

アフリカ地域低炭素開発戦略 情報収集・確認調査

最終報告書

平成 24 年 1 月
(2012 年)

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環境
JR
12-003

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1. イントロダクション

1.1. イントロダクション

三菱 UFJ モルガン・スタンレー証券は、(独) 国際協力機構 (以下、JICA) より「アフリカ地域低炭素開発戦略情報収集・確認調査」を受託した。本調査の実施にあたっては、低炭素開発の政策面や温室効果ガス削減の MRV(測定・報告・検証) 手法に精通しているコンサルタントを調査団員に配し、仕様書及びインセプション・レポートに基づいて調査を遂行した。

1.2. 本ファイナル・レポートの目的

本ファイナル・レポートは、本調査において実施した文献調査及び政策対話の結果を成果物としてとりまとめ、将来的なアフリカ地域諸国による低炭素開発戦略の策定・実施に資することである。

1.3. 調査業務の背景・経緯

1.3.1. 本調査業務の背景・経緯

2010 年 12 月にカンクンで開催された第 16 回気候変動枠組み条約締約国会合 (COP16) において「カンクン合意」が策定され、これまで 120 カ国以上が賛同表明を行っている。同合意では途上国に対して、開発戦略における緩和事業や適応事業の位置づけを明確に示した低炭素開発戦略 (Low Emission Development Strategy: LEDES) の策定を奨励することが明記された。また、同合意では、途上国が緩和事業を実施する際、温室効果ガス排出削減効果の MRV(測定・報告・検証) を行うことを定めている。しかしながら、LEDES の様式・内容に定まったものはなく、各国の裁量に委ねられているのが実情である。

アジア地域においては、LEDES の基礎となる国別報告書 (National Communication Report: NCR) や国家気候変動計画/戦略の策定が定められているが、アフリカ地域においては、同報告書や同計画/戦略の策定に関する能力向上が課題となっている。かかる状況を踏まえ、貴機構は、アフリカ地域を対象にした途上国の国家開発計画/戦略と統合的な LEDES の策定及び MRV の実施に向け、アフリカ地域の能力強化を目的とした基礎情報収集を行った。

1.3.2. 本業務の目的

上述のような状況に鑑み、気候変動に関する国際交渉の状況を踏まえて、アフリカ地域について、主要各国における LEDES 策定及び MRV 実施に向けて各国政府の気候変動政策担当者等に対する必要な能力強化策を報告書に取りまとめた。また、能力強化策取りまとめ

にあたっては、文献調査に加えて、対象国の気候変動交渉官を招聘し、日本政府（外務省、財務省、経済産業省、環境省）及び JICA との政策対話の会議を開催し、アフリカの開発をテーマとする国際会議「アフリカ開発会議（TICAD）」や「第 17 回国連気候変動枠組条約締約国会議（COP17）」など、今後の国際交渉で望まれる協議の観点などについて、幅広く意見交換を行った。

1.3.3. 調査対象国

当初調査対象国は、次の 18 カ国について文献調査を行い、最終的に 15 カ国（下線）の気候変動交渉官が来日し、政策対話に参加した。尚、タンザニア及び南アフリカ共和国については、在京大使館からの参加を得た。

- アルジェリア
- ウガンダ
- エチオピア
- カーボヴェルデ
- ガボン
- ガンビア
- ケニア
- コンゴ民主共和国
- セネガル
- ザンビア
- タンザニア
- チャド
- ブルキナファソ
- マラウイ
- マリ
- 南アフリカ共和国
- モロッコ
- レソト

2. 文献調査

2.1. 文献調査の方法

本調査の対象 18 カ国を IPCC 第 4 次報告書のに基づき地理的に 5 つの地域に分類し、気候や土壌等の地理的条件を踏まえた適応・緩和策の特徴を洗い出し、英語で取りまとめた。主な取りまとめ項目と、本調査対象国の地域別分類を以下に示す。

地域別調査の主な項目	
●	開発政策における緩和・適応策の主流化のポイント
●	地域的特性 <ul style="list-style-type: none">・ 地理的位置・ 気候・ 経済、社会情勢
●	適応策 <ul style="list-style-type: none">・ 脆弱性（想定される影響、重点セクター）・ 重点セクターにおける適応力構築手段、具体策
●	緩和策 <ul style="list-style-type: none">・ 低炭素成長のポテンシャルセクター・ 優先セクターにおける緩和の具体策

地域区分	調査対象国
北部	アルジェリア、モロッコ
東部	ウガンダ、エチオピア、ケニア、タンザニア
西部	カーボヴェルデ、ガンビア、セネガル、ブルキナファソ、マリ
中央部	ガボン、コンゴ民主共和国、ザンビア、チャド
南部	マラウイ、南アフリカ、レソト

また、各国別に LEDS の基礎となる国別報告書や国家気候変動計画/戦略の策定状況を、以下の項目ごとに英語で取りまとめた。

国別調査の主な項目	
●	開発政策における緩和・適応策の主流化のポイント
●	気候変動関連の政策
●	気候変動全般に対する具体的施策

<ul style="list-style-type: none"> ● 持続可能な開発と緩和に関する取り組み <ul style="list-style-type: none"> ・ 温室効果ガスインベントリ ・ 途上国における適切な緩和行動(NAMA)
<ul style="list-style-type: none"> ● 適応策と脆弱性への取り組み <ul style="list-style-type: none"> ・ 気候変動への脆弱性 ・ 具体的な適応策
<ul style="list-style-type: none"> ● 国内の主要産業
<ul style="list-style-type: none"> ● 国家開発戦略
<ul style="list-style-type: none"> ● 将来的な緩和/適応策の例

地域別・国別の文献調査結果は、別途開催した「政策対話」の参考資料として、参加者に配布して活用した。尚、上表の取りまとめに際して参照した文書やウェブサイト等の一覧は、調査結果のセクション(2.2章及び2.3章)に示す。

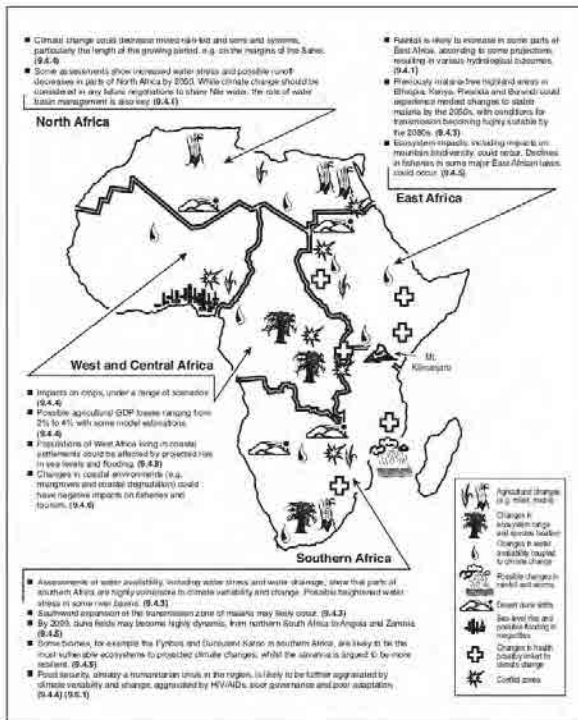
2.2. 文献調査の結果 -地域別

2.2.1. アフリカ北部

Northern Region of Africa

Mainstreaming mitigation/adaptation actions in the region

Northern African economy depends both on oil and agriculture. GHG emissions are mostly due to these sectors. Better practices and adaptation activities in agriculture and livestock will contribute to GHG reduction as well as to the economic growth. Water harvesting and conservation as well as the cultivation of drought and salt resistant crops will help support food security. Renewable energy generation together with the promotion of energy efficiency and conservation will support the economic growth while mitigating the climate change. Recovery of flare gas from the oil production is also an important mitigation strategy.



Google map

*Source: IPCC AR4

1. Regional Characteristic

a) Geographical (zone distribution)

The distinction between Northern Africa and the rest of Africa is historically and ecologically significant because of the effective barrier created by the Sahara. Throughout history, this barrier has culturally separated the North from the rest of Africa. Due to the facilitated communication and migration across the Mediterranean, the cultures of North Africa became much more closely tied to South-western Asia and Europe than Sub-Saharan Africa.

The region is bordered by the Atlantic Ocean in the west, the Red Sea in the east and the Mediterranean Sea to the north and includes Algeria, Egypt, the Libyan Arab Jamahiriya, Morocco, Tunisia, and Western Sahara. The area is 6 million km², of which 94% is in the desert ecosystems of the North African Sahara. The forest cover in this region is among the lowest in the world at around 1% of the land surface.

b) Climate

Northern Africa is characterized, in general, by a hot and dry to very dry climate. Its northern part falls under the temperate influence of the Mediterranean, while the central and southern regions are desert. Owing to the latitude in the High Atlas of Morocco, the rainfall regime is quite variable. The average annual precipitation is below 100 mm in the Sahara but as high as 2,000 mm in the mountains of Morocco. However, less than 10% of the region receives more than 300 mm/yr.

c) Economic and Social

Northern African economies are less dependent on the agricultural sector than Sub-Saharan economies. Several countries in North Africa are oil and gas exporters. Besides the growth in oil, gas, mining, and manufacturing industries, the public investment projects and household consumption have driven growth in North Africa. The Moroccan economy has been, traditionally, dependent on the agricultural sector but over the past decade has embarked upon a diversification of its structure: more growth comes from the secondary and tertiary sectors.

Some countries in the region were expecting to achieve, to a certain extent, the Millennium Development Goals (MDG) within 2015 timeframe. However, with the political and social unrest in 2011, the growth will slow down and the achievement of the MDG might be affected. In general, the economy of the region will be strongly affected by the recent political turmoil in 2011. In the case of Egypt, economic growth is expected to return to previous level in 2012.

2. Adaptation

a) Vulnerability (predicted climate change and variability, priority sectors)

Predicted impacts of climate change for Northern Africa include decreased run-off water, increased desertification, and increased frequency of flooding and drought. In the dry lands, predominant throughout the region, population growth will push people into marginal lands that are highly vulnerable to desertification. Climate change will boost the changes in water availability. Management of changes in water resources resulting from climate change will be very difficult, as the sub-region is already suffering from problems of water availability and distribution. Climate change could also decrease mixed rain-fed and semi-arid systems particularly the length of growing period, thus affecting agricultural output.

b) Adaptation and resilience building measures in priority sectors

Adaptation is proven to be successful and sustainable when linked to effective governance systems, civil and political rights and literacy. Diversification of livelihood activities, institutional framework, adjustments in farming operations, income generation projects and the move towards creating non-farm livelihood incomes surface are key adaptation options.

Agriculture
<p>Crop adaptation, diversification and intensification</p> <p>Diversify the sources of economic growth through the promotion of other products</p> <p>Expand the seedling production capacity for fruits and vegetables</p> <p>Development of early maturing and high yielding crop varieties and adaptation of agricultural technologies</p> <p>Reassessment in the distribution of agro-climate zones and development of alternative crops</p> <p>Increase farm outputs through:</p> <ul style="list-style-type: none"> - changes in the crop calendar by introducing more cropping seasons - adoption of new crop rotations and inter-cropping - use of improved genetic material (high yielding, composite, disease and drought resistant varieties) - introduction of integrated plant nutrition systems - introduction of pest control and post-harvest loss management systems
<p>Soil protection</p> <p>Rehabilitation of degraded soils</p> <p>Use of soil and water conservation techniques</p> <p>Changes in tillage practices and crop rotation</p>
<p>Water harvesting and irrigation</p> <p>Rainwater harvesting</p> <p>Building of sand dams for irrigation, reservoirs and water retention ponds</p> <p>Improved water management and irrigation systems</p> <p>Appropriate technologies to improve the effective use of rainwater for fed the agriculture (new and more efficient irrigation systems)</p>
<p>Dry farming</p> <p>Maintaining agricultural activities of the populations living in oases</p> <p>Promotion of date palm plantation/protection</p> <p>Increase plantation of olive trees</p>
Livestock
<p>Livestock management</p> <p>Promote and encourage new grazing strategies</p> <p>Breeding of animals that adapt well to climatic variety</p>

<p>Promotion of economic livelihood diversification</p> <p>Intensification of livestock production in arid areas</p>
<p>Livestock development</p> <p>Fodder production and development of fodder stocks for livestock</p> <p>Developing special livestock insurance schemes</p>
<p>Water resources and watershed management</p>
<p>Integrated watershed management</p> <p>Regulation of abstraction of freshwater from the river to maintain a delicate equilibrium between flow and saline intrusion</p> <p>Introduction of legislative measures such as licensing and permits for withdrawal of river water for irrigation</p> <p>Improvement of the efficiency of existing irrigation systems and introduction and encouragement of the use of more efficient irrigation systems such as sprinkler and drip irrigation systems</p> <p>Promote water harvesting</p> <p>Development and utilization of better planning tools such as aquifer simulation models and a predictive/operational saltwater intrusion models</p> <p>Construction of dikes or small dams in most of the smaller streams of the river</p> <p>Protection of water towers, river banks, and water bodies and de-silting of riverbeds and dams</p> <p>Research on physical, biological, social and cultural data which enables effective planning and rational management of water</p> <p>Strengthening the monitoring network weather, erosion, water runoff, sedimentation and quality of surface water</p> <p>Flood protection</p>
<p>Water supply</p> <p>Implementation of water supply system to rural and urban population</p> <p>Building capacity for water quality improvement, and awareness campaign to promote water conservation measures</p> <p>Municipal water recycling facilities</p>
<p>Cross-cutting issues</p>
<p>Education, training and public awareness</p> <p>Improvement of information, education and communication on adaptation to climate change through:</p> <ul style="list-style-type: none"> - Incorporation of climate change in school curricula - Use of mass media and development of educational and sensitization materials to enhance public awareness
<p>Research and development</p> <p>In-depth research on the climate change impacts on water and agriculture</p> <p>Improving climate forecasting capacity</p>

3. Mitigation

Northern African countries can consider the application of more stringent energy efficiency measures, improved quality of fuels, and advances in the use of higher efficiency engines and industrial plants to reduce GHG emissions. Improved energy efficiency, brought about through energy-pricing reforms and technological adaptations, could also make a substantial contribution to curbing of GHG. Alternative sources of energy—such as solar energy—can be explored, especially in the rural areas that are home to about 50% of the region’s population.

a) Potential of low-carbon development

Energy
<p>Promotion of renewable energies</p> <p>Development of renewable sources, such as hydro, wind, biomass, etc.</p> <p>Development of solar technologies such as: solar cookers, solar water heaters, solar dryers, and photovoltaic systems</p> <p>Development of solar-based rural electrification systems</p> <p>Installation of wind turbines in industrial centres</p>
<p>Improving energy generation, transmission and distribution</p> <p>Implementation of the rural electrification programme</p> <p>Improvement of power plants efficiency through optimization of maintenance plan</p>
Energy efficiency
<p>Energy efficiency in the industry</p> <p>Rational use of energy</p> <p>Combined cycle power plant</p> <p>Cogeneration</p> <p>Implementation and improvement of heat trapping system</p> <p>Retrofitting and upgrading boilers</p>
<p>Energy conservation at household level</p> <p>Awareness campaigns for energy conservation</p> <p>Establishment of energy standards for home appliances</p> <p>Substitution of incandescent bulbs by those of low consumption (e.g. Compact Fluorescent Lamps)</p>

b) Mitigation measures in priority sectors

Agriculture & Livestock
<p>Livestock</p> <p>Intensification of livestock system through integration with agriculture</p> <p>Adoption of an improved and diversified animal husbandry</p>

<p>Agriculture</p> <p>Improved water management in irrigated areas</p> <p>Substitution of nitrogen fertilizer by organic manure or other organic fertilizers</p> <p>Changes in tillage method or no-till farming (at commercial farms)</p>
<p>Waste management</p>
<p>Municipal solid waste management</p> <p>Community-based solid waste management projects</p> <p>Resource recovery and recycling</p> <p>Private sector involvement in solid waste management</p> <p>Expansion of collection and disposal</p> <p>Capture and recovery of biogas from solid waste disposal sites</p> <p>Use of appropriate technologies for safe disposal</p> <p>Composting of organic wastes</p>
<p>Wastewater treatment</p> <p>Evaluation of GHG emissions from wastewater treatment plant</p> <p>Methane capture and/or recovery from anaerobic digestion</p> <p>Biogas production from anaerobic digestion sludge</p> <p>Methane recovery from abattoirs and peri-urban dairy farms</p>
<p>Agricultural waste</p> <p>Composting of organic and agricultural wastes</p> <p>Aerobic digestion of biowastes and/or manure to produce biogas for lighting and cooking</p> <p>Biomass-based electricity generation</p>
<p>Transport and Infrastructure</p>
<p>Promotion of better transport and improvement on infrastructure and technology</p> <p>Encouragement of mass transport</p> <p>Traffic management improving and making traffic lights more effective, construction of bus lanes, pedestrian lanes, bicycle lanes</p> <p>Adequate management of transportation routes</p> <p>Development of low carbon fuels, such as biofuels</p> <p>Improvement of telecommunication to reduce commuting by giving incentives to population/companies to use email, telefax, mobile phones and teleconference to reduce the number of trips</p>
<p>Changes in transport mode</p> <p>Promotion of rail transport</p> <p>Promotion of non motorized transport</p>
<p>Improvements in vehicles</p> <p>Awareness, training and information to driver, such as course on fuel efficiency in driving schools curricula</p>

Environmental standard and compulsory inspection of vehicles
Manufacturing industry
<p>Energy recovery and efficiency</p> <p>Rational use of energy</p> <p>Combined cycle power plant</p> <p>Cogeneration</p> <p>Implementation and improvement of heat trapping system</p> <p>Retrofitting and upgrading boilers</p>
<p>Fuel switch</p> <p>Development of natural gas use in industrial sector</p> <p>Fuel switch to low carbon fuels</p> <p>Substitution of oil boilers by renewable biomass boilers</p>
Oil exploitation and refinery
<p>Gas flaring and recovery</p> <p>Gas leak prevention</p> <p>Recovering steam loss</p> <p>Recovering exhaust gas</p> <p>Electricity generation from recovered gas</p> <p>Installation of a heat pump type separation unit for propane and propylene</p> <p>Steam trap maintenance</p>
Cement industry
<p>Fuel switch and energy efficiency</p> <p>Fuel switch to low carbon fuels</p>
<p>Raw materials substitution</p> <p>Partial substitution for clinker using fly ashes, gypsum, slag, etc.</p>

Reference:

- Global Forest Resources Assessment 2000. Available at FAO Corporate Document Repository:
<http://www.fao.org/DOCREP/004/Y1997E/Y1997E00.HTM>
- African Economic Outlook: <http://www.africaneconomicoutlook.org>
- UNEP. Africa Environment Outlook and Africa Environment Outlook 2.

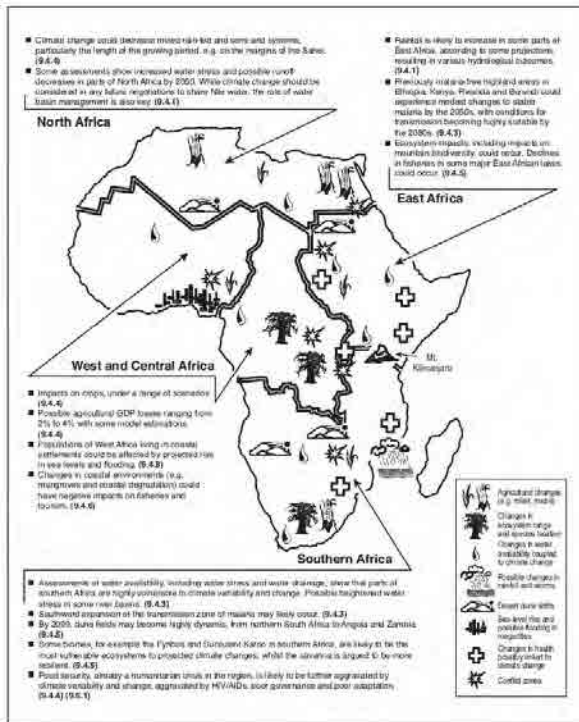
This summary was prepared based on the data/information available as of October 2011.

2.2.2. アフリカ東部

Eastern Region of Africa

Mainstreaming mitigation/adaptation actions in the region

Eastern Africa's economy depends largely on agriculture, which is the main source of GHG emissions. Tourism is also an important sector of the economy. Intensification of agriculture and livestock together with water and soil conservation are important adaptation measures that contribute to food security. Promotion of renewable energy and energy efficiency are important for the sustainable growth of the region.



Google map

*Source: IPCC AR4

1. Regional Characteristic

a) Geographical (zone distribution)

The region of East Africa lies between 21°N latitude and 11°S latitude. The Tropic of Cancer crosses southern Egypt near its border with the Sudan. East Africa covers a land area of 5.9 million km² and includes countries as Djibouti, Eritrea, Ethiopia, Kenya, Rwanda, Somalia, the Sudan, South Sudan and Uganda. The region is bordered by the Red Sea and the Indian Ocean on the east.

b) Climate

East Africa is a relatively dry area strongly influenced by the Sahara Desert. Desert covers more than 1 million km², including all of the northern Sudan. In this area, the climate is characterized by high temperatures and low precipitation (less than 200 mm). Very arid and semi-arid climates are also found in Somalia, Djibouti and along the coast of Eritrea, with annual rainfall ranging between 400 and 750 mm. Most of Ethiopia and the mountains of Kenya have mountain climate with higher rainfall and lower temperatures. Uganda and the coast of Kenya are mostly characterized by a very humid climate with high temperatures and a very short dry season. The rest of Kenya and Uganda have typical tropical climate with a long dry season. El Niño events tend to increase the rainfall in East Africa, except in the northern and western parts of the Ethiopian and Eritrean highlands, where they produce drought.

c) Economic and Social

Eastern Africa economies have recently registered a significant overall increase in activity; GDP growth varied from 3.5 to 9% in 2009. Despite this positive progress, several Eastern African economies, including informal and local-scale economic activities and livelihoods, remain vulnerable to regional conflicts, climate change, volatile commodity prices and the various influences of globalization. Several countries in the region suffer from deteriorating food security and declines in overall real wealth.

