Enhancing the Resilience of Protected Areas to Climate Change in Sierra Leone

PARCC Policy Brief

UNEP WCMC

PARCC WEST AFRICA

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The United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC) is the specialist biodiversity assessment centre of the United Nations Environment Programme (UNEP), the world's foremost intergovernmental environmental organisation. The Centre has been in operation for over 30 years, combining scientific research with practical policy advice.

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Cover picture: Western Area Peninsula National Park, Sierra Leone. © Elise Belle

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Introduction to the project and its relevance to Sierra Leone

PARCC West Africa, officially known as 'Evolution of protected area systems with regard to climate change in the West Africa region' was a full-size GEF project focusing on the impacts of climate change on protected areas (PAs) implemented from 2010 to 2016. The main objective of the project was to develop strategies and tools to increase the resilience of PAs to climate change, and build capacity to implement these new approaches. In the project, we defined resilience of PAs as their ability to cope with climate change impacts in ways that maintain their essential functions and capacity for adaptation.

The United Nations Environment Programme (UNEP) was the implementing agency and UNEP World Conservation Monitoring Centre (UNEP-WCMC) was the executing agency, working in collaboration with IUCN West and Central Africa Programme (IUCN PACO). The project focused on five core countries in West Africa: Chad, Gambia, Mali, Sierra Leone, and Togo, with three additional countries involved in regional training workshops and some of the activities at the transboundary pilot sites. However, all scientific elements of the project, such as the climate projections, vulnerability assessments and conservation planning systems, were completed at the regional scale, covering the entire West African region.

After developing new regional climate projections for West Africa, the vulnerability of species and PAs to climate change was assessed through two complementary methodologies which were later integrated: species distribution models and vulnerability assessments based on the biological traits of species. An analysis of the connectivity of the West African PA network also highlighted the importance of specific PAs and links between PAs. Based on these findings, systematic conservation planning systems were developed for each project country to help inform conservation priorities in the design of new PAs. Studies on the links between PAs, communities and climate change, and of available options for managing and financing PAs to adapt to climate change were also carried out.

Based on the scientific outputs mentioned above, five transboundary pilot sites were selected and activities on the ground implemented. For Sierra Leone, the Greater Gola Transboundary Peace Park between Sierra Leone and Liberia was selected. The project also updated the Management Effectiveness Tracking Tool (METT) with the integration of climate change questions. Importantly, capacity building took place at multiple levels throughout the project lifespan, primarily through national and regional training workshops. Adaptation strategies and policy recommendations were also developed for climate adaptation and management in Sierra Leone (and at the regional level), as well as guidelines for managers of individual PAs in the face of climate change.

Finally, the results of the PARCC project have been integrated into the Protected Planet website, the web interface of the World Database on Protected Areas (WDPA), allowing access to all project outputs and to the results of the vulnerability assessments for each individual PA in Sierra Leone and in the rest of West Africa.

The project thus generated improved information on the effects of climate change on biodiversity and PAs, thereby allowing a better understanding of how to better manage PA, especially transboundary PAs, in the face of climate change.

Link to the PARCC project website: *http://parcc.protectedplanet.net*

Belle E.M.S., Burgess N.D., Misrachi M., et al. 2016. Climate Change Impacts on Biodiversity and Protected Areas in West Africa, Summary of the main outputs of the PARCC project, Protected Areas Resilient to Climate Change in West Africa. UNEP-WCMC, Cambridge, UK.

Summary of scientific results of the project for Sierra Leone

CLIMATE CHANGE PROJECTIONS AND IMPACTS ON ECOSYSTEM SERVICES

Regional climate projections

The UK Met Office Hadley Centre (MOHC) produced a range of plausible climate projections for the West Africa region by using a spatially detailed regional climate model to downscale five global climate model projections. In Sierra Leone, it is projected with high confidence that mean annual temperatures will increase (by an estimated 2.5-4˚C according to regional climate projections) by the end of the 21st century. The highest temperature increases are expected to occur furthest inland, which is less influenced by the regulating influence of the ocean. There is low confidence in projections of an increase in precipitations (from +7 to +20% according to regional climate projections), with the larger increases in coastal areas.

