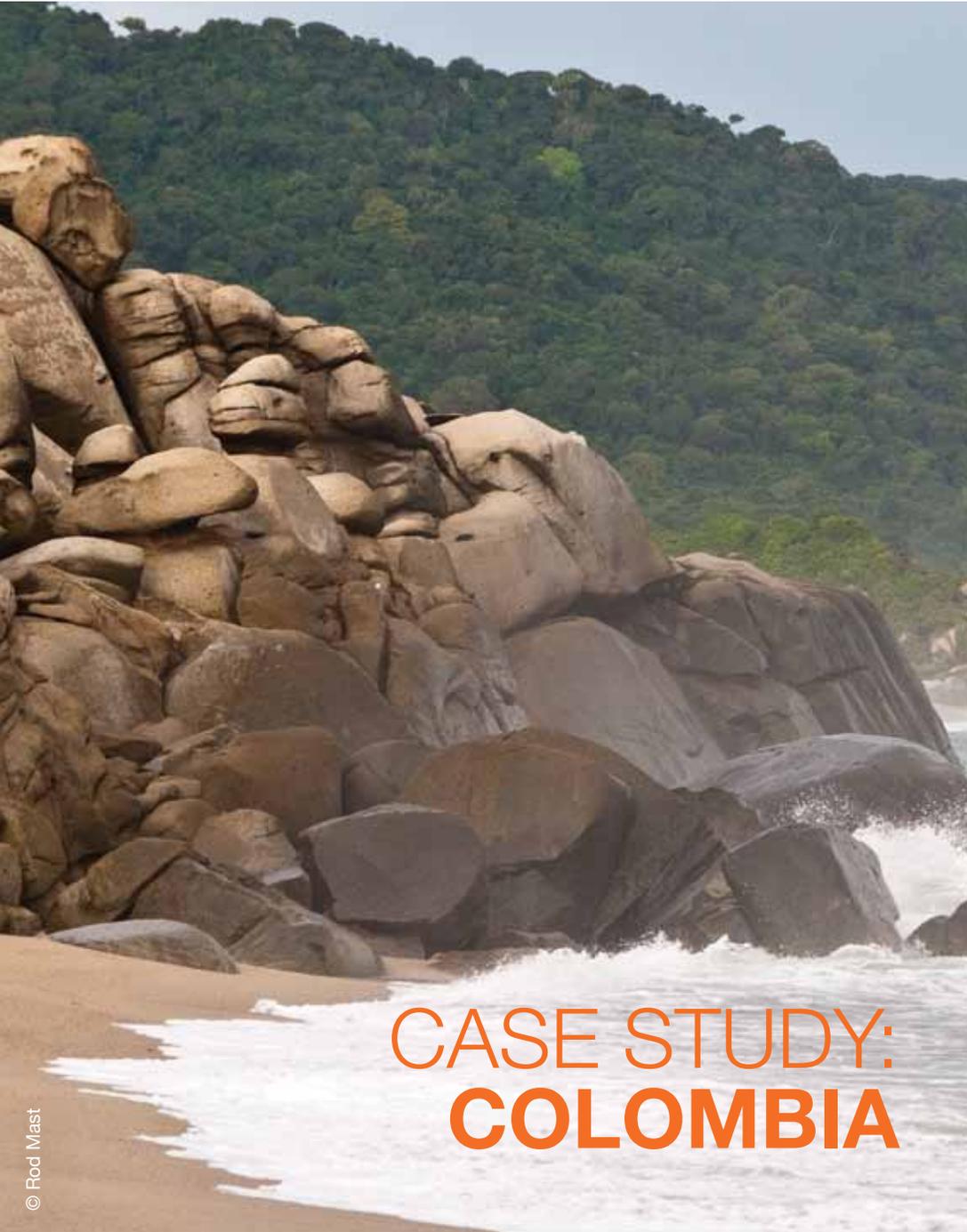
CI and the Cambodian government produced a five-year management plan for the CCPF, which was approved by the Ministry of Agriculture, Forestry and Fisheries in 2009—a principal step in building government capacity for managing protected areas in the region.