Except Kenya, all countries in this region are considered Least Developed countries (LDC). Most of the population lives in rural areas; therefore, agriculture and livestock are important for the economy of these countries. As in other parts of Africa, East Africa's social and economic development is constrained by climate change, habitat loss, and activities such as hunting and deforestation, which threaten the integrity of the continent's rich but fragile ecosystems.

East Africa has suffered from many social problems. The Sudan had been involved in a civil war in the southern part the country culminating in secession; Ethiopia, Eritrea and Somalia have been devastated by war. Due to war and the worst drought in 60 years, there has been a massive movement of refugees from their homelands. Much of the population of Rwanda crossed the border to seek refuge in Tanzania and Uganda. Refugees from Somalia are in Ethiopia and Kenya. The effects of war, combined with the severe climate, have placed increased pressure on the land and water; leading to heavy impact on agriculture, livestock, and forests. Fires are also a major problem. As a result, desertification has increased, especially in the Sudan.

2. Adaptation

a) Vulnerability (predicted climate change and variability, priority sectors)

Climate change will have impact on water availability, health, and ecosystems in Eastern African countries. Rainfall is likely to increase in some parts of East Africa, resulting in various hydrological outcomes; flooding and landslides events can increase. Previously malaria-free highland areas in Ethiopia, Kenya, Rwanda, and Burundi could experience modest changes to stable malaria by the 2050s. Ecosystem impacts, including impacts on mountain biodiversity could occur. Declines in fisheries in some major East African lakes could also occur. Changes in weather pattern will also affect the growth of some crops.

b) Adaptation and resilience building measures in priority sectors

Adaptation actions include technological, institutional, and behavioural options, the introduction of economic and policy instruments to encourage the use of these options, and research and development to reduce uncertainty and to enhance the options' effectiveness and efficiency. Below, adaptation options are presented for some of the sectors vulnerable to climate change in Eastern Africa.

Agriculture
<p>Crop adaptation, diversification and intensification</p> <p>Diversify the sources of economic growth through the promotion of other products</p> <p>Expand the seedling production capacity for fruits and vegetables</p> <p>Development of early maturing and high yielding crop varieties and adaptation of agricultural technologies</p> <p>Reassessment in the distribution of agro-climate zones and development of alternative crops</p> <p>Increase farm outputs through:</p> <ul style="list-style-type: none"> - changes in the crop calendar by introducing more cropping seasons - adoption of new crop rotations and inter-cropping - use of improved genetic material (high yielding, composite, disease and drought resistant varieties) - introduction of integrated plant nutrition systems - introduction of pest control and post-harvest loss management systems
<p>Soil protection</p> <p>Soil erosion control</p> <p>Rehabilitation of degraded soils</p> <p>Use of soil and water conservation techniques</p> <p>Changes in tillage practices and crop rotation</p> <p>Efficient management of soil and water to reduce runoff and nitrogen leaching</p>
<p>Rural development</p> <p>Research and dissemination of superior (drought tolerant, salt-tolerant, pest and disease resistant) crops</p> <p>Improvement and expansion of the fresh produce market infrastructure</p>

<p>Provide rural assistance focused on downscaled weather information (daily records of rainfall, water balance, forecasts and other information)</p> <p>Training of rural development agents on-farm adaptive research on crop management practices</p>
<p>Water harvesting and irrigation</p> <p>Rainwater harvesting</p> <p>Building of sand dams for irrigation, reservoirs and water retention ponds</p> <p>Improved water management and irrigation systems</p> <p>Appropriate technologies to improve the effective use of rainwater for fed the agriculture (new and more efficient irrigation systems)</p>
<p>Livestock</p>
<p>Livestock management</p> <p>Promote and encourage new grazing strategies</p> <p>Breeding of animals that adapt well to climatic variety</p> <p>Promotion of economic livelihood diversification</p> <p>Intensification of livestock production in arid areas</p>
<p>Livestock development</p> <p>Fodder production and development of fodder stocks for livestock</p> <p>Developing special livestock insurance schemes</p>
<p>Land Use Change & Forestry</p>
<p>LUCF policy development</p> <p>Creation of land use zoning and establishment of protected areas</p> <p>The promotion of the projects enabling the populations to be reoriented towards economic activities with less impact on the forest ecosystems</p> <p>Strengthen measures to protect forests while promoting a participatory approach by increasing awareness, training and organization of populations of villages surrounding forests</p>
<p>Improving forest management practices</p> <p>Capacity building for forestry activities</p> <p>Development of local forest communities</p> <p>Promote reforestation and afforestation to contribute with poverty alleviation, livelihood security, environmental protection, and enhancement of women's participation development</p>
<p>Water resources and watershed management</p>
<p>Integrated watershed management</p> <p>Regulation of abstraction of freshwater from the river to maintain a delicate equilibrium between flow and saline intrusion</p> <p>Improvement of the efficiency of existing irrigation systems and introduction and encouragement of the use of more efficient irrigation systems such as sprinkler and drip irrigation systems</p> <p>Promote water harvesting</p> <p>Strengthening the monitoring network weather, erosion, water runoff, sedimentation and quality of surface water</p>

Flood protection
<p>Water supply</p> <p>Implementation of water supply system to rural and urban population</p> <p>Building capacity for water quality improvement, and awareness campaign to promote water conservation measures</p>
Ecosystem protection and tourism
<p>Ecosystem conservation</p> <p>Sensitization and organization of the population for the preservation of natural resources</p> <p>Rehabilitation, sustainable management of natural vegetation, and valorisation of Non-timber forest products</p> <p>Development of seed banks</p> <p>Involving local populations in the management of their local ecosystems</p> <p>Definition of areas for regeneration of wildlife and establishment of protected areas</p>
<p>Tourism and wildlife</p> <p>Development of National Wildlife Adaptation Strategies</p>
Lake areas and coastal zone
<p>Fisheries</p> <p>Introduce biological monitoring</p> <p>Enforced fishing control measures</p> <p>Promote aquaculture</p> <p>Modify and strengthen fisheries management policies and institutions</p> <p>Strengthen and expand catch-monitoring activities</p> <p>Preserve and restore essential habitats and promote fisheries conservation and environmental education</p>
<p>Mangrove and wetland preservation</p> <p>Regulation of mangrove development</p> <p>Developing of human and infrastructural capacity for flooding and salt water intrusion</p>
Health
<p>Prevention measures</p> <p>Public investments in public health</p> <p>Awareness campaigns</p> <p>Organisation of preventive actions against vectorial diseases</p> <p>Identification and destruction of the pathogens' hideouts</p> <p>creation of a multidisciplinary research centre on climate and health</p> <p>Reinforcement of the cleansing system and mosquito eradication at national level</p> <p>Mapping of the habitat areas at climatic risk</p>
<p>Public preparedness</p> <p>Government plan for outbreak preparedness</p>

<p>Implementation of an information system on climate change risk-related diseases</p> <p>Setting up of an epidemiological monitoring system such as the development of specific indicators (human, veterinary, environmental, etc) and thresholds of alert</p>
<p>Public health investment</p> <p>Improvement of the population's access to public and community health services for infectious diseases and non-communicable chronic diseases</p> <p>Reinforcement of the medical capacities</p> <p>Construction of a large number of nomadic clinics</p> <p>Recruitment of technical staff</p>
<p>Population measures</p> <p>Eradication of areas that can attract mosquitoes (stagnated water, garbage deposits)</p> <p>Popularization and promotion of:</p> <ul style="list-style-type: none"> - mosquito coils and mosquito nets - spraying insecticides - impregnated window screen
<p>Cross-cutting issues</p>
<p>Education, training and public awareness</p> <p>Improvement of information, education and communication on adaptation to climate</p>
<p>Research and development</p> <p>In-depth research on the climate change impacts on water and agriculture</p> <p>Improving climate forecasting capacity</p>
<p>Institutional framework</p> <p>Realign current practices and policies to take into account climate variability, the projected climate change and sustainable economic and environment development and management</p> <p>Conduct institutional reforms and mainstreaming of climate change into regional and national development programmes</p>
<p>Others adaptations measures:</p> <p>Capitalising on local knowledge and adaptation strategies</p> <p>Involving local actors</p>

3. Mitigation

a) Potential of low-carbon development

<p>Energy</p>
<p>Promotion of renewable energies</p> <p>Development of hydropower plants, including micro and mini hydropower plants</p> <p>Development of solar technologies such as: solar cookers, solar water heaters, solar dryers, and photovoltaic systems</p> <p>Development of solar-based rural electrification systems</p>

<p>Development of biomass-based energy plants, such as agricultural by-products as energy source</p> <p>Promotion of geothermal energy resources</p> <p>Installation of wind turbines in industrial centres</p>
<p>Improving energy generation, transmission and distribution</p> <p>Implementation of the rural electrification programme</p> <p>Establishment of adequate energy supplies</p> <p>Improvement of regional power inter-connections</p> <p>Improvement of power plants efficiency through optimization of maintenance plan</p>
<p>Energy efficiency</p>
<p>Energy efficiency in the industry</p> <p>Rational use of energy</p> <p>Combined cycle power plant</p> <p>Cogeneration</p> <p>Implementation and improvement of heat trapping system</p> <p>Retrofitting and upgrading boilers</p>
<p>Energy conservation at household level</p> <p>Awareness campaigns for energy conservation</p> <p>Establishment of energy standards for home appliances</p> <p>Support the use of fuel efficient cook stoves at the community-level</p> <p>Substitution of incandescent bulbs by those of low consumption (e.g. Compact Fluorescent Lamps)</p>
<p>Energy conservation at buildings and tertiary sector</p> <p>Rational use of energy in public buildings, hospitals and office buildings</p> <p>Retrofitting and upgrading boilers</p>

b) Mitigation measures in priority sectors

<p>Land Use Change & Forestry</p>
<p>Reforestation and afforestation</p> <p>Development of local forest communities</p> <p>Promote reforestation and afforestation to contribute with poverty alleviation, livelihood security, environmental protection, and enhancement of women's participation development</p> <p>Expansion of tree planting into marginal agricultural and pasture land</p> <p>Conservation of existing stands (i.e. protection and maximization in recovery)</p>
<p>Agriculture & Livestock</p>
<p>Livestock</p> <p>Intensification of livestock system through integration with agriculture</p> <p>Adoption of an improved and diversified animal husbandry</p>

<p>Agriculture</p> <p>Improved water management in irrigated areas</p> <p>Substitution of nitrogen fertilizer by organic manure or other organic fertilizers</p> <p>Changes in tillage method or no-till farming (at commercial farms)</p>
<p>Waste management</p>
<p>Municipal solid waste management</p> <p>Community-based solid waste management projects</p> <p>Resource recovery and recycling</p> <p>Private sector involvement in solid waste management</p> <p>Expansion of collection and disposal</p> <p>Capture and recovery of biogas from solid waste disposal sites</p> <p>Use of appropriate technologies for safe disposal</p> <p>Composting of organic wastes</p>
<p>Wastewater treatment</p> <p>Evaluation of GHG emissions from wastewater treatment plant</p> <p>Methane capture and/or recovery from anaerobic digestion</p> <p>Biogas production from anaerobic digestion sludge</p>
<p>Agricultural waste</p> <p>Composting of organic and agricultural wastes</p> <p>Aerobic digestion of biowastes and/or manure to produce biogas for lighting and cooking</p> <p>Biomass-based electricity generation</p>
<p>Transport and Infrastructure</p>
<p>Promotion of better transport and improvement on infrastructure and technology</p> <p>Encouragement of mass transport</p> <p>Traffic management improving and making traffic lights more effective, construction of bus lanes, pedestrian lanes, bicycle lanes</p> <p>Adequate management of transportation routes</p> <p>Development of low carbon fuels, such as biofuels</p> <p>Improvement of telecommunication to reduce commuting by giving incentives to population/companies to use email, telefax, mobile phones and teleconference to reduce the number of trips</p>
<p>Changes in transport mode</p> <p>Promotion of rail transport</p> <p>Promotion of non motorized transport</p>
<p>Improvements in vehicles</p> <p>Awareness, training and information to driver, such as course on fuel efficiency in driving schools curricula</p> <p>Environmental standard and compulsory inspection of vehicles</p>

Cement industry
Fuel switch and energy efficiency Partial clinker substitution by fly ashes, gypsum, slag, etc.

Reference:

- Global Forest Resources Assessment 2000. Available at FAO Corporate Document Repository:
<http://www.fao.org/DOCREP/004/Y1997E/Y1997E00.HTM>
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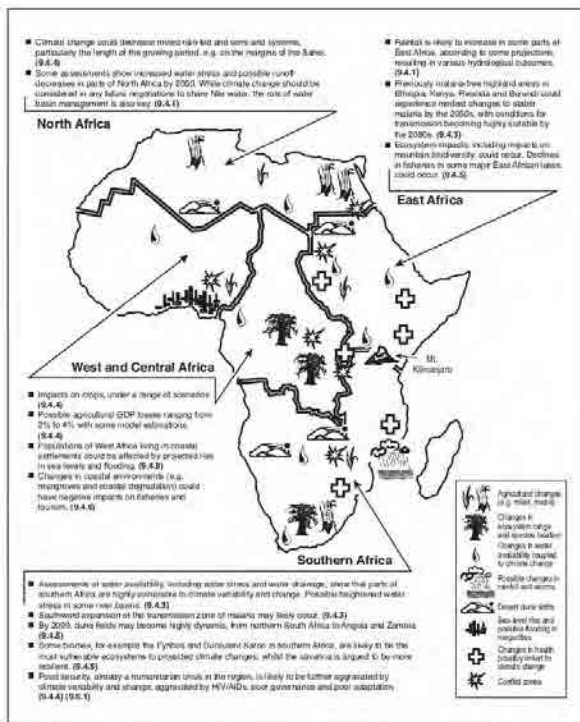
This summary was prepared based on the data/information available as of October 2011.

2.2.3. アフリカ西部

Western Region of Africa

Mainstreaming mitigation/adaptation actions in the region

West African countries depend both on agriculture and oil and ore exports. Even with the financial resources due to oil and ore exploitation, they are vulnerable to climate conditions. Promotion of renewable energy and energy efficiency are important for the sustainable development of the region. Since the most populated areas are in the coastal areas, these countries will need to cope with the risk of flooding and sea level rise.



Google map

*Source: IPCC AR4

1. Regional Characteristic

a) Geographical (zone distribution)

West Africa includes 16 countries: Benin, Burkina Faso, Cape Verde, Gambia, Ghana, Guinea, Guinea-Bissau, Ivory Coast, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone and Togo, which, with an area of 6 million km², cover one fifth of Africa.

Most of West Africa consists of an undulating low plateau below 500m, fringed on the west and south by a coastal plain; this plain is widest in Senegal, the southern Ivory Coast, the Niger delta and the lower valleys of the Volta and Niger rivers. There are some isolated highland areas above 500m and some peaks exceed 1000m.

b) Climate

West Africa has wet and dry seasons resulting from the interaction of two migrating air masses. West African countries are distributed along a climatic gradient from the semi-arid terrain known as Sahel region in the north to the Guineo-Congolese zone in the south. This gradient involves four climate zones: the arid zone (Sahel), the semi-arid zone, the sub-humid zone, and the humid zone. The general rainfall pattern is modified by ocean currents and physiographic features. Altitude also affects rainfall with the result that highland areas have more rain than the surrounding lowlands. There has been a substantial reduction in rainfall in West Africa over the second half of the 20th century. The reduction is extremely clear in the Sahel. It has taken the shape of a historical climatic aridification process.

c) Economic and Social

There are two zones of population concentration, one in the rain forest zone near the coast and the other in the Sahel savannah zone. Between these, the so-called 'Middle Belt' is relatively sparsely populated. The percentage of urban population in 2007 ranged from 19% in Burkina Faso to 48% in Ivory Coast. These figures indicate the importance of agriculture and livestock for the economy of these countries.

Economic development in Western Africa has been variable. Some economies have recently registered a significant overall increase in activity, such as Nigeria (GDP annual growth rate of 14.3% in 2008). Most of other countries had an annual GDP growth rate between 3 and 8% in 2008. Despite this positive progress, boosted in part by increases in oil exports and high oil prices, several African economies, including informal and local-scale economic activities and livelihoods, remain vulnerable to climate variability and volatile commodity prices.

2. Adaptation

a) Vulnerability (predicted climate change and variability, priority sectors)

Water availability in West Africa will be affected by climate change: rainfall pattern and amount has been changing. It was already observed that mean annual precipitation is declining in some areas, such as the tropical rain forest, and increasing along the Guinean coast. The changes in rainfall pattern together with temperature changes will affect the crop growth pattern. The agricultural sector as a whole can have GDP losses ranging from 2 to 4%.

Most of the population in West Africa is concentrated in coastal settlements; they can be affected by projected rise in sea levels and flooding. Changes in coastal environments (e.g. mangroves and coastal degradation) could have negative impacts on fisheries and tourism.

b) Adaptation and resilience building measures in priority sectors

Assessments of the impacts of sea-level rise in coastal countries show that costs of adaptation could amount to at least 5-10% of GDP. However, if no adaptation is undertaken, then the losses due to climate change could be up to 14% of GDP. Adaptation actions include technological, institutional, and behavioural options. Below, adaptation options are cited within some of the sectors vulnerable to climate change in Western Africa.

Agriculture
<p>Crop adaptation, diversification and intensification</p> <p>Diversify the sources of economic growth through the promotion of other products</p> <p>Expand the seedling production capacity for fruits and vegetables</p> <p>Development of early maturing and high yielding crop varieties and adaptation of agricultural technologies</p> <p>Reassessment in the distribution of agro-climate zones and development of alternative crops</p> <p>Increase farm outputs through:</p> <ul style="list-style-type: none"> - changes in the crop calendar by introducing more cropping seasons - adoption of new crop rotations and inter-cropping - use of improved genetic material (high yielding, composite, disease and drought resistant varieties) - introduction of integrated plant nutrition systems - introduction of pest control and post-harvest loss management systems
<p>Rural development</p> <p>Research and dissemination of superior (drought tolerant, salt-tolerant, pest and disease resistant) crops</p> <p>Improvement and expansion of the fresh produce market infrastructure</p> <p>Strengthening coordination lines between research and extension services in the promotion of high-value crops</p> <p>Provide rural assistance focused on downscaled weather information (daily records of rainfall, water balance, forecasts and other information)</p> <p>Training of rural development agents on-farm adaptive research on crop management practices</p>
<p>Water harvesting and irrigation</p> <p>Rainwater harvesting</p> <p>Building of sand dams for irrigation, reservoirs and water retention ponds</p> <p>Improved water management and irrigation systems</p> <p>Appropriate technologies to improve the effective use of rainwater for fed the agriculture (new and more efficient irrigation systems)</p>

<p>Cotton farming</p> <p>Promote the intensification of cotton production through the use of appropriate farming techniques with the systematic use of organic manure</p> <p>Promote research and development and seek funding for its implementation</p> <p>Promote alternative products to offset the shortfall in the cotton sector</p> <p>Establish incentives for better use of cotton by-products</p> <p>Reorganize the financing of the cotton sector</p>
<p>Livestock</p>
<p>Livestock management</p> <p>Promote and encourage new grazing strategies</p> <p>Breeding of animals that adapt well to climatic variety</p> <p>Promotion of economic livelihood diversification</p> <p>Intensification of livestock production in arid areas</p> <p>Fodder production and development of fodder stocks for livestock</p> <p>Developing special livestock insurance schemes</p>
<p>Land Use Change & Forestry</p>
<p>LUCF policy</p> <p>Creation of land use zoning and establishment of protected areas</p> <p>The promotion of the projects enabling the populations to be reoriented towards economic activities with less impact on the forest ecosystems</p> <p>Strengthen measures to protect forests while promoting a participatory approach by increasing awareness, training and organization of populations of villages surrounding forests</p>
<p>Improving forest management practices</p> <p>Capacity building for forestry activities</p> <p>Development of local forest communities</p> <p>Promote reforestation and afforestation to contribute with poverty alleviation, livelihood security, environmental protection, and enhancement of women's participation development</p>
<p>Water resources and watershed management</p>
<p>Integrated watershed management</p> <p>Regulation of abstraction of freshwater from the river to maintain a delicate equilibrium between flow and saline intrusion</p> <p>Introduction of legislative measures such as licensing and permits for withdrawal of river water for irrigation</p> <p>Improvement of the efficiency of existing irrigation systems and introduction and encouragement of the use of more efficient irrigation systems such as sprinkler and drip irrigation systems</p> <p>Promote water harvesting</p> <p>Development and utilization of better planning tools such as aquifer simulation models and a predictive/operational saltwater</p>

