PARCC West Africa
News & Updates

The newsletter of the project *"Protected Areas Resilient to Climate Change in West Africa (PARCC)"* provides information on latest updates on project's and related initiatives' activities and results.

This newsletter is prepared with funding from the GEF (through UNEP) and it does not necessarily express its views or the views of contributory organizations.

Issue 6–October 2015

Waterfall and riverpool, Gola Rainforest National Park ©Gola Forest Programme

Giraffe, Kouré area, Niger ©Clémentine Laratte

In this issue:

Regional climate projections and projection of change in ecosystem services 1

Integrating species distribution models and trait data to inform conservation planning 3

National systematic conservation planning systems for PAs in the face of climate change 4

Update on the implementation of transboundary pilot site activities 9

Upcoming outputs 10

Regional climate projections and projections of change in ecosystem services under climate change

Regional climate projections

The Met Office Hadley Center (MOHC, UK), one of the project partners, developed regional climate projections for the PARCC project.

Five high resolution regional climate modelling experiments were performed to assess the potential changes in temperature and rainfall across West Africa. These experiments all suggest a general warming trend, in agreement with wider global climate experiments. There is also an increase in variability within the regional climate results, which could result in a greater frequency of unusually hot events. The high level of agreement across global and regional climate models for West Africa strongly suggests that a projected increase in temperature is very likely to occur. This could have large impacts on ecosystems and livelihoods across the West African region.

With regards to rainfall, the projections with both regional and global climate modelling experiments are highly variable, and contain little to no consensus on either the direction or magnitude of potential changes in rainfall. The best recommendation is therefore to build resilience to current climate variability as either the drier or wetter modes of this variability could be enhanced in the future.

Projections of changes in ecosystem services under climate change

The MOHC used the regional climate projections to run a model in order to analyse the future impact of land use change and climate change on ecosystem services in West Africa, including carbon storage, water provision and vegetation productivity. Changes in climate would be expected to affect ecosystem types and species distributions, and therefore impact on the capacity of PAs to provide ecosystem services such as food, water, and sequestration of carbon.

Three scenarios of land use were used: (i) preservation of existing carbon stored in forest (preservation of existing forests, and expansion of forest area); (ii) reduction of grasslands in favour of croplands (human disturbance of forest unchanged in West Africa) and; (iii) no human disturbance in both the historical and future periods.

The key findings for the **region** are:

- **Carbon storage of forests is projected to increase under the effects of climate change**, however, human degradation of forest would restrict this increase (high confidence).
- Generally, **vegetation productivity is projected to increase** in most parts of West Africa. The exceptions to this are in southern Nigeria, where land use scenarios predict a high level of human activity, and in the western Sahel, where a drying signal is found in the climate projections (low confidence, but plausible).
- **In central and eastern West Africa, ecosystems are projected to shift northwards**. This includes increases in tree fraction of ecosystems in Cameroon and Central African Republic, increases in shrub fraction in the savannah grasslands of southern Chad and northern Nigeria, and increases in grass fraction on the edge of the Sahara desert in Chad and Niger.
- **Projected vegetation shifts in the Sahel, and Sudanian savannah** have a low confidence, but are plausible because there is a lack of consensus in model projections of precipitation.

For **project countries**, the key findings are:

Chad: The whole country is projected to experience a northward shift of ecosystems. Increases are projected in: shrub and tree cover in southern woody savannah ecosystems (high confidence); vegetation coverage (grassland) in arid and semi-arid ecosystems of central Chad on the edge of the Sahara (plausible, but low confidence as linked to precipitation); and vegetation productivity in central and southern Chad, indicating stronger vegetation growth thus a trend towards more closed woody savannah, and potentially larger crop yields (linked to temperature, so higher confidence); surface run off, suggesting more water available for ecosystems and agriculture (plausible, but low confidence as linked to precipitation).

Mali: In the south of Mali, an increase in the bare soil fraction, replacing grassland, and a reduction in vegetation productivity in arid and semi-arid parts of the country are projected. Given that they are related to a projection of decreased western Sahelian precipitation, these changes are plausible, but low confidence. They do however show that grasslands are highly sensitive to precipitation variability.