Tonle Sap Lake provides 7 percent of Cambodian GDP and 75 percent of Cambodia's animal protein consumption, making it vital for food security and human well-being. Flooding during the wet season expands the lake's area from 400,000 hectares (988,422 acres) in the dry season to 1.7 million hectares (4.2 million acres) in the wet season. Estimates indicate that one hectare of flooded forest provides more than 300 kilograms (661 pounds) of fish per year, ensuring employment and sustenance for a large portion of the population. Climate change is expected to modify or delay the flooding, which may affect fish populations and human well-being.

Through biological and community vulnerability assessments, CI focuses efforts on species, habitats and communities that are particularly susceptible to climate change. These assessments will ensure that communities and local authorities have the adaptive capacity to confront climate change head-on. Community workshops place participatory analysis and local knowledge at the forefront of implementation, combining adaptation activities with local socio-economic planning processes.

Pilot projects in the Greater Mekong Basin include the restoration of flooded forests through tree planting, promotion of small-scale aquaculture as economic diversification and working with local governments to mainstream the adaptation strategy into local planning processes.

CI-Cambodia and its partners work to engage local stakeholders in adaptation projects to amplify their work from the local to the national level. Specifically, CI aims to guide the creation and implementation of an updated version of the National Adaptation Programme of Action, which currently does not address the impacts of climate change on fisheries.



CASE STUDY: COLOMBIA

INTEGRATED NATIONAL ADAPTATION PROJECT

Colombia is one of the most unique areas on the planet. With less than 1 percent of the world's total land area, Colombia harbors 15 percent of the world's total species of flora and fauna and has the second most abundant water availability in Latin America after Brazil. But just like other areas of the world, Colombia is experiencing acute impacts from climate change. CI has been working in Colombia for 20 years, developing and establishing partnerships and designing and implementing programs that integrate conservation of natural resources with socio-economic development at the local, national and regional levels.

The high-mountain and páramo ecosystems of the northern Andes in Colombia provide critical water flows to lower altitudes, including Bogotá—a city of more than 8 million residents. Climate change and variability are affecting these remote areas through temperature change and rainfall reduction, thus leading to biodiversity loss, unstable provision of fresh water and the inability to regulate water quality. Hydrological changes could negatively affect Colombia's hydropower industry—ultimately weakening the country's economic stability and resilience to climate change.

Colombia's coastal marine ecosystems, small Caribbean islands (San Andres Archipelago) and low-lying coastal areas are also extremely vulnerable to climate change because of their limited natural resources, fragile ecosystems, weak economies, small areas and high population densities. Impacts such as rising sea levels, increased air and sea surface temperatures, coastal erosion, marine ecosystem loss, salinity intrusion, changing rainfall patterns and alterations in severe weather patterns threaten Colombia's coastline. As temperatures rise, malaria and dengue fever are also becoming more prevalent.

CI-Colombia and its partners—National Institute of Hydrology, Meteorology and Environmental Studies (IDEAM); National Coastal Marine Research Institute (INVEMAR); the Regional Environmental Authority of San Andres, Old Providence and Santa Catalina (CORALINA); and the National Institute of Health (INS)—have supported the government in the creation of its Integrated National Adaptation Project (INAP).

This project incorporates both marine and terrestrial ecosystem-based approaches to adaptation. Through water and carbon monitoring, CI can predict the extent of regional climate change. Ecological restoration projects and land-use planning will assist communities in achieving sustainable adaptation and development plans. Protected zones have been created to ensure long-term sustainability of key ecosystem services such as water

productivity. Local farms have been introduced to sustainable practices such as crop diversification and the use of organic fertilizer.

About 500 miles from Colombia lies the San Andreas Archipelago, a chain of small islands that harbors a stunning array of biodiversity and marine ecosystems. Communities there rely on tourism and ecosystem services for their livelihoods. Climate change will affect their way of life through ecosystem failure and economic recession. The INAP proposes several initiatives, which are currently being carried out by CORALINA, INVEMAR and CI. These initiatives include an ocean monitoring system that measures key indicators of climate change; a groundwater management plan; a communal water supply system that utilizes rainwater and wastewater recovery; marine protected areas; and coastal management.