Impacts on ecosystem services

The MOHC also assessed the projected impacts of climate change on ecosystem services, considering three scenarios of future human disturbance and the range of plausible climate projections. It is projected with high confidence that the fraction of broadleaf tree cover and vegetation productivity will increase throughout Sierra Leone as a result of temperature increases, which is expected to lead to an increase in vegetation carbon storage. However, scenarios of future land use show that human disturbance would significantly reduce this increase.

Hartley, A.J., Jones, R. and Janes, T. 2015. Projections of change in ecosystem services under climate change. UNEP-WCMC technical report.
Hartley, A.J., Jones, R. and Janes, T. 2015. Climate Change and Ecosystem Services Fact Sheet: The Gambia. UNEP-WCMC technical report.

CLIMATE CHANGE IMPACTS ON SPECIES

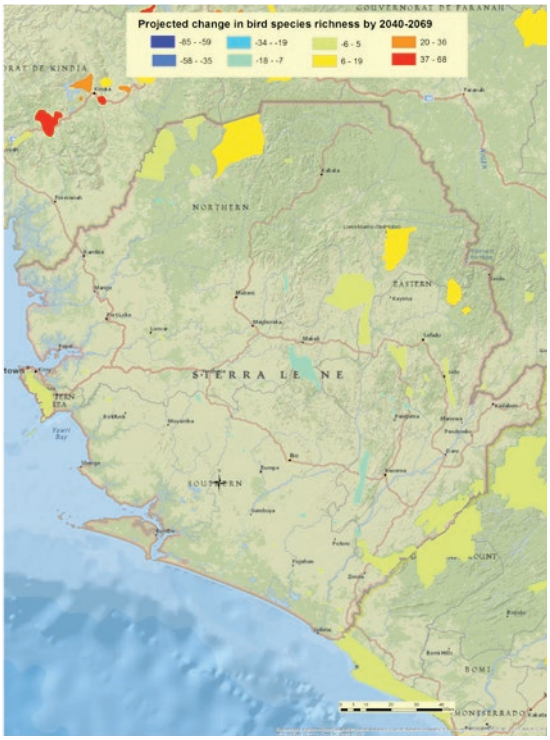
Projections of future species distributions

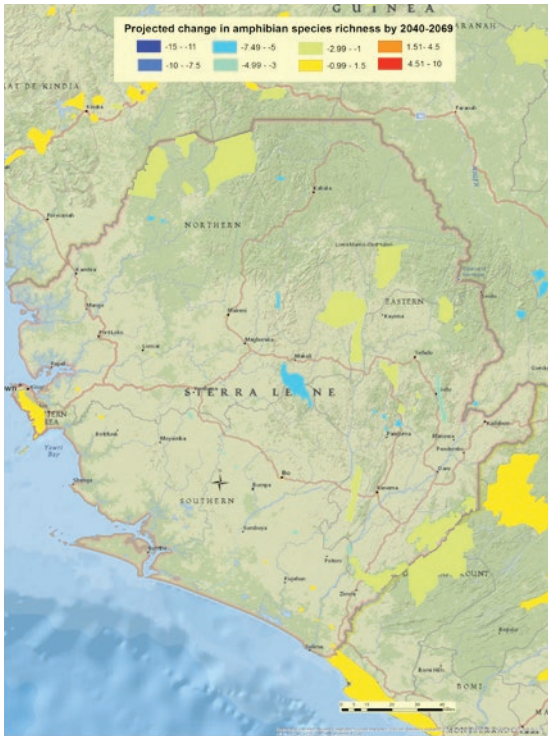
The static and fixed-boundary nature of current PAs compromises their effectiveness in the face of expected species range shifts caused by changing climatic conditions. The PARCC project used models that link species' distributions to biologically important climatic variables that are likely to define species' distributions in order to project future species (birds, mammals and amphibians) distributions across the West African PA network. The project found that by the end of the 21st century, 91% of amphibian, 40% of bird, and 50% of mammal species are projected to have reduced climate suitability across the network, and that individual PAs are likely to both lose and gain species, with species turnover within PAs expected to reach 45.7% for amphibians, 32.4% for birds and 34.9% for mammals by the end of the century.

