United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC)

GEF West Africa PPG Baseline Study A: Identifying current data gaps and status of data acquisition for Climate Change and Protected Areas in West Africa

Final Report

English

Prepared by UNEP-WCMC on September 15th, 2009

The UNEP World Conservation Monitoring Centre (UNEP-WCMC) was established in 2000 as the biodiversity assessment and policy implementation

arm of United Nations Environment Programme (UNEP). The roots of the organisation go back to 1979, when it was founded as the IUCN Conservation Monitoring Centre. We are the custodians of the World Database on Protected Areas (WDPA), a joint project with IUCN – The World Conservation Union and their World Commission on Protected Areas. The WDPA is the only global database of marine and terrestrial protected areas, comprising GIS spatial data and spatial attribute data, in existence. It is used to report the progress towards targets such as United Nations (UN) Millennium Development Goal 7, the Convention on Biological Diversity (CBD), UN List of Protected Areas as well as providing support to policy and decision managers.

'GEF West Africa PPG Baseline Study A: Identifying current data gaps and status of data acquisition for Climate Change and Protected Areas in West Africa', prepared by Lucy Fish, WDPA Data Manager – Protected Areas and Bioinformatics Programme, with funding from Global Environment Facility (GEF) via UNEP.

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Baseline Study A

Executive Summary

UNEP-WCMC has received funds from the Global Environment Facility (GEF), through UNEP, to prepare a project entitled "*Evolution of Protected Area systems with regard to climatic, institutional, social, and economic conditions in the West Africa Region*". The proposed project will run over the period 2009-2015, and will work in Chad, Gambia, Mali, Sierra Leone and Togo. The aim of this study is to identify the current gaps and status of data acquisition of the available spatial (GIS) datasets on protected areas (PA) and impacts of climate change in the project region. By identifying these 'data gaps' UNEP-WCMC and the project partners will be able to focus their investigation on the acquisition and verification of data in those specific countries or regions prior to the inception of the other baseline studies.

The overall goal of the baseline study is to compile a GIS geodatabase containing spatial (boundary), attribute and available metadata about all data layers collated on protected areas, conservation priority areas and climate change for the study area. During this study a number of key tasks were carried out such as: collation of existing in-house datasets, review of dataset coverage and completeness, identification of possible data sources or reviewers, data requests to partner organizations and recommendations to aid future project development.

UNEP-WCMC, as custodians of the World Database on Protected Areas, has established expertise in the design and management of protected areas data. From examining the WDPA, we found that both Chad and Mali have higher number of protected areas represented with boundary data and an increased recorded coverage of protection. Whilst both Togo and Sierra Leone have the highest number of recorded sites but relatively low recorded coverage of protection. After examining the WDPA data improvement history for the study area, we concluded that in-country capacity issues have prevented effective and continuous management of protected areas information. Therefore acquisition of up to date spatial (GIS) data direct from the government may not be possible immediately. We recommend that a review of the existing information held in the WDPA with national experts (and mapping support from UNEP-WCMC) may yield a dataset suitable for future project phases. This review could be conducted through a regional workshop.

A number of key biodiversity and conservation priority datasets were collated from in-house systems and requested from external partners. However a number of these datasets such as species richness and key biodiversity areas did not arrive within the duration of the baseline study . In addition, we found that acquisition of a consistent and complete dataset on climate change was a challenge. We concluded that acquisition of climate data will continue to be a significant challenge in West Africa in both the short to long term, if the capacity needs of in-country institutions are not met.

During this study a number of key points of contact within possible collaborating organisations and institutions were gathered. Our overall recommendation is that the project will directly benefit from collaboration with external partners and institutions that have the in-country contacts (to act as data sources/reviewers) and/or the technological and research expertise in project areas such as climate modelling, development of geospatial assessment tools and study of human impacts on the environment.

Identifying current data gaps and status of data acquisition for the Climate Proofing Protected Areas in West Africa project

Baseline Study A

Draft Report

1. Study Objective

The aim of this study is to identify the current gaps and status of data acquisition of the available spatial (GIS[1]) datasets on protected areas (PA) and impacts of climate change in the region. The work will cover both existing protected areas, those currently in the process of being declared and areas already proposed as protected areas, including single-country and transboundary sites. Producing the study outcomes will involve the collection and collation of existing information, but will not require new fieldwork or data collection.

By identifying these 'data gaps' UNEP-WCMC and the project partners will be able to focus their investigation on the acquisition and verification of data in those specific countries or regions prior to the inception of the other baseline studies.

2. Project Objective

UNEP-WCMC has received funds from the Global Environment Facility (GEF), through UNEP, to prepare a project entitled "*Evolution of Protected Area systems with regard to climatic, institutional, social, and economic conditions in the West Africa Region*".

The objective is to ensure the conservation and sustainable management of representative ecosystems and biodiversity by assisting countries to assess climate change related risks, develop guidelines for adaptation, and build capacity for mainstreaming risk based adaptation in protected areas. The specific aims are a) undertake vulnerability assessment and develop risk reduction strategies for existing PA systems, b) undertake gap analysis studies and spatial planning related to the extension of PA networks, and c) capacity building, awareness raising and policy operationalisation.

3. Study Region

The project will run over the period 2009-2015, and will work in Chad, Gambia, Mali, Sierra Leone and Togo.

4. Study Outcomes

1. Collate definitive set of baseline GIS data detailing the existing protected areas in the study region from the World Database on Protected (WDPA)
2. Collation of additional baseline GIS dataset detailing existing plans or proposals for protected areas and the extents of other conservation priority areas

[1] Geographical Information System: A system of computer hardware and software used for storage, retrieval, mapping, and analysis of geographic data that is references to a map projection in an earth coordinate system

3. Collation of existing GIS layers and information on the impacts of climate change

5. Study Tasks

The overall goal of the baseline study is to compile a GIS geodatabase containing spatial (boundary), attribute and available metadata about all data layers collated on protected areas, conservation priority areas and climate change for the study region. Under each study outcome the following tasks should be carried out

1

1) Extract of existing national and international protected areas from the World Database on Protected Areas (WDPA), including transboundary protected areas.
2) Identification of incomplete spatial and attribute records ('data gaps') on protected areas currently available in the WDPA.
3) Review and identification of data contact points for data verification and acquisition

2

1) Collate existing information on conservation priority areas such as Key Biodiversity Areas (KBAs), Important Bird Areas (IBAs), traditional conservation areas, community forests, Biodiversity Hotspots etc
2) Review and identification of data contact points for data acquisition
3) Identification of existing opportunities to strengthen existing transboundary PA networks or conservation priority areas

3

1) Collate existing information on scenarios of climate change and potential impact upon: rainfall, sea level, habitat/vegetation, wildlife demographics and human population.
2) Review and identification of data contact points for data acquisition
3) Identification of data gaps within available data and suggested approaches for future data acquisition
4) Production of a range of maps using data layers collated so far, with the following themes: protected areas and human population, biodiversity and conservation priority areas, keys areas of vulnerability (e.g. climate change)

Hard copy maps of the West Africa region will be prepared, with country level maps being available as digital image files (jpeg, tiff). An outline of the map documents and digital image files created are outlined in Table 11.

6. Outline of Data Collated

The GIS software used to store and map the data collated for this study is ESRI ArcGIS 9.3. The map documents (.mxd) used to prepare the regional and country level maps will be made available. All data collated during the study (that can be freely distributed to third parties) was stored in a Personal Geodatabase or in the case of Raster formats, located within a hierarchical folder system under the main project folder, as shown in Figure 1. An outline of the data collated, its location in the main project folder, its data format, the data source and whether metadata is available is outlined in Table 1. In addition, datasets highlighted in yellow have been used in map creation.

During the study a number of external biodiversity and climate change datasets were requested from external partners. Unfortunately not all datasets arrived during the 'Study A' timeline as some were not currently publicly available and others had restrictions that prevented their redistribution to third