A large school of striped fish, likely a species of snapper, swimming in clear blue water. The fish are densely packed and move in a coordinated pattern, creating a sense of movement and depth. The lighting is bright, highlighting the silvery scales and the dark stripes on their bodies.

CASE STUDY: GALÁPAGOS



PROTECTING RESILIENT AREAS

The Galápagos Islands contain some of the most unique ecosystems in the world, harboring endemic species that thrive in very specific conditions. The terrestrial and marine landscapes are rich in biodiversity and make the area extremely attractive for tourism and development. Climate models suggest that El Niño events could become more frequent or intense as climate change advances—creating unfriendly environments for many of the islands' endemic species and friendlier environments for invasive species. Climate change will affect all facets of life in the Galápagos, making adaptation critical.

CI and its partners in the area are working to protect the Galápagos from human and climate-induced impacts. Agricultural land management and the control of invasive species are crucial to reducing the human footprint in these areas. Almost 25 percent of the insect species on the Galápagos are foreign, and invasive plant species outnumber native species. Terrestrial impacts are altering ecosystems on the islands, and only through intervention and quarantine will the once pristine environments continue to thrive.

Establishing no-take zones in marine areas least affected by El Niño events helps promote the health of coral reefs and fisheries. In addition, forecasting and protecting areas where species congregate to buffer against climate change will preemptively promote resilience.

The protection of marine ecosystems also benefits aquatic mammals, such as sea lions facing food shortages. Reducing pressures on marine resources and improving management of coastal marine resources are key to protecting vulnerable species that thrive in coastal zones. Because tourism is the largest industry in the region, safeguarding emblematic species such as giant tortoises and Galápagos penguins will help sustain the industry and promote growth.

Education and creating awareness are large components of adaptation strategies. Building understanding and capacity increases employment in sustainable tourism and off-shore fishing—two activities that promote resilience in the Galápagos. The Galápagos Islands are home to such an array of life that the protection of vulnerable ecosystems and species is not an option, but a necessity.

INFORMING GLOBAL ADAPTION POLICY AND PRACTICE

Conservation International (CI) is implementing ecosystem-based adaptation (EbA) in marine, terrestrial and coastal regions as a means of improving livelihoods and conserving biodiversity in the face of climate change. The aim is to use EbA to buffer impacts of climate change in three countries where CI has strong track records, partners and relationships with government—Philippines, South Africa and Brazil.

By using a nested approach, CI not only generates results in the project sites, but also uses these experiences to benefit EbA efforts in the region and around the globe, integrating lessons learned into national policy and international fora, such as the UNFCCC. Specifically, our work consists of the following five components:

1 vulnerability assessments

Climate change vulnerability assessments determine the likely impacts of climate change, prioritize which impacts need to be targeted first and determine the appropriate ecosystem-based adaptation actions needed to address those impacts.

2 pilot projects

Pilot projects are a means of testing the feasibility and effectiveness of implementing the recommendations that result from the vulnerability assessments.

3 tracking + monitoring

Tracking and monitoring the implementation and results of activities are essential for assessing the cost effectiveness and impacts of EbA on communities and biodiversity.

4 national policy

Through engagement with national-level policy makers, the vulnerability assessments are designed and implemented in the most useful and relevant ways. Results of pilot projects inform national policy, which amplifies their impact.

5 international policy

Through engagement with international policy fora, lessons from the project can inform the global dialogue on EbA, influencing how standards are developed and how EbA is implemented worldwide.





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THE VERDE ISLAND PASSAGE, PHILIPPINES

As climate change impacts affect the planet, island nations such as the Philippines are more likely to feel the effects. CI-Philippines is working in the Verde Island Passage (VIP), part of the Sulu-Sulawesi Seascape and Coral Triangle, to protect coastlines, enhance fisheries and make livelihoods more resilient. The VIP is home to more than 1.7 million people, and the population is expected to grow rapidly within the next decade. The coastal populations rely heavily on fishing, aquaculture and tourism for survival—three activities heavily influenced by climate change.