In Sierra Leone, mammal species richness is projected to change relatively little in tropical forests rich in species, compared to other West African countries (with losses of between 3 and 7 species per PA). Regarding expected changes in bird species richness by the 2040-2069 time period, four bands of impact have been identified, running roughly north-west to south-east across the country, in parallel bands inland from the coast. Little changes (or relatively small losses) in species richness are expected in coastal PAs, whereas greater changes are expected in the north-east of the county, which is expected to even show an increase in bird species richness (up to between 6 and 19 species). Finally, projected changes in amphibian diversity are variable across the country (between -7.5 and +1.5 species), but expected to be overall rather small.

All the results showing the expected species turnover within each PA as well as the list of species for which a change in climate suitability is expected can be found at ***http://parcc.protectedplanet.net/sites/***.

Baker D.J. and Willis S.G. 2015. Projected Impacts of Climate Change on Biodiversity in West African Protected Areas. UNEP-WCMC technical report.
Durham University. 2015. Integrating species distribution models and trait data to inform conservation planning. UNEP-WCMC technical report.





Median projected change in mammal, bird and amphibian species richness in individual PAs of Sierra Leone between the present and the 2040-2069 future time period

Species vulnerability to climate change

A climate change vulnerability assessment of West African species was carried out by considering the combination of exposure (extent to which a species' physical environment will change due to climate change), sensitivity (lack of potential for a species to persist *in situ*) and low adaptability (species' inability to avoid the negative impacts of climate change through dispersal and/or micro-evolutionary change). The assessment included all the terrestrial and freshwater vertebrates of West Africa (183 amphibians, 1,172 birds, 517 freshwater fish, 405 mammals and 307 reptiles). Species that were identified as both sensitive and poorly able to adapt to climate change, and that were among the most severely exposed to climatic changes were described as 'climate change vulnerable'. Although the methodology does not provide a definitive indication of vulnerability, but a relative measure that may be compared between species within a group, these results can help prioritize among species and locations to ensure the most efficient and effective use of resources when securing species survival in the face of climate change.

Furthermore, it is recommended that when planning for future conservation and determining geographic priorities, planners should focus more on locations that contain comparatively high numbers of climate change vulnerable and/or threatened species. Such a strategy is likely to have the greatest positive impact per unit effort, and should address the conservation of the greatest number of species. However, areas with relatively low species richness and low numbers of vulnerable species should not be neglected.

For Sierra Leone, the assessment showed that the country was particularly rich in species, including threatened species, especially amphibians, birds, freshwater fish and threatened mammals. The Guinean Forest region, which ranges from Sierra Leone in the west to southern Nigeria in the east, presents a very high species richness and supports several threatened species from most taxonomic groups. Furthermore, the coastal and forest regions of Sierra Leone (as well as Liberia, Cote d'Ivoire and Nigeria) contain the highest proportions of bird species identified as climate change vulnerable by the 2040-2069 time period. Finally, it was suggested that one area where transboundary conservation efforts would be particularly valuable is along the borders of Guinea, Sierra Leone, Liberia and Cote d'Ivoire.

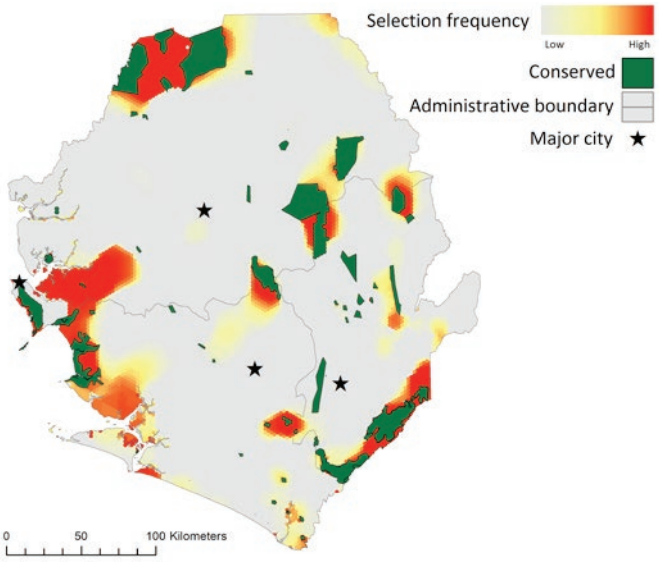
All the results showing the percentage and the list of species considered vulnerable to climate change for each PA can be found at ***http://parcc.protectedplanet.net/sites/***.

