

Climate Change Profile

BENIN

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Climate Change Profile: Benin

The expected impact of climate change in Benin, especially the projected rise in temperature and rainfall, is likely to compound the challenges already faced by the agriculture and forestry sectors, while the coastal areas will experience a sharp rise in sea level. The latter will threaten the people living along the coast where both income and population density is higher (between 250 and 1000 p/km², half of the population) than in other parts of Benin (from 0 to 250 p/km²). Both biophysical and socio-economic vulnerability is high due to limited adaptive capacity. Since agriculture is of the greatest importance for the Beninese economy, the agricultural sector will need to adopt adaptive measures in order to respond to the consequences of climate change that threaten food security.

Overall ranking

Benin ranks 151 out of 178 countries in the ND-GAIN index¹ (2013), which is better than in 2010 (rank 158). It ranks 14th on vulnerability and 124th on readiness – meaning that it is vulnerable to, yet unready to combat climate change effects. *Vulnerability* measures the exposure, sensitivity, and ability to cope with climate related hazards by accounting for the overall status of food, water, environment, health, and infrastructure within a country. *Readiness* targets those portions of the economy, governance and society that affect the speed and efficiency of adaptation.

Biophysical vulnerability

Current climate. Benin is located in West Africa and its climate is influenced by the Inter-Tropical Convergence Zone (ITCZ), creating both winds from the Ocean as well as winds from the Sahara region that are more dusty and warmer². These two opposing wind directions cause the annual West African Monsoon – resulting in a wet **season** in the north of Benin from May to November, and two wet seasons from March to July and from September to November in the southern regions of Benin³. In general, most of the country experiences transitional tropical conditions, with less rainfall than in other areas at the same latitude – a climate known as the Benin variant⁴. For the whole of Benin, the annual mean **temperature** is 27°C, whereas the annual total **precipitation** is 1150 mm⁵.

Current trends. The mean average **temperature** has increased since 1960 by 1.1°C and the average number of ‘hot’ days⁶ per year in Benin increased by 39 between 1960 and 2003, and hot nights by 73 in the same period⁷. In contrast, the frequency of ‘cold’ days and nights⁸, annually, has decreased significantly since 1960. Since the end of the 1960s the climate perturbations have increased in Benin,

¹ GAIN index summarizes a country’s vulnerability to climate change and other global challenges in combination with readiness to improve resilience. <http://index.gain.org/country/benin>

² McSweeney, C.; New, M.; Lizcano, G. (2010): *UNDP Climate Change Country Profiles: Benin*, http://www.geog.ox.ac.uk/research/climate/projects/undp-cp/UNDP_reports/Benin/Benin.lowres.report.pdf

³ McSweeney et al. (2010)

⁴ Jalloh, A.; Nelson, G.C.; Thomas, T.S.; Zougmore R.; Roy-Macauley H., (2013): *West African Agriculture and Climate Change, A Comprehensive Analysis*, IFPRI <http://www.ifpri.org/sites/default/files/publications/rr178.pdf>

⁵ Climate Service Center (2013): *Climate fact sheet Benin, Ghana, Togo* <http://www.climate-service-center.de/>

⁶ ‘Hot’ day or ‘hot’ night is defined by the temperature exceeded on 10% of days or nights in current climate of that region and season (see footnote 2)

⁷ McSweeney et al. (2010)

⁸ ‘Cold’ days or ‘cold’ nights are defined as the temperature below which 10% of days or nights are recorded in current climate of that region or season (see footnote 2)

which has manifested in reduced annual amplitude of rains by 180 mm⁹, see [Map 1](#). In addition **droughts** have intensified during the same period, especially in the 1970s and 1980s, and rains have intensified by 100 mm/h enhancing soil **erosion and floods**¹⁰. Moreover, the annual count of wet days as well as the annual maximum 30-day total rainfall showed a substantial decrease over the 1960–2000 period¹¹.

Climate change. Northern regions are especially threatened by encroaching deserts; the borderline of which gradually shifts to the lower latitudes, while the agricultural production capacity in the intensively cultivated south is endangered by nutrient mining. Under climate change, this situation is most likely to worsen, with accelerated **desertification** in the north and more frequent occurrence of torrential rains and **floods** in the south, but much less in the Middle Belt. The most notable climate risks are drought, late and intensive rains, and floods, in addition to extreme winds¹². See [Map 2](#) for projected **precipitation** change under different climate change scenarios.

Climate models project an increase in the normal annual maximum **temperature** for the whole country, ranging from slight (1–1.5°C) to substantial (2.5–3.0°C)¹³, see [Map 3](#). The mean annual temperature is projected to increase by 1.0 to 3.0°C by the 2060s, and 1.5 to 5.1°C by the 2090s. The range of projections by the 2090s under any emissions scenario is around 2.0–2.5°C¹⁴. With the current rate of **wetlands destruction** (due to human intervention), the coastal wetland is projected to reduce by 40% by 2080. **Sea level rise** due to climate change is expected to intensify, probably resulting in a coastal catastrophes (complete coastal erosion, floods, and storm waves)¹⁵.

The negative consequences of intense and successive periods of drought and floods could affect **food security**: they may reduce the production of food by 6% by 2025 if no adaptive measures are taken⁴. As for **water resources**, the consequences of climate change (decline of precipitation) could result in 40% to 60% reduction in the availability of water resources, further influencing Benin's food production¹⁶, see [Map 4](#). Moreover, according to the Global Climate Change Alliance (GCCA) the consequences of the degradation and destruction of gallery forests in the Ouémé river basin – caused by charcoal non-sustainable timber extraction and extensive fallow-based agricultural practices – is being exacerbated by climate change¹⁷. This is not only a significant problem for forest-dependent communities, but also for downstream regions, which increasingly suffer from devastating floods during the rainy season.