A vulnerability assessment in the VIP identified coastal and marine areas as particularly vulnerable to the impacts of climate change. To address this, CI is working with its partners to restore mangroves in coastal areas that are vulnerable to increased storm events and rising sea surface temperatures. CI is also working to improve fishing practices and is using marine protected areas to expand sea life habitats, which are essential for the maintenance of diverse fishery stocks on which local communities depend.

These initiatives are being implemented in close coordination with local officials and communities to increase their understanding and acceptance of ecosystem-based adaptation (EbA) concepts, thus ensuring the sustainability of CI's efforts. Through restoration projects and income diversification, CI is working to build food, water and health security in the Philippines, while promoting a test vehicle for EbA approaches.



NAMAQUALAND, SOUTH AFRICA

CI has been working in South Africa since 1998, enhancing conservation and community development. South Africa is home to three of the world's biodiversity hotspots, the Succulent Karoo, the Cape Floral Kingdom and the Maputoland Pondoland Albany hotspot. Conservation South Africa (CSA) is working in the semi-arid region of Namaqualand, an area in the Northern Cape and part of the Succulent Karoo biome.

Due to intensive over-grazing, soil erosion, infestation of invasive alien plant species and the degradation of wetlands, the Northern Cape region is one of the most environmentally degraded areas in South Africa and is facing severe water scarcity and land-use challenges. As climate change progresses, these problems will only intensify, increasing the vulnerability of its people and possibly advancing desertification in the area.

In Namaqualand, CSA is helping to reduce the impacts of climate change by restoring wetlands and grazing lands. CSA is taking the following actions to implement sustainable livestock management:

- 1 removing invasive alien plant species
- 2 reducing soil-damaging techniques by working with small-scale and commercial farmers through a stewardship approach
- 3 engaging local communities and government authorities to develop policies and plans that support an ecosystem-based approach to adaptation

Through this work, CSA will help restore this region, preventing maladaptation and reducing its vulnerability to climate change.