Figure 1 Data storage hierarchy used for this study

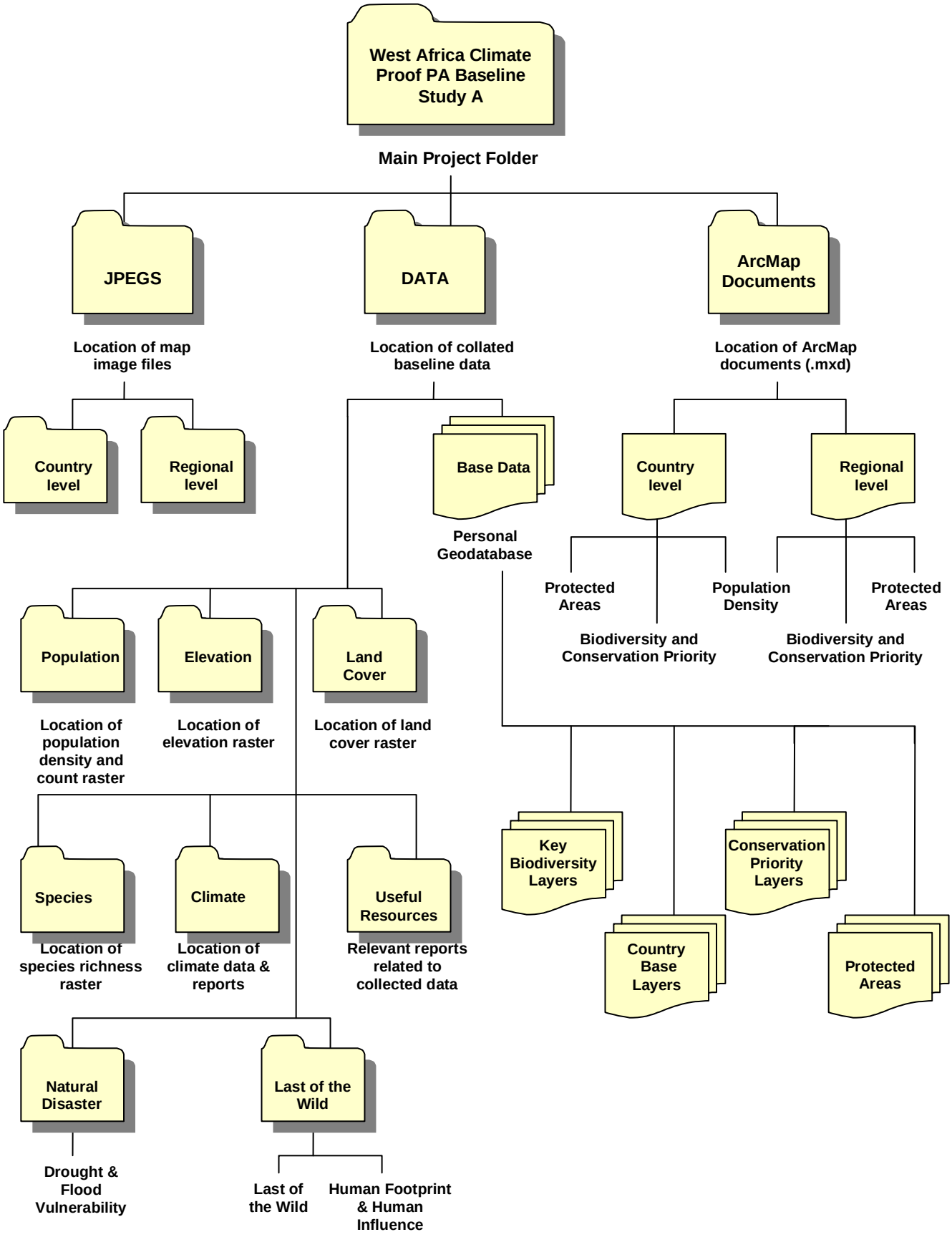


Table 1 Outline of data and resources collated during study

Dataset Theme	Dataset Name	Location of Dataset	Description of Dataset	Data Source	Data Format	Metadata available?	Terms of Use
Protected Areas	WDPApnt_2009_WAfrica	WESTAFRICA_CLIMATEPROOFPA_BASELINESTUDYA\DATA\BASE_DATA	National and International Protected Areas locational (centroid) data for Mali, Gambia, Chad, Sierra Leone, Togo, Burkina Faso, Cote d'Ivoire and Ghana from the World Database on Protected Areas (WDPA) Annual Release 2009.	World Database on Protected Areas (WDPA) Annual Release 2009 (web download version), February 2009. The WDPA is a joint product of UNEP and IUCN, prepared by UNEP-WCMC, supported by IUCN WCPA and working with Governments, the Secretariats of MEAs and collaborating NGOs. For further information: protectedareas@unep-wcmc.org	Feature Dataset within Personal Geodatabase	Yes	Yes in metadata
Protected Areas	WDPApol_2009_WAfrica	WESTAFRICA_CLIMATEPROOFPA_BASELINESTUDYA\DATA\BASE_DATA	National and International Protected Areas boundary data for Mali, Gambia, Chad, Sierra Leone Togo, Burkina Faso, Cote d'Ivoire and Ghana from the World Database on Protected Areas (WDPA) Annual Release 2009.			Yes	Yes in metadata
Protected Areas	WDPAsource_2009	WESTAFRICA_CLIMATEPROOFPA_BASELINESTUDYA\DATA\BASE_DATA	Data source information for National and International Protected Areas from the World Database on Protected Areas (WDPA) Annual Release 2009. Link to feature datasets via the metadataid field.		Table within Personal Geodatabase	Yes	Yes in metadata
Protected Areas	WestAfrica_PA_from_WDPA_2009.xls	WESTAFRICA_CLIMATEPROOFPA_BASELINESTUDYA\DATA	Protected areas covering study area extracted from the WDPA. Includes key attribute fields and source information. Workbook contains: Regional protected areas table covering all countries, individual country sheets and summary statistics per country by different categories such as legal status, convention, IUCN category. The workbook also contains a table of existing Transboundary Protected Areas extracted from the UNEP-WCMC Transboundary Protected Areas Inventory (30 April 2007)	World Database on Protected Areas (WDPA) Annual Release 2009 (web download version), February 2009. The WDPA is a joint product of UNEP and IUCN, prepared by UNEP-WCMC, supported by IUCN WCPA and working with Governments, the Secretariats of MEAs and collaborating NGOs. For further information: protectedareas@unep-wcmc.org	MS Excel Workbook	No	Yes
Protected Areas	IUCN_cat_guidelines_final_2008	WESTAFRICA_CLIMATEPROOFPA_BASELINESTUDYA\DATA\USEFUL_RESOURCES	Revised guidelines on the assigning of IUCN protected area management categories including the new IUCN protected area definition.	Dudley, N. (Editor) (2008). Guidelines for Applying Protected Area Management Categories. Gland, Switzerland: IUCN. x + 86pp.	PDF		
Protected Areas	Transboundary_Peace_Park_SLE_May2009_Press_release.html	WESTAFRICA_CLIMATEPROOFPA_BASELINESTUDYA\DATA\USEFUL_RESOURCES	Press release on the launch of the Sierra Leone-Liberia Trans-boundary Peace Park Project in May 2009. The Peace Park unites the Gola Forest Reserve in Sierra Leone (75,000 ha) and the Lofa and Foya Forest Reserves in Liberia (80,000 ha and 100,000 ha respectively), with additional forest to provide corridors for the movement of wildlife between them.	http://www.birdlife.org/news/pr/2009/05/peace_park_west_africa_pr.html	HTML		

Biodiversity	GlobCover2_2_WAfricaClip_2004_2006	DATA\LANDCOVER	Global land cover dataset has been clipped to West Africa extent. Import Globcover_Global_Legend.lyr into layer symbology to assign land cover types to raster layer. This global Land Cover map is derived by an automatic and regionally-tuned classification of a MERIS FR time series (2004 – 2006). Its 22 land cover classes are defined with the UN Land Cover Classification System (LCCS). See accompanying documentation for more information.	Source Data: © ESA / ESA Globcover Project, led by MEDIAS-France/Postel	Raster (Tiff) layer	No - see accompanying documentation	
Biodiversity	CI_Biodiversity_Hotspots	WestAfrica_ClimateProofPA_BaselineStudyA\DATA\BASE_DATA	The biodiversity hotspots are regions known to hold especially high numbers of species found nowhere else, yet their remaining habitat combined covers a little more than two percent of Earth's land surface. This dataset has been clipped to the West Africa extent.	Conservation Synthesis, Center for Applied Biodiversity Science at Conservation International, 2004.	Feature Dataset within Personal Geodatabase	Yes	Yes in metadata
Biodiversity	IUCN Species Richness Grids	WestAfrica_ClimateProofPA_BaselineStudyA\DATA\SPECIES	The low resolution of the Species Richness grid prevents display at a county level.		Raster (Tiff) layer	Yes	Yes
Biodiversity and Conservation Priority	KBA_guidlines_2007_IUCN.pdf	WestAfrica_ClimateProofPA_BaselineStudyA\DATA\USEFUL_RESOURCES	These guidelines draw on cutting-edge science as well as methods developed in a number of different organizations, and are already implemented as Important Bird Areas and Important Plant Areas in more than 170 countries. The Key Biodiversity Areas framework provides a bottom-up approach to extend the bird and plant work to date to identify globally significant sites for biodiversity.	Langhammer, P.F., Bakarr,M.I., Bennun, L.A., Brooks, T.M., Clay, R.P., Darwall,W., De Silva, N., Edgar, G.J., Eken, G., Fishpool, L.D.C.,3 Fonseca, G.A.B. da, Foster, M.N., Knox, D.H., Matiku, P., Radford, E.A., Rodrigues, A.S.L., Salaman, P., Sechrest, W., and Tordoff, A.W. (2007). Identification and Gap Analysis of Key Biodiversity Areas: Targets for Comprehensive Protected Area Systems. Gland, Switzerland: IUCN.	PDF		
Conservation Priority	WWF_G200_Terr_ecoregions	WestAfrica_ClimateProofPA_BaselineStudyA\DATA\BASE_DATA	WWF's Global 200 is a first attempt to identify a set of ecoregions whose conservation would achieve the goal of saving a broad diversity of the Earth's ecosystems. These ecoregions include those with exceptional levels of biodiversity, such as high species richness or endemism, or those with unusual ecological or evolutionary phenomena. This dataset contains the Terrestrial G200 ecoregions and has been clipped to the West Africa extent.	Olson, D. M. and E. Dinerstein. The Global 200: Priority ecoregions for global conservation. (PDF file) Annals of the Missouri Botanical Garden 89:125-126. See Olson_Dinerstein_2002_WWF_G200_Missouri_BotGard in WestAfrica_ClimateProofPA_BaselineStudyA\DATA\USEFUL_RESOURCES.	Feature Dataset within Personal Geodatabase	Yes	Yes
Conservation Priority	Olson_etal_2000_WWF_G200_Bioscience	WestAfrica_ClimateProofPA_BaselineStudyA\DATA\USEFUL_RESOURCES	This paper outlines the delineation and selection of the WWF G200 ecoregions.	Olson, D. M., Dinerstein, E., et al (2000) Terrestrial Ecoregions of the World: A New Map of Life on Earth, Bioscience. Vol. 51. No. 11	PDF		
Conservation	IBA_WAfrica	Cannot be distributed to third	Important Bird Areas (IBAs) are a particularly	BirdLife International (2009). West	Shapefile	No	

Priority		parties only available direct from BirdLife International	effective way of identifying conservation priorities. A site is recognised as an IBA only if it meets certain criteria, based on the occurrence of key bird species that are vulnerable to global extinction or whose populations are otherwise irreplaceable.	African Important Bird Area (IBA) data extracted from the World Bird Database on 4th June 2009. For further information please visit www.birdlife.org.			
Conservation Priority	ltw_africa_geo	WestAfrica_ClimateProofPA_BaselineStudyA\DATA\LAST_OF_THE_WILD	The Last of the Wild represent the 10% wildest areas in each biome. Continental scale dataset for Africa has been downloaded for this study	Last of the Wild Data Version 2, 2005 (LWP-2): Global Last of the Wild (LTW). Wildlife Conservation (WCS) and Center for International Earth Science Information Network (CIESIN). Downloaded from http://sedac.ciesin.columbia.edu/wildareas/	Shapefile (zipped)	Yes - see accompanying documentation	Yes in metadata
Climate Change	UNDP Climate Change Profiles and associated data contained within respective Country folders.	WestAfrica_ClimateProofPA_BaselineStudyA\DATA\CLIMATE	The UNDP climate change country profiles were available for Chad, Sierra Leone, Gambia, Mali and Togo. The profiles were funded jointly between the National Communications Support Program (NCSP) and the UK Dept. for International Development (DfID) and were developed to address the climate change information gap in many developing countries by making use of existing climate data to generate country-level data plots from the most up-to-date climate observations and the multi-model projections from the WCRP CMIP3 archive.	McSweeney, C., New, N. and Lizcano, G. (2008) 'UNDP Climate Change Profiles', School of Geography and Environment, University of Oxford and Tyndall Centre for Climate Change Research. Downloaded from http://country-profiles.geog.ox.ac.uk/	PDF reports and underlying data in txt format.	Yes – see accompanying documentation	None specified
Climate Change	Hole etal_2009.Clch_and_PA_networks_EcolLettMay09.pdf	WestAfrica_ClimateProofPA_BaselineStudyA\DATA\CLIMATE	The study investigated the projected impacts of climate change on a continent wide protected area network. By using modelled projected shifts in the distributions of sub-Saharan Africa's entire breeding avifauna, it showed that species turnover across the continents Important Bird Area (IBA) network is likely to vary regionally and will be substantial at many sites (> 50% at 42% of IBAs by 2085 for priority species). It demonstrated that rigorously defined networks of protected areas can play a key role in mitigating the worst impacts of climate change on biodiversity.	Hol, D.G., et al (2009) 'Projected impacts of climate change on a continent-wide protected area network' Ecology Letters, 12:420 – 431	PDF		
Climate Change and Human Population	clim-migr-report-june09_final.pdf	WestAfrica_ClimateProofPA_BaselineStudyA\DATA\CLIMATE	This report written was written by researchers at CIESIN, the United Nations University, and CARE International. The report explores how climate change is already causing people to leave their homes, and details some of the specific ways displacement may occur over the next decades.	In search of shelter: mapping the effects of climate change on human migration © by 2008 Cooperative for Assistance and Relief Everywhere, Inc. (CARE). Used by permission. http://www.careclimatechange.org http://www.ciesin.columbia.edu/documents/clim-migr-report-june09_final.pdf	PDF		Yes in report
Human	hfp_Africa_geo_grid	WestAfrica_ClimateProofPA_B	The Human Footprint Index expresses as a	Last of the Wild Data Version 2, 2005	Raster (Grid)	Yes - see	Yes in