Togo: Under a scenario of no human disturbance, small increases in vegetation productivity are projected, resulting in an increase in vegetation carbon in woody savannah ecosystems. Under a scenario of human disturbance, a reduction in vegetation carbon in central Togo is projected. A small increase in the fraction of broadleaf tree cover over most of the country is projected in some, but not all, regional climate model projections.

Sierra Leone: Increases in the fraction of broadleaf tree cover are projected to occur throughout Sierra Leone, although human disturbance would restrict this increase.

Vegetation productivity and consequently vegetation carbon storage are also projected to increase as broadleaf tree cover increases in the whole country. This is related to increases in minimum temperature, since photosynthesis is not limited by water availability in this region, and consequently has a high confidence.

Gambia: An increase in the bare soil fraction, replacing grass cover, and a small reduction in vegetation productivity are projected. These projections are related to a projected decrease in western Sahelian precipitation and thus are plausible but not confident. Projections for change in grass and bare soil fractions in The Gambia are also highly sensitive to precipitation variability, indicated by both year-to-year variability and decade-to-decade variability in vegetation cover.

Some **advices for national planning include**:

- Reducing future land use change in order to increase the carbon storage of forest and savannah ecosystems (e.g. Togo);
- Preparing the land for the management of biodiversity and the annual fire regime, given the projected increases in woody savannah (e.g. Togo);
- Carbon stocks in tropical forests can take up to 100 years to recover to 'natural levels' following the cessation of human disturbance;
- Uncertainty in precipitation projections can be incorporated into decision making by building resilience to wet years, as well as dry years (e.g. Mali and Chad), in order to account for extremes of year-to-year and decade-to-decade variability, as observed in the past.

Integrating species distribution models and trait data to inform conservation planning

Introduction

Durham University, one of the project's technical partner, conducted a study which compared and combined species distribution models (SDMs) with traits-based vulnerability assessments (TVAs) to produce integrated assessments of the potential threat of climate change to West African protected areas.

TVAs are based on the Climate Change Vulnerability Assessment Framework, developed by IUCN, and use species trait data to inform:

- The **exposure** to climate change: the extent to which each species' physical environment will change in the future due to climate change,
- The **sensitivity** to climate change: the lack of potential for a species to persist *in-situ*, and
- The **capacity to adapt** to such changes: the ability of a species to avoid the negative impacts of climate change through dispersal and/or micro-evolutionary change.

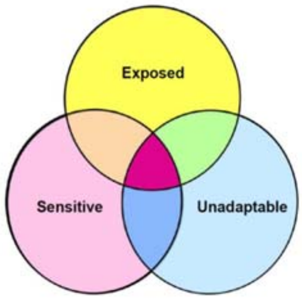

Fig 1. The IUCN Climate Change Vulnerability Assessment Framework

SDMs relate current species distributions to current climate and apply these relationships to future climate projections to assess the vulnerability of species to the projected changes.

Methods

The combination of SDMs and TVAs was carried out in two ways:

1. By integrating SDMs into TVAs: Using climate suitability projections for individual species under scenarios of future climate. Estimations of the likely exposure of species to climate change were combined with sensitivity and adaptability information from TVAs. For each of the species assessed in TVAs as having a high vulnerability, the relative change in modelled climate suitability for each species in each PA in which it occurs was calculated.

2. By integrating TVAs into SDMs: Incorporating relevant trait data into climate suitability projections to assess how individual species could respond to climate change; quantitative traits that can be considered within a dynamic modelling framework (generation length and natal dispersal distances - only available for birds) were combined into a dynamic SDM. For qualitative traits, which could not be readily incorporated into a modelling framework for most species, a post-hoc analyses on the output from SDMs was used to identify species that might be affected by factors not considered in the dynamic SDMs.

Preliminary results

It was found that the degree to which the TVA and SDM methodologies diverged was greatly affected by how species are treated that have no consensus regarding their future response to climate change (i.e. either considering a 'worst case scenario' regarding the vulnerability of these species, or a 'best case scenario').

Integrating TVAs into SDMs

The projected changes in range under future climate change, after considering traits such as dispersal ability, generation length, and age to first breeding in addition to climatic suitability, were very variable.