Carr, J.A., Hughes, A.F. and Foden, W.B. 2014. A Climate Change Vulnerability Assessment of West African Species. UNEP-WCMC technical report.

IDENTIFICATION OF PRIORITY AREAS FOR CONSERVATION

Systematic conservation planning is the most widely used approach for designing PA networks. Based on a list of important conservation features to protect (such as species, habitats and ecological processes), their distributions are mapped and targets are set for how much of each feature should be protected. A gap analysis is then carried out to measure the extent to which the existing PA system meets the targets, and priority areas for conservation are identified.

In Sierra Leone, 5.8 % of the territory is included in PAs and 0.7% is included in currently unprotected Important Bird and Biodiversity Areas (IBAs), according to the data included in the World Database on Protected Areas (WDPA). The conservation features considered included all ecoregions and vegetation types, as well as the present distribution of all amphibian, bird and mammal species and future projected distribution of threatened species found in Sierra Leone. The gap analysis showed that the existing national PA system meets targets for only 11.7% of conservation features and is failing to meet targets for almost all species considered, especially amphibians. Most of the priority areas for protection were identified around existing PAs and in the central and western parts of the country. Therefore, given the important gaps identified, it is recommended that Sierra Leone expands its national PA system, which would need to cover 19.7% of the territory in order to achieve all conservation targets.



Conservation priority areas identified in Sierra Leone for meeting conservation targets, whilst avoiding areas with high human population density where possible

Smith R.J. 2015. Gap Analysis and Spatial Conservation Prioritisation in Sierra Leone. UNEP-WCMC technical report.

Pilot activities implemented in Sierra Leone

In Sierra Leone, the site selected for pilot activities was the transboundary area between Gola Rainforest National Park (GRNP) in Sierra Leone and the Gola Forest National Park (GFNP) in Liberia, which will become part of the Greater Gola Transboundary Peace Park (GGTPP). The planned activities, as defined by the representatives from Sierra Leone, were all geared towards contributing to enhancing the resilience of the transboundary area to the negative impacts of climate change. These activities included:

1. **Operationalisation of the existing transboundary MoU and signing of a transboundary collaboration agreement.** This included technical consultations between the Forestry Development Authorities of Liberia, the Forestry Division of Sierra Leone, and other partners, and a Transboundary Collaboration Agreement.
2. **Transboundary chiefdom meetings.** A meeting with local communities was planned to raise awareness about the 2011 Mano River Union Agreement and the process leading to the GGTPP creation.

Furthermore, the METT (Management Effectiveness Tracking Tool), revised within the framework of the PARCC project to include questions related to climate change, was meant to be applied to the two transboundary PAs. Unfortunately, none of the planned activities could be implemented during the project, partly due to the Ebola crisis and the fact that the National Park on the Liberian side had not yet been gazetted.

Adaptation strategy and policy recommendations for Sierra Leone

The aim of the proposed strategy, which was developed in consultation with country representatives, is to increase the resilience of PAs in Sierra Leone to the effects of climate change. Its objectives are in line with Sierra Leone's vision for the National Biodiversity Strategy and Action Plan 2003, and its mission addresses the following three strategic areas: (i) ongoing conservation activities; (ii) the anticipation of climate change in decision-making on the creation, expansion and connection of PAs; and, (iii) the environment for a successful implementation of the strategy.