⁹ UNDP; Beninese Ministry of Environment and Nature Protection (2008): *Convention-cadre des Nations Unies sur les changements climatiques* (PANA-Benin),

http://unfccc.int/files/adaptation/napas/application/pdf/02_ben_pp.pdf

¹⁰ UNDP; Beninese Ministry of Environment and Nature Protection (2008)

¹¹ Climate Service Center (2013)

¹² Centre for World Food Studies (SOW-VU) (no date): *The impact of climate change on crop production and health in West Africa, An underutilized Middle Belt in West Africa*, <http://www.sow.vu.nl/Activities/Benin.html>

¹³ Jalloh et al. (2013)

¹⁴ UNDP; Beninese Ministry of Environment and Nature Protection (2008)

¹⁵ UNDP; Beninese Ministry of Environment and Nature Protection (2008)

¹⁶ Climate Service Center (2013)

¹⁷ Global Climate Change Alliance (GCCA) (2013): *From Integrated Climate Strategies to Climate Finance Effectiveness – Experiences from the GCCA*. <http://www.gcca.eu/sites/default/files/soraya.khosravi/gcca2013-eng-pdf.pdf>

Socio-economic vulnerability

Key facts:

GDP (PPP) per capita (2013) ¹⁸ :	1,790 international \$
Population (October 2014) ¹⁹ :	10,879,828
Projected population (2050) ²⁰ :	22,137,000
Population density per km ² (2013) ²¹ :	92
Human Development Index (2013) ²² :	165 out of 187 countries
Corruption Perceptions Index (2014) ²³ :	80 out of 175 countries
Gender Inequality Index (2013) ²⁴ :	134 out of 187 countries
Adult literacy (2014) ²⁵ :	42.4% (male 55.2%; female 30.3%)

Agriculture is a key economic sector for employment in Benin: 70% of the population is active in agriculture and it contributes for 32.6% to the country's GDP²⁶. The major staple food crops are yams, cassava, and maize, and the major cash crops are seed, cotton, and cashew nuts²⁷. Since agriculture is especially vulnerable to its consequences, climate change will disproportionately affect the poor, who depend on agriculture for their livelihoods and who have a lower capacity to adapt²⁸. Without adaptive measures such as enhanced crops and improved irrigation²⁹, agricultural production is expected to decrease by 3 to 18% in 2025. However, the high percentage of households in poverty (36.2% of Benin households are below the national poverty line³⁰) may limit investment and hinder adoption of adaptive measures. The most vulnerable socio-economic groups are small-scale cattle herders, smallholder farmers and fishermen; smallholder farmers and small-scale cattle herders are to some extent interdependent since herders may depend on farms for the feed for their cattle, partly covered by post-harvest grazing. There is also a gender dimension to climate change: a study focusing on dry grains found that only 28% of the households surveyed that are headed by women were able to cover the basic annual needs of their families compared to 43% of male-headed households. As a result of the consequences of climatic changes, the self-sufficiency of rural households headed by women will be even lower³¹.

¹⁸ World Bank Data – GDP per capita, PPP. <http://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD>

¹⁹ World Population Review – Benin, <http://worldpopulationreview.com/countries/benin-population/>

²⁰ UNDESA (2012): *World Population Prospects: The 2012 Revision*, <http://esa.un.org/wpp/>

²¹ World Bank Data – Population density, <http://data.worldbank.org/indicator/EN.POP.DNST>

²² UNDP (2014) <http://hdr.undp.org/en/content/table-1-human-development-index-and-its-components>

²³ Transparency International (2014) <http://www.transparency.org/cpi2014/results>

²⁴ UNDP (2014) <http://hdr.undp.org/en/content/table-4-gender-inequality-index>

²⁵ Index Mundi (2014) <http://www.indexmundi.com/benin/literacy.html>

²⁶ Programme Alimentaire Mondial (2009): *Analyse Globale de la Vulnérabilité, de la Sécurité Alimentaire et de la Nutrition au Bénin* (AGVSAN).

http://reliefweb.int/sites/reliefweb.int/files/resources/43DA51077604F6EAC12575CC004CE9B0-Rapport_Complet.pdf

²⁷ Jalloh et al. (2013)

²⁸ Jalloh et al. (2013)

²⁹ République du Bénin, Ministère de l'Environnement, de l'Habitat et de l'Urbanisme, Direction de l'Environnement (2001): *Communication Nationale Initiale du Bénin sur les Changements Climatiques* <http://unfccc.int/resource/docs/natc/benncl1f.pdf>

³⁰ World Bank data (2014): http://data.worldbank.org/country/benin#cp_wdi

³¹ Rochat, A.; Guenat, D. (2013): *Agriculture + Food Security Network Brief No 3 Climate change: farmers' perceptions and strategies*. Bern University of Applied Sciences. https://www.hafl.bfh.ch/fileadmin/docs/Studium/BScAgronomie/Majors/afs_brief_no3_en.pdf

Some climate change scenarios show that parts of the most productive zones for staple crops (north, north-west, and centre) could experience reduced precipitation as well as an average increase of 2°C in temperature, with substantial negative effects on staple yields (e.g., a decline of 5–25% for maize)³². The lengthening of the dry season has an overall effect on agricultural production. Net exports of maize are shown to increase due to favourable changes in climate for large-scale maize production in combination with economic developments, whereas for tubers and root crops (yams, sweet potatoes, cassava, and others), imports will grow: cassava production and yields are shown to improve until 2030 and then stagnate, at between 3 and 4 million metric tons and at just over 15 tons per hectare, respectively³³. For yams and sweet potatoes, results of studies and climate models vary: some models project an increase, others a decrease of yield. Most likely is that yam yield will decline significantly during the period 2041–2050 ranging from 18 to 33%³⁴. Reduction in yam yield is not explainable by the change in temperature but due to a decline in precipitation. Net imports of crops are expected to increase slightly³⁵ which could compensate the food availability. Concerning the impact of climate change on cotton cultivation, it is expected that yield will decrease due to insufficient and unequal rainfall, potentially leading to crop diversification.

As for the other sectors: a rising sea level and increased coastal erosion are threatening poor communities living along the urbanised coast and the sensitive coastal ecosystems. In the future, this is expected to lead to population migration, disease outbreaks, and to contribute to food shortages. Overall, the coastal, north-western, and far northern zones of Benin are considered to be particularly vulnerable to the impacts of climate change³⁶.

National government strategies and policies

Numerous action plans and policy documents have been formulated by the Government of Benin, including Agenda 21, Benin 2025, the Agreement on Sustainable Development, and several reforestation programmes, as well as an Initial and Second National Communication document on climate change that are currently under implementation. Benin also ratified the UN Convention on Biological Diversity (CBD) in 1994 for which it had a National Biodiversity Strategy and Action Plan approved in 2002³⁷, the Convention to Combat Desertification (CCD) in 1996 for which it developed a National Action Programme in 2000³⁸, and the Framework Convention on Climate Change (UNFCCC) in 1994³⁹.