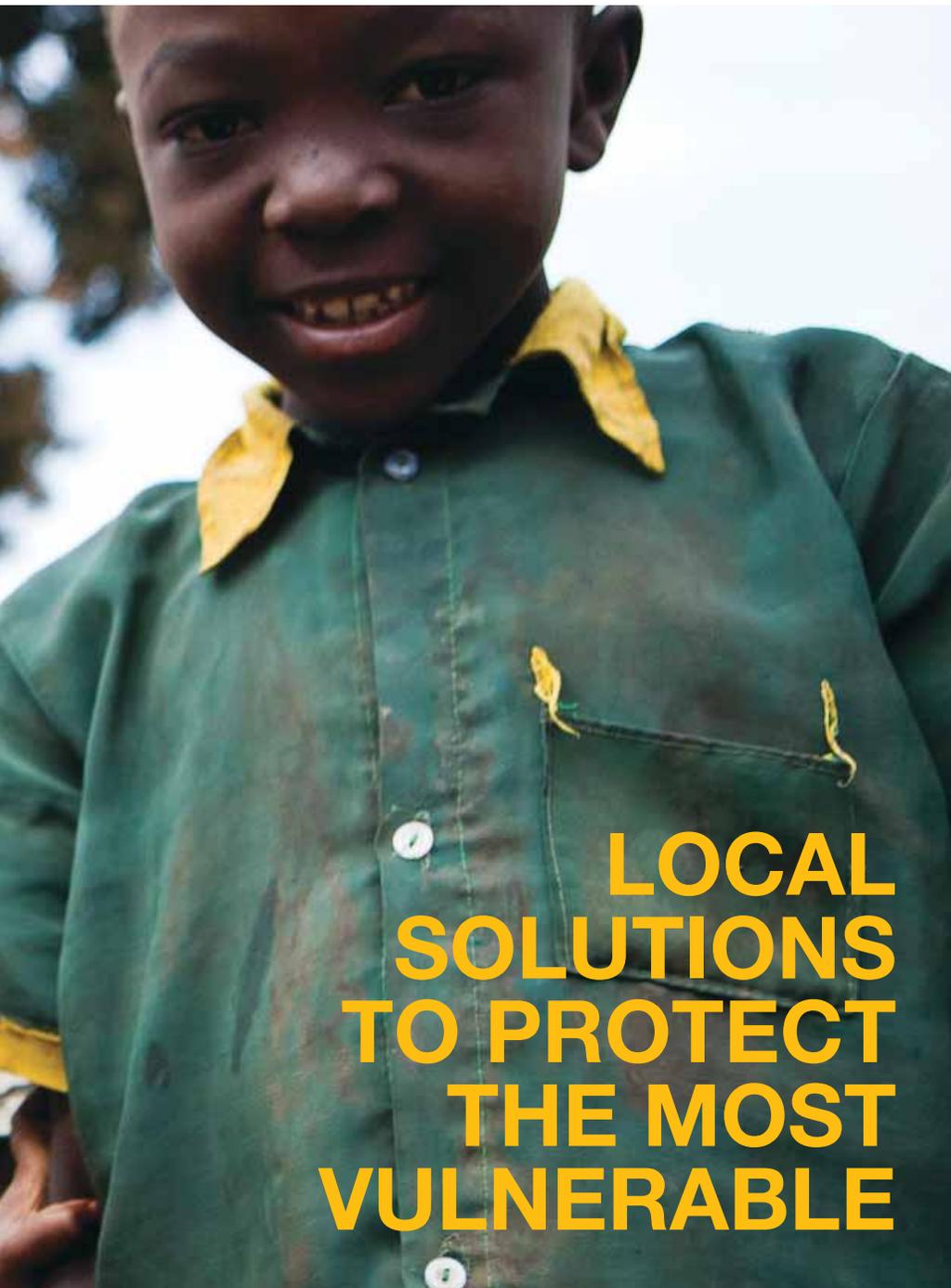
SOUTHERN BAHÍA + ABROLHOS, BRAZIL

Southern Bahia/Abrolhos is home to the largest forest remaining within the northeastern area of the Atlantic Forest biome in Brazil. It has the largest and most biologically diverse coral reefs in the Southern Atlantic, which are part of the Abrolhos Seascape. With more than 100,000 people dependent on the ecosystem services provided in this area, conservation and sustainable management of natural resources are critical.

Unsustainable resource use is putting significant stress on the region's ecosystems, which are critical for protecting people and species from climate change impacts. Forest fragmentation is already affecting rainfall patterns, which will only be exacerbated by climate change. Temperature warming combined with water sedimentation is causing coral bleaching and an overall decline in the health of coral reefs, negatively impacting fisheries and food security.

To strengthen climate resiliency in the region, CI-Brazil is implementing ecosystem-based adaptation (EbA) approaches that address the interdependence between terrestrial and marine ecosystems. After mapping vulnerable terrestrial and marine areas, CI will pilot forest connectivity restoration projects and sustainable fisheries production. Recommendations will be developed with the aim of integrating them into regional and national adaptation plans.





LOCAL SOLUTIONS TO PROTECT THE MOST VULNERABLE

CONCLUSION

As the world's climate continues to shift, every human community will be impacted by these changes in a different way—some subtly and gradually, while others will experience major and immediate challenges to their way of life through climate 'shocks' such as severe storm damage or drought.

Even if global greenhouse gas emissions were stabilized today, the changes that are already locked into the climate system would continue to challenge community resilience for many years. Regionally and locally driven solutions will be needed to protect the most vulnerable from the worst impacts. Adaptation solutions must make the best use of all available financial, social, political, technological and natural resources to target regional and local challenges.

Conservation International is working to ensure that ecosystem-based solutions buffer the impacts of climate change on livelihoods and are implemented alongside more conventional adaptation solutions. Adaptation efforts in different regions and ecosystems will provide their own set of lessons that will benefit future approaches in the field of ecosystem-based adaptation.

OUR VISION

We imagine a healthy, prosperous world in which societies are forever committed to caring for and valuing nature, our global biodiversity, for the long-term benefit of people and all life on Earth.

OUR MISSION

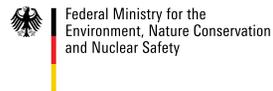
Building upon a strong foundation of science, partnership and field demonstration, CI empowers societies to responsibly and sustainably care for nature, our global biodiversity, for the well-being of humanity.

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