Integrating SDMs into TVAs

It is assumed that if, at a species level within a PA, climate suitability is increasing, the climate change vulnerability will be low and, if climate suitability is decreasing the climate change vulnerability will be high. Hence, this approach assigned different climate exposure categories to species in different parts of their range.

Maps of the differences in the vulnerability to climate change of species assemblages in protected areas across West Africa were produced, highlighting which PAs are likely to be the most affected by climate change (Fig 2).

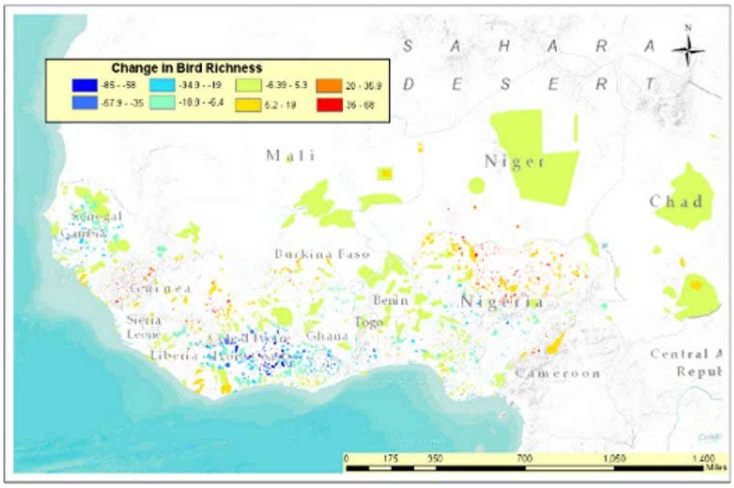

Fig. 2 Example: Expected future change in bird richness in West African protected areas as a result of climate change.

NB: the full results will be presented in a report that will soon be available on the project website.

Management recommendations for individual species based on their potential to respond to forecast changes

For most species of West Africa, the main management options that will maximise the occurrence of species of conservation concern under climate change will be:

- to facilitate the natural dispersal of species from their current range to areas of suitable climate in future (shifting ranges), and
- to identify sites of suitable climate persisting within their current range within West Africa that can be prioritised for conservation management.

National systematic conservation planning systems for PAs in the face of climate change

Introduction

Systematic conservation planning (SCP) is an approach for designing protected area (PA) systems and other conservation networks. It is the best way to identify where new PAs should be located. DICE University of Kent, one of the project technical partners, developed systematic conservation planning systems for the five core project countries[1] and for the whole West Africa sub-region to help countries identify where new protected areas should be created (or extended) in the face of climate change.

In July 2014, the project organized a regional training workshop to build the countries capacity to better understand how to undertake systematic conservation planning and a gap analysis. The workshop also provided an introduction to the systematic conservation planning software (CLUZ, Marxan) that is widely used to identify priority conservation areas. The regional workshop was followed by national workshops in 2015 during which national conservation planning systems were developed together with participants from the five core project countries.

National workshops

The objectives of the national workshops were to present the initial results from the national planning systems and refine the outputs with the participants so that they can be used to inform conservation policy and practice. The national workshops were held in Banjul, The Gambia, in February 2015 for The Gambia, and in Lomé, Togo, in March 2015 for Francophone countries (Chad, Mali, Togo). The Sierra Leone conservation planning system was developed via e-mail and telephone communications with the national focal points due to travel restrictions caused by the recent Ebola crisis.

Workshop activities consisted of:

1. Checking targets: specifying how much of each conservation feature should be protected;
2. Identifying areas that should always be included/excluded from the set of priority areas (for example because of urban development or mining operations);
3. Checking fragmentation levels (to ensure a minimum size for the creation of new PAs); and
4. Identifying a set of priority areas for meeting the protection targets.

[1] Chad, Mali, Sierra Leone, The Gambia, Togo

The national conservation planning systems were therefore designed and refined based on the participants' feedback.

Systematic conservation planning systems

The results of the planning systems are summarized in a series of report (available online soon), which describe for each project country how each of these planning systems was developed and used to measure how well the current PA system meets conservation targets (also known as a gap analysis) and to identify priority areas for expanding PA networks.