Reflecting its development priorities, Benin emphasizes the need in its climate change actions to alleviate extreme poverty and promote economic growth⁴⁰. These priorities are reflected in its Initial National

³² Lawin et al. (2012)

³³ Lawin et al. (2012)

³⁴ Kumar Srivastava, A.; Gaisera, T.; Paethb, H.; Ewert, F. (2012): *The impact of climate change on Yam (Dioscorea alata) yield in the savanna zone of West Africa*, Elsevier, <http://www.ukm.my/ipi/wp-content/uploads/2013/07/10.2012The-impact-of-climate-change-on-Yam-Dioscorea-alata-yield-in-the-savanna-zone.pdf>

³⁵ Jalloh et al. (2013)

³⁶ BMEHU (2001), in: De Vit, C.; Parry, J-O., (2011): *Review of Current and Planned Adaptation Action: West Africa, Ghana*. Adaptation Partnership. https://www.iisd.org/pdf/2011/West_Africa_Adaptation_Action.pdf

³⁷ Convention on Biological Diversity. Clearing House Mechanism Benin. <http://bj.chm-cbd.net/implementation/documents>

³⁸ Programme d'Action National de Lutte Contre la Désertification. <http://www.unccd.int/ActionProgrammes/benin-fre2000.pdf>

³⁹ https://unfccc.int/essential_background/convention/status_of_ratification/items/2631.php

⁴⁰ BMEHU (2001)

Communication (2002) and its National Adaptation Programme of Action (NAPA, 2008). The first phase is called 'Integrated adaptation programme for the fight against the damaging effects of climate change for the agricultural production and food security in Benin'. This phase started in January 2010 and is still under implementation. Its focus is on the four most climate vulnerable agro-ecological zones of Benin: zone 1: Extreme Nord (Malanville), zone 4: West Atacora-Donga (Ouaké, Matéri), zone 5: Central coastal zone (Savalou, Aplahoué), zone 8: fisheries zone (Ouinhi, Bopa, Adjohoun, and Sô-Ava), see [Map 5](#). The general objective is to strengthen the capacities of agricultural communities in order to make them adaptive to climate change. Envisaged results are the establishment of nine executive Community Committees for Technical Coordination, cultivation of short cycle crops, studies, and validation workshops. Achieved performance so far is between 77% (physical annual measures) and 93% (annual financial execution)⁴¹. The Adaptation Partnership, a USAID supported platform on climate adaptation, identified the gaps in current adaptation action: they appear to be in coastal zone management, maintenance of freshwater resources, forestry, and energy. Gender does not constitute a significant component of any current adaptation or proposed projects⁴².

The priority projects as submitted to the UNFCCC⁴³ have a slightly different focus than the most viable options for making Benin more adaptive to climate change effects as formulated in the NAPA⁴⁴. In the NAPA, agricultural production systems and climate-related diseases protection were priorities. In the projects submitted to the UNFCCC, these are less explicitly mentioned. Submitted projects are:

- Implementation of a forecasting system for early warning and climatic risks for food security in four vulnerable agro-ecological regions;
- Climate change adaptation of households through awareness-raising and capacity building on solar energy and efficient stoves in areas vulnerable to climate change and with degraded soils;
- Exploitation of surface water as a means to adapt to climate change in the most vulnerable areas in the Centre and North Provinces;
- Malaria protection for children and pregnant women in areas most vulnerable to climate change;
- Protection of coastal areas against sea level rise.

Furthermore, Benin communicated three Nationally Appropriate Mitigation Actions (NAMAs) to the UNFCCC that are currently being translated into concrete projects:

- The development of an urban transport system in greater Cotonou to reduce GHG emissions;
- The sustainable development of natural forests and forest planting to strengthen carbon sinks;
- Recovery of CH₄ emitted by landfills in local communities with a special status (Cotonou and greater Cotonou, Porto-Novo and Parakou)⁴⁵.

Lastly, Benin has developed a National Climate Change Learning Strategy that is expected to be formally adopted by the Council of Ministers in 2015⁴⁶.

⁴¹ Loconon, D.Z. (2013): *Integrated adaptation programme for the fight against the damaging effects of climate change for the agricultural production and food security in Benin, Quelques acquis du PANA*

⁴² De Vit, C.; Parry, J.E. (Adaptation Partnership) (2011)

⁴³ UNFCCC (2012): *NAPA Priorities Database, Benin*,

http://unfccc.int/adaptation/workstreams/national_adaptation_programmes_of_action/items/4583.php

⁴⁴ UNDP; Beninese Ministry of Environment and Nature Protection (2008)

⁴⁵ UNFCCC (2014): *Pre-2020 action by countries, Benin*,

http://unfccc.int/focus/mitigation/pre_2020_ambition/items/8167.php

⁴⁶ UN Climate Change Learn (2015): <http://unccllearn.org/benin-strategy>

Climate finance

In the last decade, there have been numerous projects and programmes financed by donors aimed at improving Benin's climate preparedness, including tree plantations, capacity building of national and local governmental institutes, and agricultural strategy development. Donors include international organisations such as UNDP, World Bank, DFID, IDRC, French/German/Danish/Dutch Ministries of Foreign Affairs, LDCF, and GIZ. Overall, the majority of climate change related projects in Benin are financed by donors from France (ministries, research institutes NGOs etc.) that are in some cases also involved in the implementation⁴⁷. The largest donor for overall development in Benin is the European Union (372 million Euros in the 11th European Development Fund) investing mainly in sustainable agriculture and energy and good governance⁴⁸. As for climate funds utilization: according to the Overseas Development Institute (ODI), Benin received 22,850,000 USD in climate funds between 2004 and 2014 – placing it at nr. 51 of the climate finance approved ranking list of 135 countries⁴⁹.

Benin is a pilot country for the inception phase of the Green Climate Fund (GCF) Readiness Programme. It is expected that on-stream investment from the private sector in climate change adaptation follows after the pipeline of vital and viable national projects drawn from national climate change strategies, plans and policies has been developed⁵⁰. This access programme is coordinated through UNDP and the World Resources Institute (WRI). The National Adaptation Plan Global Support Programme (NAP-GSP) is linking with the GCF Readiness Programme to maximize opportunities to coordinate adaptation actions in Benin. Indeed, last year donors pledged 11 billion USD to boost the economy of Benin although no specifications on climate change were made⁵¹. The Government of Benin stated that it plans to invest in priority sectors such as transport, energy, agriculture, and tourism.