The national strategy for Sierra Leone comprises 3 Goals, 11 Objectives, and 38 specific actions.

Strategic Goal 1: Strengthen ongoing conservation plans and programs and their implementation by improving the performance of existing PAs and finalise the designation and regulation of areas identified as requiring protection, building inter alia on the National Protected Areas Act (NPAA) adopted in 2012 and the Conservation Trust Fund.

- **Objective 1.1:** Assess existing PAs and ensure their sustainable and effective management so as to improve the achievement of the conservation objectives for which they were created.
- **Objective 1.2:** Accelerate and complete the designation and integration of areas identified as requiring protection in the national PA system.
- **Objective 1.3:** Identify biodiversity components and related ecosystem services important for Sierra Leone and adopt measures for their protection as needed, bearing in mind the Sustainable Development Goals and the new perspectives in the conservation of biological diversity, adaptation to climate change and land degradation issues.
- **Objective 1.4:** Conduct a gap analysis using an updated list of conservation features, i.e., components of biodiversity that should be protected, and prioritize them bearing in mind the threats posed to them and their ecological/biological and socioeconomic importance in the country.

Strategic Goal 2: Anticipate and respond to ongoing and future environmental changes, focusing on changes caused by climate change.

- **Objective 2.1:** Increase knowledge on observed and projected impacts of climate change on biodiversity and associated ecosystem services Sierra Leone.
- **Objective 2.2:** Identify and appropriately manage climate refugia, areas that are resilient to climate change, and areas that will include the future geographical distribution of species displaced by climate change.
- **Objective 2.3:** Bearing in mind the possible shifts in species ranges, develop, re-evaluate, restore and/or maintain ecological corridors and stepping stones between PAs, taking into account climate change impacts.

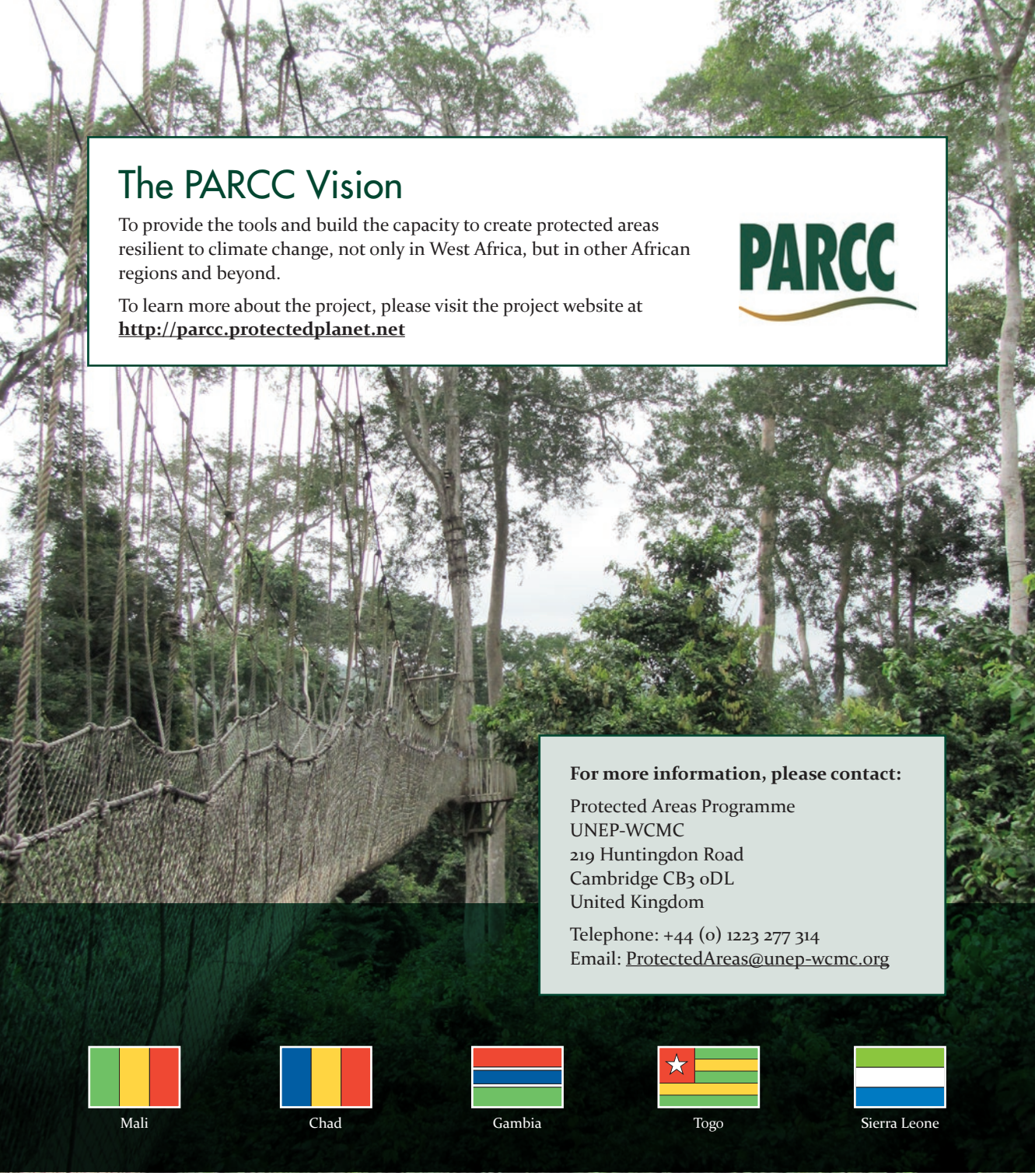
Strategic Goal 3: Create and/or strengthen the enabling environment for the successful implementation of the strategy.