<p>intrusion models</p> <p>Construction of dikes or small dams in most of the smaller streams of the river</p> <p>Protection of water towers, river banks, and water bodies and de-silting of riverbeds and dams</p> <p>Research on physical, biological, social and cultural data which enables effective planning and rational management of water</p> <p>Strengthening the monitoring network weather, erosion, water runoff, sedimentation and quality of surface water</p> <p>Flood protection</p>
Ecosystem protection
<p>Ecosystem conservation</p> <p>Sensitization and organization of the population for the preservation of natural resources</p> <p>Rehabilitation, sustainable management of natural vegetation, and valorisation of Non-timber forest products</p> <p>Development of seed banks</p> <p>Involving local populations in the management of their local ecosystems</p> <p>Definition of areas for regeneration of wildlife and establishment of protected areas</p> <p>Promote regeneration or forestation of degraded zones to preserve the ecosystem and the surrounding habitat and improve the biodiversity</p> <p>Management of natural resources</p>
Lake areas and coastal zone
<p>Fisheries</p> <p>Introduce biological monitoring</p> <p>Enforced fishing control measures</p> <p>Promote aquaculture</p> <p>Modify and strengthen fisheries management policies and institutions</p> <p>Strengthen and expand catch-monitoring activities</p> <p>Preserve and restore essential habitats and promote fisheries conservation and environmental education</p>
<p>Coastal zone development</p> <p>Coastal area development policy and management plan</p> <p>Delineation of building and residential areas</p> <p>Development and enactment of appropriate regulations and policies relevant to construction, urban growth planning, and wetland preservation and mitigation</p> <p>Construction of revetments, seawalls/bulkheads and breakwater systems in order to protect the economically and culturally important areas</p> <p>Construction of physical structures (e.g. groin, breakwaters, dykes, and sea wall) to combat sporadic flooding and coastal erosion</p> <p>Improvement of tidal water level monitoring</p>
<p>Mangrove and wetland preservation</p> <p>Regulation of mangrove development</p>

Developing of human and infrastructural capacity for flooding and salt water intrusion
Infrastructure including transportation and telecommunication networks
<p>Ensuring that the infrastructure is climate-proof over its lifespan</p> <p>Factoring a maintenance component into all infrastructural development funds</p> <p>Designing infrastructure that can withstand the prevailing climatic conditions, e.g. structures that can withstand strong winds and tides</p> <p>Improvements in physical infrastructure as well as in communication and road networks usually improve the adaptive capacity</p> <p>Ensuring proper communication during disasters</p>
Social amenities and human settlements
<p>Strengthening disaster preparedness</p> <p>Proper planning of urban settlements which takes into consideration the expected high growth rate of urban population due to climate induced migration from rural areas to urban centres</p> <p>Establishing insurance schemes to support preparedness in regions susceptible to climatic disasters</p> <p>Improving the quality of physical structures</p>
Cross-cutting issues
<p>Education, training and public awareness</p> <p>Improvement of information, education and communication on adaptation to climate change through:</p> <ul style="list-style-type: none"> - Incorporation of climate change in school curricula - Use of mass media and development of educational and sensitization materials to enhance public awareness
<p>Research and development</p> <p>In-depth research on the climate change impacts on water and agriculture</p> <p>Improving climate forecasting capacity</p> <p>Establishment of a climate databank</p> <p>Development of the agro-meteorology network</p> <p>Improvement of the quality of seasonal forecasts for rain fall and surface water flow and their integration into an overall strategy for assessing vulnerability, as well as their integration in model-based decision-making support systems</p>
<p>Institutional framework</p> <p>Realign current practices and policies to take into account climate variability, the projected climate change and sustainable economic and environment development and management</p> <p>Conduct institutional reforms and mainstreaming of climate change into regional and national development programmes</p>
<p>Others adaptations measures:</p> <p>Capitalising on local knowledge and adaptation strategies</p> <p>Involving local actors</p>

3. Mitigation

Climate change mitigation activities in West African countries can be divided into two categories: a) related to boosting the development while keeping a low-carbon economy, and b) related to decreasing the GHG emissions in the sectors with largest contribution.

a) Potential of low-carbon development

Energy
<p>Promotion of renewable energies</p> <p>Development of hydropower plants, including micro and mini hydropower plants</p> <p>Development of solar technologies such as: solar cookers, solar water heaters, solar dryers, and photovoltaic systems</p> <p>Development of solar-based rural electrification systems</p> <p>Development of biomass-based energy plants, such as agricultural by-products as energy source</p>
Energy efficiency
<p>Energy efficiency in the industry</p> <p>Rational use of energy</p> <p>Combined cycle power plant</p> <p>Cogeneration</p> <p>Implementation and improvement of heat trapping system</p> <p>Retrofitting and upgrading boilers</p>
<p>Energy conservation at household level</p> <p>Awareness campaigns for energy conservation</p> <p>Establishment of energy standards for home appliances</p> <p>Support the use of fuel efficient cook stoves at the community-level</p> <p>Substitution of incandescent bulbs by those of low consumption (e.g. Compact Fluorescent Lamps)</p>

b) Mitigation measures in priority sectors

Land Use Change & Forestry
<p>Reforestation and afforestation</p> <p>Development of local forest communities</p> <p>Promote reforestation and afforestation to contribute with poverty alleviation, livelihood security, environmental protection, and enhancement of women's participation development</p> <p>Expansion of tree planting into marginal agricultural and pasture land</p> <p>Conservation of existing stands (i.e. protection and maximization in recovery)</p>
<p>Improving forest management practices</p> <p>Implementation of sectoral legislation for better natural resources management, including land use policy</p> <p>Promotion of forest development technologies and management practices</p>

Capacity building
Agriculture & Livestock
<p>Livestock</p> <p>Intensification of livestock system through integration with agriculture</p> <p>Adoption of an improved and diversified animal husbandry</p>
<p>Agriculture</p> <p>Improved water management in irrigated areas</p> <p>Substitution of nitrogen fertilizer by organic manure or other organic fertilizers</p> <p>Changes in tillage method or no-till farming (at commercial farms)</p>
Waste management
<p>Municipal solid waste management</p> <p>Community-based solid waste management projects</p> <p>Resource recovery and recycling</p> <p>Private sector involvement in solid waste management</p> <p>Expansion of collection and disposal</p> <p>Capture and recovery of biogas from solid waste disposal sites</p> <p>Use of appropriate technologies for safe disposal</p> <p>Composting of organic wastes</p>
<p>Wastewater treatment</p> <p>Evaluation of GHG emissions from wastewater treatment plant</p> <p>Methane capture and/or recovery from anaerobic digestion</p> <p>Biogas production from anaerobic digestion sludge</p> <p>Methane recovery from abattoirs and peri-urban dairy farms</p>
<p>Agricultural waste</p> <p>Composting of organic and agricultural wastes</p> <p>Aerobic digestion of biowastes and/or manure to produce biogas for lighting and cooking</p> <p>Biomass-based electricity generation</p>
Transport and Infrastructure
<p>Promotion of better transport and improvement on infrastructure and technology</p> <p>Encouragement of mass transport</p> <p>Traffic management improving and making traffic lights more effective, construction of bus lanes, pedestrian lanes, bicycle lanes</p> <p>Adequate management of transportation routes</p> <p>Development of low carbon fuels, such as biofuels</p> <p>Improvement of telecommunication to reduce commuting by giving incentives to population/companies to use email, telefax, mobile phones and teleconference to reduce the number of trips</p>

<p>Changes in transport mode</p> <p>Promotion of rail transport</p> <p>Revitalization and promoting of river transport</p> <p>Promotion of non motorized transport</p>
<p>Improvements in vehicles</p> <p>Awareness, training and information to driver, such as course on fuel efficiency in driving schools curricula</p> <p>Awareness and regulation to promote good management of vehicles</p>
<p>Oil exploitation</p>
<p>Gas flaring and recovery</p> <p>Gas leak prevention, recovering exhaust gas</p> <p>Electricity generation from recovered gas</p>
<p>Mining</p>
<p>Fuel switch and energy efficiency</p> <p>Establishment of energy efficiency standards</p> <p>Fuel switch to low carbon fuels</p> <p>Using more efficient engines</p> <p>Conservation and retrofitting of equipment</p>

Reference:

- Global Forest Resources Assessment 2000. Available at FAO Corporate Document Repository: <http://www.fao.org/DOCREP/004/Y1997E/Y1997E00.HTM>
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- UNEP. Africa Environment Outlook and Africa Environment Outlook 2.
- IPCC Fourth Assessment Report.

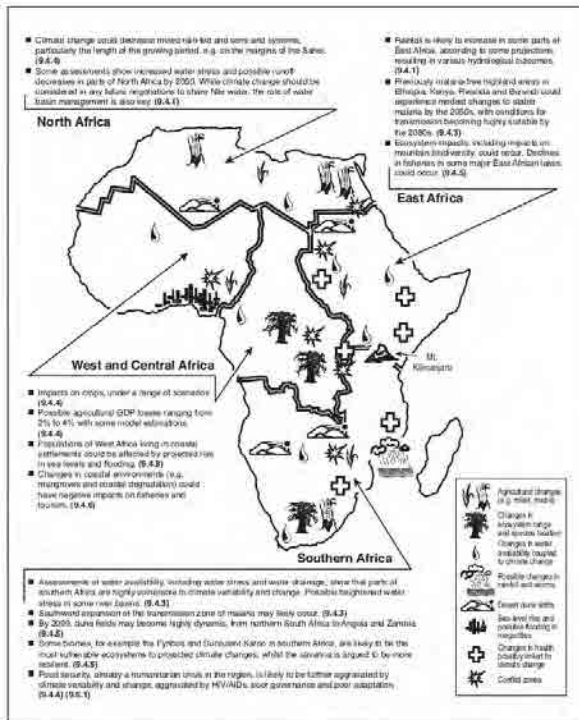
This summary was prepared based on the data/information available as of October 2011.

2.2.4. アフリカ中部

Central Region of Africa

Mainstreaming mitigation/adaptation actions in the region

East African countries are among the most economically vulnerable countries in Africa. They are heavily dependent on agriculture, livestock and forestry. Promoting improved agricultural practices, research climate resistant varieties and looking into diversifying the crops would contribute to securing food security and economic growth. Conservation efforts in forestry and strengthening institutional as well as public capacity in order to protect forests are also important for the region.



Google map

*Source: IPCC AR4

1. Regional Characteristic

a) Geographical (zone distribution)

The United Nations denominated this region as Middle Africa, which includes Cameroon, the Central African Republic, Chad, the Republic of the Congo, the Democratic Republic of the Congo, Equatorial Guinea, Gabon, and São Tomé and Príncipe.

b) Climate

Central Africa is predominantly covered by forest and savannas. The coastal humid belt, with high and relatively constant rainfall, supports dense tropical forests, whereas the northern parts of Cameroon, Central African Republic, and Chad are drier, with more variable rainfall, and the dominant vegetation is savannah. Land use is sensitive to climatic and vegetation characteristics, with forestry and commercial plantation agriculture largely found in the humid zones (where rainfall reaches up to 4,000 mm/yr), and livestock rearing, with some subsistence cultivation, in the semi-arid zones (where rainfall averages 500 mm/yr). The semi-arid zone is also highly vulnerable to climatic variations and drought, which limit agricultural expansion. Soils are highly vulnerable to erosion, because most of the rainfall occurs in intense heavy storms and the clay and silt content also makes the soils prone to crusting when exposed.

c) Economic and Social

Natural resources have played a large part in history and continue to play a role as a reservoir for the export of raw materials to the industrialized nations. In particular, wood and, more recently, oil are the main exports. The uses of the forest are multiple, including non-wood forest products gathering, and vary from low-impact harvesting to high-intensity commercial logging. Central Africa is not a uniform political or socio-economic entity: more than 70% of the population in Central Africa is rural, although Gabon and the Congo are the most urbanized. Population densities in certain regions are among the lowest in Africa. However, Burundi is very densely populated, with 90% of their population living in rural conditions. In general, central African countries are among the poorest in the world, with the exception of Gabon.

Approximately 8% of the total area is currently used for arable and permanent crops (with Cameroon having the largest share, at 15% of its land area), and 16.5% is used as permanent pasture. Irrigated agriculture is limited, partly because the fertile soils and the high, reliable rainfall in the humid zone are conducive to rain-fed agriculture, and partly because the infrastructure development required to establish irrigated cultivation in the semi-arid zone has so far been prohibitively expensive. The priority issues in central Africa are improving food security, through enhanced production and distribution of resources; and reducing the pressures that shifting cultivation has on forests and woodlands.

2. Adaptation

a) Vulnerability (predicted climate change and variability, priority sectors)

Droughts in the Central African Sahelian zone have become more frequent since the late 1960s, and food security is declining, particularly among the poor who are forced to cultivate marginal lands and are unable to accumulate food reserves. Flooding is common in the more humid areas of Central Africa, especially where forests and natural vegetation have been cleared for cultivation or human settlements. Climate

change models indicate that significant part of Central Africa will have more rainfall, which can increase flooding events.

Climate change can also cause changes in ecosystem range and specie location, especially in the humid areas.

b) Adaptation and resilience building measures in priority sectors

Agriculture
<p>Crop adaptation, diversification and intensification</p> <p>Diversify the sources of economic growth through the promotion of other products</p> <p>Expand the seedling production capacity for fruits and vegetables</p> <p>Development of early maturing and high yielding crop varieties and adaptation of agricultural technologies</p> <p>Reassessment in the distribution of agro-climate zones and development of alternative crops</p> <p>Increase farm outputs through:</p> <ul style="list-style-type: none"> - changes in the crop calendar by introducing more cropping seasons - adoption of new crop rotations and inter-cropping - use of improved genetic material (high yielding, composite, disease and drought resistant varieties) - introduction of integrated plant nutrition systems - introduction of pest control and post-harvest loss management systems
<p>Water harvesting and irrigation</p> <p>Rainwater harvesting</p> <p>Building of sand dams for irrigation, reservoirs and water retention ponds</p> <p>Improved water management and irrigation systems</p> <p>Appropriate technologies to improve the effective use of rainwater for fed the agriculture (new and more efficient irrigation systems)</p>
Livestock
<p>Livestock management</p> <p>Promote and encourage new grazing strategies</p> <p>Breeding of animals that adapt well to climatic variety</p> <p>Promotion of economic livelihood diversification</p> <p>Intensification of livestock production in arid areas</p>
Land Use Change & Forestry
<p>Creation of land use zoning and establishment of protected areas</p> <p>The promotion of the projects enabling the populations to be reoriented towards economic activities with less impact on the forest ecosystems</p> <p>Strengthen measures to protect forests while promoting a participatory approach by increasing awareness, training and organization of populations of villages surrounding forests</p>

Capacity building for forestry activities
Water resources and watershed management
<p>Integrated watershed management</p> <p>Regulation of abstraction of freshwater from the river to maintain a delicate equilibrium between flow and saline intrusion</p> <p>Introduction of legislative measures such as licensing and permits for withdrawal of river water for irrigation</p> <p>Improvement of the efficiency of existing irrigation systems and introduction and encouragement of the use of more efficient irrigation systems such as sprinkler and drip irrigation systems</p> <p>Promote water harvesting</p> <p>Flood protection</p>
Ecosystem protection
<p>Ecosystem conservation</p> <p>Definition of areas for regeneration of wildlife and establishment of protected areas</p> <p>Promote regeneration or forestation of degraded zones to preserve the ecosystem and the surrounding habitat and improve the biodiversity</p>
Cross-cutting issues
<p>Education, training and public awareness</p> <p>Improvement of information, education and communication on adaptation to climate change through:</p> <ul style="list-style-type: none"> - Incorporation of climate change in school curricula - Use of mass media and development of educational and sensitization materials to enhance public awareness
<p>Research and development</p> <p>In-depth research on the climate change impacts on water and agriculture</p> <p>Improving climate forecasting capacity</p> <p>Establishment of a climate databank</p> <p>Development of the agro-meteorology network</p> <p>Improvement of the quality of seasonal forecasts for rain fall and surface water flow and their integration into an overall strategy for assessing vulnerability, as well as their integration in model-based decision-making support systems</p>
<p>Institutional framework</p> <p>Realign current practices and policies to take into account climate variability, the projected climate change and sustainable economic and environment development and management</p> <p>Conduct institutional reforms and mainstreaming of climate change into regional and national development programmes</p>
<p>Others adaptations measures:</p> <p>Capitalising on local knowledge and adaptation strategies</p> <p>Involving local actors</p>

3. Mitigation

a) Potential of low-carbon development

Energy
<p>Promotion of renewable energies</p> <p>Development of hydropower plants, including micro and mini hydropower plants</p> <p>Development of solar technologies such as: solar cookers, solar water heaters, solar dryers, and photovoltaic systems</p> <p>Development of biomass-based energy plants, such as agricultural by-products as energy source</p>
<p>Improving energy generation, transmission and distribution</p> <p>Implementation of the rural electrification programme</p> <p>Improvement of regional power inter-connections</p>
Energy efficiency
<p>Energy efficiency in the industry</p> <p>Rational use of energy</p> <p>Cogeneration</p> <p>Retrofitting and upgrading boilers</p>

b) Mitigation measures in priority sectors

Land Use Change & Forestry
<p>Reforestation and afforestation</p> <p>Development of local forest communities</p> <p>Promote reforestation and afforestation to contribute with poverty alleviation, livelihood security, environmental protection, and enhancement of women's participation development</p> <p>Expansion of tree planting into marginal agricultural and pasture land</p> <p>Conservation of existing stands (i.e. protection and maximization in recovery)</p>
Waste management
<p>Municipal solid waste management</p> <p>Community-based solid waste management projects</p> <p>Resource recovery, recycling and composting</p> <p>Capture and recovery of biogas from solid waste disposal sites</p> <p>Use of appropriate technologies for safe disposal</p>
<p>Agricultural waste</p> <p>Composting of organic and agricultural wastes</p> <p>Aerobic digestion of biowastes and/or manure to produce biogas for lighting and cooking</p> <p>Biomass-based electricity generation</p>

Oil exploitation
<p>Gas flaring and recovery</p> <p>Gas leak prevention</p> <p>Electricity generation from recovered gas</p>
Mining
<p>Fuel switch and energy efficiency</p> <p>Establishment of energy efficiency standards</p> <p>Fuel switch to low carbon fuels</p> <p>Using more efficient engines</p> <p>Conservation and retrofitting of equipment</p>
<p>Ecosystem recovery</p> <p>Rehabilitation of stripped mining sites through tree planting</p>

References:

- African Economic Outlook: <http://www.africaneconomicoutlook.org>
- UNEP. Africa Environment Outlook and Africa Environment Outlook 2.
- IPCC Fourth Assessment Report.

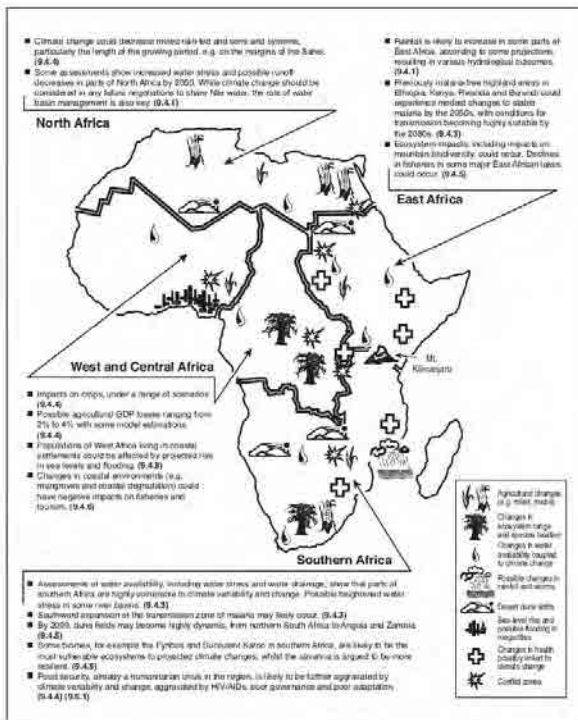
This summary was prepared based on the data/information available as of October 2011.

2.2.5. アフリカ南部

Southern Region of Africa

Mainstreaming mitigation/adaptation actions in the region

Southern African economy depends mostly on commercial agriculture, mining and manufacturing industry. Better practices and adaptation activities in agriculture and livestock will contribute to GHG reduction as well as to food security. Renewable energy and energy efficiency measures, when taken into account, will lead to assuring sustainable development. Afforestation and forestation activities will also contribute to GHG mitigation while protecting water resources and ecosystems.



Google map

*Source: IPCC AR4

1. Regional Characteristic

a) Geographical (zone distribution)

The region is bordered by the Indian Ocean in the east and the Atlantic-Indian basin in the south and includes the countries of Angola, Botswana, Lesotho, Madagascar, Malawi, Mozambique, Namibia, Saint Helena, South Africa, Swaziland, Zambia, Zimbabwe and the United Republic of Tanzania. The total area is 6.49 million km², a substantial part of which belongs to the Kalahari Desert ecosystems. Despite the vast area of the Kalahari Desert, the forest cover in this region is moderately high at around 30% of the countries' total land area. The landscape of Southern Africa is varied, ranging from forest and grasslands to deserts. The region has a wide diversity of ecosystems including grassland, savannas, and riparian zones.

b) Climate

The region is characterized by different climatic conditions depending on location. On the southern side of South Africa the climate is warm-temperate humid. It becomes subtropical north of the Cape region, in Lesotho and southern Mozambique and then tropical in the remainder of the region. In the western strip, from Angola to north of the Cape region, the dry climate of the tropical Kalahari Desert dominates. The rainfall regimes also vary greatly. The average annual precipitation is very low and limited to a few rainy weeks in the desert area to more than 2,200 mm in the mountains of Tsaratanana in Madagascar and Gurue and Chimanimani in Mozambique. Rainfall in Southern Africa is strongly influenced by the Inter-Tropical Convergence Zone (ITCZ). The ITCZ changes position during the year and is associated with favourable rainfall. Another system, the Botswana High, often tends to push the ITCZ away, resulting in periods of drought.

c) Economic and Social

The majority of Southern Africa's primary energy comes from fossil fuels, in the form of coal and petroleum, and the region's level of industrialization is high compared to other parts of Africa. South Africa, Botswana, Angola, Namibia, and Zimbabwe depend largely on mining and manufacturing industries. Even so, some countries within the region, such as Malawi, depend almost exclusively from agriculture, livestock, and forest resources.