Benin joined the GEF in April 1994 and completed GEF enabling activities (to qualify for funding from GEF), including a NAPA, National Biodiversity Strategy and Action Plan (NBSAP) and country self-assessment. In total, it was allocated 13,600,270 US\$ for biodiversity projects, 30,332,091 US\$ for climate change, and 15,658,158 US\$ for multi focal area projects⁵².

Although eligible for the Scaling Up Renewable Energy in Low Income Countries Program (SREP), Benin has so far not submitted applications for this fund⁵³.

⁴⁷ De Vit, C.; Parry, J.E. (2011)

⁴⁸ Union Européenne (no date): *Les relations de l'Union Européenne avec le Bénin*
http://eeas.europa.eu/benin/index_fr.htm

⁴⁹ Nakhooda, S.; Norman, M. (2014): *Climate Finance: Is it making a difference? A review of the effectiveness of Multilateral Climate Funds*. ODI. <http://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/9359.pdf>

⁵⁰ UNDP Adaptation Learning Mechanism (2013): *Supporting Benin to advance their NAP Process*, <http://www.undp-alm.org/benin-advancing-adaptation-agenda>

⁵¹ UNDP (2014): <http://www.undp.org/content/undp/en/home/presscenter/pressreleases/2014/06/17/a-paris-les-bailleurs-de-fonds-annoncent-usd-11-milliards-pour-relancer-l-economie-b-ninoise.html>

⁵² GEF – *Country profile Benin*. https://www.thegef.org/gef/country_profile/BJ

⁵³ Climate Investment Funds (2015): http://www.climateinvestmentfunds.org/cif/Scaling_Up_Renewable_Energy_Program_in_Low_Income_Countries

Climate change projects

Projects in Benin that are involved in climate change adaptation and mitigation in relation to water and food security are numerous. Below follows a selection of the main programmes currently under implementation:

- 'Integrated Adaptation Programme to Combat the Effects of Climate Change on Agricultural Production and Food Security', financed by LDCF and implemented by UNDP, currently in finalisation phase⁵⁴;
- A number of projects in the energy sector to reduce the use of coal and promote climate-friendly energy sources, financed by the World Bank⁵⁵;
- '2SCALE'⁵⁶ funded by the Netherlands Ministry of Foreign Affairs (2012–2017), aiming to improve rural livelihoods and food and nutrition security in Africa by creating partnerships to enable farmers and entrepreneurs to grow together in their agribusiness⁵⁷;
- Several climate change and food security projects supported by the World Food Programme (WFP)⁵⁸;
- Several climate relevant programmes executed by GIZ, including: 1) 'Adapting agriculture to climate change' (PACC) (2014–2019), a project aimed at sustainable management of natural resources, in particular of water and soil, to help those agricultural areas of northern Benin most affected by climate change better adapt to these changes; 2) 'Trans boundary Biosphere Reserve in the Mono Delta' (2013–2019), a project that aims to protect natural resources, particularly biodiversity, and promotes natural resources use in a sustainable manner; and 3) 'Integrated management of water resources and water supply' (2014–2017), aiming at ensuring water access by intervening in the interrelationship between water, climate change and food security⁵⁹;
- A GCCA programme for reduction of flood impacts (2012–2017), notably by promoting the conservation and sustainable use of gallery forests in the lower valley of the Ouémé River and by equipping Benin with basic geographic information systems (GIS) and cartographic equipment in support of improved forest and land management, with the objective to inform the Growth strategy for Poverty reduction, the National Environmental Management Programme and the National Action Programme of Adaptation to climate change⁶⁰.

The following regional programmes with a focus on food security and/or water are currently also being implemented in Benin:

- The 'Adaptation Learning Programme for Africa' (in finalisation phase in 2015), executed by CARE, is aiming to increase the capacity of vulnerable households in Sub-Saharan Africa to adapt to climate variability and change and supported by the United Kingdom's Department for International Development (DFID), The Ministry of Foreign Affairs of Denmark, The Ministry of Foreign Affairs of Finland and the Austrian Development Cooperation⁶¹;

⁵⁴ UNDP (2015).

http://www.bj.undp.org/content/benin/fr/home/operations/projects/environment_and_energy/project_sample1.html

⁵⁵ World Bank – Benin (2015). <http://www.worldbank.org/en/country/benin>

⁵⁶ 2SCALE is a consortium of the International Fertilizer Development Center (IFDC), BoP Innovation Center (BoPInc.), and the International Centre for development oriented Research in Agriculture (ICRA)

⁵⁷ 2SCALE consortium (2013): *Business as unusual, the 2SCALE project – highlights 2013*, <http://ifdc.org/benin>

⁵⁸ World Food Programme (WFP) (2015) <http://www.wfp.org/countries/benin>

⁵⁹ GIZ (2015): Benin. <https://www.giz.de/en/worldwide/342.html>

⁶⁰ GCCA (2013)

⁶¹ CARE Climate Change Information Centre (2014): *Adaptation Learning Programme for Africa*, <http://www.careclimatechange.org/adaptation-initiatives/alp>

- 'Promotion of climate change research in the region through the West African Science Service Centre on Climate Change and Adapted Land Use' (WASCAL), supported by the United Nations University (UNU)⁶²;
- 'Great Green Wall' financed by Multi Trust Fund (GEF), SCCF, World Bank, AfDB⁶³;
- 'Programme to Build Resilience to Food and Nutrition Insecurity in the Sahel' (P2RS) (2014–2019) funded by the African Development Bank in a move aimed at ending the frequent cycles of drought and famine in the Sahel region⁶⁴;
- Regional programmes executed by GIZ, including 1) 'Promotion of a climate-friendly interconnected power system in West Africa' (2013–2016), aiming at creating key conditions for a climate-friendly interconnected power system in the ECOWAS region; and 2) 'Energising Development (EnDev) – Programme for Energy Access' (2005–2019), aiming at the development of commercial markets for the diffusion of renewable energies and energy-efficient technologies for households, public and social institutions, and small and medium-sized enterprises⁶⁵.

For a complete list of projects in Benin funded through bilateral/multilateral climate funds, see the list in the [Annex](#).

Climate contribution of the Netherlands Embassy: Pitch & Bid

In 2014, the Netherlands Embassy in Benin prepared a 'Pitch & Bid' to describe how it aims to contribute to climate change adaptation and mitigation in its food security and water activities. It used Rio Markers to assess the portion of these activities' budgets that can be counted as a 'climate contribution'. The resulting climate contribution for 2015–2017 is equal to 32.12 million euros (10.96 million for 2015; 11.74 million for 2016; 9.41 million for 2017). Of this, 42% concerns both *adaptation and mitigation* and 58% concerns only *adaptation*.