Elephants, Nazinga Game Reserve, Burkina Faso ©Bora Masumbuko

The approach for developing a national systematic conservation planning system was based on the following 3 steps:

1. <u>Selecting and mapping the conservation features</u>

Three types of conservation feature were selected: broad elements of biodiversity, current species distribution, and future distribution of species that may be vulnerable to climate change. These conservation features were selected with the aim of:

i. *Representing broad elements of biodiversity*: landcover types, ecoregion types and elevation zones were used.
ii. *Conserving the current distribution of particular species:* all amphibian, bird and mammal species, except those listed in the IUCN Red List as Data Deficient, were used.
iii. *Conserving the future distribution of species that may be vulnerable to climate change:* the mapping of future species distributions was done by using Species

Distribution Models (SDMs) produced by the University of Durham. The size of the dataset was subsequently reduced by only including species that were currently listed as Threatened on the IUCN Red List and/or had been identified as vulnerable to climate change in a study conducted for PARCC by IUCN Global Species Programme (GSP).

2. Setting targets

Setting the initial targets for each project country used two different approaches. For the landcover types and elevation zones, targets were set as 10% of their total area in the country (setting high targets for broad-scale biodiversity surrogates is an inefficient method for conserving narrow-range or threatened species). For the ecoregion types and species, targets were set based on determining the global range for the ecoregions and current species distributions and the total area that had been modelled for the SDMs. Since priority areas should directly inform the location of new PAs, it was decided to cap all targets at 20%. The percentage of PA coverage was also set to 20%, which is in line with the targets set by each country to meet their CBD commitments.

3. Producing the conservation Planning Systems

The first step in developing a conservation planning system is to define the planning region, which in our case was the national boundary of each country, which was then divided into a number of planning units that were regular hexagons. The World Database on Protected Areas (WDPA) provided the data on the PA boundary (polygons for most PAs) and the IBA (Important Bird Areas) data was provided by BirdLife International. The 'cost' of each planning unit was then calculated based on the human population density, so that the Marxan software would avoid selecting areas with a high population density.

All data were then imported into the CLUZ and Marxan software to produce the systematic conservation planning systems. The status of each planning unit was set as either "Conserved" (i.e. it should always be included in the priority areas), "Excluded" (i.e. it should never be selected by Marxan), or "Free" to be selected.

Below is a summary of the results of the systematic conservation planning systems and the identification of priority areas for conservation for each project country.

Chad

The Chad conservation planning system classified 149,636 km^2 (11.8%) as being already included in PAs and 30,373 km^2 (2.4%) as being in currently unprotected IBAs.

The current Chad PA and IBA network is meeting most of the conservation targets set. However, it is failing to conserve any of the East Saharan montane xeric woodland and very little of the Sahara desert ecoregion.

In general, regarding the current distribution of amphibians, birds and mammals, on average, about 80% of these species have met their protection targets in the current PA and IBA system (Figure 3). However, threatened species are less well protected, although the proportion of species where the targets have been met is still relatively high.

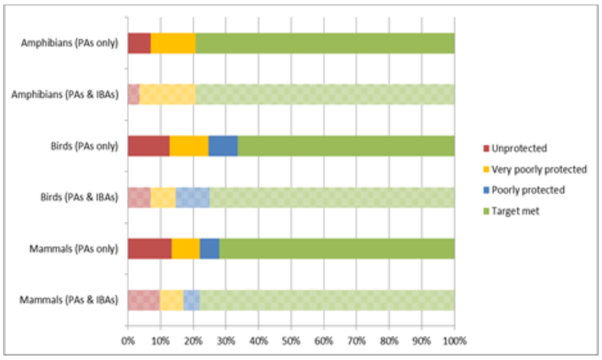

Fig 3. PA and IBA coverage for amphibian, bird and mammal species in Chad. The proportion of unprotected species is in red and the proportion of species that have met their targets is in green.

Most of the priority areas are found around existing conservation areas, with smaller priority areas found in patches in the south of the country (Fig 4). The analysis also showed that large areas in the north should also be included in the PA network to meet targets.