In terms of natural resources, the region has the world's largest resources of platinum and the platinum group elements, chromium, vanadium, and cobalt, as well as uranium, gold, titanium, iron and diamonds. For this reason, the mining sector is very important within the region.

Economic, social and environmental functions of the forest cover and resources vary greatly among Southern African countries. Angola, Madagascar, Mozambique and Zambia have the greatest timber production capacities from natural forests. The ecological conditions in Namibia, Lesotho, Swaziland, Botswana and South Africa do not favour timber-producing natural forests. In countries such as Malawi and Zimbabwe, natural forests of high timber potential were largely eliminated through clearing for agriculture, fuelwood and pole collection, infrastructure development and overstocking of domestic animals. Nevertheless, the forestry sector continues to be a huge reservoir providing an array of goods and services vital to the livelihood of local populations in all countries.

2. Adaptation

a) Vulnerability (predicted climate change and variability, priority sectors)

Southern Africa's background of climate variability, food insecurity, and water stress makes it one of the most vulnerable areas to climate change. The region is expected to experience a mean temperature rise and increased rainfall variability and insecurity. This will increase water stress. Flooding and drought events are likely to occur more often. The expected impacts of these changes include reductions in the extent of grasslands and expansion of thorn savannas and dry forest, together with a general increase in the extent of desertification across the region. This will in turn affect the distribution of wildlife and some of the major national parks could suffer economic losses through reduced tourism potential. Crop yields are also expected to vary, dropping by as much as 10 to 20% in some parts of the region. It is also predicted that the malaria-carrying mosquito will spread to parts of Namibia and South Africa where it has not been found before.

The economies of most Southern African countries are vulnerable to a changing climate because of their dependence on commercial agriculture. In addition, over 50% of the population is based in rural areas and is directly dependent on small-scale cultivation and rearing of livestock.

b) Adaptation and resilience building measures in priority sectors

Adaptation is proven to be successful and sustainable when linked to effective governance systems, civil and political rights and literacy. Diversification of livelihood activities, institutional framework, adjustments in farming operations, income generation projects are key adaptation options.

Agriculture
Crop adaptation, diversification and intensification
Diversify the sources of economic growth through the promotion of other products
Expand the seedling production capacity for fruits and vegetables
Development of early maturing and high yielding crop varieties and adaptation of agricultural technologies
Reassessment in the distribution of agro-climate zones and development of alternative crops
Increase farm outputs through:
- changes in the crop calendar by introducing more cropping seasons
- adoption of new crop rotations and inter-cropping
- use of improved genetic material (high yielding, composite, disease and drought resistant varieties)
- introduction of integrated plant nutrition systems
- introduction of pest control and post-harvest loss management systems

<p>Rural development</p> <p>Research and dissemination of superior (drought tolerant, salt-tolerant, pest and disease resistant) crops</p> <p>Improvement and expansion of the fresh produce market infrastructure</p> <p>Strengthening coordination lines between research and extension services in the promotion of high-value crops</p> <p>Provide rural assistance focused on downscaled weather information (daily records of rainfall, water balance, forecasts and other information)</p> <p>Training of rural development agents on-farm adaptive research on crop management practices</p>
<p>Water harvesting and irrigation</p> <p>Rainwater harvesting</p> <p>Building of sand dams for irrigation, reservoirs and water retention ponds</p> <p>Improved water management and irrigation systems</p> <p>Appropriate technologies to improve the effective use of rainwater for fed the agriculture (new and more efficient irrigation systems)</p>
<p>Land Use Change & Forestry</p>
<p>LUCF policy</p> <p>Creation of land use zoning and establishment of protected areas</p> <p>The promotion of the projects enabling the populations to be reoriented towards economic activities with less impact on the forest ecosystems</p> <p>Strengthen measures to protect forests while promoting a participatory approach by increasing awareness, training and organization of populations of villages surrounding forests</p>
<p>Improving forest management practices</p> <p>Capacity building for forestry activities</p> <p>Development of local forest communities</p> <p>Promote reforestation and afforestation to contribute with poverty alleviation, livelihood security, environmental protection, and enhancement of women's participation development</p>
<p>Water resources and watershed management</p>
<p>Integrated watershed management</p> <p>Regulation of abstraction of freshwater from the river to maintain a delicate equilibrium between flow and saline intrusion</p> <p>Introduction of legislative measures such as licensing and permits for withdrawal of river water for irrigation</p> <p>Improvement of the efficiency of existing irrigation systems and introduction and encouragement of the use of more efficient irrigation systems such as sprinkler and drip irrigation systems</p> <p>Promote water harvesting</p> <p>Development and utilization of better planning tools such as aquifer simulation models and a predictive/operational saltwater intrusion models</p> <p>Construction of dikes or small dams in most of the smaller streams of the river</p> <p>Protection of water towers, river banks, and water bodies and de-silting of riverbeds and dams</p> <p>Research on physical, biological, social and cultural data which enables effective planning and rational management of water</p>

<p>Strengthening the monitoring network weather, erosion, water runoff, sedimentation and quality of surface water</p> <p>Flood protection</p>
<p>Ecosystem protection</p>
<p>Ecosystem conservation</p> <p>Sensitization and organization of the population for the preservation of natural resources</p> <p>Rehabilitation, sustainable management of natural vegetation, and valorisation of Non-timber forest products</p> <p>Development of seed banks</p> <p>Involving local populations in the management of their local ecosystems</p> <p>Definition of areas for regeneration of wildlife and establishment of protected areas</p> <p>Promote regeneration or forestation of degraded zones to preserve the ecosystem and the surrounding habitat and improve the biodiversity</p>
<p>Infrastructure including transportation and telecommunication networks</p>
<p>Ensuring that the infrastructure is climate-proof over its lifespan</p> <p>Factoring a maintenance component into all infrastructural development funds</p> <p>Designing infrastructure that can withstand the prevailing climatic conditions, e.g. structures that can withstand strong winds and tides</p> <p>Improvements in physical infrastructure as well as in communication and road networks usually improve the adaptive capacity</p> <p>Ensuring proper communication during disasters</p>
<p>Health</p>
<p>Prevention measures</p> <p>Public investments in public health</p> <p>Awareness campaigns</p> <p>Organisation of preventive actions against vectorial diseases</p> <p>Identification and destruction of the pathogens' hideouts</p> <p>creation of a multidisciplinary research centre on climate and health</p> <p>Reinforcement of the cleansing system and mosquito eradication at national level</p> <p>Mapping of the habitat areas at climatic risk</p>
<p>Public preparedness</p> <p>Government plan for outbreak preparedness</p> <p>Implementation of an information system on climate change risk-related diseases</p> <p>Setting up of an epidemiological monitoring system such as the development of specific indicators (human, veterinary, environmental, etc) and thresholds of alert</p>
<p>Public health investment</p> <p>Improvement of the population's access to public and community health services for infectious diseases and non-communicable chronic diseases</p> <p>Reinforcement of the medical capacities</p>

<p>Construction of a large number of nomadic clinics</p> <p>Recruitment of technical staff</p>
<p>Population measures</p> <p>Eradication of areas that can attract mosquitoes (stagnated water, garbage deposits)</p> <p>Popularization and promotion of:</p> <ul style="list-style-type: none"> - mosquito coils and mosquito nets - spraying insecticides - impregnated window screen
<p>Social amenities and human settlements</p>
<p>Strengthening disaster preparedness</p> <p>Proper planning of urban settlements which takes into consideration the expected high growth rate of urban population due to climate induced migration from rural areas to urban centres</p> <p>Establishing insurance schemes to support preparedness in regions susceptible to climatic disasters</p> <p>Improving the quality of physical structures</p>
<p>Cross-cutting issues</p>
<p>Education, training and public awareness</p> <p>Improvement of information, education and communication on adaptation to climate change through:</p> <ul style="list-style-type: none"> - Incorporation of climate change in school curricula - Use of mass media and development of educational and sensitization materials to enhance public awareness
<p>Research and development</p> <p>In-depth research on the climate change impacts on water and agriculture</p> <p>Improving climate forecasting capacity</p> <p>Establishment of a climate databank</p> <p>Development of the agro-meteorology network</p> <p>Improvement of the quality of seasonal forecasts for rain fall and surface water flow and their integration into an overall strategy for assessing vulnerability, as well as their integration in model-based decision-making support systems</p>
<p>Institutional framework</p> <p>Realign current practices and policies to take into account climate variability, the projected climate change and sustainable economic and environment development and management</p> <p>Conduct institutional reforms and mainstreaming of climate change into regional and national development programmes</p>

3. Mitigation

a) Potential of low-carbon development

Energy
<p>Promotion of renewable energies</p> <p>Development of hydropower plants, including micro and mini hydropower plants</p> <p>Development of solar technologies such as: solar cookers, solar water heaters, solar dryers, and photovoltaic systems</p> <p>Development of solar-based rural electrification systems</p> <p>Development of biomass-based energy plants, such as agricultural by-products as energy source</p> <p>Promotion of geothermal energy resources</p> <p>Installation of wind turbines in industrial centres</p>
<p>Improving energy generation, transmission and distribution</p> <p>Implementation of the rural electrification programme</p> <p>Establishment of adequate energy supplies</p> <p>Improvement of regional power inter-connections</p> <p>Improvement of power plants efficiency through optimization of maintenance plan</p>
Energy efficiency
<p>Energy efficiency in the industry</p> <p>Rational use of energy</p> <p>Combined cycle power plant</p> <p>Cogeneration</p> <p>Implementation and improvement of heat trapping system</p> <p>Retrofitting and upgrading boilers</p>
<p>Energy conservation at household level</p> <p>Improve building designs</p> <p>Awareness campaigns for energy conservation</p> <p>Establishment of energy standards for home appliances</p> <p>Promotion of improved energy efficient devices, such as improved refrigerators</p> <p>Substitution of incandescent bulbs by those of low consumption (e.g. Compact Fluorescent Lamps)</p>
<p>Energy conservation at buildings and tertiary sector</p> <p>Rational use of energy in public buildings, hospitals and office buildings</p> <p>Retrofitting and upgrading boilers</p>

b) Mitigation measures in priority sectors

Land Use Change & Forestry
<p>Reforestation and afforestation</p> <p>Development of local forest communities</p>

<p>Promote reforestation and afforestation to contribute with poverty alleviation, livelihood security, environmental protection, and enhancement of women's participation development</p> <p>Expansion of tree planting into marginal agricultural and pasture land</p> <p>Conservation of existing stands (i.e. protection and maximization in recovery)</p>
<p>Improving forest management practices</p> <p>Implementation of sectoral legislation for better natural resources management, including land use policy</p> <p>Promotion of forest development technologies and management practices</p> <p>Capacity building</p>
<p>Ecosystem conservation</p> <p>Definition of areas for regeneration of wildlife</p> <p>Promote regeneration and/or forestation of degraded zones to preserve the ecosystem and the surrounding habitat and improve the biodiversity</p> <p>Bush fire countermeasures</p> <p>Management of natural resources</p>
<p>Waste management</p>
<p>Municipal solid waste management</p> <p>Community-based solid waste management projects</p> <p>Resource recovery and recycling</p> <p>Capture and recovery of biogas from solid waste disposal sites</p> <p>Use of appropriate technologies for safe disposal</p> <p>Composting of organic wastes</p>
<p>Wastewater treatment</p> <p>Evaluation of GHG emissions from wastewater treatment plant</p> <p>Methane capture and/or recovery from anaerobic digestion</p> <p>Biogas production from anaerobic digestion sludge</p> <p>Methane recovery from abattoirs and peri-urban dairy farms</p>
<p>Agricultural waste</p> <p>Composting of organic and agricultural wastes</p> <p>Aerobic digestion of biowastes and/or manure to produce biogas for lighting and cooking</p> <p>Biomass-based electricity generation</p>
<p>Transport and Infrastructure</p>
<p>Promotion of better transport and improvement on infrastructure and technology</p> <p>Encouragement of mass transport</p> <p>Traffic management improving and making traffic lights more effective, construction of bus lanes, pedestrian lanes, bicycle lanes</p> <p>Development of low carbon fuels, such as biofuels</p>

<p>Changes in transport mode</p> <p>Promotion of rail transport</p> <p>Promotion of non motorized transport</p>
<p>Improvements in vehicles</p> <p>Awareness, training and information to driver, such as course on fuel efficiency in driving schools curricula</p> <p>Environmental standard and compulsory inspection of vehicles</p>
<p>Manufacturing industry</p>
<p>Energy recovery and efficiency</p> <p>Rational use of energy</p> <p>Combined cycle power plant</p> <p>Cogeneration</p> <p>Implementation and improvement of heat trapping system</p> <p>Retrofitting and upgrading boilers</p>
<p>Fuel switch</p> <p>Development of natural gas use in industrial sector</p> <p>Fuel switch to low carbon fuels</p> <p>Substitution of oil boilers by renewable biomass boilers</p>
<p>Mining</p>
<p>Fuel switch and energy efficiency</p> <p>Establishment of energy efficiency standards</p> <p>Fuel switch to low carbon fuels</p> <p>Using more efficient engines</p> <p>Conservation and retrofitting of equipment</p>
<p>Ecosystem recovery</p> <p>Rehabilitation of stripped mining sites through tree planting</p>
<p>Cement industry</p>
<p>Fuel switch and energy efficiency</p> <p>Fuel switch to low carbon fuels</p> <p>Vertical mill</p> <p>Suspension pre-heater</p>
<p>Raw materials substitution</p> <p>Partial substitution for clinker using fly ashes, gypsum, slag, etc.</p>
<p>Chemical industry</p>
<p>Raw materials substitution</p> <p>Use of damp phosphate instead of dry phosphate rock in chemical facility</p>

Partial substitution for black phosphate rock with light phosphate

Reference:

- Global Forest Resources Assessment 2000. Available at FAO Corporate Document Repository:
<http://www.fao.org/DOCREP/004/Y1997E/Y1997E00.HTM>
- UNEP. Africa Environment Outlook and Africa Environment Outlook 2.
- IPCC Fourth Assessment Report.

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2.3. 文献調査の結果 -国別

2.3.1. アルジェリア

Algeria

● **Mainstreaming mitigation/adaptation actions in the national development strategy**

The People's Democratic Republic of Algeria's economy is largely dependent on extraction and export of natural resources, namely hydrocarbon and natural gas. As such, unlike many other countries of Africa, the main source of GHG emissions of the country is from the energy sector. Energy efficiency improvement in industries will contribute to GHG emissions reduction as well as economic and infrastructure development.

● **Summary on climate change related issues in the country**

1. Climate change policy

The People's Democratic Republic of Algeria signed United Nations Framework Convention on Climate Change (UNFCCC) in 1993 and ratified the Kyoto Protocol in 2004, marking its commitment to participate in the international effort to fight against climate change and its potential impact, particularly on the climate system, natural ecosystems and the sustainability of economic development.

The country is highly vulnerable to climate change both on natural aspect as well as on economical plans. The national strategy is essentially based on three components: sustainable development, adaptation to climate change, and mitigation of greenhouse gas (GHG) emissions. This national strategy comes in sectoral programs, such as:

- National plan of action and adaptation to climate change (*Plan national d'action et d'adaptation aux changements climatiques, PNA-ACC*) 2003
- Programme of sectoral policy for integrated water management (*Programme de politique sectorielle de gestion intégrée de l'eau*)
- National programme for energy conservation (*Programme national de maîtrise de l'énergie, PNME*);
- National programme for integrated municipal solid waste management (*Programme national de gestion intégrée des déchets solides municipaux, PROGDEM*)
- National programme of actions to combat desertification (*Programme d'action national de lutte contre la desertification, PAN-LCD*).

2. National efforts/measures against climate change

Several specialized agencies have been established to design and implement programs in the context of sustainable development as follows:

- National Observatory of the Environment and Sustainable Development (*Observatoire National de l'Environnement et du Développement Durable – ONEDD*), 2003
- National Council for Spatial Planning and Sustainable Development (*Conseil National d'Aménagement et de Développement Durable du Territoire – CNADD*), 2001
- National Waste Agency (*Agence Nationale des Déchets – AND*), 2002
- National Center of Cleaner Production Technologies (*Centre National des Technologies de Production plus Propres – CNTPP*), 2002
- National Centre for Development of Biological Resources (*Centre National de Développement des Ressources Biologiques – CNDRB*), 2003

- National Agency on Climate Change (*Agence Nationale des Changements Climatiques – ANCC*), 2005
- Intersectoral Council for Energy Conservation (*Conseil Intersectoriel de la Maitrise de l’Energie – CIME*), 2005
- National Agency of Earth Sciences (*l’Agence Nationale des Sciences de la Terre – ANSTS*), 2006
- Coastal National Commissioner (*Commissariat National du Littoral – NLC*), 2004
- National Conservatory for Environmental Education (*Conservatoire National des Formations à l’Environnement – CNFE*), 2002

Algeria has submitted its First National Communication in April 30, 2001 and Second National Communication in November 25, 2010.

Algeria established Designated National Authority (DNA) for CDM under Ministry of Territorial Planning and Environment and Ministry of Foreign Affairs. To date Algeria has not hosted any CDM projects.

3. Sustainable Development and Mitigation

• National inventory of greenhouse gas

GHG emissions in Algeria totalled about 91,758.0 kt CO₂e in 1994 and 111,022.6kt CO₂e in 2000, excluding CO₂ emissions/removals in the LUCF sector.

There is an increasing trend of GHG emissions in Algeria in the period 1994-2000. Second National Communication indicates that net GHG emissions were 103.143kt of CO₂e in 2000 corresponding to 2.61 ton per capita.

Table 1: Algeria GHG emissions summary

Total National Emissions and Removals	CO ₂ Emissions (kt)	
	1994	2000
CO ₂ emissions without LUCF	63,705	71,593.3
CO ₂ net emissions/removals by LUCF	7,835	-8,148.2
CO ₂ net emissions/removals with LUCF	71,540	63,446.1
GHG emissions without LUCF	91,758	111,022.6
GHG net emissions/removals by LUCF	8,566	-7,879.8
GHG net emissions/removals with LUCF	100,344	103,142.8

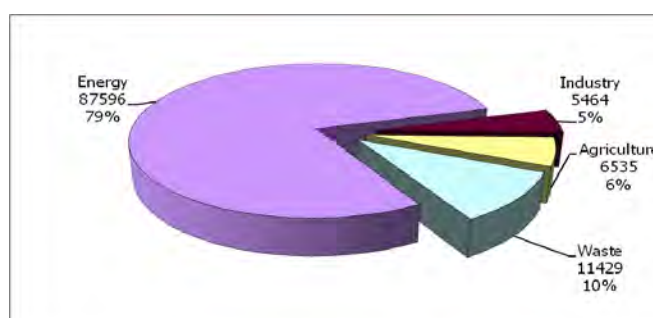


Figure 1: Total GHG emissions (ktCO₂e) and contribution to the total (%) by sector in 2000 (without LUCF)

Nearly 80% of the GHG emissions come from the energy sector. The hydrocarbon industry is the driver of the national economy. As such, it represents a major part in economic activities and consequently the national emissions of GHGs. Nearly 20% of emissions from this sector are associated with the production, processing, and transportation of hydrocarbons having significant portion exported. Natural gas liquefaction whose product (LNG) is exported is also responsible for a significant share of these emissions (8%). The remaining 47% comes mainly from energy consumption for power generation, crude oil refinery, domestic industry, residential, transportation, etc.

Agriculture contributes to nearly 6,535 ktCO₂e or 6% of total GHG emissions. Most of emissions are from enteric fermentation. Waste and industrial processes take 10% and 5% respectively of total emissions. Cement industry contributes 60% of the industrial processes sector and methane emission from landfills contributes to 66% of the waste sector.

• **Summary of Nationally Appropriate Mitigation Action (NAMA) plan**

Algeria has not submitted its NAMA plan. However, as presented in the Section 7 "Mitigation/Adaptation Option" in this summary, the National Communication of the country raises several mitigation options for the country.

4. Adaptation and Vulnerability

• **Vulnerability to climate change**

Algeria is in the semi-arid area and risks of desertification remain very high. According to the Algeria Second National Communication, it implies concern on vulnerability to the global climate change in the water supply sector. Adaptation strategies are explained in the following section.