In addition to this, the Embassy described a number of reproductive health activities which can indirectly contribute to climate change mitigation by leading to a reduction in population growth and thus greenhouse gas emissions. These reproductive health activities have a total budget of 2.11 million euros for 2015–2017 (all *mitigation*).

The Embassy's Pitch & Bid indicates the following focus areas for its climate contribution:

- **Integrated water resources management (IWRM):** disaster risk reduction in urban areas along the coast will be enhanced through introduction of the Delta approach in the Ouémé Basin, while support to a National Water Institute will help the country to deal with the uncertain effects of climate change;
- **New water and energy sources:** a change from ground water to surface water as a source for drinking water will contribute to climate adaptation, while a shift from fossil fuels to solar energy contributes to mitigation;
- **Land rights and land use:** a land ownership system will be developed to enable long-term adaptation investments by farmers;
- **Rural infrastructure:** remote rural areas that are often isolated during rainy spells will have better access to markets, production areas and health facilities through improved road and water infrastructure;

⁶² West African Science Service Center on Climate Change and Adapted Land Use (WASCAL) (2015)

<https://icg4wasal.icg.kfa-juelich.de>

⁶³ GEF (2015) https://www.thegef.org/gef/project_detail?projID=4511

⁶⁴ African Development Bank (2014): *AfDB approves US \$231 million for building resilience to food and nutrition insecurity in the Sahel*, <http://www.afdb.org/en/news-and-events/article/afdb-approves-us-231-million-for-building-resilience-to-food-and-nutrition-insecurity-in-the-sahel-13625/>

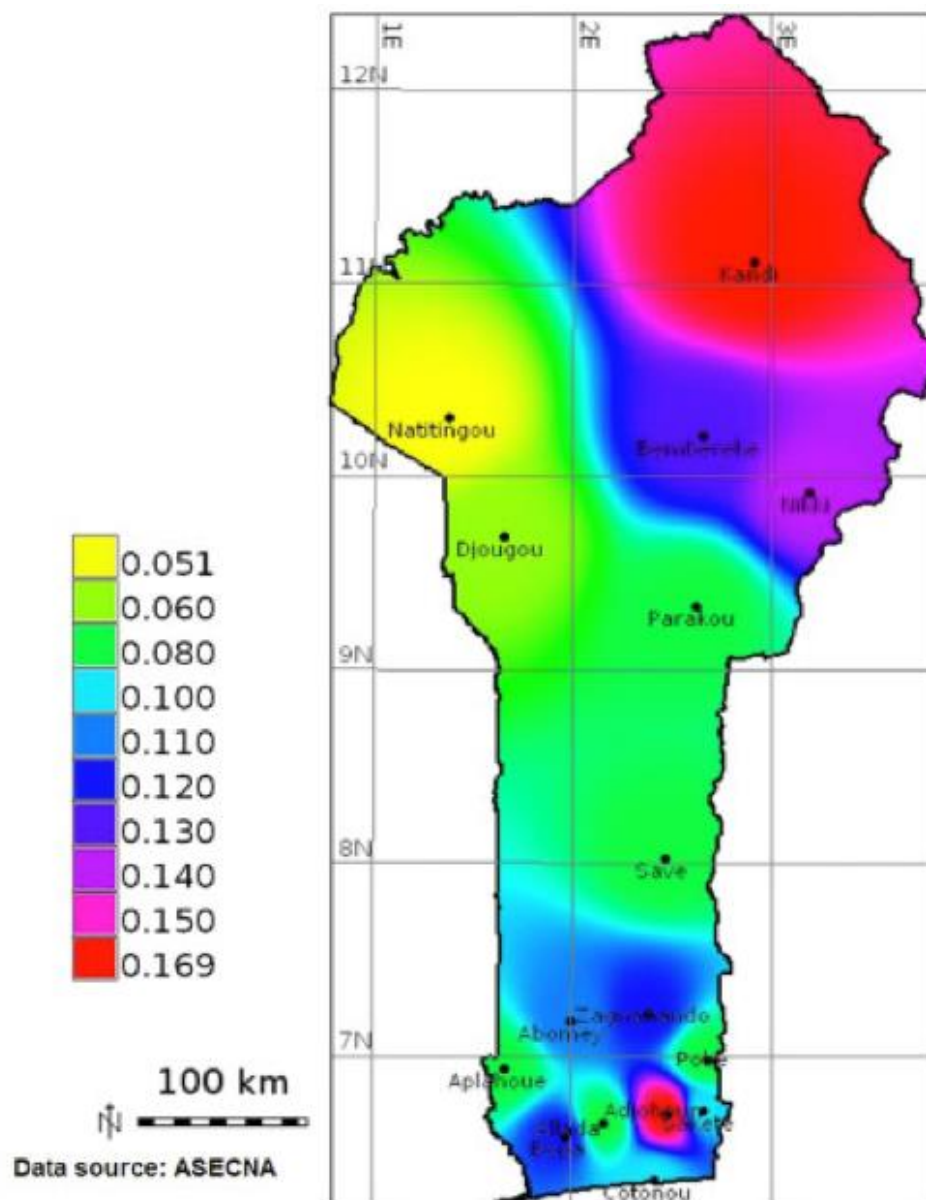
⁶⁵ GIZ (2015)

- **Innovative adaptation for food security and businesses:** innovative practices that improve both food security and business development options will be researched and supported, e.g. the production of biofuels;
- **Reproductive health:** improved family planning will result in a decreasing population growth and thereby address one of the main drivers of greenhouse gas emissions.

The following Embassy activities were identified as ‘climate contributions’ for these focus areas, with the last three focusing on reproductive health:

- Land ownership (food security; 25826);
- Agro business (food security; 25558);
- Hunger project (food security; 24941);
- PASTR II (food security; 26197);
- WASH Gov (water; 24275);
- WASH AT (water; 24277);
- GIRE AT (water; 24278);
- GIRE GOV (water; 24276);
- Access plus (reproductive health; 24558);
- Amour et vie (reproductive health; 24077);
- Leaders religieux (reproductive health; 25479).