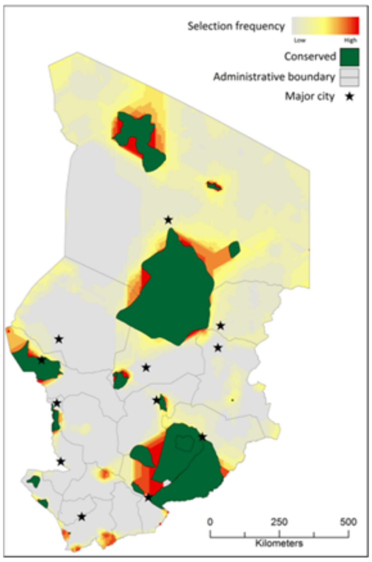

Fig 4. Priority areas in Chad for meeting conservation targets, whilst avoiding areas with high human population density where possible. Areas in red are needed to meet the targets, areas in yellow are less important but some are needed to meet the targets.

The Gambia

The Gambia conservation planning system classified 422 km^2 (4%) as being already included in PAs and 215km^2 (2%) as being in currently unprotected IBAs.

The current Gambia PA and IBA network does not meet most conservation targets. Notably, it is failing to meet targets for almost all species (Fig 5), although the unprotected IBAs are playing an important role in increasing protection for all three taxonomic groups.

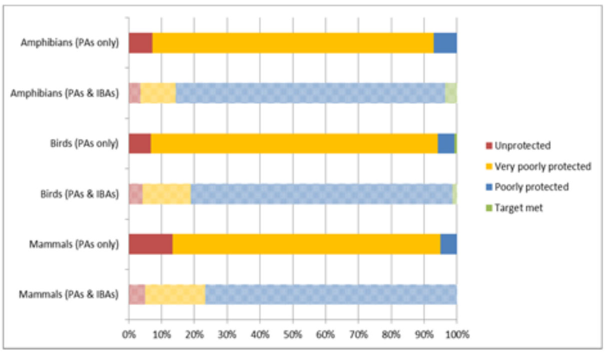

Fig 5. PA and IBA coverage for amphibian, bird and mammal species in The Gambia. The proportion of unprotected species is in red and the proportion of species that have met their targets is in green.

A number of important priority areas were identified in different parts of the country. These are found from East to West and reflect biogeographic patterns (Fig 6).

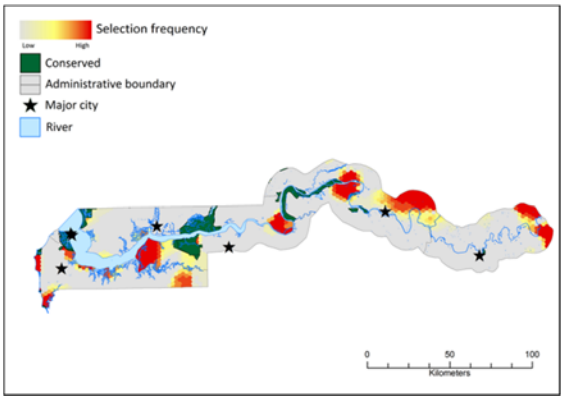

Fig 6. Priority areas in The Gambia for meeting conservation targets, whilst avoiding areas with high human population density where possible. Areas in red are needed to meet the targets, areas in yellow are less important but some are needed to meet the targets.

Mali

The Mali conservation planning system classified 69,839 km^2 (5.6%) as being already included in PAs and 14,501 km^2 (1.2%) as being in currently unprotected IBAs.

The Mali PA and IBA system is failing to conserve any of the Sahara desert ecoregion and very little of the Inner Niger Delta flooded savanna. Birds are relatively well protected, especially when IBAs are included, but mammals and particularly amphibians are poorly represented (Fig 7). The situation is much worse for threatened species, especially for mammals.