Population and Conservation Priority		aselineStudyA\DATA\LAST_OF_THE_WILD	percentage the relative human Influence in every biome on the land's surface. Continental scale dataset for Africa has been downloaded for this study.	(LWP-2): Global Human Footprint data set (HF). Wildlife Conservation (WCS) and Center for International Earth Science Information Network (CIESIN). Downloaded from http://sedac.ciesin.columbia.edu/wildareas/	(zipped)	accompanying documentation	metadata
Human Population and Conservation Priority	hii_Africa_geo_grid	WestAfrica_ClimateProofPA_BaselineStudyA\DATA\LAST_OF_THE_WILD	The Human Influence Index (HII) is a measure of direct human influence on terrestrial ecosystems. Continental scale dataset for Africa has been downloaded for this study	Last of the Wild Data Version 2, 2005 (LWP-2): Global Human Influence Index (HII). Wildlife Conservation (WCS) and Center for International Earth Science Information Network (CIESIN). Downloaded from http://sedac.ciesin.columbia.edu/wildareas/	Raster (Grid) (zipped)	Yes - see accompanying documentation	Yes in metadata
Human Population	af_gpwfe_pcount_05_wrk_25 - 2005 af_gpwfe_pcount_10_wrk_25 - 2010 af_gpwfe_pcount_15_wrk_25 - 2015 af_gpwfe_pcount_00_wrk_25 - 2000 af_gpwfe_pcount_90_wrk_25 - 1990 af_gpwfe_pcount_95_wrk_25 - 1995	WestAfrica_ClimateProofPA_BaselineStudyA\DATA\POPULATION\GPW_V3_COUNT	Gridded Population of the World, Version 3 (GPWv3) consists of estimates of human population for the years 1990, 1995, and 2000 by 2.5 arc-minute grid cells and associated datasets dated circa 2000. In addition there are projected future estimates for 2010 and 2015. For this study population count grids (raw counts) were downloaded for continental Africa for years: 1990, 1995, 2000, 2005, 2010, 2015.	Center for International Earth Science Information Network (CIESIN), Columbia University; and Centro Internacional de Agricultura Tropical (CIAT). 2005. Gridded Population of the World Version 3 (GPWv3): Population Grids. Palisades, NY: Socioeconomic Data and Applications Center (SEDAC), Columbia University. Available at http://sedac.ciesin.columbia.edu/gpw. (Downloaded May 2009).[2]	Raster (Grid) (zipped)	Yes - see accompanying documentation	Yes in metadata
Human Population	af_gpwfe_pdens_05_wrk_25 - 2005 af_gpwfe_pdens_10_wrk_25 - 2010 af_gpwfe_pdens_15_wrk_25 - 2015 af_gpwfe_pdens_00_wrk_25 - 2000 af_gpwfe_pdens_90_wrk_25 - 1990 af_gpwfe_pdens_95_wrk_25 - 1995	WestAfrica_ClimateProofPA_BaselineStudyA\DATA\POPULATION\GPW_V3_DENSITY	Gridded Population of the World, Version 3 (GPWv3) consists of estimates of human population for the years 1990, 1995, and 2000 by 2.5 arc-minute grid cells and associated datasets dated circa 2000. In addition there are projected future estimates for 2010 and 2015. For this study population density grids (per square km) were downloaded for continental Africa for years: 1990, 1995, 2000, 2005, 2010, 2015.	Center for International Earth Science Information Network (CIESIN), Columbia University; and Centro Internacional de Agricultura Tropical (CIAT). 2005. Gridded Population of the World Version 3 (GPWv3): Population Density Grids. Palisades, NY: Socioeconomic Data and Applications Center (SEDAC), Columbia University. Available at http://sedac.ciesin.columbia.edu/gpw. (Downloaded May 2009).[3]	Raster (Grid) (zipped)	Yes - see accompanying documentation	Yes in metadata
Human	gddrgmrt	WestAfrica_ClimateProofPA_B	Global Drought and Flood Mortality Risks and	Center for Hazards and Risk Research	Raster (Grid)	Yes	Yes in

[2] For future estimates use the following source: Center for International Earth Science Information Network (CIESIN), Columbia University; United Nations Food and Agriculture Programme (FAO); and Centro Internacional de Agricultura Tropical (CIAT). 2005. Gridded Population of the World: Future Estimates, 2015 (GPW2015): Population Grids. Palisades, NY: Socioeconomic Data and Applications Center (SEDAC), Columbia University. Available at http://sedac.ciesin.columbia.edu/gpw. (Downloaded May 2009).

[3] For future estimates use the following source: Center for International Earth Science Information Network (CIESIN), Columbia University; United Nations Food and Agriculture Programme (FAO); and Centro Internacional de Agricultura Tropical (CIAT). 2005. Gridded Population of the World: Future Estimates, 2015 (GPW2015): Population Density Grids. Palisades, NY: Socioeconomic Data and Applications Center (SEDAC), Columbia University. Available at http://sedac.ciesin.columbia.edu/gpw. (Downloaded May 2009).

Population		aselineStudyA\DATA\NATURAL_DISASTER\DROUGHT_VULNERABILITY	Distribution is a 2.5 by 2.5 minute grid of global drought and flood mortality risks. Gridded Population of the World (GPW) Version 3 (beta) data provide a baseline estimation of population per grid cell from which to estimate potential mortality risks due to drought and flood hazard. Mortality loss estimates per hazard event are calculated using regional, hazard-specific mortality records of the Emergency Events Database (EM-DAT) that span the 20 years between 1981 and 2000.	(CHRR) & Center for International Earth Science Information Network (CIESIN) at Columbia University; International Bank for Reconstruction and Development/The World Bank (2005) 'Global Drought Mortality Risks and Distribution', Version 1.0, CHRR, Columbia University. Downloaded from 'Natural Disaster Hotspots – A Global risk Analysis' website at http://www.ldeo.columbia.edu/chrr/research/hotspots/coredata.html	(zipped)		metadata
Human Population	gdfldmrt	WestAfrica_ClimateProofPA_BaselineStudyA\DATA\NATURAL_DISASTER\FLOOD_VULNERABILITY		Center for Hazards and Risk Research (CHRR) & Center for International Earth Science Information Network (CIESIN) at Columbia University; International Bank for Reconstruction and Development/The World Bank (2005) 'Global Flood Mortality Risks and Distribution', Version 1.0, CHRR, Columbia University. Downloaded from 'Natural Disaster Hotspots – A Global risk Analysis' website at http://www.ldeo.columbia.edu/chrr/research/hotspots/coredata.html	Raster (Grid) (zipped)	Yes	Yes in metadata
Human Population	POP_Density_Africa_2000	\DATA\POPULATION	Population density grid for Africa in 2000 extracted from the Africa population database (UNEP/GRID). Import Population_Density_2000 layer file into the raster Symbology to produce breakdown and colour scheme as used in maps.	Nelson, Andy, 2004. African Population Database, UNEP GRID Sioux Falls. Retrieved 29th May 2009.	Raster (Tiff)	Yes	Yes in metadata
All	The CD consists of HTML interface and a geographic interface. GIS data can be loaded and viewed directly in GIS software packages.	WESTAFRICA_CLIMATEPROOFPA_BASELINESTUDYA\DATA\BASE_DATA\CONS_PRIOTY_CD	The CD-ROM presents the body of information assembled and the findings of the Conservation Priority Setting Workshop held in Elmina, Ghana, in 1999. The workshop focussed on the Upper Guinea forest ecosystem, that extends from Eastern Sierra Leone to South-eastern Guinea through Liberia, Cote d'Ivoire, Ghana and into Western Togo.	Center for Applied Biodiversity Science and CI West Africa. 2002. From the Forest to the Sea: Biodiversity Connections from Guinea to Togo. West Africa Conservation Priority Setting Workshop CD-ROM, December 1999. Washington, DC: Conservation International.	Contents of CD-ROM have been placed in folder	Yes	Yes
Country Base Data	CitiesLocation_WAfrica	WESTAFRICA_CLIMATEPROOFPA_BASELINESTUDYA\DATA\BASE_DATA	Locations of major cities for Mali, Gambia, Chad, Sierra Leone, Togo, Burkina Faso, Cote d'Ivoire and Ghana (1:15,000,000)	ESRI Data and Maps 2006	Feature Dataset within Personal Geodatabase	No	
Country Base Data	DCWCountryBoundary_WAfrica	WESTAFRICA_CLIMATEPROOFPA_BASELINESTUDYA\DATA\BASE_DATA	Country boundary dataset for Mali, Gambia, Chad, Sierra Leone, Togo, Burkina Faso, Cote d'Ivoire and Ghana from the Digital Chart of the World (1:1,000,000 scale).	ESRI Data and Maps 2006	Feature Dataset within Personal	No	

					Geodatabase		
Country Base Data	DCWCountryBoundary_Mask_WAfrica	WESTAFRICA_CLIMATEPROOFPA_BASELINESTUDYA\DATA\BASE_DATA	Boundary dataset of countries surrounding area of interest to create a mask used for map display. Country dataset extracted from the Digital Chart of the World (1:1,000,000 scale).	ESRI Data and Maps 2006	Feature Dataset within Personal Geodatabase	No	
Country Base Data	DCWCountryBoundary_WAfrica_Line	WESTAFRICA_CLIMATEPROOFPA_BASELINESTUDYA\DATA\BASE_DATA	Boundary line dataset of countries surrounding area of interest to create a mask used for map display. Country dataset extracted from the Digital Chart of the World (1:1,000,000 scale).	ESRI Data and Maps 2006	Feature Dataset within Personal Geodatabase	No	
Country Base Data	DCWBathmet_WestAfrica	WESTAFRICA_CLIMATEPROOFPA_BASELINESTUDYA\DATA\BASE_DATA	Bathymetry boundary dataset containing depth in meters. Use the Description field to symbolised depth intervals.	ESRI Data and Maps 2006	Feature Dataset within Personal Geodatabase	No	
Country Base Data	DCWRivers_WAfrica	WESTAFRICA_CLIMATEPROOFPA_BASELINESTUDYA\DATA\BASE_DATA	Line dataset of rivers for West Africa. Rivers dataset extracted from the Digital Chart of the World (1:1,000,000 scale).	ESRI Data and Maps 2006	Feature Dataset within Personal Geodatabase	No	
Country Base Data	DCWWaterbodies_WAfrica	WESTAFRICA_CLIMATEPROOFPA_BASELINESTUDYA\DATA\BASE_DATA	Boundary dataset of water bodies for West Africa. Water bodies dataset extracted from the Digital Chart of the World (1:1,000,000 scale).	ESRI Data and Maps 2006	Feature Dataset within Personal Geodatabase	No	
Base Imagery	World 2D Imagery	Cannot be distributed to third parties only available from ESRI ArcGIS Online Content Sharing Program.	2D true colour earth imagery used as background layer for protected areas maps	Copyright:© 2008 ESRI, i-cubed			
Base Imagery	Hillshade	\DATA\ELEVATION	Hillshade layer created from DEM to enhance the visualization of the surface elevation. Import Hillshade_WAfrica layer file into symbology. Set the display transparency of Hillshade layer to 30%. Place the Hillshade on top of the DEM.	Created by UNEP-WCMC using ArcGIS software (2008).	Raster (Grid)	No	
Base Imagery	DEM_WAfrica	\DATA\ELEVATION	Digital Elevation Model (DEM) for West Africa extracted from GTOPO30. Elevations spaced at 30 arc seconds (approx 1 km).	GTOPO30 (1996), U.S. Geological Survey's EROS Data Center, Sioux Falls, South Dakota.	Raster (Grid)	Yes – see accompanying documentation	

parties. An outline of the datasets collected, the progress of any data request and the individual or organization contacted is outlined in Table 2.