• **Adaptation**

The adaptation strategies suggested are in line with the sustainable development strategies that support the non-climate factors, and are as follows:

- Studies on integrated water resources planning, examining the role of water managers and their influence on the adaptability;
- Assessing the current capacity of the water management structures and institutions to cope with climate change;
- Economic and environmental adaptation through implementation of the actions bellow:
 - Take measures for water saving;
 - Improve strategies for planning and preparation for drought and severe flooding;
 - Protect water quality;
 - Strengthen monitoring and observation;
 - Improve the process for equitable distribution of water resources.
- Controlling the operation at the dam: the volume of water supplied must correspond to actual needs in the downstream and in particular for agricultural needs;
- Improving food security through adaptation of crops;
- Implementing reforestation, land and landscape protection and management, land consolidation, and the development of an agricultural zoning plan;
- Injecting surface water in groundwater;

- Developing wastewater reuse, especially for agriculture and watering green areas;
- Protecting water resources against pollution;
- Using efficient irrigation techniques that consume little water, such as drip irrigation;
- Improving the efficiency of irrigation systems through strengthening of maintenance and rehabilitation programs;
- Improving the efficiency of drinking water supply system;
- Developing rational irrigation management and water conservation measures;
- Strengthening and optimizing the measurement of climate, hydrological, geological, and water quality parameters;
- Creating and strengthening the expertise in remote sensing, weather forecasting, drought monitoring and forecast, and agricultural research in dry-land zone;
- Raising public awareness for water conservation; and
- Establishing and strengthening institutional measures.

5. Major Industries

According to the Algeria section of World Factbook published by the Central Intelligence Agency (CIA), Oil and gas (Hydrocarbons) industry have long been the backbone of the economy, accounting for roughly 60% of budget revenues, 30% of GDP, and over 95% of export earnings. Algeria has the eight-largest reserves of natural gas in the world and is the fourth-largest gas exporter. It ranks 16th in oil reserves.

6. National development strategy

The Algerian government approved the Five year Plan 2010-2014 that aims to boost infrastructure as well as diversify the country's economy away from oil dependency.

The 2010-2014 Public Program for Economic and Social Development, is based on six major axes, including human development, basic infrastructure development, public service improvement, economic development, unemployment control, scientific research and new communication technologies.

7. Mitigation/Adaptation Options

Table 2: Mitigation Options for Algeria

<p>Energy sector</p> <ul style="list-style-type: none"> - Development of energy park exclusively using natural gas and renewable energy(solar, wind)
<p>Industrial Sector</p> <ul style="list-style-type: none"> - The promotion of cogeneration - Requirement for energy efficiency in future investments, - Improving energy efficiency in industry by a) massive introduction of variable speed motors b) introduction of efficient burners in the cement industry c)energy audits of industrial units.
<p>Efficient energy management</p> <ul style="list-style-type: none"> - The PNME 2006-2010 allows deferral of capital with a capacity of 161 MWe for electricity generation and about 897 ktce savings over the period in the context of significant economic growth. Half of these savings are to be carried out by industry that should curb its consumption through the introduction of new technologies. The service sector represents a major challenge (services and local authorities) for energy efficiency. - Energy savings expected over the period of implementation of the plan amount to 69 ktce. The largest volume is expected in the

action for lighting performance with 56 ktoe of energy saved. The efficient lighting plan leads to a reduction of 168 ktCO₂e. Overall, the Residential action plan allows a reduction of 207 ktCO₂e in GHG emissions.

- The implementation of the energy efficiency action plan in the service sector expects to save 13 ktoe over the period of the implementation of the plan. The largest saving is expected in Energy Performance of Buildings plan, with 7 ktoe of energy saved in total being 4 ktoe due to solar water heating. In total, the plan of action in the service sector allows a reduction of 38 ktCO₂e.
- The energy savings in transport sector is expected to be 176 ktoe for the period of five years. The largest volume is expected in the action for buses and coaches saving 131 ktoe of energy. The introduction of LPG and CNG in private vehicles and utilities is expected to save 36 ktoe. LPG use in private vehicles allows a reduction of 108 ktCO₂e. In total, the transport sector action plan reduces 216 ktCO₂e.

Table 3: Adaptation Options for Algeria

<p>Capacity building</p> <ul style="list-style-type: none"> - Formation, information and sensibilisation - Technology and Research - Monitoring system
<p>Institutional</p> <ul style="list-style-type: none"> - Strengthening institutional capacity in the CDM through the following actions: <ul style="list-style-type: none"> - An assessment of investment opportunities in CDM projects, - Identification of links between GHG reductions and national priorities and Sustainable Development - An analysis of the potential supply from foreign investors for financing projects that reduce GHG - Identification of concerns regional / national on trade in GHG - Establishment of a well-defined process for registration, approval, implementation, monitoring and verification of CDM projects.
<p>Cooperation</p> <ul style="list-style-type: none"> - Contribution and collaboration of several states that share a heritage and environmental require concerted bilateral or multilateral action. - International cooperation is one of the main ways to improve the prevention of climate changes. It is necessary to promote South-South cooperation through institutions in developing countries that are able to support the activities of capacity building at national, subregional and regional levels, wherever possible and useful, as Algeria is concerned with international negotiations in Climate Change - Cooperation in research should also be developed in the field of climate change. Thus, joint research and development (R & D) to monitor climate change and its impact on natural systems provide an area of constructive cooperation.

Reference:

- Algeria Second National Communication, November 2010
 - UNFCCC website (GHG Profile, NAMA, Designated National Authorities, CDM)
 - CIA World Fact Book website on country page for Algeria
 - Algeria Five year Plan (2010-2014) on Ambassade D'Algerie, Stockholm
- http://www.embalgeria.se/beta/index.php?option=com_content&view=article&id=116:algeria-five-year-plan-2010-2014&catid=60:discours&Itemid=100&lang=fr

This summary was prepared based on the data/information available as of September 2011.

2.3.2.ウガンダ

Uganda

● **Mainstreaming mitigation/adaptation actions in the national development strategy**

While the Republic of Uganda's contribution to the GHG emissions is low, the economy mainly depends on agriculture which is its main source of GHG (CH₄) emissions. Uganda's national priority, like many other African countries is poverty alleviation. Uganda is already attempting to mainstream climate change in its five-year National Development Plan by identifying climate change as one of the cross cutting issue to tackle. Some of the mitigation actions under plan include transport sector while adaptation actions include measures in forestry and agriculture sectors all of which could have positive impacts on the livelihood of the Ugandan people. Through putting individual measures into actions, Uganda could be a model case for neighbouring countries.

● **Summary on climate change related issues in the country**

1. Climate change policy

Uganda has ratified the United Nations Framework Convention on Climate Change (UNFCCC) on September 8, 1993.

The primary focus of government is poverty eradication. Poverty Eradication Action Plan (PEAP) is Uganda's Comprehensive Development framework, which has guided the formulation of government policies since 1997. PEAP aims at transforming Uganda into a modern economy. The PEAP programme operates based on following four pillars:

- Fast and sustainable economic growth and structural transformation;
- Good governance and security;
- Increased ability of the poor to raise their incomes; and
- Improved quality of life of the poor.

The government gives priority support to activities and programmes that have direct and positive implications to the four pillars of PEAP. For any project to be included in the government development programme for financial or material support it must address poverty eradication directly. Although sectoral policies were developed to support PEAP, these policies do provide a good basis for implementation of the Convention. The relevant policies are:

- Plan for Modernisation of Agriculture (PMA);
- Population Policy;
- Health Policy;
- Disaster Management and Preparedness Policy;
- Forestry Policy (2001);
- Environment Policy;
- National Water Policy;
- Energy Policy;
- Waste Management;
- National Wetlands Policy (1995); and

- Climate Monitoring.

2. National efforts/measures against climate change

Considering the cross-cutting nature of climate change issues, no single sector or institution can independently handle all the aspects of climate change. Implementation of the UNFCCC requires the involvement of stakeholders at all levels. Proposed measures to address climate change, particularly adaptation, should also take into account inputs from the local communities. In order to develop effective measures to implement the Convention, Uganda will consider the following:

- Capacity development;
- Strengthening climate and climate change monitoring institutions;
- Development of Adaptation Action Plan;
- Applying participatory and consultative approaches; and
- Establishment of legal and institutional framework.

A number of Policy Gaps and Constraints to the implementation of the Convention still do exist. These include the following:

- The lack of a comprehensive Land-use Plan;
- Inadequate capacity; and
- Lack of awareness.

Regarding awareness, it is recognized that effective implementation of the Convention depends on the level of awareness of the population at the various levels of society. Public awareness as well as education and training must be an integral component of national programmes to address climate change and its adverse effects. In this regard, Uganda has already taken advantage of climate change meetings and workshops to invite the media to cover climate change events with the objective of raising the level of awareness of the public. Lack of financial and technical assistance remains the main barrier to education, training and public awareness.

3. Sustainable Development and Mitigation

• National inventory of greenhouse gas

The main greenhouse gas (GHG) emitted in Uganda is methane, which corresponds to 64% of the emissions excluding the LUCF and to 54% of the emissions when LUCF is taken into account.

As shown in Table 1, GHG emissions in Uganda totalled about 49,799.9 ktCO₂e in 1994 including CO₂ emissions of the Land Use Change and Forestry (LUCF) sector. The national GHG inventory shows fairly high GHG emissions. These are reflected in biomass burned for energy, agricultural waste burning, and savannah burning and grassland conversion.

Table 1: Uganda GHG emissions summary

Total National Emissions and Removals	CO ₂ Emissions (kt)
	1994
CO ₂ emissions without LUCF	730.3
CO ₂ net emissions/removals by LUCF	8,122.7

CO ₂ net emissions/removals with LUCF	8,852.9
GHG emissions without LUCF	41,547.2
GHG net emissions/removals by LUCF	8,252.7
GHG net emissions/removals with LUCF	49,799.9

Figure 1 shows Uganda's total GHG emissions by sector, which is dominated by the agriculture sector.

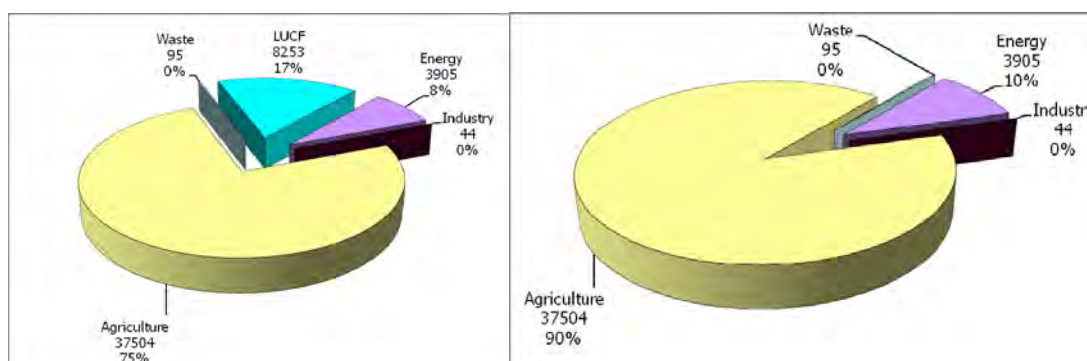


Figure 2: Total GHG emissions (ktCO₂e) and contribution to the total (%) by sector in 1994 (with and without LUCF)

As presented in Figure 1, agriculture is the largest source, being responsible for net emissions in the order of 37,504 ktCO₂e or 75% of the country's total GHG emissions (with LUCF), mostly from Prescribed Burning of Savannas. The second largest source is LUCF, whose contribution corresponds to 17% of total emissions. The energy sector contributes 3,905 ktCO₂e or 8% of the country's total GHG emissions. The waste and industry sectors emit respectively 95 ktCO₂e and 44 ktCO₂e.

• **Nationally Appropriate Mitigation Action (NAMA) plan**

Uganda has yet to submit a NAMA plan, but after the COP15, in March 2010, Uganda has communicated to the UNFCCC Secretariat its intention to be listed as agreeing to the Copenhagen Accord. As presented in the Section 7 "Mitigation/Adaptation Option" in this summary, the National Communication of the country raises several mitigation options for the country.

4. Adaptation and Vulnerability

• **Vulnerability to climate change**

IPCC findings indicate that the poorer countries such as Uganda will suffer disproportionately despite their little contribution to climate change. Climate change will have far reaching consequences for Uganda for various reasons such as weak institutional capacity, lack of skills in disaster management, lack of equipment for disaster management, limited financial resources and above all an economy, which depends entirely on exploitation of its natural resources.

Uganda's economy is totally dependent on climate and therefore vulnerable to adverse effects of climate change. As pointed out in the National Communication, a limited preliminary vulnerability and adaptation assessment was done under the US Climate Change Country Study Programme (1996). The study covered

agriculture (crop and livestock), water resources, and forestry sectors. Vulnerability assessment was done based on climate scenarios derived from General Circulation Models (GCMs).

• **Climate Change National Adaptation Programme of Action (NAPA)**

Climate variability and its impacts have led communities to develop coping strategies to climate related disasters such as droughts, floods, and storms. However, frequency of these events was low and therefore coping mechanisms have not been documented, developed or popularized but have been passed from generation to generation through traditional and cultural practices.

The literature review and the participatory rural appraisal (PRA) informed and guided the preparation of the Ugandan NAPA. The criteria were developed to rank the identified intervention areas and key activities. The final list of prioritized and ranked intervention strategies is presented in Table 2.

Table 2: NAPA Priority projects of Uganda

	Project Title	Sector	Indicative Cost (USD)
1	Community tree growing project	Forestry	5,500,000
2	Land degradation management project	Forestry	4,700,000
3	Strengthening meteorological services	Weather and climate information	6,500,000
4	Community water and sanitation project	Water resources	4,700,000
5	Water for production project	Water resources	5,000,000
6	Drought adaptation project	Weather and climate information	3,000,000
7	Vectors, Pests and Disease Control Project	Health	8,000,000
8	Indigenous Knowledge (IK) and Natural Resources Management Project	Agriculture	1,200,000
9	Climate Change and Development Planning Project	Weather and climate information	1,200,000

5. Major Industries

Uganda has substantial natural resources, including fertile soils, regular rainfall, small deposits of copper, gold, and other minerals, and recently discovered oil. Uganda has never conducted a national minerals survey. Agriculture is the most important sector of the economy, employing over 80% of the work force. Coffee accounts for the bulk of export revenues. Oil revenues and taxes will become a larger source of government funding as oil comes on line in the next few years.

The global economic downturn has hurt Uganda's exports; however, Uganda's GDP growth is still relatively strong due to past reforms and sound management of the downturn.

Instability in South Sudan is the biggest risk for the Ugandan economy in 2011 because Uganda's main export partner is Sudan, and Uganda is a key destination for Sudanese refugees.

6. National development strategy

Uganda was the first country to prepare a comprehensive, participatory, and country owned national development strategy in 1997, creating the model for the Poverty Reduction Strategy Paper (PRSP). The 1997 PEAP received international praise. It was revised and updated in 2000 (PEAP II) and 2004 (PEAP III). PEAP III was extended for two years, to June 2010, due to delays in preparing its successor.

In February 2010, the government finalized a new five-year (FY2011-2015) National Development Plan (NDP). The NDP's main theme is "Growth, Employment and Socio-Economic Transformation for Prosperity," marking a broadening of the country's development strategy from poverty reduction, the focus of the PEAPs, to structural transformation to raise growth and living standards. It is the first in a series of six plans intended to transform Uganda over thirty years into a modern and prosperous country.

The NDP has eight objectives. These are:

- (i) Increase household income and promote equity;
- (ii) Enhance the availability and quality of gainful employment;
- (iii) Enhance human capital development;
- (iv) Improve the stock and quality of economic infrastructure;
- (v) Increase access to quality social services;
- (vi) Promote science, technology, innovation, and information and communications technology (ICT) to enhance competitiveness;
- (vii) Strengthen good governance, defence, and security; and
- (viii) Promote sustainable population and use of the environment and natural resources.

In addition, the NDP identifies four priority areas for investment:

- (i) Infrastructure development
- (ii) Human resource development
- (iii) Critical production inputs
- (iv) Science, technology, and innovation

The NDP identifies fifteen "national flagship projects" intended to address binding constraints to growth.

The NDP includes analysis of cross-cutting issues crucial to sustained growth, such as gender. It highlights gender inequalities, commits to mainstreaming gender-responsive development, and proposes strategies to address gender gaps. Other cross-cutting issues include: governance, urbanization and decentralization, climate change, and regional cooperation. The NDP also includes a detailed discussion by sector, including a situational analysis, constraints, objectives, and planned interventions.

7. Mitigation/Adaptation Options

Table 3: Mitigation Options for Uganda

Energy Sector

- Petrol/Ethanol Blending
- Elimination of Residual/fuel oil in Industry
- Hydro power based mitigation options and photovoltaic-based mitigation options

<p>Transport Sector</p> <ul style="list-style-type: none"> - Encouraging vehicles with lower energy consumption intensity with respect to transportation capacity - Implementing the National and the Greater Kampala Transportation Master Plans - Engineering design of roads where one-way streets and by-pass roads can reduce traffic congestion - Establishing dedicated Non-Motorised Transport (NMT) lanes - Putting in place suitable regulatory measures to reduce traffic congestion
<p>Forestry Sector</p> <ul style="list-style-type: none"> - Enhancement of sinks for CO2
<p>Agriculture Sector</p> <ul style="list-style-type: none"> - Improve the efficiency of live stock feed

The adaptation options proposed in the subsequent sections are based on empirical and indigenous knowledge built over time.

Table 4: Adaptation options for Uganda

<p>Agricultural Sector</p> <ul style="list-style-type: none"> - Irrigation - Diversification of crops - Improved farming methods - Processing and storage facilities
<p>Grassland and Livestock</p> <ul style="list-style-type: none"> - Reduction of animal population - Improve pastures and rangeland management - Reduce silting of river banks and lake shores - Water harvesting
<p>Forestry Sector</p> <ul style="list-style-type: none"> - Develop drought resistant species - Improve management of forests - Research into new pests and diseases - Preservation of indigenous species
<p>Water Resources Sector</p> <ul style="list-style-type: none"> - Water conservation - Construction and maintenance of storage structures - River Basing Planning - Use of ground water - Pollution control - Water harvesting - Wetlands and catchment protection

Reference:

- Uganda Initial National Communication, October 2002
- UNFCCC website (GHG Profile, NAMA, NAPA, Designated National Authorities, CDM)
- CIA World Fact Book website on country page for Uganda
- The World Bank website on Country Assistance Strategy for Uganda (CAS FY11-15)

This summary was prepared based on the data/information available as of September 2011.

2.3.3. エチオピア

Ethiopia

● Mainstreaming mitigation/adaptation actions in the national development strategy

While the Federal Democratic Republic of Ethiopia's contribution to the GHG emissions is low, economy in Ethiopia mainly depends on agriculture which is its main source of GHG (CH₄) emissions. Development of agriculture sector to improve the poor land management and the low technology would contribute to alleviating the increase of GHG emissions, in addition to increasing the accessibility of electricity generated from renewable energy (Hydro and Geothermal).

● Summary on climate change related issues in the country

1. Climate change policy

Ethiopia ratified the United Nations Framework Convention on Climate Change (UNFCCC) on 15 April 2005, Biodiversity Convention, Desertification Convention, Convention and Protocols to protect the Ozone Layer, etc. Accordingly, relevant governmental institutions have been entrusted to discharge responsibilities in the area of environment and development amongst which, the NMSA (National Meteorological Services Agency) is mandated to deal with climate related affairs.

Ethiopia has not yet developed specific climate change policies, programs and measures. However, there are a number of environmentally oriented policies, strategies and action plans already in place that can directly or indirectly contribute to the objectives of the Climate Convention. Followings are examples of these policies, strategies and action plans.

- 1994 Environmental Policy
- Conservation Strategy of Ethiopia
- Population Policy
- Science and Technology Policy
- Energy Policy of Ethiopia
- Agricultural Policy
- Water Policy
- Forestry Action Plan
- Disaster Prevention and Preparedness and Early Warning Policy
- Health Policy
- Development Plan of the Addis Ababa City Council, etc.

The First National Communication submitted to UNFCCC in June 2001 stresses that support for the implementation of relevant policies, strategies and action plans in the form of funding, technical assistance, training and technology transfer through the Convention mechanisms is extremely essential to Ethiopia.

2. National efforts/measures against climate change

Ethiopia participated in UNCED in 1992 and is a signatory to UNFCCC. Since then, Ethiopia has paid great attention to the issues of climate change and various activities have been undertaken including conducting climate change country studies and participating in climate change negotiations.

Ethiopia established Designated National Authority (DNA) for CDM under its Environmental Protection Authority (EPA). To date, the country has developed one afforestation CDM project supported by the World

Bank as a trustee of BioCarbon Fund. The project has been registered in December 2009 and is expected to achieve approximately 29,000 tCO₂e removals by sinks per year.

3. Sustainable Development and Mitigation

• National inventory of greenhouse gas

GHG emissions in Ethiopia totalled about 47,401.5kt CO₂e in 1994, excluding CO₂ emissions/removals in the LUCF sector.

There general is an increasing trend of GHG emissions in Ethiopia in the period 1990-1995. It is expected to increase in the future along with socio-economic development and population growth. Recent figures from the World Bank indicate that CO₂ emissions were 65,036kt in 2008 corresponding to 0.082 ton per capita.

The sink capacity of Ethiopia in the LUCF sector is decreasing rapidly due to deforestation mainly for agricultural and energy use.