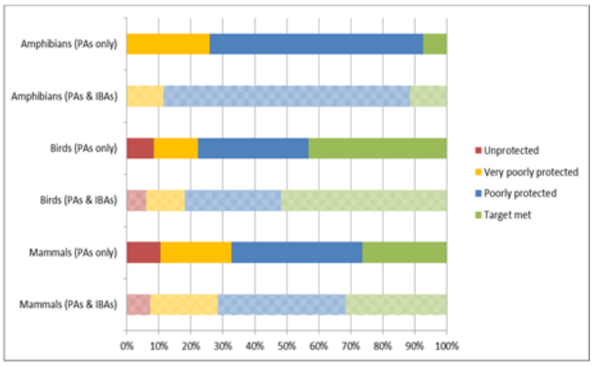

Fig 7. PA and IBA coverage for amphibian, bird and mammal species in Mali. The proportion of unprotected species is in red and the proportion of species that have met their targets is in green.

Most of the priority areas are found in the central and southern sections of Mali, especially around existing protected areas (Fig 8). Mali needs to expand its PA network throughout the country to meet conservation targets.

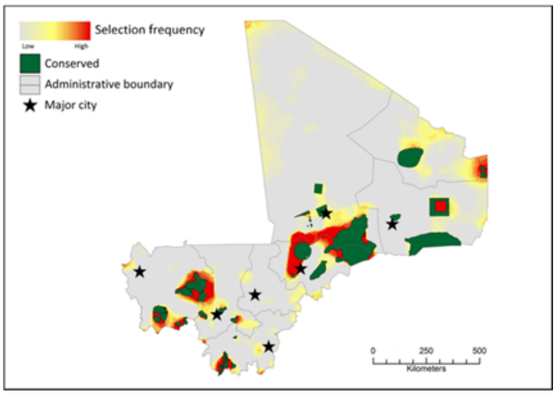

Fig 8. Priority areas in Mali for meeting conservation targets, whilst avoiding areas with high human population density where possible. Areas in red are needed to meet the targets, areas in yellow are less important but some are needed to meet the targets.

Sierra Leone

The Sierra Leone conservation planning system classified 4,211 km^2 (5.8%) as being already included in PAs and 512 km^2 (0.7%) as being in currently unprotected IBAs.

The current Sierra Leone PA and IBA network does not meet most conservation targets. Notably, it is failing to meet targets for almost all species, especially amphibians (Fig 9).

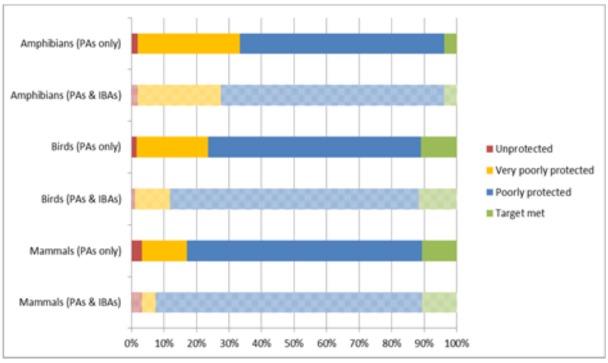

Fig 9. PA and IBA coverage for amphibian, bird and mammal species in Sierra Leone. The proportion of unprotected species is in red and the proportion of species that have met their targets is in green.

Most of the priority areas are found in the central and western sections of Sierra Leone, especially around existing protected areas (Fig 10). Sierra Leone needs to expand its PA network throughout the country to meet conservation targets.

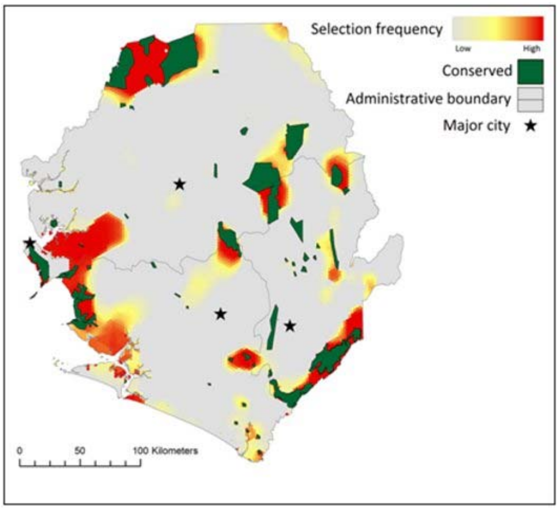

Fig 10. Priority areas in Sierra Leone for meeting conservation targets, whilst avoiding areas with high human population density where possible. Areas in red are needed to meet the targets, areas in yellow are less important but some are needed to meet the targets.

