Climate change and the Darwin Initiative: Addressing the Change

"A change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate change variability observed over comparable time periods."

The UNFCCC definition of climate change

Climate change – the predictions

There has been increasing evidence of human-induced changes in climate in recent years. The most recent report from the Intergovernmental Panel on Climate Change (IPCC) published in 2007, the Fourth Assessment Report, predicted the following changes:

- Mean global temperature increase over the 21st century of greater than 1.5°C is "very likely".
- Greater temperature increases over land and at high latitudes in the northern hemisphere.
- Fewer low temperature spells.
- More severe "extreme" weather events such as monsoons, heatwaves, tropical cyclones.
- A general decrease in rainfall in the subtropics.
- The changes in climate will vary in direction and magnitude from region to region.

Climate change therefore represents both opportunities and risks – it is likely to favour regions currently limited by low temperatures while posing threats of sea-level rise for low-lying coastal zones. Whilst the effects may be beneficial in some parts of the world, the overall impact on society and the natural environment is likely to be negative.

A recent thematic review of the Darwin Initiative investigated the success of 245 Darwin Initiative projects in contributing to our ability to deal with climate change. This briefing note highlights the key issues from the review.

Photo credit: Hernan Vargas – 12-018

Galápagos penguin – endangered species threatened by El Niño episodes.

What does climate change mean for biodiversity?

Projected climate change is predicted to have significant impacts on biodiversity and ecosystems. Some of these impacts remain poorly understood. However it is clear that some species and ecological processes are particularly vulnerable to changes in climate. IPCC reports note some key, vulnerable ecosystems and regions, identified as experiencing a high level of change and/or being sensitive to these changes and/or having low adaptive capacity due to their ecology or to human pressures.

Already, since the 19th century, human activity has restricted the range, populations and genetic variability of many species – making them more vulnerable to extinction. Climate change induced by greenhouse gas emissions serves only to exacerbate this vulnerability dramatically. The rate and magnitude of species loss currently already

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exceeds normal 'background rates'. A mean global temperature rise of 1-2°C could adversely affect many more ecosystems and species - not just in terms of their range or existence, but also their ability to deliver the services on which humans depend.

Climate change is one of the cross-cutting issues of the Convention on Biological Diversity. The impacts of climate change on biodiversity - and the potential for biodiversity to mitigate some impacts of climate change - are increasingly being recognised, as is the need for adaptation.

How do biodiversity conservation and the Darwin Initiative help?

There are three key groups of activity that make biodiversity conservation actions particularly relevant to climate change. These are **mitigation**, **adaptation** and **monitoring**. While few Darwin Initiative projects have explicitly addressed climate change, a number of Darwin Initiative projects have undertaken very relevant activities.

Actions contributing to climate change - mitigation

As well as being influenced by climate change, biodiversity conservation can influence the changes in climate. Climate change mitigation is about reducing the amounts of greenhouse gases in the atmosphere.

Biodiversity conservation has a potentially powerful role in contributing to mitigation through protecting and promoting land-use and habitats which act as carbon sinks through sequestration. Forests, wetlands and peatlands are particularly important for carbon sequestration.

A number of Darwin Initiative projects has been protecting and promoting carbon sinks, although the total area of land directly affected is limited. Darwin projects can serve as pilot studies, examples of best practice and a focus for capacity building. A number of key Darwin Initiative examples are highlighted here.

Actions contributing to climate change - adaptation

Climate change adaptation is about enabling both people and biodiversity/living organisms to cope with, and survive through, climate change. Resilient ecosystems should be able to cope with disturbance, maintain biodiversity and re-establish themselves. A system that accommodates changes is one where species can migrate easily and flourish in a new location quickly.