7. Results from Study Task 1

The World Database on Protected Areas (WDPA) is the only global database of marine and terrestrial protected areas, comprising GIS spatial data and aspatial attribute data, in existence. Using the information currently available in the 2009 WDPA Annual Release, a number of tables and maps have been produced demonstrating the current protected area coverage for the study area.

a) Coverage of Protected Areas in Study Area

Accompanying this report is a MS Excel workbook that contains lists of all national and international protected areas for each country in the study area extracted from the WDPA. Each table contains key attributes such as site name, designation or convention, IUCN protected area management category, legal status, establishment date, total area as well as the data source. The MS Workbook is located in the main project directory under the DATA folder (see Figure 1).

The following table's present summary information about protected areas in the study area as listed in the WDPA in May 2009.

Table 2 Summary of total number and area of protected areas in study area from the WDPA

Country	Total Number of National Sites	Total Number of Internationally Recognized Sites	International Sites	National Sites
			Total Documented Area (Ha)	Total Documented Area (Ha)
Chad	13	5	9,879,068	12,914,300
Gambia	7	2	186,180	26,304
Mali	14	3	37,219	3,326,618
Sierra Leone	58	1	295,000	517,453.2
Togo	94	4	1,210,400	2,123,569

Table 3 Summary of the total number of national protected areas by legal status ('official standing')

Country	Status (at June 15 2009)	Total Number of National Sites	Total Documented Area (Ha)
Chad	Designated	9	11,494,000
Chad	Proposed	4	1,420,300
Gambia	Designated	5	14,219
Gambia	Proposed	2	23,000
Mali	Degazetted	1	158,989
Mali	Designated	10	2,600,429
Mali	Proposed	3	567,200
Sierra Leone	Designated	39	292,293
Sierra Leone	Proposed	19	225,160
Togo	Degazetted	4	1,519,466
Togo	Designated	90	604,103

Table 4 Summary of total number of nationally designated protected areas by IUCN category

Country	IUCN Category	Total Number of National Sites	Total Documented Area (Ha)
Chad	II	2	414,000
	IV	7	11,080,000
Gambia	II	1	2,500
	IV	2	719
	Not Known	2	11,000
Mali	II	1	187,762
	IV	7	2,303,398
	Not Known	2	109,269
Sierra Leone	II	4	143,587
	IV	1	1,200

	Not Known	33	138,933
	VI	1	8,573
Togo	II	3	357,290
	IV	6	71,915
	Not Known	81	174,898

Table 5 Summary of the total number of internationally recognized protected areas by convention

Country	International Convention or Agreement site recognized under	Criteria	Total number of sites	Total Documented Area (Ha)
Chad	Wetlands of International Importance (Ramsar)		5	9879068
Gambia	Wetlands of International Importance (Ramsar)		2	26304
Mali	UNESCO-MAB Biosphere Reserve		1	2500000
Mali	Wetlands of International Importance (Ramsar)		1	4119500
Mali	World Heritage Convention	Cultural (v) Natural (vii)	1	400000
Sierra Leone	Wetlands of International Importance (Ramsar)		1	295000
Togo	Wetlands of International Importance (Ramsar)		4	1210400

As well as presenting summaries of the protected area attribute data in the study area, country level and regional maps were also produced using the available spatial (GIS) data. By examining the spatial data coverage, attribute completeness and the data source (or origin) of the protected areas information in the WDPA, we can indentify data gaps and propose an approach for data improvement.

b) Current status of protected areas information in the WDPA for the study area

As shown in Figure 2, both Chad and Mali have higher number of protected areas represented with boundary data and an increased recorded coverage of protection. Meanwhile, as shown in Table 3, both Togo and Sierra Leone have the highest number of recorded sites in the WDPA but relatively low recorded coverage of protection. When doing an assessment of protected areas in a country or region it is important to ensure that you are using the best available information. You need to make sure that a ‘gap’ in protected area network is not simply due to a ‘gap’ in your knowledge.

UNEP-WCMC, as custodians, has established expertise in the design and management of protected areas data. We routinely assess the information held in the WDPA to identify ‘data or knowledge gaps’ by examining the origin of the raw data. We assess the completeness of each attribute, when it was last updated, who was the data source (e.g. governmental or non-governmental source), and whether boundary (GIS) data is present and how detailed that boundary is. We have performed this ‘current status’ assessment on the data currently available in the WDPA for each country, as shown in Table 6.

Table 6 Current status of protected areas information in the WDPA for the study area

Country	Percentage of National Sites with boundary (GIS) data	Percentage of complete attribute fields	Percentage of sites with IUCN category	Earliest Attribute Date	Latest Attribute Date	Earliest boundary (GIS) date	Latest boundary (GIS) date	Current Status
Chad	69%	85%	69%	1993	2008	1987	2008	In need of verification
Gambia	57%	75%	43%	2003	2007	1987	1987	In need of improvement
Mali	71%	75%	57%	2004	2005	1992	1992	In need of verification
Sierra Leone	59%	60%	10%	1993	2006	1990	1999	In need of improvement
Togo	64%	60%	10%	1987	2006	1987	1987	In need of

								improvement

From our assessment, we have concluded that:

- The data for Chad and Mali is in need of verification by in country experts and minor data improvements made
- For Gambia, Sierra Leone and Togo, due to the relatively low levels of boundary data in the WDPA and that a full country update has not been performed for over 5 years, an urgent review of the current data is required.

It is important to note that when examining the data improvement history for Gambia, Sierra Leone and Togo we concluded that:

- In-country capacity issues have prevented effective and continuous management of protected areas information.
- Acquisition of up to date spatial (GIS) data direct from the government may not be possible immediately
- A review of the existing information held in the WDPA with national experts (and mapping support from UNEP-WCMC) may yield a dataset suitable for future project phases.

Overall identification of up to date contact points within government agencies responsible for protected area data management or in NGOs is essential to ensuring that the best available protected areas dataset is used within this project.

c) Identification of data contact points for data verification and acquisition

Our experience of protected area data management and the methods employed in the coordination of and communication with data providers has led us to undertake the following methodology outlined below:

a) Review of existing data contact information in the WDPA.
b) Identification of additional points of contact within NGO and intergovernmental organizations to request assistance in acquisition of protected areas data or local data sources contact details
c) Development of data request letter to send to data contacts

From our records the current points of contact for protected areas information within the study area are outlined in Table 7. For Mali and Togo we do not have a direct point of contact regarding protected areas data management, therefore our initial request letter is directed to the department head requesting their assistance in provision of a direct point of contact. For Chad, Sierra Leone and the Gambia, the main contact listed is the head of the Protected Areas department or the person responsible for protected areas management, therefore our initial request letter is requesting their commitment to the process and for them to by provide an assessment of what protected areas data is currently available. By initiating direct contact with the manager of the protected areas information, UNEP-WCMC can provide support throughout the updating process, resulting in a greater likelihood that a comprehensive review will be performed.

In addition to the data contacts outlined in Table 7, we also utilised a network on contacts within NGO and intergovernmental organizations who may be able to assist in the data acquisition process by a) providing held by their organization or b) directing us to a new potential data source or data reviewer. An outline of the organizations contacted can be found in the Table 8. We also compiled a list of other organizations and individuals who may be able to assist with the project and these are outlined in Table 10.