Togo

The Togo conservation planning system classified 7.273 km^2 (12.8%) as being already included in PAs and 151km^2 (0.3%) as being in currently unprotected IBAs.

The Togo PA and IBA system is representing most of the ecoregions and landcover types. The current network is already meeting targets for most species and only a very small proportion are completely missing from the existing PA network (Fig 11). However, it is worth noting that Togo's PA network is currently being revised.

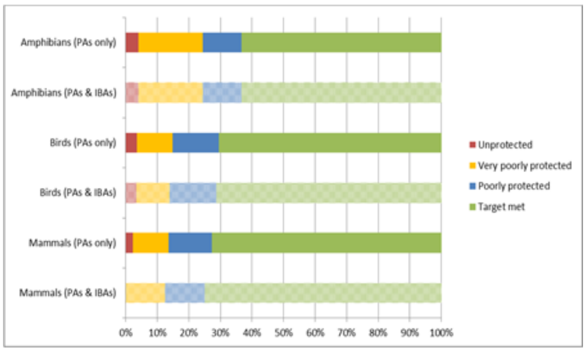

Fig 11. PA and IBA coverage for amphibian, bird and mammal species in Togo. The proportion of unprotected species is in red and the proportion of species that have met their targets is in green.

A small number of priority areas have been identified outside the existing conservation area network (Fig 12). However, there is still a need to expand the existing PA network in order to meet all the conservation targets, notably with some additional areas in the south.

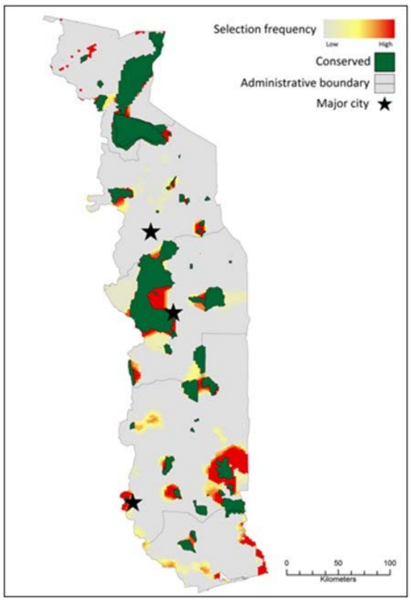

Fig 12. Priority areas in Togo for meeting conservation targets, whilst avoiding areas with high human population density where possible. Areas in red are needed to meet the targets, areas in yellow are less important but some are needed to meet the targets.

General recommendations for future work

- Enhance data collection with the inclusion of other types of conservation areas that are not currently included in the WDPA (such as Forest Reserves that are managed for biodiversity).
- Include better landcover and vegetation maps in future analyses and seek support from donors for the development of such maps in countries that currently lack them.
- Improve the planning unit cost metric in those countries with coarse-scale human population size data by combining it with data on distance to roads and settlements.
- Develop new approaches for setting targets that account for taxonomic differences in the precision of range maps and the relationship between range and area of occupancy.
- Visit proposed priority areas and survey biodiversity to verify that they are indeed important for their conservation features for which they were selected.

Update on the implementation of transboundary pilot site activities

As reported in a previous issue of the newsletter (Issue 4), the project is currently implementing transboundary pilot activities involving each of the five project countries. Below we present an overview of the work in progress at the different sites.

o Chad - Cameroon: Sena Oura National Park - Boubba Ndjidda

Information and awareness raising meetings and campaigns were held between government and traditional authorities in 26 villages surrounding the two national parks. The participants understood that the unsustainable use of natural resources could exacerbate their vulnerability to climate change.

A nursery of the species *Faidherbia albida* has been created for the complex at Sena Oura National Park headquarters. These seedlings (from which 9,600 plants should be obtained) will enable to restore the most degraded village areas surrounding the national park, which should allow to alleviate anthropic pressures on this PA.