Ecosystem or region	Key issues and potential impacts
Terrestrial	• Mountain ecosystems are especially sensitive to climate change and are important indicators. • Boreal forests will suffer most from temperature increases. • Some tropical forests could become much drier. • Dry and sub-humid areas (prairies, Mediterranean forests, desert margins) are especially vulnerable. • Increasing vulnerability to invasive alien species.
Marine and coastal	• Loss of significant ecological services (storm & erosion protection, fisheries, nutrient cycling, tourism opportunities). • Coral reef bleaching events and more frequent. • Algal blooms more frequent. • Sea level rises. • Ocean acidification.
Wetlands	• Shifting ecological processes may affect distributions for up to 40% of the world's species, including migratory birds. • Decreased water in arid and semi-arid regions. • Increased accumulation of pollutants.
Arctic	• Large temperature increase. • Rapid melting of glaciers, sea-ice and permafrost. • Sea level rises. • Retreating vegetation zones and reduced breeding areas.
Sub-Saharan Africa	• High exposure and sensitivity to the predicted changes. • Widespread poverty constrains adaptive capacity. • Significant changes in forest and rangeland cover, migration patterns, especially in south and east Africa. • Significant existing pressures – many species already close to tolerance limits.
Small islands	• Already experiencing sea-level rise and increased tropical cyclones, storm surges, inundations, and coastal erosion. • Negative effects on water resources, coastal infrastructure, health, tourism, fisheries.
Asian mega-deltas	• Typically heavily populated due to fertile alluvial plains. • Sea level rise, storm-surges and coastal erosion.

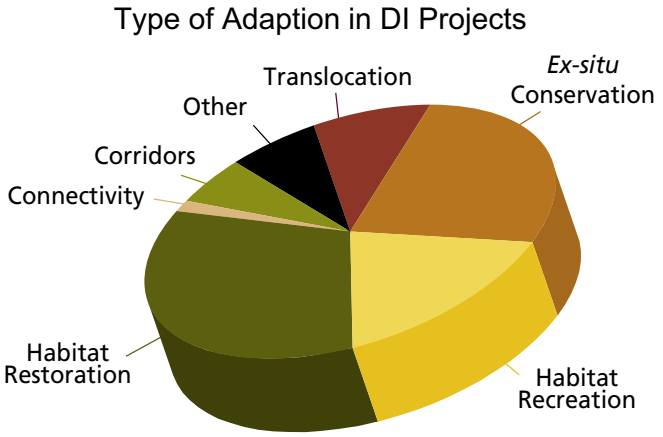
"Management of biodiversity and habitats is characterised by the need to continuously adapt to changing circumstances through a learning-by-doing approach." (IUCN, 1999)

In this respect, adaptation strategies to reduce the vulnerability of ecosystems to climate change resemble other activities for conserving biodiversity under threat. Whilst climate change is a significant and rapidly growing threat, it is not something that biodiversity conservationists should be afraid of addressing as part of their conservation strategy.

Key activities that could help biodiversity in adaptation to climate change include:

- Habitat restoration and habitat recreation:
- Improving habitat connectivity and migration corridors:
- Coastal zone conservation: plays an important role in reducing the impacts of projected sea-level rise on terrestrial habitats:
- Translocation:
- Ex-situ conservation.

20% of all projects analysed carry out these activities.



Case study: Mitigation through forest protection.

A project in Argentina supports the Yabotí Biosphere Reserve – a significant remnant of Atlantic Forest that once flourished over SE Brazil, Paraguay and Misiones. It is now estimated that only 5% of this global biodiversity hotspot remains. The Reserve is threatened by illegal logging and poaching. The project intends to ensure that the forest is better protected through increased capacity and co-operation of all the stakeholders – Reserve staff, the host Ministry, local people. This involves improving the scientific capacity, as well as training the local Guaraní people to be forest rangers.

Project 14-034: A biodiversity conservation training programme for the Yaboti Biosphere Reserve

Photo credit: Darwin Initiative

Arecastrum romazoffianum palm.

Case study: Mitigation through protecting peat swamps.

Photo credit: Jack Rieley

Peat swamp forest, Indonesia.

Indonesia contains about 70% by area of the global tropical peat swamp resource, which performs important environmental functions including carbon fixation, flux and storage. Yet its biodiversity was little studied and poorly understood. A Darwin project remedied this by documenting the biodiversity, structure, ecological and hydrological functions of the forest, and determining the effects of both natural and human impacts on it.