Table 1: Ethiopia GHG emissions summary

Total National Emissions and Removals	CO ₂ Emissions (kt)		
	1990	1994	1995
CO ₂ emissions without LUCF	2,307.0	2,592.0	2,862.0
CO ₂ net emissions/removals by LUCF	-31,810.0	-150,063.0	-10,653.0
CO ₂ net emissions/removals with LUCF	-29,503.0	-12,471.0	- 7,791.0
GHG emissions without LUCF	43,018.0	47,401.5	47,745.0
GHG net emissions/removals by LUCF	-14,406.7	-14,406.7	-9,876.0
GHG net emissions/removals with LUCF	11,728.0	32,994.8	37,869.0

As presented in below figure, by sector, Ethiopia's GHG emissions profile is dominated by emissions from agriculture contributing 80% of the total while by gas, it is dominated by CH₄ contributing 80% of the total CO₂ equivalent emissions in 1994.

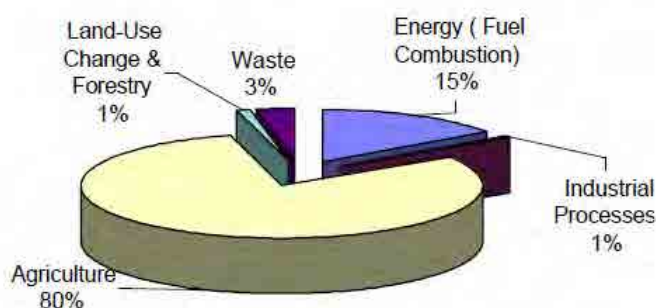


Figure 1: Percentage Contribution by Sector to the Total (Aggregated) GHG Emissions in CO₂e in 1994

In terms of CO₂ emission, about 88% of total emission came from fossil fuel combustion in the Energy sector, and the Transport (road) sub-sector is the main emitter of CO₂ within this sector. The total CO₂ emission

from the Energy Sector is estimated at 2,287 kt for 1994. Figure 3.2 shows the sectoral share of CO₂ emissions from fossil fuel combustion for 1994. The Transport sub-sector account for 44% of energy sector emissions and is the largest consumer of the petroleum imported into the country. The Industrial Processes sector contributed 12% of the total CO₂ emissions mainly as a result of cement production.

• **Summary of Nationally Appropriate Mitigation Action (NAMA) plan**

In response to Copenhagen Accord, Ethiopia submitted its NAMA in January 2010. Ethiopia's NAMA is composed of various individual projects with the aim of implementation by 2020. In particular, big emission reductions potential is expected in energy generation with renewable sources such as hydro and geothermal.

Table 2: Ethiopia Proposed NAMA activities

Type of Activity	Planned Action	Capacity/scale
Hydro power projects development	10 projects to be completed from 2010 to 2015	5,632 MW
Hydro power projects feasibility study	11 studies to be completed from 2010 to 2012	8,915 MA
Wind power projects development	7 projects to be completed from 2011 to 2013	762 MW
Geothermal Projects	1 project to be completed in 2012 and 7 in 2018	450 MW
Bio-fuel production for transport & household use	Produce ethanol and biodiesel from 2010 up to 2015	125.52 mil liter
Electricity generation from renewable sources (All from 2010 up to 2015)	<ul style="list-style-type: none"> - Solar home installation - Small hydro electric power facilities construction - Wind and solar pumps installation - PV installation starting - Solar lanterns installation - Solar water heaters instillation - Solar cookers distribution - Improved biomass household stoves distribution - Biodiesel stoves distribution - Household biogas digesters installation - Institutional biogas plant installation 	<ul style="list-style-type: none"> 150,000 units 65,000 units 600 units 3,000 units 3 million units 3,500 units 10,000 units 9,000,000 units 10,000 units 25,000 units 1,000 units
Rail way transport development	<ul style="list-style-type: none"> - 8 train routes (First one to be completed by 2015) - 1 Light Rail Transit project by 2020 	<ul style="list-style-type: none"> 4,589 km 300 km
Forestry/forests	<ul style="list-style-type: none"> - deforestation and forest degradation mitigation - sustainable management of natural forest area - desertification mitigation 	610,293.66 km ²
Agriculture	<ul style="list-style-type: none"> - Compost application on agricultural land - Agro-forestry practices and systems implementation 	<ul style="list-style-type: none"> 80,000 m² 261,840 m²
Waste management	<ul style="list-style-type: none"> - Urban waste methane reductions - Liquid waste treatment and energy generation 	n/a

4. **Adaptation and Vulnerability**

• **Vulnerability to climate change**

Economy in Ethiopia mainly depends on agriculture which is very sensitive to climate variations. Hence, climate change in Ethiopia has far reaching implication to the country. A large part of the country is arid

and semiarid and is highly prone to desertification and drought. It has also a fragile highland ecosystem, which is currently under stress due to population pressure. Forest, water and biodiversity resources of the country are also climate sensitive. Vector-born diseases, such as malaria also affect Ethiopia, which are closely associated with climate variations.

The main environmental problems in Ethiopia are soil erosion, deforestation, recurring droughts, desertification, and land degradation as a result of over cultivation and over grazing and loss of biodiversity including wildlife. With the implementation of the Conservation Strategy and the 1994 Environmental Policy of Ethiopia these environmental problems are expected to improve in the course of time.

According to the latest World Bank country study on economics of adaptation to climate change, Ethiopia's GDP could be 2-8 percent lower than expected if it does not invest in adaptation.

• **Climate Change National Adaptation Programme of Action (NAPA)**

Ethiopia is highly vulnerable to drought. Drought is the single most important climate related natural hazard impacting the country from time to time. Ethiopian economy depends on rain-fed agriculture. 85% of the population livelihood is contingent upon this sector. But, climate extremes shackle the livelihood and economy of the country as it is closely linked to recurrent drought. Rainfall is erratic and since the early 1980s, the country has suffered seven major droughts, five of which have led to famines. Its geographic location and topography make it highly vulnerable to the impacts of climate change.

Under such circumstances, Ethiopia put highest priority to promote “Drought /Crop Insurance Program” in the country. Drought insurances will minimize these shocks. The recurrent drought occurrences and population affected time series data reveal that population affected increases abruptly with time. To partially reverse this statistical trend and sustain the farmers’ livelihood in the drought prone areas, drought insurance is one of the solutions. It will as well ease the impacts from climate change shocks. The table below presents NAPA priority projects of Ethiopia.

Table 3: Ethiopia NAPA Priority Projects

	Project Title	Sector	Indicative Cost (USD)
1	Promoting drought/crop insurance program in Ethiopia	Crop Insurance	8,000,000
2	Strengthening/enhancing drought and flood early warning systems in Ethiopia	Early warning System	10,000,000
3	Development of small scale irrigation and water harvesting schemes in arid, semi-arid, and dry subhumid areas of Ethiopia	Irrigation	30,000,000
4	Improving/enhancing rangeland resource management practices in the pastoral areas of Ethiopia	Livestock	2,000,000
5	Community based sustainable utilization and management of wet lands in selected parts of Ethiopia	Wetlands Ecosystem	2,000,000
6	Capacity building program for climate change adaptation in Ethiopia	Capacity Building	3,000,000
7	Realizing food security through multi-purpose large-scale water development project in Genale–Dawa Basin	Food security, water resources and infrastructure	700,000,000
8	Community Based Carbon Sequestration Project in the Rift Valley System of Ethiopia	Forest ecosystems	1,000,000

9	Establishment of national research and development (R&D) centre for climate change	Research and Development Infrastructure	2,000,000
10	Strengthening malaria containment program(MCP) in selected areas of Ethiopia	Malaria program	6,000,000
11	Promotion of on farm and homestead forestry and agro-forestry practices in arid, semi-arid and dry-sub humid parts of Ethiopia	Forest ecosystems	5,000,000

5. Major Industries

According to Ethiopian Investment Agency, agriculture is the backbone of the Ethiopian Economy. The sector contributes about 43% of the GDP, 86% of exports, and employs 80% of labour force. The export of Ethiopia is dominated by coffee and oil seeds, which together accounted to 50.6% in 2008/09. Other principal export commodities are 'chat', flowers, pulses, and live animals. Ethiopia with 18 major agro-ecological zones and various agro-ecological sub-zones has a suitable climate for growing over 146 types of crops.

Mining and manufacturing also is other major industry in Ethiopia which constitutes approximately 10% of GDP. Gold, marble, limestone, and small amounts of tantalum are the major minerals mined in Ethiopia. Of these minerals, gold, which provided US\$12.5 million to the economy in 1996, is the most significant contributor to export earnings.

The manufacturing sector of the Ethiopian economy produces construction materials, metal, and chemical goods, in addition to basic consumer goods such as food, beverages, clothing, and textiles. Despite massive privatization campaigns, the industrial sector remained dominated by the state, with 150 public (state) enterprises accounting for more than 90 percent of the entire sector's value in 1999. Production by state-owned enterprises is centred on food and beverages, textiles, clothing, leather products, tobacco, rubber, plastic and cement. In 1999, there were also 165 private sector manufacturing firms involved in producing goods such as bakery products, textiles, footwear, and furniture.

6. National development strategy

Ethiopia is currently implementing its second poverty reduction strategy (PRS), known as the Plan for Accelerated and Sustained Development to End Poverty (PASDEP) for the period 2008-2011. This vision shows great elements of continuity with the first PRS (SDPRP, the Sustainable Development and Poverty Reduction Program) in areas such as infrastructure, human development, rural development, human security and capacity building. However, significant new elements have been introduced, namely an explicit link with an exercise on what it would cost to achieve the MDGs in Ethiopia. New elements also include a renewed focus on growth, specifically in the areas of private sector and urban development, industry and the commercialization of agriculture. PASDEP priorities in key sectors are summarized below.

Table 4: Key sector in PASDEP priorities

<p>Market based development of agriculture</p> <p>Ethiopia's agriculture is subsistence agriculture, characterized by poor land management and a limited resource base, the low supply and dissemination of technology, the limited flow of information and inadequate implementation capacity as some of the major problems in the sector.</p> <p>Training programs, the introduction of appropriate technologies and marketing systems with a strong push on marketing cooperatives,</p>

<p>measures to improve land use and the conservation of natural resources, improved access for farmers to agriculture inputs, markets, rural financial services, and improved security of land tenure are required.</p>
<p>Private sector development</p> <p>Integration and interdependence between the agricultural and industrial sectors is key to Ethiopia's economic development and to the expansion of the service sector. Infrastructure, power generation, and construction and supply opportunities are also highlighted in PASDEP as high potential areas for private sector participation, and so are the social sectors based on the substantial growth of private schools in urban areas.</p>
<p>Urban development</p> <p>Provision of efficient and effective public services to urban residents, with particular emphasis on regional equity is key to Ethiopia's development. Particularly, efforts based on the 4 pillars: support for micro and small enterprises and job creation, integrated housing development, improved access to land infrastructure, transport, and services, and promoting urban-rural and urban-urban linkages is are being prioritized.</p>
<p>Infrastructure</p> <p>Road network expansion, increased access to electricity, water and telecom services are seen as central to the growth agenda and contain strong elements of continuity with the past, particularly in the road sector. A major innovation is a large-scale rural electrification program, the Universal Electrification Access Program (UEAP). Under UEAP, access will be extended to 24 million people, reaching penetration of 50 percent of the country over five years. Further, 11 electric power generating stations will be constructed with a total capacity of 4,091 MW. Also, provide access to clean potable water to the entire population and improve sanitation outcome within seven years. It also aims to promote integrated water resources management with multi purpose water resources development and providing emphasis to irrigation development in an integrated manner.</p>
<p>Human development</p> <p>Aims to implement a twenty-year sector plan expected to improve the quality, equity, and relevance of education, with special emphasis on primary education for all by 2015. Also, Technical and Vocational Education Training (TVET), teacher's training and cross-cutting issues such as gender, civic, ethics and HIV/AIDS education are planned. In the area of health services, Ethiopia continues implementing its Health Sector Development Program (HSDP) with an increased focus on poverty-related health conditions such as communicable diseases. PASDEP also includes an enhanced focus on nutrition, with a new National Nutrition Strategy (NNS) having recently been approved.</p>
<p>Governance</p> <p>Improve the capacity of Parliament and political institutions through stronger law making and public consultation mechanisms; performing annual public audit reports and implementing systems of annual disclosure of accounting and performance information directly to the public; and holding local elections for woreda (district), kebele, and city councils.</p> <p>Ensure human rights protection and enforcement a number of public awareness campaigns will be organized and human rights legislation and conventions will be published. A comprehensive series of reforms has been planned under the PASDEP including participatory mechanisms to be established at the local level and many legal and administrative regulations for CSOs to be amended. The performance of the judiciary will be improved through a computerized database system in courts implementing case management system and judge training programs.</p>
<p>Vulnerability</p> <p>Food Security Program (FSP), initiated during SDPRP implementation, remains Ethiopia's strategy to overcome food insecurity and reduce reliance on food aid. The key interventions under the FSP are: (i) building household assets through on-farm activities; (ii) voluntary resettlement from environmentally degraded to more productive areas; (iii) the Productive Safety Nets program, which is helping transition from food-aid to cash-aid while building community assets; and (iv) promoting non-farm income generating activities. Related efforts include an increased focus on nutrition and putting in place flood preparedness and early warning systems.</p>

7. Mitigation/Adaptation Options

As a party to the UNFCCC, Ethiopia is willing to contribute to the achievement of the ultimate objective of the Convention despite her very low contribution to the global GHG emissions. There are a number of potential mitigation options/ opportunities, which could meet both objectives of socio-economic development and climate protection. In the First National Communication, following options are listed as potential mitigation options.

Table 5: Mitigation Options for Ethiopia

<p>Promoting the use of renewable energy</p> <p>Ethiopia could contribute to GHG mitigation by developing and exploiting her huge hydro, solar, wind, biomass and, geothermal energy resources not only for her own consumption but for neighbouring countries as well.</p>
<p>Improving/promoting energy efficiency and conservation</p> <p>Wide dissemination of improved biomass and charcoal stoves, such as 'Mirt Mitad and lackech'.</p>
<p>Promoting the use of fuels with low carbon content (fuel switching)</p> <p>Exploiting the Ogaden natural gas reserve and use of gasohol (blending of gasoline with ethanol which is a by-product of sugar factories in the country) for various purposes including transport.</p>
<p>Promoting better transport</p> <p>The promotion of the use of smaller cars through tax differentiation based on engine size, expansion of public transport infrastructure, improving the efficiency of operating vehicles by carrying out maintenance, inspections and training, improving urban traffic, promoting environmentally friendly transport modes such as bicycles.</p>
<p>Improving forest management practices</p> <p>Protection/preservation of existing forests from loses by deforestation and other practices, initiating new afforestation and reforestation programs, rehabilitation of degraded forests, promoting agro-forestry, developing and restoring gallery forests along river banks.</p>
<p>Increasing livestock productivity</p> <p>Improved nutrition with supplementation and treatment of forages to improve digestibility and through improved genetic characteristics, promoting sustainable agriculture, promoting mixed crop livestock farming practices where appropriate, promoting the use of manure-management system facilities, adopting appropriate fertilizer application, promoting conservation tillage techniques to sequester carbon in cultivated soils, rehabilitation of overgrazed watering points and long-term settlement areas and redistribution of manure that is accumulated near these settlements.</p>
<p>Integrated waste management</p> <p>Composting solid waste of Addis Ababa city and landfill gas recovery from solid waste site of Addis Ababa city.</p> <p>Implementation of these options with the financial and technical support and appropriate technology transfer from developed countries will enable to reduce GHG emissions and enhance sinks. It should be noted that mitigation options identified in each sector are results of preliminary analysis and further study is highly recommended.</p>

There are five socio- economic sectors namely Agriculture (crops + livestock), Forestry, Water Resources, Wildlife and Human Health have been considered in Ethiopia's vulnerability and adaptation assessment.

Table 6: Adaptation Options for Ethiopia

<p>Crop sector</p> <ul style="list-style-type: none"> - Improving and changing management practices and techniques such as planting date, seeding rate, fertilizer application rate, etc. - Change in crop regions - Proper use of climate information for land use plaping and early warning systems etc. - Promoting irrigation agriculture
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<ul style="list-style-type: none"> - Enhancing erosion control - Adopting suitable crop varieties and developing new ones
<p>Grassland and Livestock sector</p> <p>1. Highlands</p> <ul style="list-style-type: none"> - Selection of crops and cropping systems that maximize biomass production and therefore, CO2 and N2 fixation - Improved animal genotype and better disease parasite control to take advantage of the improved management - Use of multipurpose cattle that work and provide milk and meat and also breed to provide suitable draught animals, in addition to supplying fuel and fertilizer from their excreta. <p>2. Lowlands/rangelands</p> <ul style="list-style-type: none"> - Strengthening the early warning systems and coping strategies - Introduce mixed farming system, where appropriate; Conservation and utilization of hay from natural pastures (hay making with local grasses)
<p>Forestry sector</p> <ul style="list-style-type: none"> - Planting trees and establishing plantations - Environmental education and training - Promoting conservation/ preservation - Adopting sustainable forest management practices - Maintain untouched forest lands and river banks as migration corridors - Developing disaster resistant tree species.
<p>Water Resources sector</p> <ul style="list-style-type: none"> - Allocation of water supply through market based systems, control of pollution, conservation of water and use of river basin planning and coordination
<p>Wildlife Sector</p> <ul style="list-style-type: none"> - Avoiding habitat destruction and fragmentation - Increase public awareness about the use of wild life - Improving land use planning - Avoid induced species - Reduce pollution from industrial effluents - Ensure benefits from wildlife parks and sanctuaries for the local community; and etc. - Protect and enhance migration corridors or buffer zones - Improve wildlife and ecological surveillance systems - Improve farming and husbandry practices - Minimize population pressure; - Ecosystem, wetland, watershed conservation, preservation and protection
<p>Human Health sector</p> <ul style="list-style-type: none"> - Establish and strengthen surveillance system - Improve ecosystem management which are sensitive to malaria invasion - Encouraging utilization of climate and meteorological information in the planning of malaria control - Planning developmental activities that encompass malaria control - Promote integrated vector control approach - Strengthening research in the health sector

Reference:

- First National Communication, June 2001
- Plan for Accelerated and Sustained Development to End Poverty (PASDEP), 2008-2011
- UNFCCC website (GHG Profile, NAMA, NAPA, CDM)
- The World Bank website on country page for Ethiopia
- CIA the World Fact Book

This summary was prepared based on the data/information available as of September 2011.

2.3.4. カーボヴェルデ

Cape Verde

● Mainstreaming mitigation/adaptation actions in the national development strategy

The economy of Republic of Cape Verde is service and industry oriented. The energy sector is the main source of GHG (CO₂) emissions. The government aims to increase the renewable energy generation through private-sector investment and government-supported projects, so the country will be less dependent on oil imports. Similarly, the promotion of energy efficiency and conservation will contribute to less dependency on oil imports while mitigating the climate change. Last, but not least, better practices and adaptation activities in agriculture, livestock and forestry will contribute to GHG reduction as well as to the economic growth.

● Summary on climate change related issues in the country

1. Climate change policy

Cape Verde has ratified the United Nations Framework Convention on Climate Change (UNFCCC) on March 1995. Besides, the country has ratified other international conventions related to environment protection and sustainability such as the Biodiversity Convention, and the Desertification Convention.

The First National Communication, dated of December 1999, and submitted to UNFCCC on November 2002, identifies the need to strengthen international cooperation to establish common goals to improve the environment at the global level, both in terms of information exchange and in science and technology transfer. It also identifies the need to strengthen the institutional capacity to ensure continuity of the actions implemented, transfer of technology and "know how", and to guarantee actual participation of the community through training program information.

According to the First National Communication, national policies should put emphasis on the following areas:

- Policy and energy and environmental planning,
- Rural electrification and urban periphery, and
- Rational use and energy management of firewood and biomass.

The country has developed an Energy and Environmental National Plan (*Plan National d'Énergie et Environnement*) as well as the National Forestry Action Plan (*Plan d'action Forestier National*). Main programmes under the country national plans are:

- Programme of massive introduction of compact fluorescent lamps (*Programme d'introduction massive de lampes fluorescentes compactes*);
- Program to improve the energy efficiency of maritime and land transport, rationalization of urban and intercity transport and the introduction of micro-bus with low fuel consumption and pollution in urban centres (*Programme d'amélioration déficience énergétique de la flotte de transports terrestres et maritime, la rationalisation des transports urbains et interurbains et l'introduction de mini-bus à faible consommation et pollution dans les circuits urbains*);

- National action programme to combat desertification and mitigation of drought effects (*Programme d'action nationale de lutte contre la désertification et mitigation des effets de la sécheresse*); and
- Programme of formation and information environnement (*Programme de formation et information pour l'environnement*).

2. National efforts/measures against climate change

Cape Verde established the Designated National Authority (DNA) for CDM under its National Direction of Environment. To date, the country has attempted to develop only one Wind CDM project.

This CDM project was implemented by InfraCo Management Services Ltd., Cape Verde Government and Water, and Electricity Power Facility Company. The project purpose is a bundling of four wind farms (28 MW), which will contribute to the reduction of fossil fuel dependence and consequently help to decrease the GHG emissions to the atmosphere by generating an amount of renewable electrical energy from wind power. The emission reductions estimate is 94,989 tCO₂e per year, during a seven-year credit period, and total of 664,929 tCO₂e. The project received a negative validation opinion in April 2009.

3. Sustainable Development and Mitigation

• National inventory of greenhouse gas

The Cape Verde greenhouse gas (GHG) emissions inventory evaluates GHG emissions for the base year 1995 in the following categories: energy, agriculture, land use change and forestry (LUCF), industry and waste management. The GHGs included in the study were carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbonates (HFC), perfluorocarbonates (PFC), and sulphur hexafluoride (SF₆). As shown in Table 5, the total GHG emissions, not including LUCF, were 292.9 ktCO₂e and total GHG emission including LUCF were 222.6 ktCO₂e.