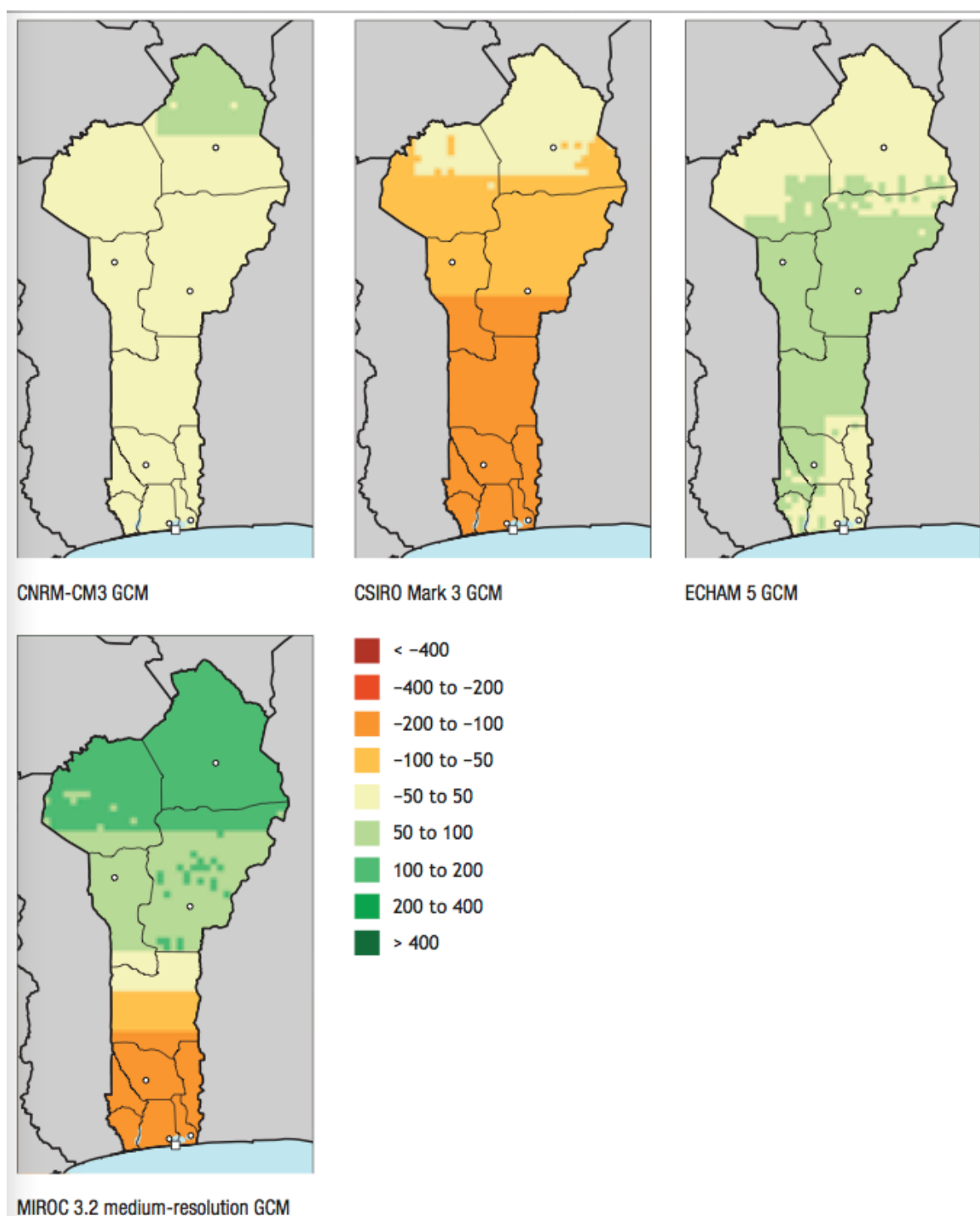
Map 1: Frequency of years of extreme rainfall deficiency in Benin



Source: Yabi and Afouda (2011), retrieved from Konrad Adenauer Stiftung, *Les Enjeux du Changement Climatique au Bénin*

Legend: The clearer colours (upper half of legend) indicate a high number of 'bad' years where the pluvial-metric deficit is higher than or equal to 30%. Years: 1951 – 2010.

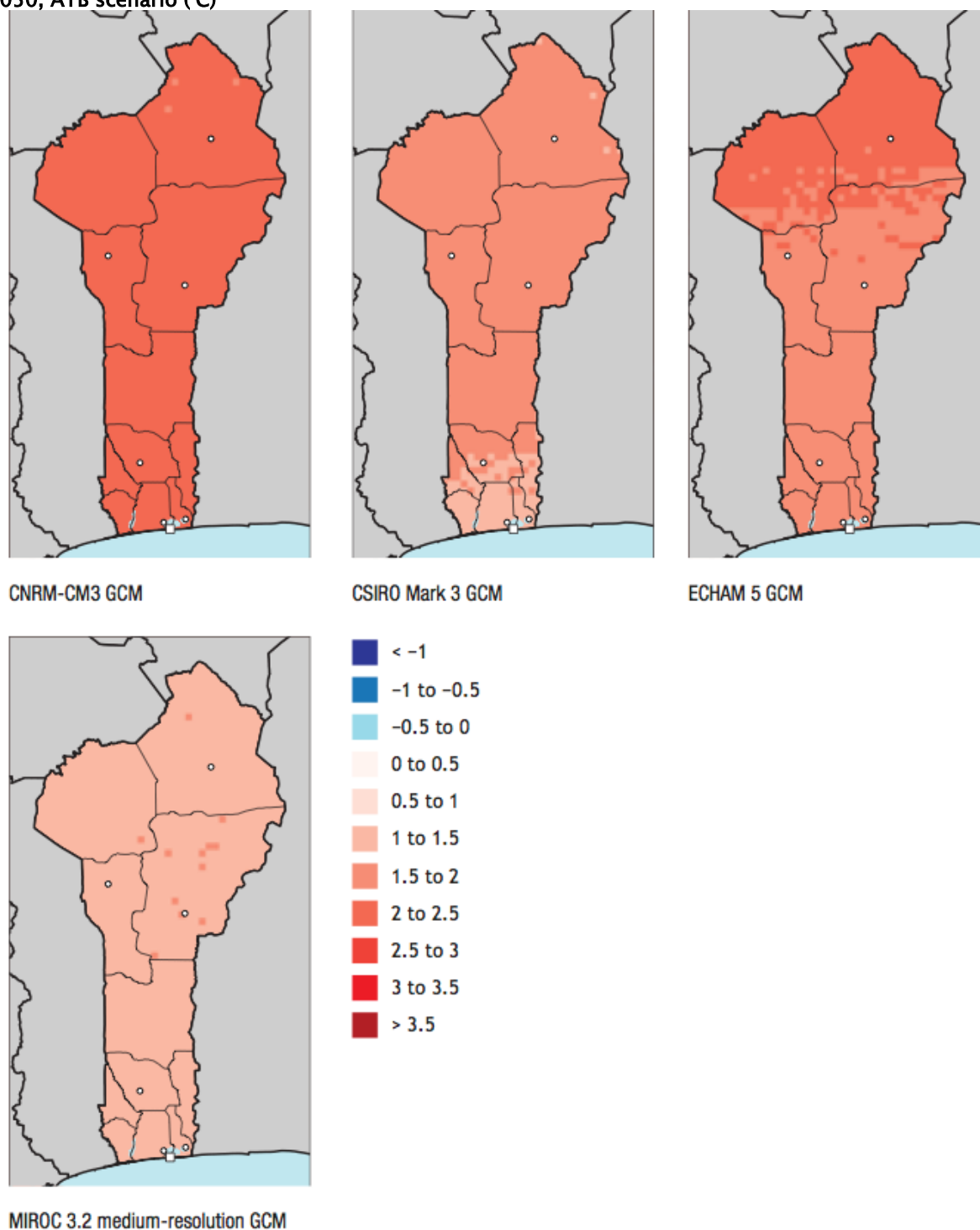
Map 2: Changes in mean annual precipitation in Benin, 2000–2050, A1B scenario (millimetres)