Figure 2 Protected Areas within West Africa

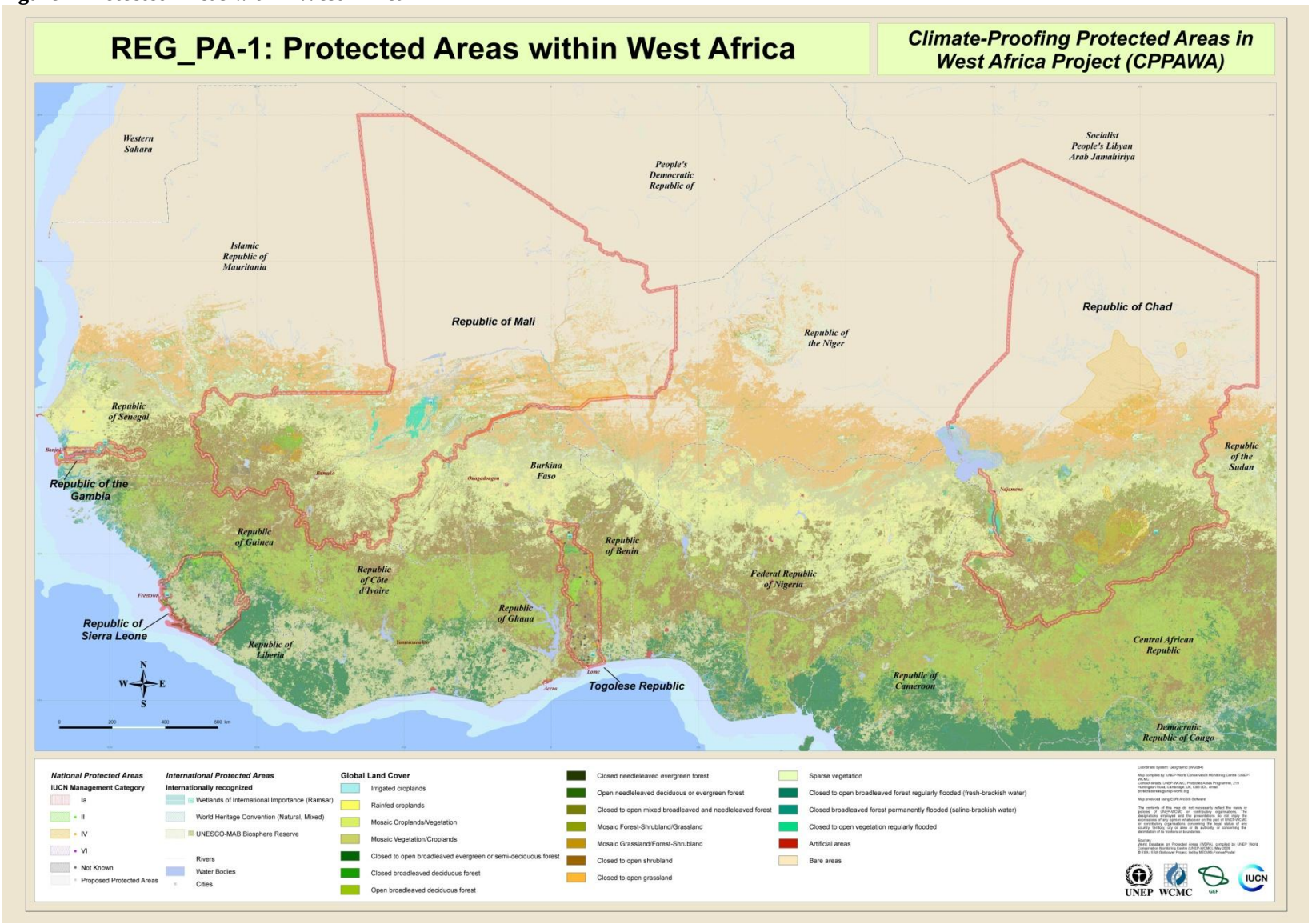


Table 7 Governmental protected areas data contacts from the WDPA

Country	Contact Name	Position and Organization	Address	Telephone / Email	Request Letter Drafted
Chad	Mr. Habib Gademi	Directeur Adjoint des Parcs Nationaux, de Reserve de Faune et de la Chasse	Ministère de l'Environnement, de l'Eau et des Ressources Halieutiques BP 447 N'Djamena Chad	+235 630 34 10 +235 52 38 39; +235 52 44 70; 235 51 89 95 hgademi@hotmail.com zakouma@intnet.td	
	Mr. Tahir Hassan Mahamat	Ressources Forestières	Ministère de l'Environnement, de l'Eau et des Ressources Halieutiques BP 447 N'Djamena Chad	hmahamat2000@yahoo.fr	
	Mr. Kadiom Amidou	Chef de Division des Aires Protégées Direction de Conservation de la Faune et des Aires Protégées	Ministère de l'Environnement, de l'Eau et des Ressources Halieutiques BP 447 N'Djamena Chad	+235 52 4470, 235 52 2305 +235 52 3839 kadio_amidou@yahoo.fr	Yes
Gambia	Mr. Alpha Omar Jallow	Acting Director Department of Parks & Wildlife Management	c/o Department of State for Forestry & Environment State House Banjul Gambia	+220 4376972; 9916993 +220 4392179 alphaojay@gmail.com alphaojay@yahoo.com	Yes
	Mr. Kawsu Jammeh	Environmental Education Officer Department of Parks & Wildlife Management	c/o Department of State for Forestry & Environment State House Banjul Gambia	kjammehsopee@yahoo.com	
Mali	M. Mohamed Ag Hamaty	Ingénieur des Eaux et Forêts Direction Nationale de Conservation de la Nature	Ministère de l'Environnement et de l'Assainissement B.P. 275 Bamako Mali	+223 223 36 95; 96; 97 +223 223 36 96 medaghamati@live.fr wartehen@hotmail.fr	Yes
	Adama Togo	Head of Direction Nationale de Conservation de la Nature Department for Flora and Fauna (DCFH)	Ministère de l'Environnement et de l'Assainissement B.P. 275 Bamako Mali	+223 222 52 51 atogo8@yahoo.fr	

Sierra Leone	Mrs. Kate Garnett	Assistant Conservator of Forests	Forestry Division Freetown Sierra Leone	+232 76 627 320, +232 30 423 327 kgarnett@nacef-sl.org majelarnett@yahoo.co.uk	
Togo	M. Trévé Kokou Tengue	Directeur Direction de la Faune et de la Chasse	Ministère de l'Environnement et des Ressources Forestières BP 355 Lomé Togo	+228 221 40 29; +228 221 40 29; +228 221 03 33 direfaune@yahoo.fr tktengue@yahoo.fr	Yes

Table 8 Outline of resources requested from external data sources

Theme	Resource requested	Point of Contact	Requested When	Reply to Request	Data or Resource Received	Comment
All	Assistance with finding up to date points of contact or data sources (governmental and NGO) on protected areas, climate change, land cover, wildlife demographics and human population for the study region.	Dr Rob Brett, Regional Director for Africa Fauna & Flora International Jupiter House, 4th Floor Station Road Cambridge, CB1 2JD, UK E:rob.brett@fauna-flora.org W:www.fauna-flora.org	28th May 2009	No	No	
All	Assistance with finding up to date points of contact or data sources (governmental and NGO) on protected areas, climate change, land cover, wildlife demographics and human population for the study region.	Dr Paulinus Ngeh, West Africa Sub-regional Coordinator for the BirdLife African Partnership E:paulinus@africaonline.com.gh W: www.birdlife.org/regional/africa/partnership.html	8th June 2009	20th June 2009	No	BirdLife International is only working within Sierra Leone in the West Africa region. We were directed to contact Daniel Siaffa (Executive Director) on the Conservation Society of Sierra Leone (ddsiaffa@yahoo.co.uk) directly regarding our request.
Conservation Priority	From the Forest to the Sea: Biodiversity Connections from Guinea to Togo. West Africa Conservation Priority Setting Workshop CD-ROM, December 1999. http://www.biodiversityscience.org/priority_outcomes/west_africa/index.html	Center for Applied Biodiversity Science 1919 M St., NW Suite 600 Washington, DC 20036 (202)912-1000 E: infotools@conservation.org	28th May 2009	No	Yes	Dr Neil Burgess from WWF US visited CI offices and picked up a copy of the CD ROM.
All	Assistance with finding up to date points of contact or data sources (governmental and NGO) on protected areas, climate change, land cover, wildlife demographics and human population for the study region.	Geoffroy Mauvais UICN - Union internationale pour la conservation de la nature Bureau Régional pour l'Afrique de l'Ouest BP 1618 Ouagadougou 01 Burkina Faso E: geoffroy.mauvais@iucn.org W: www.papaco.org	9th June 2009	15th June 2009	No	UNEP-WCMC to follow up with Beatrice Chataigner with a focussed reply on what we require. We also had some tips on possible GIS data centres that need investigating further.
Conservation Priority	Key Biodiversity Areas (KBAs)	Matthew N. Foster Director, Conservation Outcomes Centres for Applied Biodiversity Science	8th June 2009	10th June 2009	No	KBAs are only available for Sierra Leone in West Africa. Put in contact with David Knox (Outcomes Manager for Africa and Eurasia) for

		Conservation International 2011 Crystal Driver, Suite 500 Arlington, VA 22202, USA E: m.foster@conservation.org W:www.biodiversityscience.org				additional information and for primary point of contact for Sierra Leone KBAs.
Biodiversity	IUCN Red List Species range datasets and Species Richness grids for West Africa for Amphibians and Mammals.	Vineet Katariya GIS Manager - Species Program IUCN, International Union for Conservation of Nature 219 Huntingdon Road, Cambridge, CB3 ODL, UK E: Vineet.Katariya@iucn.org	9th June 2009	10th June 2009 and 16th June 2009	Yes	Received invertebrate species richness layer awaiting delivery of mammal species richness layer. Due to resolution of richness grids only regional maps can be created. .
Biodiversity	Important Bird Areas (IBAs) and any possible points of contacts that can assist with the data gathering for the study.	Ian May Global Information Management Coordinator BirdLife International Wellbrook Court Girton Road Cambridge, CB3 ONA., UK E: ian.may@birdlife.org W: www.birdlife.org	3rd June 2009	4th June 2009	Yes	Important Bird Areas GIS dataset received for West Africa. Also directed to Dr Paulinus Ngeh, West Africa Sub-regional Coordinated for the BirdLife African Partnership
Climate Change	Synthetic Assessment of Global Distribution of Vulnerability to Climate Change dataset	Alex de Sherbinin Senior Staff Associate for Research Center for International Earth Science Information Network (CIESIN), Columbia University P.O. Box 1000 Palisades , NY 10964 , USA E: adesherbinin@ciesin.columbia.edu W: http://www.ciesin.columbia.edu/	22nd May 2009	26th May 2009	No	Directed to Xiaoshi Xing who informed us the GIS data is held by Gary Yohe at Wesleyan (gyohe@wesleyan.edu) the lead author of the paper. However there are data gaps in the West Africa region. CIESIN for National Intelligence Council (NIC) with updated adaptive data with broader coverage from Joint Global Change Research Institute (JGCRI). This data should be released soon, contact Marc Levy (marc.levy@ciesin.columbia.edu)about it.
		Xiaoshi Xing Senior Staff Associate Center for International Earth Science Information Network (CIESIN), Columbia University 203 Geoscience 61 Route 9W - PO Box 1000 Palisades, NY 10964-8000, USA E: xxiaoshi@ciesin.columbia.edu		1st June 2009	No	

Recommendation 1: **Initiate contact with the IUCN Regional Office in West Africa and the IUCN WCPA West and Central Africa Vice Chair.**

Recommendation 2: **Convene a regional workshop with main data providers to review content and provide updates to base datasets such as protected areas.**

8. Results from Study Task 2

UNEP-WCMC has a number of key biodiversity and conservation priority datasets already in-house as well as key contacts within NGO partners who can assist in data acquisition.

a) Collation of key biodiversity and conservation priority datasets

During this study a number of key datasets were requested. However, not all arrived during this study timeline. Table 1 outlines the datasets collected, grouped under common study themes such as protected areas, biodiversity, conservation priority and climate change. Figure 3 shows key biodiversity and conservation priority layers collated during this study for the West Africa region. The map includes BirdLife International's Important Bird Areas, WWF G200 Terrestrial Ecoregions, Conservation International's Biodiversity Hotspots and the Last of the Wild dataset from the Columbia University Centre for International Earth Science Information Network (CIESIN) and Wildlife Conservation Society (WCS). Country level maps were also created and are detailed in Table 11.

b) Identification of contact points for biodiversity and conservation priority datasets held by external organizations/partners

Table 8 outlines the data requests sent, the contact point and whether any reply to our request was received within the study timeline.

c) Identification of existing opportunities to strengthen existing transboundary protected area networks or conservation priority areas