Future activities will include discussions with authorities in the two countries to initiate the elaboration of a joint management plan for the complex.

o Mali – Burkina Faso: Gourma Elephant Reserve - Sahel Partial fauna Reserve

The process that should lead to the signature of the agreement for the transboundary management of the Gourma-Sahel shared ecosystem, which includes Gourma Elephant Reserve and Sahel Partial fauna Reserve, is underway, and the draft agreement is now ready for signature.

Stakeholders received training on the updated Management Effectiveness Tracking Tool (METT), which includes specific questions related to climate change; this tool will be applied to the two PAs of the pilot site.

The existing master plan for a management plan for Gourma-Sahel was shared during a workshop attended by government representatives, NGOs and park stakeholders. This document highlights the current zoning, which includes the areas where elephants are concentrated, migration corridors, and areas of eco-development i.e. local development areas where activities such as small scale agriculture, forest exploitation or pastoralism are authorized. It shows the importance of adequately establishing a zoning in order not to disturb the elephants migration. This master plan will also integrate climate change aspects and will serve as a basis to elaborate the future joint management plan.

Gourma Elephant reserve during the rainy season ©Bourama Niagate

- The Gambia -Senegal: Niumi National Park - Delta du Saloum National Park

A draft updated management plan for the Niumi Biosphere reserve and for the transboundary protected areas are now available. These plans now integrate climate change aspects, thus contributing towards enhancing the resilience of the transboundary protected area to the negative impacts of climate change.

A social assessment of the social vulnerability to climate change of natural resource dependent human populations living in the Jinack community of the Delta du Saloum in Senegal is currently being conducted by a team of facilitators under the leadership of the NGO *ENDA Energie*. These assessments will allow comparing the level and type of vulnerability to climate change of communities in Senegal and The Gambia (where this assessment has already been done as part of another project) and lead to the development of adaptation action plans.

- Togo – Benin, Burkina Faso, Niger: Oti-Kéran-Mandouri (OKM) – WAP complex

A draft agreement for the management of the ecological migratory routes between OKM and the WAP has been developed and is now available.

Other important activities include a study to map migration corridors between OKM and the WAP, the setting up of a monitoring system to regularly monitor big mammal species, especially elephants, and the establishment of water points to reduce the displacements of pastoralists within the PAs to access water, thus reducing the competition with wildlife.

Upcoming outputs

The following outputs will be produced by the end of the project:

- Recommendations for species monitoring and for transboundary management plans;
- Guidelines for PA managers in the face of climate change;
- Strategies for the best approaches to manage PAs for climate change and policy recommendations at the regional level and for the five PARCC project countries;
- Link to the project results for all protected areas in West Africa on Protected Planet website www.protectedplanet.net);
- Brochure summarising all the main outputs of the PARCC project.

In addition, the final regional meeting of the project is scheduled to take place at the end of the project, in January 2016. It will review and disseminate the key project outputs, and make them relevant to national and regional decision-makers.

A Massive Open Online Course (MOOC) on Protected Areas Management!

This online course deals with conservation challenges in Africa and explores how to improve the management and the governance of protected areas using the best practices edited by the World Commission on Protected Areas (WCPA). The course is in French, subtitled in English.

Watch the teaser here: https://www.youtube.com/watch?v=k26pijss32k

Subscribe for free to the Mooc: https://www.coursera.org/course/apafrique?authMode=signup&action=enroll&sessionId=976261

More information on the content of the course here: http://papaco.org/trainings/

Links to partners' web sites:

UNEP DEPI www.unep.org/depi
UNEP-WCMC www.unep-wcmc.org
IUCN-PACO www.iucn.org/paco
IUCN Global Species Programme www.iucn.org/about/work/programmes/species/
Met Office Hadley Centre www.metoffice.gov.uk/
DICE University of Kent /www.kent.ac.uk/dice/
Birdlife International www.birdlife.org
Durham University www.dur.ac.uk

Project contacts:

Regional project manager:
bora.masumbuko@iucn.org

Global project manager:
elise.belle@unep-wcmc.org

We welcome any contribution relevant to the subject in the form of articles, news, announcements, photos, events, etc.
Thanks in advance for contributing.

Kiang West National Park, The Gambia ©Elise Belle

Download project-related documents at:
www.parcc-web.org