The project contributed to the establishment of the Centre for International Co-operation in Management of Tropical Peatlands within the University of Palangka Raya. This is a regional centre of excellence contributing to strategies for managing this important resource.

Project 7-135: Impact of fire and land-use change on the biodiversity of peat swamp forest in central Kalimantan, Indonesia.

Case study: Habitat restoration.

A project in Peru is working to restore Huarango (*Prosopis pallida*), originally the dominant tree species in the region. Huarango forest provides many food and forage products that potentially offer lucrative sustainable livelihoods. This is a habitat of dry forest vegetation, highly susceptible to degradation and desertification, with very infrequent natural regeneration. The project has sought to develop and disseminate technology for habitat restoration to protect biodiversity and combat desertification. The restorations in progress will improve the conservation status of the habitat and its species, thus making it more resilient to cope with climate change, and also potentially offering mitigation opportunities.

Photo credit: Darwin Initiative

Ancient Huarango tree in an increasingly desertified lanscape.

Project 15-016: Habitat restoration and sustainable use of southern Peruvian dry forest

Case study: Corridors and connectivity.

The Eastern Tropical Pacific Seascape Project (ETPSP) is an excellent example of an international marine protection initiative and involves two active Darwin Initiative projects. This project works to protect one of the world's most biologically diverse provinces, and the region has a high degree of connectivity and complex oceanographic characteristics due to major marine current convergences.

Projects 12-021 and EIDPO017 in Panama, have been working to include the Las Perlas Archipelago in the ETPSP, through highly credible scientific and legal research. Local organisations have demonstrated the value of the area as a biological corridor for important species such as humpback whale. Project 14-048 in the Galápagos also provides important evidence about such biological corridors, and works together with project 12-021/EIDPO017 to share knowledge, information and data to support high quality research. Together they are developing best practice approaches to managing marine protected areas in a region of high climate variability.

Photo credit: Charles Darwin Foundation

The last remaining extensive coral reefs in the Galápagos islands after the extreme 1982/83 and 97/98 El Niño events persist in Wolf and Darwin islands.

Project 12-021: Marine biodiversity assessment and development in Perlas Archipelago, Panama
Project EIDPO017: Conservation Management Zoning Implementation and Facilitation in Perlas Archipelago, Panama
Project 14-048: Galápagos Coral Conservation: Impact mitigation, mapping and monitoring.

Photo credit: Charles Darwin Foundation

The Whale shark (*Rhincodon typus*) is the largest fish in the ocean and the Eastern Tropical Pacific corridor is a critical habitat for these migratory species 14-048.

Many local people are reliant on biodiversity for their livelihoods and wellbeing. It is important to help them to be able to better understand the potential changes in their resource, to monitor the changes and to respond, plan and manage appropriately. Darwin Initiative projects have become increasingly good at involving local people in biodiversity conservation activities. Awareness needs to be raised about the additional threats and opportunities that climate change brings to enable appropriate adaption in the way they use and manage biodiversity.

Actions contributing to Climate Change - monitoring

Climate change is just one of the major threats to biodiversity. As biodiversity is affected by other drivers, in addition to climate change, the analysis of the role of climate change is challenging. The detection, attribution and quantification of climate change impacts requires evidence from monitoring. Good, scientific monitoring also allows a better understanding of the change processes and allows improved predictions. Importantly, it provides the objective basis for assessing the level of threat, and for planning both practical and policy responses for conservation (adaptive management).

Many Darwin Initiative projects are involved in generating first-class scientific monitoring information. Baseline surveys are a good example. These are an important first step in establishing any longer-term monitoring programmes, which can contribute to the detection and attribution of climate (and other) ecosystem changes.

Case study: Climate change, biodiversity and livelihoods.

Madagascar, as much of sub-Saharan Africa, suffers from a highly unpredictable climate, and its biologically unique littoral forests are critical to local communities. A Darwin project there worked with remote sensing, climatic data, ecological field surveys and social-ecological-systems analysis. Using this, the project could decouple the impacts of natural processes from the impacts of human activities. This helped to form management strategies based on clear predictions of different activities, and of climate risks.