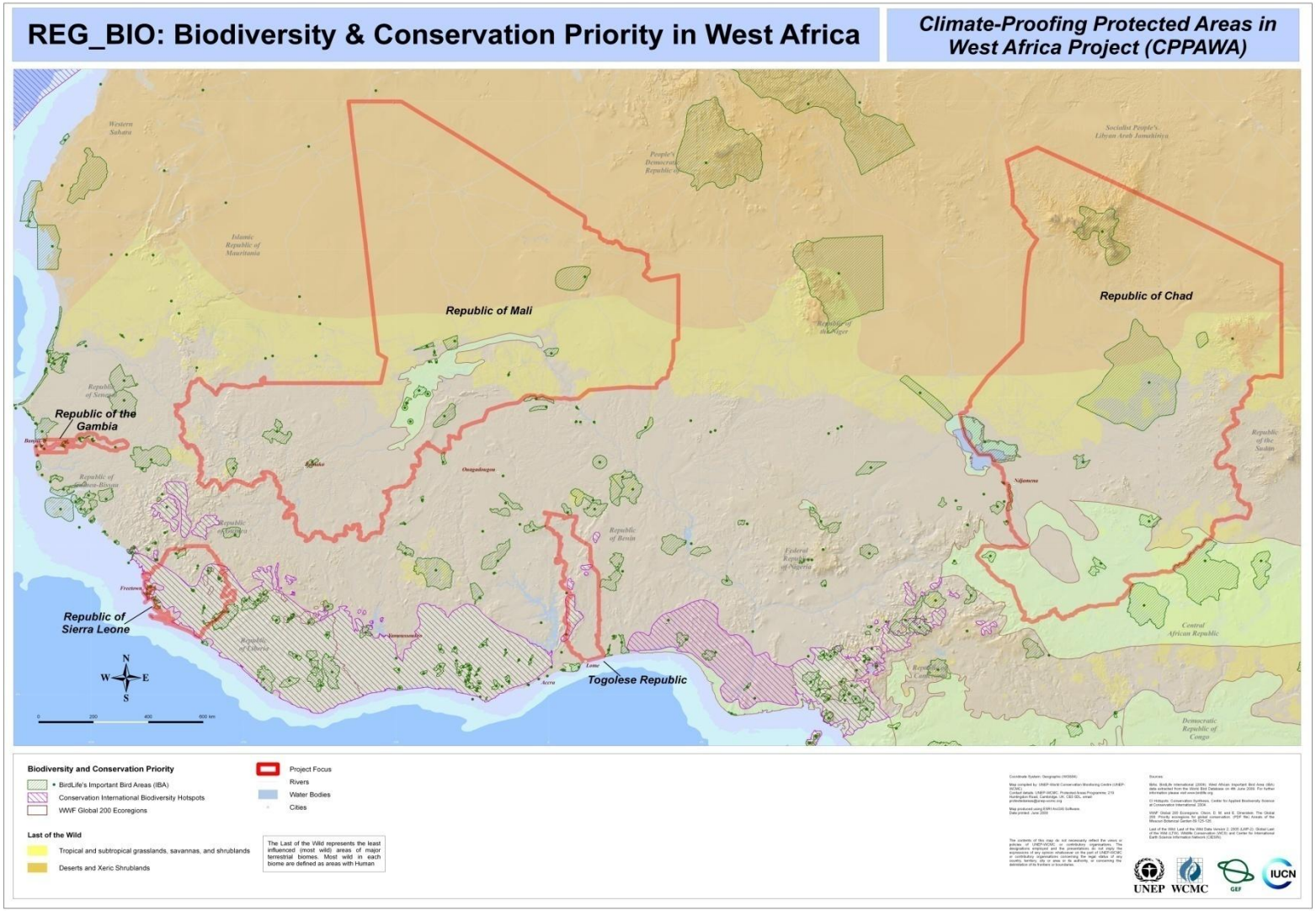
As Table 9 shows there are currently two transboundary protected area projects in the study area. In 2007 UNEP-WCMC developed a list of transboundary protected areas (TBPA)[4]. TBPAs were incorporated that fit entirely into the IUCN definition (confirmed international cooperative or sympathetic management through legal or other effective means) and internationally adjoining protected areas that may still require development of collaborative efforts or further formalizing of ongoing cooperation.

Table 9 **Transboundary Protected Areas in the Study Area**

Country	Transboundary Protected Area Name	Protected Area Name	Category	Size (Ha)	Total Area (Ha)
Cameroon		Kalamaloue National Park	II	6,696	368,294
Chad		Mandelia Faunal Reserve	IV	138,000	
Nigeria		Chad Basin National Park	II	230,000	
Sierra Leone	Sierra Leone - Liberia Transboundary Peace Park	Gola North Forest Reserve	Not Known	75,000	255,000
		Gola East Forest Reserve	Not Known		
Liberia		Lofa Forest Reserve	Not Known	80,000	
		Foya Forest Reserve	Not Known	100,000	

[4] UNEP-WCMC Transboundary Protected Areas Inventory (30 April 2007) see www.tbpa.net/tpa_inventory.html

Figure 3 Biodiversity and Conservation Priority within West Africa



In May 2009, the Presidents of Sierra Leone and Liberia announced the establishment of a new Trans-boundary Peace Park[5], to protect one of the largest remaining blocks of intact forest in the Upper Guinea area of West Africa. The Peace Park unites the Gola Forest Reserve in Sierra Leone (75,000 ha) and the Lofa and Foya Forest Reserves in Liberia (80,000 ha and 100,000 ha respectively), with additional forest to provide corridors for the movement of wildlife between them. The work to establish the Peace Park has involved several conservation organisations in the BirdLife International Partnership, working together with the Forest Development Authority (FDA) of Liberia, and the Forestry Division in Sierra Leone. This project may provide the opportunity to strengthen these existing transboundary protected area initiatives.

***Recommendation 3*: Initiate contact with Birdlife International's African Partnership in West Africa regarding the Sierra Leone – Liberia Transboundary Peace Park Project.**

9 Results from Study Task C

UNEP-WCMC has a number of key contacts within NGO partners and research institutions that can assist in the acquisition on climate change related data.

a) Collation of existing information on scenarios of climate change and potential impact upon: rainfall, sea level, habitat/vegetation, wildlife demographics and human population.

During this study a number of key datasets were requested. However, not all arrived during this study timeline or were not publicly available. Table 1 outlines the datasets collected, grouped under common study themes such as protected areas, biodiversity, conservation priority and climate change. Figures 4 and 5 illustrate some of the data collated on human population for the study, including population density in 2000 and the Human Influence Index (HII), which is a measure of direct human influence on terrestrial ecosystems, produced by WCS and CIESIN. Country level maps were also created and are detailed in Table 11

b) Review and identification of data contact points for data acquisition

Table 8 outlines the data requests sent, the contact point and whether any reply to our request was received within the study timeline.

c) Identification of data gaps within available data and suggested approaches for future data acquisition

This study faced a number of problems when trying to acquire consistent up to date data sets on climate change or climate impacts. Even where datasets existed for the West Africa region, often those datasets themselves had gaps or missing information (particularly in Chad and Mali) or were in non-GIS data formats. In a number of climate publications collected for this study, the common reason cited as to why climate models had missing information was due to the lack of individual and institutional capacity within many Africa countries to carry out climate change research.

There is no short term solution to this problem. However by working directly with in-country agencies and institutions through this project, a better understanding of their capacity (technical, manpower, and hardware) could be obtained along with an indication of where resources or capacity development projects could be focused in the long term.

[5] Extracted from BirdLife International Press Release entitled 'Trans-boundary Rainforest Park will be a symbol of peace and stability' (15/05/2009) http://www.birdlife.org/news/pr/2009/05/peace_park_west_africa_pr.html.

Figure 4 Population Density and Protected Areas within West Africa

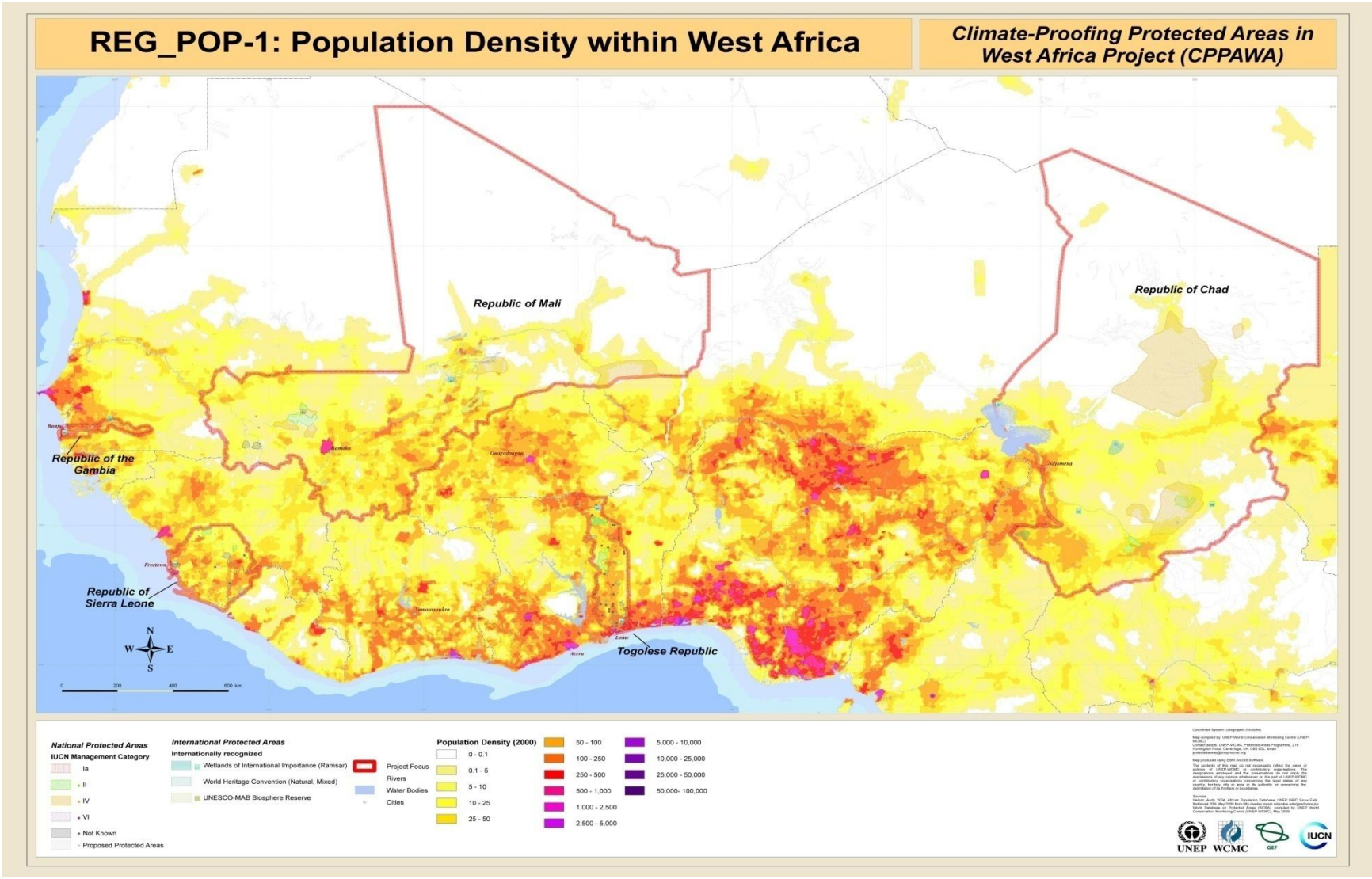
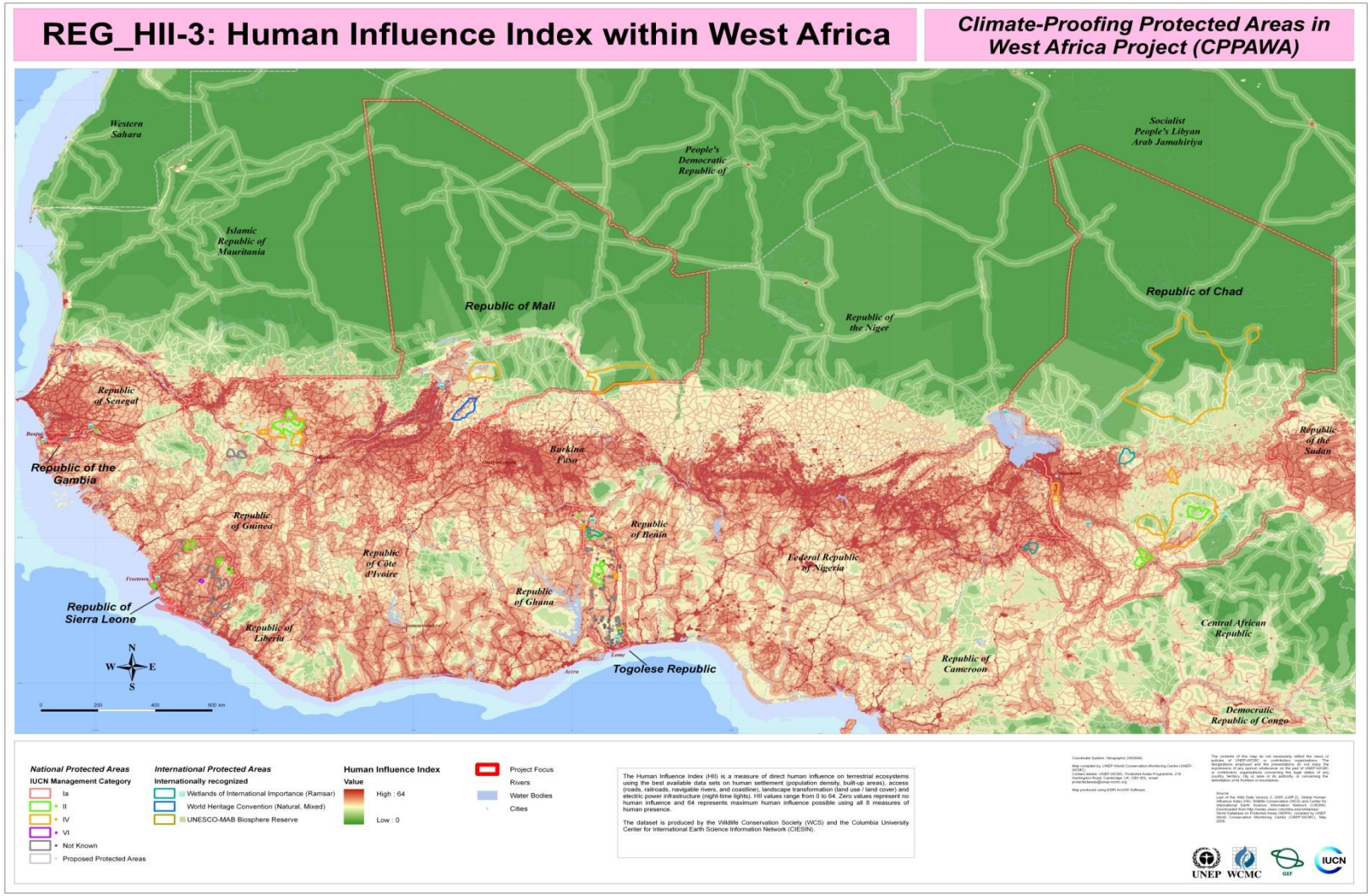