Table 5: Cape Verde CO₂ emissions summary

Total National Emissions and Removals	CO ₂ Emissions (kt)
	1995
CO ₂ emissions without LUCF	217.7
CO ₂ net emissions/removals by LUCF	-79.5
CO ₂ net emissions/removals with LUCF	138.2
GHG emissions without LUCF	292.9
GHG net emissions/removals by LUCF	-70.3
GHG net emissions/removals with LUCF	222.6

Figure 3 shows Cape Verde GHG emissions by sector. Energy is the largest source, being responsible for net emissions in the order of 220 ktCO₂e or 75% of the country's total GHG emissions. The second largest source is agriculture, which contribution is 39 ktCO₂e or 13% of the country's total GHG emissions. Waste sector contributes to 12% of the total, 34 ktCO₂e.

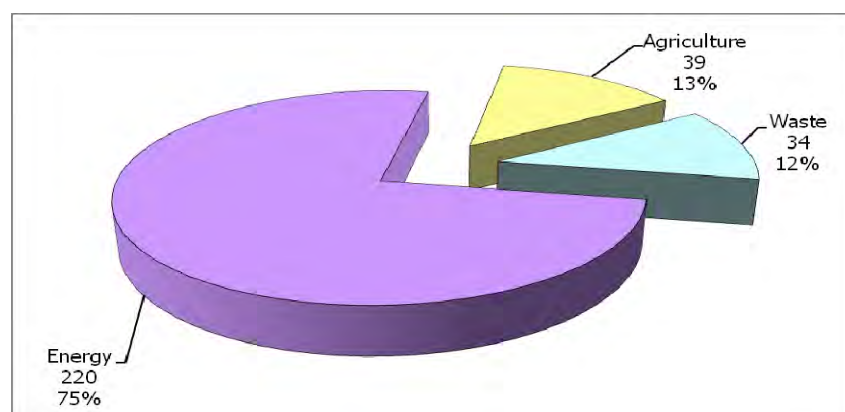


Figure 3: Total GHG emissions (ktCO₂e) and contribution to the total (%) by sector in 1995 (without LUCF)

• **Nationally Appropriate Mitigation Action (NAMA) plan**

Cape Verde has not submitted its NAMA plan. However, as presented in the Section 7 “Mitigation/ Adaptation Option” in this summary, the National Communication of the country raises several mitigation options for the country.

4. Adaptation and Vulnerability

Cape Verde is made up of small islands and 80% of the population lives in large cities that are concentrated in coastal areas. An increase in the mean water level of the sea could threaten much of the infrastructure of economic development located in coastal areas of the islands, which makes the country very vulnerable.

Low existing water resources represents one of the biggest limitations to economic development in Cape Verde. The country has frequent droughts caused by the high variability of annual precipitation that makes the agriculture sector very vulnerable in terms of production. Frequent droughts are also a major cause of desertification. The forestry sub-sector is very vulnerable to climate change in terms of vegetation cover reduction, especially due to the desertification.

Cape Verde has developed the National Adaptation Programme of Action on Climate Change (NAPA). The goal of NAPA is identify and prioritize national needs so that effective implementation measures may be put into place to combat the adverse effects of climate change.

• **Climate Change National Adaptation Programme of Action (NAPA)**

The Cape Verde NAPA process identified and prioritized three adaptation activities. These projects are organized in a hierarchy of importance of which water resource sustainable management is the most important activity to be implemented. Table 6 presents Cape Verde's NAPA projects in the order of priority.

Table 6: Cape Verde NAPA projects in order of priority

	Project Title	Sector	Indicative Cost (USD)
1	Mobilization and integrated water resource management project	Water Resources	13,680,000
2	Modernization and diversification of agricultural production for food security improvement	Food Security	1,500,000

3	Integrated Protection and management of coastal zones	Coastal/Marine Ecosystems	1,500,000
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Source: Adapted from National Adaptation Programmes of Action

5. Major Industries

The economy of Cape Verde is service-oriented by mainly commerce, transport, and public services.

Cape Verde has few natural resources and suffers from poor rainfall and limited fresh water. Therefore there is no significant agricultural production, and over 90% of all food consumed in the country is imported. In the agriculture sector, main products are bananas, corn, beans, sweet potatoes, sugarcane, coffee, peanuts, and fish.

According to the Cape Verde section of World Factbook published by the Central Intelligence Agency (CIA), GDP in 2010 was US\$1.908 billion. For the same year, agriculture, industry, and services represented respectively 8.9%, 16.1%, and 75.1% of the GDP.

Main industries are food and beverages, fish processing, shoes and garments, salt mining, ship repair. In 2010, the industrial production growth rate was 4%.

The country export commodities are fuel, shoes, garments, fish, hides, which are mainly consumed by Spain and Portugal. The import commodities are foodstuffs, industrial products, transport equipment, fuels, which are mainly imported from Portugal and The Netherlands.

Regarding the energy sector, the country is dependent on oil imports and the electricity generated attends only its internal demand. One of the government plans is to increase energy production from renewable resources, through private-sector investment and government-supported projects. The goal is to generate at least 50% of electricity from renewable sources by the year 2020, up from the current level of 3.2%.

6. National development strategy

The Cape Verde development challenges, as identified in the five pillars of its second Growth and Poverty Reduction Strategy, are mainly: to promote effective governance, to strength human development, to address structural and social challenges from competitiveness, to invest in infrastructure and to enhance social cohesion. Cape Verde also faces important social challenges with unemployment among vulnerable groups.

The current portfolio of projects with the World Bank is related to: (a) SME Capacity Building and Economic Governance (b) Road Sector Support, and (c) West Africa Regional Fisheries.

The objectives of the World Bank Country Partnership Strategy (CSP) for the period 2009 to 2012 are to help the Government sustain high levels of growth and reduce unemployment, poverty and inequality. To achieve these major results, the Bank is providing technical and financial support to: (a) promote good governance and public sector capacity; (b) improve competitiveness and the investment climate for private sector-led growth, and (c) strengthen human capital and social inclusion. In addition, the grant funding for statistical capacity building in the amount of US\$287,000 was approved in July 2011.

7. Mitigation/Adaptation Options

The FNC identified specific needs for the implementation of the National Mitigation Plan in the sectoral areas of education and capacity building, technical capacity and management, access to the database on the environment and energy, and institutional and financial supports.

According to the First National Communication, key measures to promote the country adaptation to climate change are promotion of systematic investigation, education, financial assistance, and technology transfer. Main adaptation options described in the FNC are for the agriculture and forestry sectors. A summary of this adaptation options is described in Table 7.

Table 7: Adaptation measures for Cape Verde

<p>Agriculture</p> <ul style="list-style-type: none">-Reassessment in the distribution of agro-climate zones and structure of cultures-Intensification of livestock production in arid areas-Development of alternative crops-Building and maintenance activities for the conservation of soil and water-Expansion of irrigated areas-The massive introduction of sprinkler system drop by drop-The more efficient management of water sources and existing irrigation infrastructure-Use of improved varieties adapted to agro-climate conditions of the country
<p>Forestry</p> <ul style="list-style-type: none">-Promote greater integration of forestry in agriculture-Develop appropriate model for the management of forestry and pasture areas-Promote other forms of energy-Promote domestic energy alternatives to firewood-Provide subsidies for energy alternatives such as of butane gas

Reference:

- Cape Verde Initial National Communication, November 2000
- UNFCCC website (GHG Profile, NAMA, NAPA, Designated National Authorities, CDM)
- The World Bank website on country page for Cape Verde
- CIA World Fact Book website on country page for Cape Verde

This summary was prepared based on the data/information available as of September 2011.

2.3.5. ガボン

Gabon

● **Mainstreaming mitigation/adaptation actions in the national development strategy**

Due to its forestry sector and low level of land use activities, the Gabonese Republic is net carbon sink, resulting in negative GHG emissions. Nevertheless, its economic dependence on the oil sector has led to the majority of GHG emissions to come from the energy sector. Diversifying fuel and increasing efficiency in industries could contribute to the country's economic development while enhancement of the vulnerable coastal zones could lead to improvement of socio-economic conditions.

● **Summary on climate change related issues in the country**

1. Climate change policy

Gabon has ratified the United Nations Framework Convention on Climate Change (UNFCCC) on January 21, 1998. As a party to the UNFCCC, Gabon has committed to submit a National Communication to the Conference of Parties (COP) in accordance with Article 12 of the Convention. The preparation of the National Communication is considered a first step in the implementation of the UNFCCC. The strategy of Gabon to cope with climate change, initiated by the government includes identification, inventory, planning and evaluation of key parameters in forest environment, urban and coastal biodiversity protection. Forest and Environment Sector Programme (*Programme Sectoriel Forêts et Environnement* - PSFE) explores the synergies of various sectors. On the other hand the programme helps generate jobs, and improve waste management.

2. National efforts/measures against climate change

On a national level, policies are being put in place to establish agroforestry projects in rural areas to increase soil fertility as well as to invest and improve their weather stations to observe changes in the climate. Gabon established Designated National Authority (DNA) for CDM under Ministry of Environment, Nature Conservation & Town (*Ministère de l'environnement, du développement durable de la protection de la nature*) and Ministry of Prevention & Management of Natural Disasters (*Ministère de la prévention et de la gestion des calamités naturelles*).

To date, Gabon has not developed a CDM project but studies measures to preserve its forests through reducing emissions from deforestation and degradation (REDD).

3. Sustainable Development and Mitigation

• National inventory of greenhouse gas

Gabon emitted 8,382.95Gg in 1994. The energy sector represents 94% while the non-energy constitutes 6% of the total emissions. Emissions from agriculture and forestry sectors, waste and industry process are insignificant due to the low level of industrialization.

The results of the study on national emissions of greenhouse gases show that Gabon has a very strong capacity for carbon sequestration (494,897.42 Gg CO₂e) due to the importance of its forest and low use and

land use.

Table 1: Gabon GHG emission summary

Total National Emissions and Removals	CO ₂ Emissions (kt)
	1994
CO ₂ emissions without LUCF	4,407.7
CO ₂ net emissions/removals by LUCF	-500,972.8
CO ₂ net emissions/removals with LUCF	-496,565
GHG emissions without LUCF	6,524.3
GHG net emissions/removals by LUCF	-500,875.7
GHG net emissions/removals with LUCF	-494,351.4

The energy sector represents 98% and the non-energy 2%. Emissions from agriculture and forestry sectors, waste and industry process are insignificant due to the low level of industrialization, as showed in Figure 1.

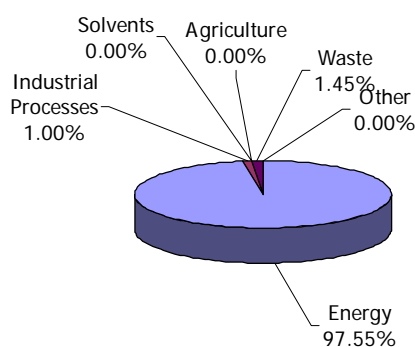


Figure 1: Total GHG emissions (ktCO₂e) and contribution to the total (%) by sector in 1994 (without LUCF)

• Summary of Nationally Appropriate Mitigation Action (NAMA) plan

In response to Copenhagen Accord, Gabon submitted its NAMA in February 24, 2010. Gabon intends to conduct voluntary actions especially in the fields of energy, transportation and forestry in accordance with the provisions of the UNFCCC.

Table 2: Efforts envisaged by Gabon in fight against global climate change (2010)

Type of Activity	Planned Action	Capacity/Scale
Sustainable forest management	Forest area under sustainable management, certified by internationally recognized standards	12,000,000 ha
Sustainable forest management	Forest area under sustainable management	12,000,000 ha
Sustainable forest management	Forest area in process of sustainable management	12,000,000 ha
Reafforestation/Restoration	Plantation/ Restoration of degraded zone	10,000,000 ha
Reafforestation/Restoration	Afforestation (Reafforestation in savannah)	1,000,000 ha
Community forest/ Agroforestry	Community forest/ Agroforestry	2,000,000 ha

Forestry potential	Annual cutting	15,000,000 m3
Forestry potential	Annual harvest	6,500,000 m3
Forest stratification	1 st Forest zone stratification(coastal zone)	5,000,000 ha
Forest stratification	2 nd Forest zone stratification(coastal zone)	21,667,000 ha
National Forest Inventory	National Forest Inventory	22,000,000 ha
Biodiveristy conservation	Biodiveristy conservation	4,000,000 ha
Development of new energy source	Construction of hydroelectric dam	
Development of new energy source	Construction of solar panels	
Enhancing energy efficiency in public buildings and industrial units	Building with low energy consumption	
Enhancing energy efficiency in public buildings and industrial units	Construction of industrial units with low carbon emission	CDM development
Ban on gas flaring in urban tanker	Ban on gas flaring in urban tanker	CDM development
Promoting clean transport sector	Public transportation fueled with natural gas	
Promoting clean transport sector	Import and sale of used vehicles less than five years	
Waste recycling	Construction of waste treatment facilities and sewage	CDM Development

4. Adaptation and Vulnerability

- **Vulnerability to climate change**

Special emphasis is needed in Gabon on the coastal area due to multiple issues. The coastal areas are unstable, fragile environments with high exposure to natural hazards: flooding, erosion and storms. The demographic and economic concentration makes the coastal zone of Gabon particularly exposed to the potential effects of climate change.

- **Adaptation**

- Build capacity of technical, scientific and public institutions to acquire and analyze scientific information on the condition of Gabon's coastal zone and threats climate change poses to the coastal zone
- Undertake analysis of laws and regulations regarding land use in coastal areas and make necessary changes, based upon the challenges of climate change
- Implement demonstration projects to fight the degradation of coastal areas, such as reforestation, erosion control structures and extension of non-buildable areas
- Train those implementing climate change adaptation plans, on the cost and benefits of adaptation, based on vulnerability assessments and sectoral adaptation options, so agencies can integrate the costs of adaptation into their planning
- Create a climate change information unit within the Ministry of the Environment to develop, among other things, a climate change awareness campaign

5. Major Industries

Gabon's economy is dominated by oil. Oil revenues comprise roughly 46% of the government's budget, 43% of gross domestic product (GDP), and 81% of exports. Oil production has been declining rapidly from its

high point of 370,000 barrels per day in 1997. Some estimates suggest that Gabonese oil will be expended by 2025. In spite of the decreasing oil revenues, planning has only recently begun for an after-oil scenario.

6. National development strategy

A new World Bank's Country Assistance Strategy (CAS) for Gabon is in preparation, and will cover the period 2010-2013. The Gabon's 2005-2009 CAS reflects the Government's priorities over the medium term, which is: (i) to improve efficiency in the use of public resources, with a focus on improving the quality and quantity of basic services; and (ii) to improve the environment for private sector-led investment in the non-oil sectors of the economy.

7. Mitigation/Adaptation Options

The tables below describe mitigation and adaptation options for Gabon.

Table 3: Mitigation Options for Gabon

<p>Use of new and renewable energy</p> <p>Use of hydro, solar, biomass and wind energy. Extensive electrification program in some rural areas across the country has been initiated since 2000 by the Government.</p>
<p>Energy efficiency in administrative building</p>
<p>Energy efficiency in manufacturing and construction industries</p> <p>Substitution of natural gas by hydro electricity in the industrial process</p>

Table 4: Adaptation Options for Gabon

<p>Coastal zone strategy</p> <p>Active option - protection of coastal areas and urban areas (Libreville and Port Gentil). Passive option – identification of priority areas.</p>
<p>Water resources strategy</p> <ol style="list-style-type: none"> 1. Construction of dikes, creating dams, retention basins, soil erosion protection focusing in the area with flooding risk. 2. Population management in areas with risks of flooding such as displacement of population from vulnerable areas.
<p>Strategy in agriculture sector</p> <ul style="list-style-type: none"> • Program to identify local cultivars of cassava • The establishment of an experimental fields of the most consumed cultivars • Soil restoration program, drainage construction • Extensive agriculture to intensive agriculture by initiating agroforestry projects; • Rehabilitation of existing weather stations inside the country to observe and identify the impact of climate change; • The establishment of an integrated pest management
<p>Strategy in health sector</p> <ul style="list-style-type: none"> • Implementation of enhanced screening programs for onchocerciasis • Improve supply conditions of drinking water and sanitation • Curbing deforestation

Reference:

- Gabon Initial National Communication, December 2004

- UNFCCC website (GHG Profile, NAMA, Designated National Authorities, CDM)
- The World Bank website on country page for Gabon
- Africa Adaptation Programme: <http://www.undp-aap.org/countries/gabon>
- U.S. Department of state: <http://www.state.gov/r/pa/ei/bgn/2826.htm>
- Farming First:
<http://www.farmingfirst.org/2010/04/climate-change-mitigation-strategies-in-gabon-help-to-preserve-national-crop/>

This summary was prepared based on the data/information available as of September 2011.

2.3.6. ガンビア

Gambia

- **Mainstreaming mitigation/adaptation actions in the national development strategy**

With largely agrarian economy and low level of land use activities, the Republic of the Gambia is net carbon sink, resulting in negative GHG emissions. As one of the Least Developed Countries (LDCs), Gambia's priority lies with economic development and in terms of climate change, adaptation. Adaptation actions in water and land management as well as improvement of agricultural practice could support the country to improve socio economic conditions.

- **Summary on climate change related issues in the country**

1. Climate change policy

The Republic of the Gambia ratified the United Nations Framework Convention on Climate Change (UNFCCC) on 10 June, 1994 and the Kyoto Protocol on 1 June, 2001. The Department of State for Fisheries, Natural Resources and the Environment, Department of Water Resources and the National Climate Committee (NCC) are mainly responsible for the management of environmental and climate change matters.

The First National Communication was submitted to UNFCCC in October 2003. It emphasizes that the government and its collaborating institutions are constrained by inadequate human and institutional capacity to finalise an Action Plan. The major area of difficulty is in the economic analysis and presentation of the cost of the activities and their implementation.

2. National efforts/measures against climate change

The Gambia has set up the inventory, using 1993 as the base year, but not all emission categories are included. In an effort to meet the requirements of the UNFCCC but taking particular consideration of the national needs for sustainable development the NCC designed the mitigation assessment to satisfy the needs of the various possible users or stakeholders. Mitigation measures were screened and the following 8 options were selected, and detailed studies were conducted to five of them.

- (i) Rural electrification using Solar Home Systems to displace a planned diesel plant.
- (ii) Greenhouse gas reduction through the use of Improved Cooking Stoves.
- (iii) Carbon sequestration through reforestation and protection of existing forests.
- (iv) Large scale introduction of Liquefied Petroleum Gas to displace fuel wood.
- (v) Utilizing waste for two city authorities to generate landfill gas for bottling.
- (vi) Integrated crop and livestock farming- utilizing rice straw (treated with urea) as cattle feed.
- (vii) Managing a multi-product forest for cashew nuts, honey-bee-keeping, etc.
- (viii) Waste management using composting

With regards to CDM projects, although Gambia has set up Designated National Authority (DNA), there has not been any project submitted to UNFCCC.

3. Sustainable Development and Mitigation

• National inventory of greenhouse gas

GHG emissions in The Gambia totalled about 4,257.8 kt CO₂e in 1993, excluding CO₂ emissions/removals in the LUCF sector.

Table 1: The Gambia GHG emissions summary

Total National Emissions and Removals	GHG Emissions (kt CO ₂ e)
	1993
CO ₂ emissions without LUCF	181.1
CO ₂ net emissions/removals by LUCF	-50,023.4
CO ₂ net emissions/removals with LUCF	-49,842.3
GHG emissions without LUCF	4,257.8
GHG net emissions/removals by LUCF	-49,983.1
GHG net emissions/removals with LUCF	-45,725.3

As presented in the tables below, Gambia's GHG emissions from the waste sector contributes for 73% of the total (without LUCF), with wastewater treatment being the major contributor. In terms of GHG emissions by gas, CH₄ contributes for 94% of the total GHG emissions (without LUCF) in 1993.

Table 2: GHG emission by sector (without LUCF) for 1995

Sector	tCO ₂ e	%
Energy	254.6	6.0%
Energy Industries	54.5	1.3%
Man. industries and construction	3.4	0.1%
Transport	109.1	2.6%
Other sectors	87.6	2.1%
Agriculture	893.2	21.0%
Enteric Fermentation	254.2	6.0%
Manure Management	11.0	0.3%
Rice Cultivation	572.2	13.4%
Agricultural Soils	53.1	1.2%
Prescribed Burning of Savannas	2.4	0.1%
Field Burning of Agricultural Residues	0.3	0.0%
Waste	3,110.0	73.0%
Solid Waste Disposal on Land	197.2	4.6%
Waste Incineration	2,912.8	68.4%
TOTAL	4,257.8	100.0%

Table 3: GHG emission by gas (without LUCF) for 1993

	tCO ₂ e	%
CO ₂	181.06	4.25%
CH ₄	4,010.74	94.20%
N ₂ O	66.01	1.55%
TOTAL	4,257.81	100.00%

• **Summary of Nationally Appropriate Mitigation Action (NAMA) plan**

The Gambia has not submitted its NAMA plan. However, as presented in the Section 7 “Mitigation/Adaptation Option” in this summary, concrete mitigation plans has been specified in the National Communication of the country.