Project 9-006: Toward the sustainable development of south eastern Madagascar's biologically unique littoral forest.

Photo credit: Terry Dawson

The Verreaux's Sifaka lemur is threatened by climate change and deforestation in Madagascar.

Case study: Initiating long-term monitoring.

Project 13-027, a collaboration between the University of Newcastle and Shoals Rodrigues in Mauritius, compiled a large amount of monitoring information. The project was working towards supporting the Rodrigues Regional Assembly to establish a network of 4 marine protected areas and evaluating further resource management strategies which can help to protect the unique biodiversity of Rodrigues. The team established two long-term monitoring programmes, firstly looking at the population dynamics of targeted fish within the large lagoon of Rodrigues, the main fisheries source for the island. Secondly, the team implemented a habitat monitoring programme which utilised underwater substrate surveys, in addition to using technology such as temperature loggers to record changes in sea surface temperature, in order that any anomalous warming events causing coral bleaching and mortality can be recorded.

Photo credit: Shoals Rodrigues

Coral reef monitoring, Rodrigues.

Project 13-027: Developing reserves for biodiversity conservation & sustainable fisheries in Rodrigues

Best practice for climate change and biodiversity

The role of Darwin Initiative projects in climate change mitigation and adaptation could be further highlighted and strengthened, with a significant number of projects undertaking relevant useful activities. There is also significant potential for DI projects to contribute more to our understanding of climate change, especially through their monitoring activities. This is particularly important, given the ability of these projects to raise awareness of biodiversity and climate change issues.

Photo credit: Deepak Apte

T. maxima, Lakshadweep Islands.

The following guidelines are offered in order to further exploit this potential and to allow Darwin projects to explicitly address climate change and climate change issues in their strategies.

Climate change mitigation
• Conserve and/or restore forests, wetlands and peatlands as a priority.
• Consider how to inform and use the Clean Development Mechanism (CDM) and Reduced Emissions from deforestation and degradation (REDD) for future ecosystem valuations.
• Ensure livelihoods strategies encourage energy efficiency and carbon-neutral energy.
• Consider minimising and where necessary offsetting carbon emissions generated by projects.
Climate change adaptation
• Always recognise the dynamic nature of species and their geographical ranges.
• Aim to increase population numbers of rare and endemic species, for example through habitat creation, enlargement or restoration paying attention to possible future range changes.
• Use an ecosystems approach to conservation.
• Take steps to maintain genetic diversity, as this helps populations to more effectively respond to rapid climate change.
• Take into account the wider landscape, identify gaps in the network of existing projected areas, and increase or maintain connectivity and mobility of target species.
• Investigate opportunities for individual projects that are regionally located together to collaborate more closely for shared knowledge and advocacy.
• Try to link into National Adaptation Programmes of Action (NAPA) being produced by host countries under the UNFCCC.
• Seek to identify and reduce all (other) pressures on biodiversity, so that species can better cope with or adapt their situation.
Monitoring
• Ensure that surveys can be replicated and that all monitoring data and methodologies are deposited nationally and if appropriate, internationally (eg Global Biodiversity Information facility).
• Work to secure the capacity for monitoring into the long-term.
• Give emphasis to specific species and genus' which are known to be sensitive to climate change and are easy to record (eg birds, butterflies).
• Ensure simple weather measurements (precipitation, temperature, snow cover) are recorded as a minimum.

The Darwin Initiative aims to promote biodiversity conservation and sustainable use of resources around the world. It uses UK expertise working with local partners to help countries rich in biodiversity but poor in resources to fulfil their commitments under the CBD. The Initiative is funded and administered by the UK Government's Department for Environment, Food and Rural Affairs (Defra). Since 1992, the DI has committed over £45m to over 450 projects in over 100 countries.

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For information on the Darwin Initiative see www.defra.darwin.gov.uk. For information on the CBD see www.biodiv.org.

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