Figure 5 Human Influence Index within the West Africa Region



For this project, our recommendation is that a collaborative partnership is formed with the Center for International Earth Science Information Network (CIESIN) at Columbia University. CIESIN was established in 1989 as an independent non-governmental organization to provide information that would help scientists, decision-makers, and the public better understand the changing relationship between human beings and the environment. In 1998, CIESIN became a Centre within Columbia University's Earth Institute. Its mission is to provide access to and enhance the use of information worldwide, advancing understanding of human interactions in the environment and serving the needs of science and public and private decision making. Their expertise in data management, research and geospatial applications makes them a key partner in the development of any future project phases.

In addition we recommend the expertise of the researchers at the School of Geography and the Environment (Oxford University Centre for the Environment), who prepared the UNDP Climate Change Country Profiles, is sought in the scoping of climate modelling tools and as possible sources of raw climate data (see Table 8).

Recommendation 4: **Acquire the raw data and the expertise of Dr Mark New and Dr Carol McSweeney at the School of Geography and the Environment (Oxford University Centre for the Environment) who prepared the UNDP Climate Change Profiles**

Recommendation 5: **CIESIN become collaborative project partners, to provide the scientific, modelling and technological expertise for the development of later project stages.**

10 Baseline Study A Conclusions

In the collation of data for this study, the three main issues we faced were:

- Acquiring current data sources
- Data consistency and format
- Data availability

Throughout this report we have made a number of key recommendations that may yield immediate benefit and support to the future development of the project. In addition we have found that acquisition of a consistent and complete dataset on climate change will prove a particular challenge in the short to long term, if the capacity needs of in-country institutions are not met.

Therefore, our overall recommendation is that:

- The project will directly benefit from collaboration with external partners and institutions that have the in-country contacts and/or the technological and research expertise in project areas such as climate modelling or assessment of human influence on the ecosystem.

With this in mind we have prepared a list of organizations and institutions that may be able to provide support to the development of future stages in this project, along with an outline of the type of assistance they could provide (see Table 10).

Table 10 Outline of contacts of contacts or organizations who may provide project assistance

Theme	Assistance with	Point of Contact	Comment
All	Acquisition of up to date points of contact or data sources (governmental and NGO) on protected areas, climate change, land cover, wildlife demographics and human population for the study region.	Dr Rob Brett, Regional Director for Africa Fauna & Flora International Jupiter House, 4th Floor Station Road Cambridge, CB1 2JD, UK E:rob.brett@fauna-flora.org W:www.fauna-flora.org	
All	Acquisition of data, development of modeling tools and integration of geospatial technologies.	Alex de Sherbinin Senior Staff Associate for Research Center for International Earth Science Information Network (CIESIN), Columbia University P.O. Box 1000 Palisades , NY 10964 , USA E: adesherbinin@ciesin.columbia.edu W: http://www.ciesin.columbia.edu/	Alex is a main point of contact within CIESIN and will be able to direct you to the right staff member within CIESIN depending on the information required.
All	Acquisition of up to date points of contact or data sources (governmental and NGO) on protected areas, climate change, land cover and wildlife demographics.	David Banks, Director, Africa Program The Nature Conservancy (TNC) 4245 North Fairfax Drive, Suite 100, Arlington, VA 22203-1606, USA E: africa@tnc.org W: http://www.nature.org/wherewework/africa/about/	
All	Acquisition of up to date points of contact or data sources (governmental and NGO) on protected areas, climate change, land cover and wildlife demographics.	Wildlife Conservation Society (WCS) Africa Program Wildlife Conservation Society 2300 Southern Boulevard Bronx, NY, USA 10460 E: wcsafrica@wcs.org W: www.wcs.org/globalconservation/Africa	
All	Acquisition of up to date points of contact or data sources (governmental and NGO) on protected areas, climate change, land cover and wildlife demographics. As well as acquisition of data, development of modeling tools and integration of geospatial technologies.	David Knox Senior Manager, Africa-Eurasia Outcomes Definition Centre for Applied Biodiversity Science Conservation International 2011 Crystal Driver, Suite 500, Arlington, VA 22202, USA E: d.knox@conservation.org W: http://science.conservation.org/portal/server.pt	
All	Acquisition of up to date points of contact or data sources (governmental and NGO) on protected areas, climate change, land cover and wildlife demographics.	Susan Minnemeyer Associate II/GIS Manager People and Ecosystems World Resources Institute (WRI) 10 G Street NE Suite 800 Washington, DC 20002, USA E: susanm@wri.org	Susan has been a main point of contact in WRI regarding protected areas and forest cover data for Central Africa. She may be able to direct you to the right staff member within WRI depending on the information required.

		W: www.wri.org/	
All	Acquisition of up to date points of contact or data sources (governmental and NGO) on protected areas, climate change, land cover and wildlife demographics.	Dr Neil Burgess Senior Conservation Scientist (Africa) c/o Conservation Science Group Zoology Department Cambridge University Downing Street Cambridge , CB2 3EJ, UK E: neil.burgess@wwfus.org	Neil has been a main point of contact in WWF regarding protected areas for Africa. He may be able to direct you to the right staff member within WWF depending on the information required.
Protected Areas	Acquisition of up to date points of contact or data sources (governmental and NGO) on protected areas particularly Ramsar (wetland) sites.	Abdoulaye Ndiaye Capacity Development Officer and Wings over Wetlands Focal Point Wetlands International Africa Office Rue 111, Zone B, Villa N° 39B P.O. Box 25581 Dakar Fann, Senegal E: ablaywet@orange.sn W: http://wow.wetlands.org	The United Nations Environment Programme (UNEP) - with support from the Global Environment Facility (GEF), the Government of Germany, UNEP/AEWA and a range of other donors - is the implementing agency of WOW. UNEP-WCMC provides the technical leadership in the development of state-of-the-art IT tools for managing and increasing our knowledge on waterbird migrations.
Protected Areas	Acquisition of up to date points of contact or data sources (governmental and NGO) on protected areas.	Dr Charlotte Karibuhoya MPA Programme Coordinator - FIBA/PRCM c/IUCN Fondation Internationale du Banc d`Arguin Ave Bourguiba x Castors PO Box 3215 Dakar Senegal E: karibuhoye@lafiba.org	The World Commission on Protected Areas (WCPA) is the world's premier network of protected area expertise, administered by the IUCN Programme on Protected Areas. WCPA works by helping governments and others plan protected areas and integrate them into all sectors; by providing strategic advice to policy makers; by strengthening capacity and investment in protected areas; and by convening the diverse constituency of protected area stakeholders to address challenging issues. There are increasing efforts in Western and Central Africa to link the WCPA network with the activities of the IUCN regional office.
Protected Areas	Acquisition of up to date points of contact or data sources (governmental and NGO) on transboundary protected areas, conservation priority and biodiversity.	Daniel Siaffa Executive Director Conservation Society of Sierra Leone E: ddsiaffa@yahoo.co.uk E: cssl_03@sierratel.sl	The Conservation Society of Sierra Leone (CSSL) was formed in 1986 in response to the need for a local conservation organization. They are part of the BirdLife African Partnership and worked with and Society for the Conservation of Nature in Liberia, the RSPB (BirdLife in the UK), Vogelbescherming (BirdLife in The Netherlands), the Forest Development Authority (FDA) of Liberia, and the Forestry Division in Sierra Leone to establish the Sierra Leone-Liberia Trans-boundary Peace Park Project in May 2009. See http://www.birdlife.org/news/pr/2009/05/peace_park_west_africa_pr.html
Climate Change	Development and application of climate modelling in study region. Collaboration on the integration of the raw data produced for the UNDP Climate Change reports into modelling and mapping tools developed for study.	Dr Mark New, Reader in Climate Science and Dr Carol McSweeney, Researcher School of Geography and the Environment Oxford University Centre for the Environment South Parks Road Oxford OX1 3QY United Kingdom E: mark.new@ouce.ox.ac.uk E: carol.mcsweeney@ouce.ox.ac.uk	The UNDP climate change country profiles were available for Chad, Sierra Leone, Gambia, Mali and Togo. The profiles were funded jointly between the National Communications Support Program (NCSP) and the UK Dept. for International Development (DfID) and were developed to address the climate change information gap in many developing countries by making use of existing climate data to generate country-level data plots from the most up-to-date climate observations and the multi-model projections from the WCRP CMIP3 archive. Downloaded from http://country-profiles.geog.ox.ac.uk/