Source: Authors' calculations based on Jones, Thornton, and Heinke (2009).

Notes: A1B = greenhouse gas emissions scenario that assumes fast economic growth, a population that peaks midcentury, and the development of new and efficient technologies, along with a balanced use of energy sources; CNRM-CM3 = National Meteorological Research Center–Climate Model 3; CSIRO = climate model developed at the Australia Commonwealth Scientific and Industrial Research Organisation; ECHAM 5 = fifth-generation climate model developed at the Max Planck Institute for Meteorology (Hamburg); GCM = general circulation model; MIROC = Model for Interdisciplinary Research on Climate, developed by the University of Tokyo Center for Climate System Research.

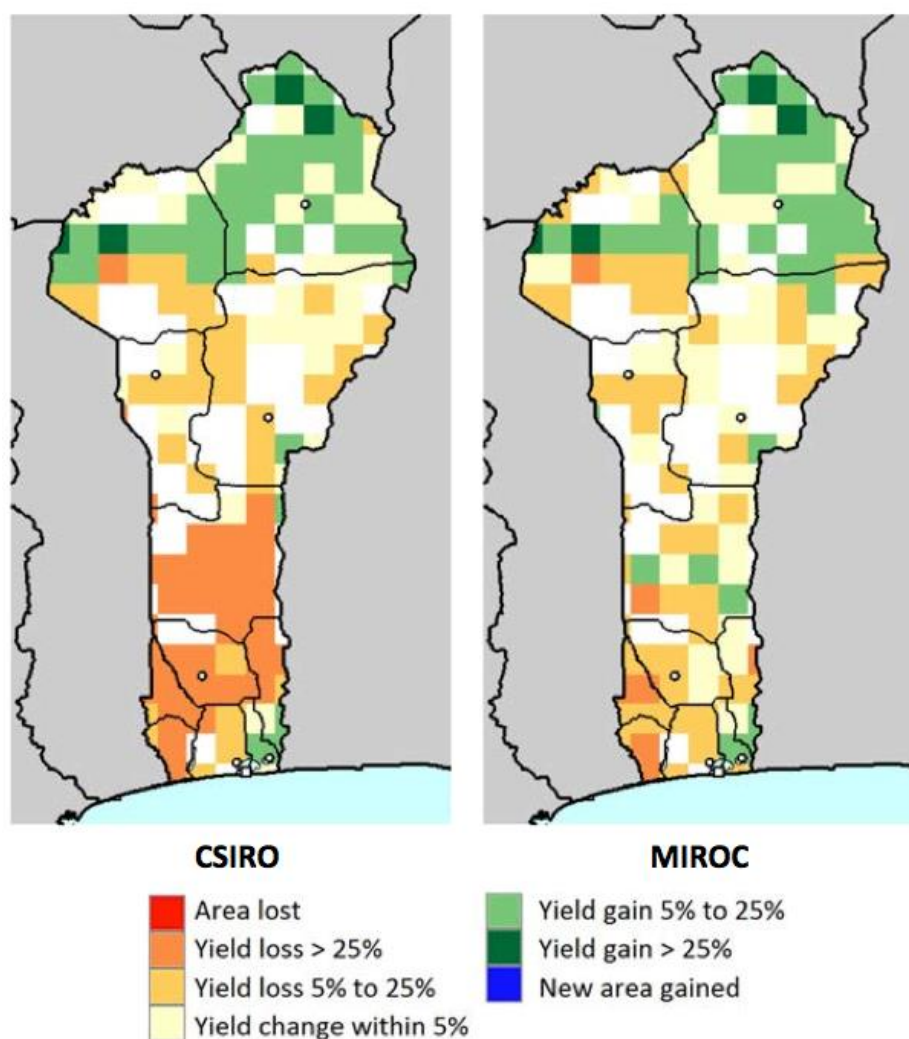
Map 3: Change in monthly mean maximum daily temperature in Benin for the warmest month, 2000–2050, A1B scenario (°C)



Source: Authors' calculations based on Jones, Thornton, and Heinke (2009).

Notes: A1B = greenhouse gas emissions scenario that assumes fast economic growth, a population that peaks midcentury, and the development of new and efficient technologies, along with a balanced use of energy sources; CNRM-CM3 = National Meteorological Research Center–Climate Model 3; CSIRO = climate model developed at the Australia Commonwealth Scientific and Industrial Research Organisation; ECHAM 5 = fifth-generation climate model developed at the Max Planck Institute for Meteorology (Hamburg); GCM = general circulation model; MIROC = Model for Interdisciplinary Research on Climate, developed at the University of Tokyo Center for Climate System Research.