- **Objective 3.1:** Integrate this strategy on PAs and climate change in broader national strategies and plans.
- **Objective 3.2:** Strengthen human, financial, institutional, legislative and technological capacities.
- **Objective 3.3:** Strengthen communication, education, research and awareness on the issues of PAs, the impact of climate change and adaptation to climate change.
- **Objective 3.4:** Strengthen coordination and cooperation, including transboundary cooperation.

Mulongoy, J. 2015. National strategy and policy recommendations for the planning and management of protected areas in the face of climate change: Sierra Leone. UNEP-WCMC technical report.

Conclusions for Sierra Leone

- **The climate of Sierra Leone has been observed to be changing in recent decades, with some of these changes clearly attributable to climate change**. Regional climate projections have shown that there is a high level of confidence that temperatures will increase in the country, but there is little consensus on the direction and magnitude of potential changes in rainfall, with a high variability between projections. These changes could have significant impacts on ecosystem services, with an expected increase in tree cover and vegetation productivity, although human disturbance would significantly reduce this increase.
- **Biodiversity and PAs are being affected by climate change in Sierra Leone, and some PAs appear to be more vulnerable than others to its impacts, with different patterns emerging according to the taxa considered.** Although, a relatively small proportion of amphibian, bird and mammal species are expected to experience a decline in climate suitability by the end of the century compared to other West African countries, a non insignificant number of species found in Sierra Leone (including amphibians, birds, freshwater fish, mammals and reptiles) have been identified as being vulnerable to climate change based on their specific biological traits. Of these species, those that have been assessed as globally threatened should be considered as priorities for conservation.
- **PA management should be improved in order to enhance the resilience of PAs to climate change in Sierra Leone, and the PA network should be extended.** PAs in Sierra Leone are facing a number of anthropogenic threats. It is therefore crucial to first improve the management effectiveness of existing PAs to give them a better chance to be able to cope with climate change impacts. For species identified as vulnerable to climate change, specific management options are to facilitate their dispersal and to identify sites of suitable climate persisting within their current ranges. In addition, in order to fully protect all essential conservation features in Sierra Leone, it is recommended that the existing national PA network is significantly extended.



The PARCC Vision

To provide the tools and build the capacity to create protected areas resilient to climate change, not only in West Africa, but in other African regions and beyond.

To learn more about the project, please visit the project website at **http://parcc.protectedplanet.net**

PARCC

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