Appendix

Table 11 Outline of map outputs produced during study

Theme	Map Title	Description	File Name	Location	Format
Protected Areas and Human Population	HII_REG: Human Influence Index for West Africa	West Africa regional map showing the Human Influence Index (v2) with Protected Areas. The Human Influence Index (HII) is a measure of direct human influence on terrestrial ecosystems, produced by Wildlife Conservation Society (WCS) and the Columbia University Center for International Earth Science Information Network (CIESIN).	WAFRICA_HII_DRAFT.mxd	WestAfrica_ClimateProofPA_BaselineStudyA\ArcMap_Documents	ArcMap Document (.mxd)
	HII_REG: Human Influence Index for West Africa		WAfrica_Regional_HII	WestAfrica_ClimateProofPA_BaselineStudyA\JPEGS	Hard copy A0 Map image file (JPEG and TIFF, 300 dpi)
	TCD_HII 1: Human Influence Index for the Republic of Chad	Country level map showing the Human Influence Index (v2) with Protected Areas. The Human Influence Index (HII) is a measure of direct human influence on terrestrial ecosystems, produced by Wildlife Conservation Society (WCS) and the Columbia University Center for International Earth Science Information Network (CIESIN).	CHAD_HII_DRAFT.mxd	WestAfrica_ClimateProofPA_BaselineStudyA\ArcMap_Documents	ArcMap Document (.mxd)
	GMB_HII 2: Human Influence Index for the Republic of Gambia		GAMBIA_HII_DRAFT.mxd	WestAfrica_ClimateProofPA_BaselineStudyA\ArcMap_Documents	
	MLI_HII 3: Human Influence Index for the Republic of Mali		MALI_HII_DRAFT.mxd	WestAfrica_ClimateProofPA_BaselineStudyA\ArcMap_Documents	
	SLE_HII 4: Human Influence Index for the Republic of Sierra Leone		SLEONE_HII_DRAFT.mxd	WestAfrica_ClimateProofPA_BaselineStudyA\ArcMap_Documents	
	TGO_HII 5: Human Influence Index for the Togolese Republic		TOGO_HII_DRAFT.mxd	WestAfrica_ClimateProofPA_BaselineStudyA\ArcMap_Documents	
	TCD_HII 1: Human Influence Index for the Republic of Chad		CHAD_HII_DRAFT	WestAfrica_ClimateProofPA_BaselineStudyA\JPEGS	Map image file (JPEG and TIFF, 300 dpi)
	GMB_HII 2: Human Influence Index for the Republic of Gambia		GAMBIA_HII_DRAFT	WestAfrica_ClimateProofPA_BaselineStudyA\JPEGS	
	MLI_HII 3: Human Influence Index for the Republic of Mali		MALI_HII_DRAFT	WestAfrica_ClimateProofPA_BaselineStudyA\JPEGS	
	SLE_HII 4: Human Influence Index for the Republic of Sierra Leone		SLEONE_HII_DRAFT	WestAfrica_ClimateProofPA_BaselineStudyA\JPEGS	
	TGO_HII 5: Human Influence Index for the Togolese Republic		TOGO_HII_DRAFT	WestAfrica_ClimateProofPA_BaselineStudyA\JPEGS	
Protected Areas and Human Population	POP_REG: Population Density for West Africa	West Africa regional map showing the Population Density (2000) with Protected Areas. Population density grid for Africa in 2000 extracted from the Africa population database (UNEP/GRID).	WAFRICA_POP_DRAFT.mxd	WestAfrica_ClimateProofPA_BaselineStudyA\ArcMap_Documents	ArcMap Document (.mxd)
	POP_REG: Population Density for West Africa		WAfrica_Regional_POP	WestAfrica_ClimateProofPA_BaselineStudyA\JPEGS	Hard copy A0 Map image file (JPEG and TIFF, 300 dpi)
	TCD_POP 1: Population Density for the Republic of Chad	Country level map showing the Population Density (2000) with Protected Areas. Population density grid for Africa in 2000 extracted	CHAD_POP_Density_DRAFT.mxd	WestAfrica_ClimateProofPA_BaselineStudyA\ArcMap_Documents	ArcMap Document (.mxd)
	GMB_POP 2: Population Density for the Republic of Gambia		GAMBIA_POP_Density_DRAFT.mxd	WestAfrica_ClimateProofPA_BaselineStudyA\ArcMap_Documents	

	MLI_POP 3: Population Density for the Republic of Mali	from the Africa population database (UNEP/GRID).	MALI_POP_Density_DRAFT.mxd	WestAfrica_ClimateProofPA_BaselineStudyA\ArcMap_Documents	
	SLE_POP 4: Population Density for the Republic of Sierra Leone		SLEONE_POP_Density_DRAFT.mxd	WestAfrica_ClimateProofPA_BaselineStudyA\ArcMap_Documents	
	TGO_POP 5: Population Density for the Togolese Republic		TOGO_POP_Density_DRAFT.mxd	WestAfrica_ClimateProofPA_BaselineStudyA\ArcMap_Documents	
	TCD_POP 1: Population Density for the Republic of Chad		CHAD_POP_Density_DRAFT	WestAfrica_ClimateProofPA_BaselineStudyA\JPEGS	Map image file (JPEG and TIFF, 300 dpi)
	GMB_POP 2: Population Density for the Republic of Gambia		GAMBIA_POP_Density_DRAFT	WestAfrica_ClimateProofPA_BaselineStudyA\JPEGS	
	MLI_POP 3: Population Density for the Republic of Mali		MALI_POP_Density_DRAFT	WestAfrica_ClimateProofPA_BaselineStudyA\JPEGS	
	SLE_POP 4: Population Density for the Republic of Sierra Leone		SLEONE_POP_Density_DRAFT	WestAfrica_ClimateProofPA_BaselineStudyA\JPEGS	
	TGO_POP 5: Population Density for the Togolese Republic		TOGO_POP_Density_DRAFT	WestAfrica_ClimateProofPA_BaselineStudyA\JPEGS	
Protected Areas	PA_Landcov_REG: Protected Areas of West Africa	West Africa regional map showing the Protected Areas with Land Cover. Population density grid for Africa in 2000 extracted from the Africa population database (UNEP/GRID).	WAFRICA_PA_Landcov_DRAFT.mxd	WestAfrica_ClimateProofPA_BaselineStudyA\ArcMap_Documents	ArcMap Document (.mxd)
	PA_Landcov_REG: Protected Areas of West Africa		WAfrica_Regional_PA_Landcov	WestAfrica_ClimateProofPA_BaselineStudyA\JPEGS	Hard copy A0 Map image file (JPEG and TIFF, 300 dpi)
	TCD_PA 1: Protected Areas for the Republic of Chad	Country level map showing the Protected Areas with Land Cover. Population density grid for Africa in 2000 extracted from the Africa population database (UNEP/GRID).	CHAD_ PA_Landcov_DRAFT.mxd	WestAfrica_ClimateProofPA_BaselineStudyA\ArcMap_Documents	ArcMap Document (.mxd)
	GMB_PA_LC 2: Protected Areas for the Republic of Gambia		GAMBIA_PA_Landcov_DRAFT.mxd	WestAfrica_ClimateProofPA_BaselineStudyA\ArcMap_Documents	
	MLI_PA_LC 3: Protected Areas for the Republic of Mali		MALI_PA_Landcov_DRAFT.mxd	WestAfrica_ClimateProofPA_BaselineStudyA\ArcMap_Documents	
	SLE_PC_LC 4: Protected Areas for the Republic of Sierra Leone		SLEONE_ PA_Landcov_DRAFT.mxd	WestAfrica_ClimateProofPA_BaselineStudyA\ArcMap_Documents	
	TGO_PA_LC 5: Protected Areas for the Togolese Republic		TOGO_PA_Landcov_DRAFT.mxd	WestAfrica_ClimateProofPA_BaselineStudyA\ArcMap_Documents	
	TCD_PA_LC 1: Protected Areas for the Republic of Chad		CHAD_ PA_Landcov_DRAFT	WestAfrica_ClimateProofPA_BaselineStudyA\JPEGS	Map image file (JPEG and TIFF, 300 dpi)
	GMB_PA_LC 2: Protected Areas for the Republic of Gambia		GAMBIA_ PA_Landcov_DRAFT	WestAfrica_ClimateProofPA_BaselineStudyA\JPEGS	
	MLI_PA_LC 3: Protected Areas for the Republic of Mali		MALI_PA_Landcov_DRAFT	WestAfrica_ClimateProofPA_BaselineStudyA\JPEGS	
	SLE_PA_LC 4: Protected Areas for the Republic of Sierra Leone		SLEONE_PA_Landcov_DRAFT	WestAfrica_ClimateProofPA_BaselineStudyA\JPEGS	
	TGO_PA_LC 5: Protected Areas for the Togolese Republic		TOGO_PA_Landcov_DRAFT	WestAfrica_ClimateProofPA_BaselineStudyA\JPEGS	
Biodiversity and Conservation Priority	BIO_REG: Biodiversity and Conservation Priority for West Africa	West Africa regional map showing BirdLife's Important Bird Areas, Conservation International	WAFRICA_ BIO _CONS_DRAFT.mxd	WestAfrica_ClimateProofPA_BaselineStudyA\ArcMap_Documents	ArcMap Document (.mxd)

	BIO_REG: Biodiversity and Conservation Priority for West Africa	Biodiversity Hotspots, WWF Global 200 Ecoregions and Last of the Wild datasets. The base dataset is a Digital Elevation Model (DEM).	WAfrica_Regional_BIO_CONS	WestAfrica_ClimateProofPA_BaselineStudyA\JPEGS	Hard copy A0 Map image file (JPEG and TIFF, 300 dpi)
	TCD_BIO 1: Biodiversity and Conservation Priority for the Republic of Chad	Country level map showing BirdLife's Important Bird Areas, Conservation International Biodiversity Hotspots, WWF Global 200 Ecoregions and Last of the Wild datasets. The base dataset is a Digital Elevation Model (DEM).	CHAD_ BIO_CONS_DRAFT.mxd	WestAfrica_ClimateProofPA_BaselineStudyA\ArcMap_Documents	ArcMap Document (.mxd)
	GMB_BIO 2: Biodiversity and Conservation Priority for the Republic of Gambia		GAMBIA_BIO_CONS_DRAFT.mxd	WestAfrica_ClimateProofPA_BaselineStudyA\ArcMap_Documents	
	MLI_BIO 3: Biodiversity and Conservation Priority for the Republic of Mali		MALI_ BIO_CONS_DRAFT.mxd	WestAfrica_ClimateProofPA_BaselineStudyA\ArcMap_Documents	
	SLE_BIO 4: Biodiversity and Conservation Priority for the Republic of Sierra Leone		SLEONE_ BIO_CONS_DRAFT.mxd	WestAfrica_ClimateProofPA_BaselineStudyA\ArcMap_Documents	
	TGO_BIO 5: Biodiversity and Conservation Priority for the Togolese Republic		TOGO_BIO_CONS_DRAFT.mxd	WestAfrica_ClimateProofPA_BaselineStudyA\ArcMap_Documents	
	TCD_BIO 1: Biodiversity and Conservation Priority for the Republic of Chad		CHAD_BIO_CONS_DRAFT	WestAfrica_ClimateProofPA_BaselineStudyA\JPEGS	Map image file (JPEG and TIFF, 300 dpi)
	GMB_BIO 2: Biodiversity and Conservation Priority for the Republic of Gambia		GAMBIA_ BIO_CONS_DRAFT	WestAfrica_ClimateProofPA_BaselineStudyA\JPEGS	
	MLI_BIO 3: Biodiversity and Conservation Priority for the Republic of Mali		MALI_ BIO_CONS_DRAFT	WestAfrica_ClimateProofPA_BaselineStudyA\JPEGS	
	SLE_BIO 4: Biodiversity and Conservation Priority for the Republic of Sierra Leone		SLEONE_ BIO_CONS_DRAFT	WestAfrica_ClimateProofPA_BaselineStudyA\JPEGS	
	TGO_BIO 5: Biodiversity and Conservation Priority for the Togolese Republic		TOGO_ BIO_CONS_DRAFT	WestAfrica_ClimateProofPA_BaselineStudyA\JPEGS	