Map 4: Changes in yields under climate change: rain-fed maize



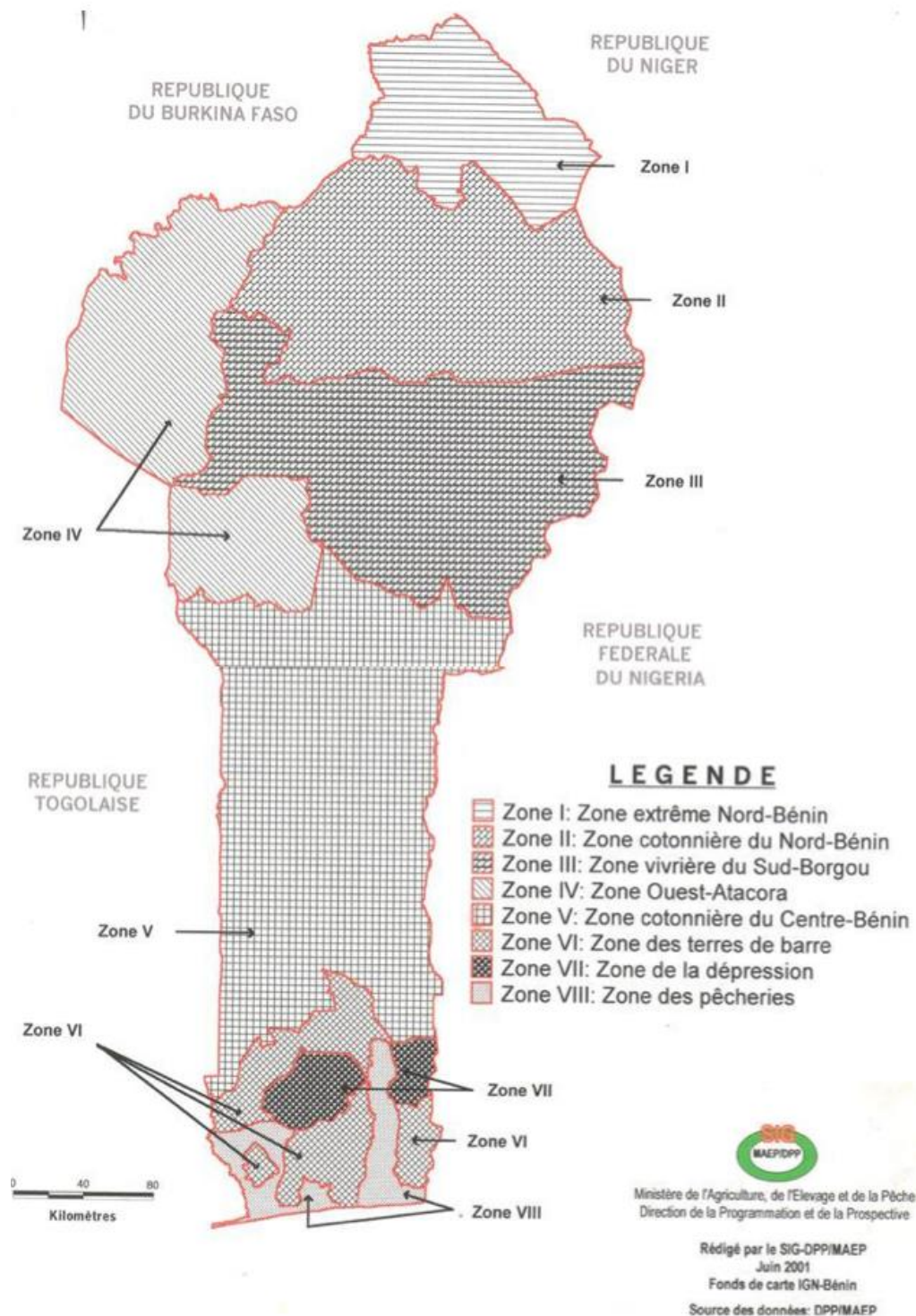
Source: Emmanuel A. Lawin, P. B. Irénikatché Akponikpè, Abdulai Jalloh, and Timothy S. Thomas, December 2012, *West African agriculture and climate change: A comprehensive analysis – Benin*

The maps above depict the results of the Decision Support System for Agro technology Transfer (DSSAT) crop modelling software projections for rain-fed maize, comparing crop yields for 2050 with climate change to yields with 2000 climate. The data indicate a slight yield increase of 5–25 percent in the north. For the central and the southern parts of the country (covering the most productive zone of maize), the MIROC⁶⁶ model shows mostly yield reductions of 5–25 percent. The CSIRO⁶⁷ model predicts even greater reduction in maize yields, exceeding 25 percent. No area is lost.

⁶⁶ Model for Interdisciplinary Research on Climate (MIROC) is a coupled general circulation model and consists of five component models: atmosphere, land, river, sea ice, and ocean (http://ccsr.aori.u-tokyo.ac.jp/~hasumi/miroc_description.pdf)

⁶⁷ Comprehensive climate system model developed by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) including atmosphere, land surface, ocean, and polar ice (http://www.cawcr.gov.au/publications/technicalreports/CTR_021.pdf).

Map 5: Agro-ecologic zones in Benin



Annex: List of projects in Benin under bilateral and multilateral climate funds

Source: *Climate Funds Update (2014)*: <http://www.climatefundsupdate.org/data>

Name of Project	Name of Fund	Implementing Agency	App- roved (USD mil- lions)	Dis- bur- sed (USD mil- lions)	Con- cessi- onal loan	Grant
Project for the Elaboration of the National Programme of Action for Adaptation for Climate Change (NAPA)	Least Developed Country Fund (LDCF)	UNDP	0.2			0.2
Integrated Adaptation Programme to Combat the Effects of Climate Change on Agricultural Production and Food Security	Least Developed Country Fund (LDCF)	UNDP	3.18			3.18
Adaptation to climate change in Benin – Providing a reliable base mapping and fighting floods by preserving and developing gallery forests	Global Climate Change Alliance (GCCA)		5.22			5.22
Strengthening Climate Information and Early Warning Systems in Western and Central Africa for Climate Resilient Development and Adaptation to Climate Change – Benin	Least Developed Country Fund (LDCF)	UNDP	4.1			4.1
Flood Control and Climate Resilience of Agriculture Infrastructures in Ouémé Valley– Benin	Least Developed Country Fund (LDCF)	AfDB	7.45			7.45
Strengthening the Resilience of the Energy Sector in Benin to the Impacts of Climate Change	Least Developed Country Fund (LDCF)		8.2			8.2
Benin Energy Efficiency Program	Global Environmental Facility (GEF4)		1.82			1.82
Improving Mobility in Parakou	Global Environmental Facility (GEF6)	AfDB	1.826			1.826
Preparation of Benin's First Biennial Update Report (BUR1) to UNFCCC	Global Environmental Facility (GEF5)	UNEP	0.35			0.35