4. Adaptation and Vulnerability

• **Vulnerability to climate change**

The Gambian economy is predominantly agrarian. The agriculture sector alone provides employment for about 75% of the labour-force, and an estimated two-thirds of total household income. The sector is characterized by subsistence rain-fed, cash and food crops production and horticulture. Gambian agriculture is dominated by food and cash crop production (contributing 60% of agricultural GDP and 14% of national GDP). As such, crop production is susceptible to climate change.

Climate change is also expected to affect biodiversity and wildlife, shoreline retreat of coastal zones, fisheries and fish resources, forestry and forestry sector, rangelands and livestock and water resources.

• **Climate Change National Adaptation Programme of Action (NAPA)**

Gambia prepared and submitted its NAPA in January 2008. Nearly half the economically active population owes their livelihoods to agriculture and animal husbandry, which in turn rely heavily on ecosystem services.

The project portfolio presented below, comprising projects numbered 1 to 10, address the following issues:

- Impairment of ecosystem goods and services
- Amplification of adverse effects of climate change by human factors
- Food security and sustainable livelihoods
- Poverty reduction and equity
- Technology acquisition, innovation, and diffusion
- Inadequate strategies for dealing with moving target (incremental effects of climate change).

Table 4: The Gambia NAPA Priority Projects

	Project Title	Sector	Cost (USD)
1	Rehabilitation of Early Warning Systems on Climate-Related Natural Hazards	Water resources	450,000
2	Improvement of Fresh Water Availability	Water resources	910,000
3	Diversification and Intensification of Agricultural Production, Processing, and Marketing	Agriculture	2,710,000
4	Expansion of Community Participation in the Management of Forests and Protected Areas	Forestry	1,412,000

5	Expansion and Intensification of Agro-forestry and Re-forestation Activities	Forestry	2,753,000
6	Briquetting and Carbonization of Groundnut Shells	Energy	230,000
7	Reduction of climate change related diseases	Health	1,217,000
8	Improved livestock and rangeland management for food security and environmental sustainability	Livestock	2,800,000
9	Restoration/Protection of coastal environments	Coastal zone	2,300,000
10	Increasing fish production through aquaculture and conservation of post harvest fishery products	Fisheries	300,000

5. Major Industries

The economy is relatively undiversified and limited by a small internal market. Services account for over half of GDP, reflecting the importance of the re-export trade, which has been driven by liberal trade policies and an efficient port infrastructure. Tourism is also a key driver of the economy and the country's most significant foreign exchange earner. Agriculture accounts for approximately one-third of GDP and over 70 percent of employment. It is dominated by groundnuts, which account for 60 percent of domestically produced exports. The sustainability of the recent economic performance is contingent on the completion of actions aimed at further reducing energy costs; modernizing transport logistics and infrastructure; increasing growth and innovation in tourism; encouraging private sector-led agricultural export diversification; revitalizing the groundnut sub-sector; and promoting greater regional integration.

6. National development strategy

In the Gambia, both the World Bank and the African Development Bank have aligned their support in a Joint Assistance Strategy (JAS) which was completed in February 2008 and covers the period of four years (FY08-11). It lays out how the World Bank and the African Development Bank intend to support the implementation of The Gambia's for 2007 to 2011. The JAS strategic objectives are in line with the PRSP. Taking into consideration limited resources for project support, the JAS focuses on two major areas of intervention: (i) strengthening the institutional framework for economic management and public service delivery, and (ii) enhancing growth and competitiveness and the productive capacity of the poor.

The JAS pillars have the following components.

(i) Strengthening the institutional framework for economic management and public service delivery

- Improving the Transparency and Accountability in the Use of Public Resources
- Improving Civil Service
- Improving Public Service Delivery in Education, Health, Water and Sanitation, and Rural Electrification

(ii) Enhancing growth and competitiveness and the productive capacity of the poor

- Promoting a competitive investment climate/Growth and Competitiveness
- Facilitating access to financial resources by micro, small and medium enterprises
- Strengthening the agricultural sector
- Enabling the Environment for Development of the Energy Sector

7. Mitigation/Adaptation Options

For the Gambia, climate change is viewed as a development path, and the following strategy was developed for the future implementation of the emission reduction efforts under UNFCCC.

Table 5: Mitigation/Adaptation Options for the Gambia

<p>Coastal zone of The Gambia</p> <ol style="list-style-type: none"> 1. Management of the Sand Bar at the Laguna and Palm Grove hotels; 2. Construction of 16 km of dykes to protect villages bordering the wetlands and swamplands from seasonal flooding; 3. Rehabilitation of the groyne systems; 4. Construction of revetments, seawalls/bulkheads and breakwater systems in order to protect the economically and culturally important areas; 5. Development and enactment of appropriate regulations and policies relevant to construction, urban growth planning, and wetland preservation and mitigation; and 8. Development of a Coastal Zone Management Plan.
<p>Water resources sector</p> <ol style="list-style-type: none"> 1. Regulation of abstraction of freshwater from the river to maintain a delicate equilibrium between flow and saline intrusion; 2. Introduction of legislative measures such as licensing and permits for withdrawal of river water for irrigation; 3. Improvement of the efficiency of existing irrigation systems and introduction and encouragement of the use of more efficient irrigation systems such as sprinkler and drip irrigation systems; 4. Promote water harvesting; 5. Development and utilization of better planning tools such as aquifer simulation models and a predictive/operational saltwater intrusion models; 6. Construction of dikes or small dams in most of the smaller streams of the river; and 7. Improvement of tidal water level monitoring and water resources assessment capability of the water resources institutions.
<p>Agriculture (crop production sub-sector)</p> <ol style="list-style-type: none"> 1. Integrated Crop/Livestock Farming; 2. Methane recovery from abattoirs and peri-urban dairy farms; 3. Waste recycling for agricultural production through composting; 4. Efficient management of soil and water so as to reduce runoff and nitrogen leaching and also improve soil conditions to enhance crop production; 5. Contour farming and construction of dykes, crop residue farming, fallowing and crop rotation for the maintenance of soil structure; and 6. Crop cultivar screening, training of rural development agents and on-farm adaptive research on crop management practices.
<p>Rangelands and livestock</p> <ol style="list-style-type: none"> 1. Active selection of plant species; 2. Control animal stocking; and 3. Promote and encourage new grazing strategies.
<p>Fisheries sector</p> <ol style="list-style-type: none"> 1. Introduce biological monitoring; 2. Enforced fishing control measures; 3. Promote aquaculture; 4. Modify and strengthen fisheries management policies and institutions; 5. Strengthen and expand catch-monitoring activities; 6. Preserve and restore essential habitats and promote fisheries conservation and environmental education; 7. Foster international and interdisciplinary research; and 8. Use hatcheries to enhance natural recruitment.
<p>Forest and wetland ecosystems</p> <ol style="list-style-type: none"> 1. Establishment of Plantations, National Parks and PAs;

<ol style="list-style-type: none"> 2. Reforestation of landscapes with fragmented forest areas; 3. Conservation of existing carbon pools in forests; 4. Expansion of carbon stocks in forest ecosystems; 5. Switching from fossil-fuel-based to biomass-based energy products; 6. Introduction and promotion of incentive programs; 7. Development of Seed Banks; and 8. Promotion of effective management practices and flexible criteria for intervention.
<p>Energy sector</p> <ol style="list-style-type: none"> 1. Promote energy efficiency and reduce energy use by applying basic house keeping and retrofitting; 2. Promote and use of renewable energy (Solar Home Systems); 3. Replacement of firewood and charcoal by LPG as a source of domestic energy supply, and 4. Revitalization and promoting of river transport.
<p>Waste management sector</p> <ol style="list-style-type: none"> 1. Landfill/Dump site management; 2. Alternative waste-management strategies; 3. Wastewater Treatment; 4. Aerobic Treatment; and 5. Recovery and utilization of methane from anaerobic digestion of wastewater or sludge.
<p>Cross-cutting issues (education, training and public awareness, research and systematic observations)</p> <ol style="list-style-type: none"> 1. Incorporate climate change in curricula for the lower and upper basic cycles and at the tertiary level; 2. Use mass media techniques such as television/video, radio, print media, traditional communicators and extension agents in well designed campaigns aimed at enhancing public awareness; 3. Develop educational and sensitization materials to enhance public awareness on climate change; 4. Enhance the capacity of the members of the NCC through training in economic assessment of mitigation and adaptation measures and projects; 5. Realign current practices and policies to take into account climate variability, the projected climate change and sustainable economic and environment development and management; 6. Conduct institutional reforms and mainstreaming of climate change into national development programmes of The Gambia; 7. Replace and upgrade conventional hydrological and meteorological equipment; 8. Rehabilitate and expand existing station networks for more representative monitoring of weather, climate and other environmental issues; 9. Provide better and bigger capacity data processing and storage equipment for the upgrading, networking and interconnectivity of the various data base systems of the Department and other collaborating institutions; and 10. Strengthen the human resources and capacity of the institutions involved in the collection, processing and maintenance of data and information related to meteorology, hydrology and climatology.

Reference:

- First National Communication, October 2003
- Joint Assistance Strategy for Gambia, Fiscal 2008-2011
- UNFCCC website (GHG Profile, NAMA, NAPA, CDM)
- The World Bank website on country page for Gambia
- CIA the World Fact Book

This summary was prepared based on the data/information available as of September 2011.

2.3.7. ケニア

Kenya

- **Mainstreaming mitigation/adaptation actions in the national development strategy**

Kenyan economy largely depends on agriculture, which is the main source (56%) of GHG (CH₄) emissions. Kenya is net carbon sink due to changes in use of forests and wood biomass stock. As the sink capacity is decreasing, improving forest management practices will contribute to CO₂ capture while improving the quality of life of rural population. Better practices and adaptation activities in agriculture and livestock will contribute to GHG reduction as well as to the economic growth. Renewable energy generation together with the promotion of energy efficiency and conservation will support the country economic growth while mitigating climate change.

- **Summary on climate change related issues in the country**

1. Climate change policy

The Republic of Kenya ratified the United Nations Framework Convention on Climate Change (UNFCCC) on 30 August 1994. It has also ratified the Biodiversity Convention, Desertification Convention, Convention and Protocols to protect the Ozone Layer, Hazardous Wastes, Law of the Sea, Marine Dumping, Marine Life Conservation, etc. The National Environment Management Authority (NEMA) is the focal point for all national environmental issues, including climate change.

The First National Communication dated 01 June 2002 stresses the need to integrate climate change concerns and sustainable principles in all national development plans and programmes in order to (1) ameliorate the negative effects of poverty; (2) provide basic needs; and (3) meet peoples' aspirations for a better life and ensure effective environmental management. It also stresses the need for assistance, such as funding, technical assistance, training, and technology transfer through the Convention mechanisms.

Kenya is in the process of developing a policy, National Environmental Policy, which is yet to be approved. The National Climate Change Response Strategy (NCCRS) was completed in April 2010, but has yet to be implemented.

Also, there are a number of other environment-oriented policies, strategies, and action plans already in place that can contribute directly or indirectly to the objectives of the Climate Convention. To date, NEMA has developed regulations and guidelines, and some of them contribute to the objectives of the convention as follows:

- Environmental Impact Assessment & Environmental Audit Regulations, 2003
- Waste Management Regulations, 2006
- Water Quality Regulations, 2006
- Conservation of Biological Diversity and Resources, Access to Genetic Resources and Benefit Sharing Regulations, 2006
- Controlled Substances Regulations, 2007
- Wetland Regulations, 2009
- National Sand Harvesting Guidelines
- Draft Land Use Guidelines

- Draft Air Quality Regulations

The overall goal of the Environmental Policy is the integration of environmental concerns into the national planning and management processes and provision of guidelines for environmentally sustainable development. It specifically cites poverty, population growth, rural-urban migration, and urban environmental degradation and pollution as key challenges to achieving this goal. Over the years, the Kenyan government tried to implement environmental policies within a multisectoral development framework. However, strategies to achieve these objectives have not been fully developed or implemented. They have been blocked mainly by the lack of institutional capacity and resources to mobilize and link activities effectively within and between sectors. Moreover, the individual environmental policies that now exist do not adequately articulate the links between population and environmental concerns.

2. National efforts/measures against climate change

Kenya participated in the United Nations Conference on Environment and Development in 1992; it is a signatory to UNFCCC since 1994. From this time, Kenya has been giving attention to the issues of climate change and various activities have been undertaken including creating working groups, conducting climate change country studies, and participating in climate change negotiations.

Kenya established Designated National Authority (DNA) for CDM under its National Environment Management Authority (NEMA). To date, there are five CDM projects have developed in Kenya obtained registration status and one is requesting registration. In total, the country has 27 CDM projects submitted to UNFCCC. More than half of these projects are biomass power generation and reforestation projects. There are also 4 Programme of Activities, of which two are hydropower projects by Kenya Tea Development Agency. The other two are efficient cook stove projects of which one of them are developed in multiple countries such as Burundi, Rwanda, Sudan, Tanzania, and Uganda. To date, there has not been any project issued CER.

3. Sustainable Development and Mitigation

• National inventory of greenhouse gas

GHG emissions in Kenya totalled 21,466.2kt CO₂e in 1994, excluding CO₂ emissions/removals in the LUCF sector. Taking into account the LUCF activities, Kenya is net carbon dioxide sink, absorbing 22,750.3 ktCO₂e in 1994.

The GHG emissions in Kenya are expected to increase in the future along with socio-economic development and population growth. The World Bank indicates that CO₂emissions were 11,226.5kt in 2007 correspondent to 0.30 ton per capita. The GHG main emissions (CO₂, CH₄ and NO₂) amounted 43,898kt CO₂e corresponding approximately to 1.14 tCO₂e per capita¹.

¹ Assuming a country population of 38.46 million inhabitants based on the World Bank Country Data, 2008.

Table 1: Kenya CO₂ emissions summary

Total National Emissions and Removals	CO ₂ Emissions (kt)
	1994
CO ₂ emissions without LUCF	5,512.0
CO ₂ net emissions/removals by LUCF	-28,262.2
CO ₂ net emissions/removals with LUCF	-22,750.3
GHG emissions without LUCF	21,466.2
GHG net emissions/removals by LUCF	-28,000.2
GHG net emissions/removals with LUCF	-6,534.0

As presented at Figure 1, by sector, Kenya's GHG emissions profile (1994) is dominated by emissions from agriculture contributing 56% of the total, followed by energy sector, 37% of the total. Regarding gas type, methane emissions contributed to 73% of the total CO₂ equivalent emissions in 1994.

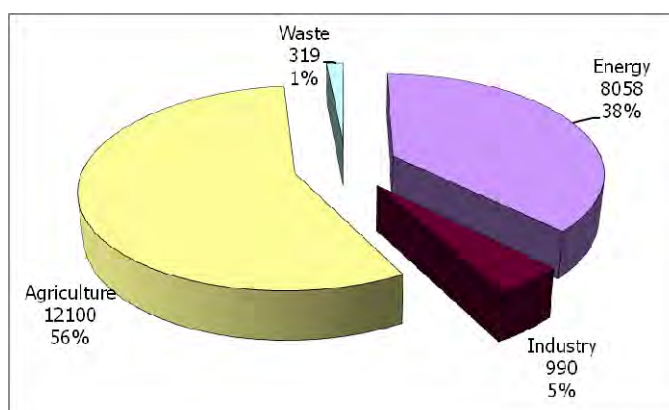


Figure 1: Total GHG emissions (ktCO₂e) and contribution to the total (%) by sector in 1994 (without LUCF)

The total GHG emission from the Energy Sector totalled 8,058 kt in 1994 of which, 4,522 kt were CO₂ emissions mostly from fossil fuel consumption. The rest was from combustion of fuel wood and charcoal 142.8 kt and 5.3 kt of CH₄ respectively. GHG emissions from industrial processes contributed to 5% of total emissions and were mainly a result of cement industry in 1994. In agricultural sector, most of emissions, approximately 95%, were from enteric fermentation of livestock. Mining and quarrying activities also contribute to climate change through emission of GHGs from heavy diesel equipment and truck operations.

The sink capacity of Kenya in the LUCF sector is decreasing due to deforestation mainly for subsistence activities and agricultural expansion. Overall forest loss in Kenya has been moderate. 5% of the country's forest coverage was lost between 1990 and 2005. The annual average deforestation rate is 0.34%.

• **Summary of Nationally Appropriate Mitigation Action (NAMA) plan**

On 26 May 2010, the government of Kenya communicated to the UNFCCC to confirm their support to Copenhagen Accord. However, concrete NAMA plan has yet to be submitted.

4. Adaptation and Vulnerability

• Vulnerability to climate change

Kenya's economy is dependent mainly on agriculture, fisheries, tourism and agro-based industries which make them very sensitive to the climate change. There exists overwhelming evidence of climate change in Kenya, and one of the apparent signals is rapid and drastic vanishing of glacier on Mount Kenya. The scientists project the ice cap on the mountain could disappear by the year 2020. In addition, the country's lakes are experiencing serious declines in water levels. Similar drastic changes have been observed in volumes of river flows. The eminent water scarcity poses a serious challenge to the country's economic development, geothermal power production and its sustainability, for example, is largely dependent on natural water recharge.

Agricultural lands covers about 12% of the country's surface area and supports 80% of the population. The remaining 88% of land surface area is arid and semi arid lands (ASALs) which supports only 20% of the population. However, ASALs is home to 50% of the livestock and 80-90% of wildlife resources in the country. Kenya has seven agro-ecological zones that represent major ecosystems as well as productivity and suitability of land. If climate change results in reduced precipitation in Kenya, then area of ASAL will increase, while the high potential ones would diminish in size.

Key environmental challenges in Kenya include a decline in wildlife populations, deforestation, soil erosion, and water scarcity — due in large part to increased areas of land in agricultural production and livestock grazing and increased demand for wood for fuel and timber. Furthermore, continued deforestation, loss of natural habitat, and illegal poaching has led to a decline in most wildlife species in the country.

According to a study carried out by the Stockholm Environment Institute, future climate change will lead to additional and potentially very large economic costs in Kenya. These are uncertain. However, aggregate models indicate additional net economic costs (on top of existing climate variability) could be equivalent to a loss of almost 3% of GDP each year by 2030. Costs include potential threats to coastal zones (sea-level rise), health burdens, energy demand, infrastructure, water resources, agriculture, and loss of ecosystem services.

5. Major Industries

Agriculture is the main industrial sector of Kenyan economy. The sector contributes about 23.8% of the GDP, 86% of exports, and employs 75% of labour force.

The main exports in the first half of 2010 were tea (23.6%), horticulture (14.5%), manufactured goods (12%), raw materials (4.4%), coffee (3.9%), and oil products (2.2%). Other principal export commodities are fish and cement.

The manufacturing sector's share of GDP is 16.7%. Within this sector, food and metals are the most important industries. Kenya's manufacturing sector contributed significantly to total output and export earnings in 2010 and has a strong potential to create employment. It is dominated by food processing. Growth in manufacturing was mainly attributed to the strong expansion of food manufacturing, beverages and tobacco.

Services, including banking and finance, tourism, transport and communications, account for 62% of GDP. They are mainly provided by the private sector and they employ a large segment of the urban population. The Government's plan to expand economic infrastructure is partly aimed at boosting private sector service provision further.

In the order of highest values of annual output, small-scale consumer goods (plastic, furniture, batteries, textiles, soap, cigarettes, flour) ranks first followed by agricultural products, oil refining, aluminium, steel, lead, cement, commercial ship repair and tourism.

6. National development strategy

Since 2005, Kenya has worked to develop a long-term national development strategy called *Kenya Vision 2030*. The Kenya Vision 2030 aims to transform Kenya into a rapidly industrialising middle-income nation by the year 2030. It envisions a globally competitive and prosperous nation with a high quality of life by 2030. The vision is anchored on three key pillars: economic, social and political. The main aims are:

- Economic: reach a sustainable economic growth rate of 10 percent per annum over the next 25 years.
- Social: achieve a just and cohesive society with equitable social development in a clean and secure environment.
- Political: establish an issue-based, people-oriented, results-oriented, and accountable democratic political system.

The vision has largely incorporated the attainment of the millennium development goals (MDG's), which can be considered as the internationally accepted standards for measuring progress towards poverty alleviation. The Kenya Vision 2030 will be implemented in successive five-year Medium Term plans in order to allow evaluation, accountability, and continuous impetus towards its achievement.

For the economic plan, six sectors have been prioritized: tourism, agriculture, wholesale and retail trade, manufacturing, IT Enabled Services (previously known as business process off-shoring) and financial services.

The objective of the Social Pillar is investing in the people of Kenya in order to improve the quality of life for all Kenyans by targeting a cross-section of human and social welfare projects and programmes, specifically: education and training; health; environment; housing and urbanisation; gender, children and social development; youth and sports; and labour and employment.

Table 2: Projects and Key Sectors of the Social Pillar of Vision 2030

<p>Infrastructure</p> <p>Youth empowerment centres</p>
<p>Education and Training</p> <p>Construction and Equipping of 560 Secondary Schools and Expansion and Rehabilitation of Existing Schools</p> <p>Construction and Equipping of 560 Secondary Schools and Expansion and Rehabilitation of Existing Schools</p> <p>Recruitment of additional teachers</p> <p>Establishment of a Computer Supply Program</p>

<p>Construction and Rehabilitation of at Least One Boarding Primary School in Each Constituency in Arid and Semi Arid Lands.</p> <p>Establishment of a Voucher System Programme in Five of the Poorest Districts</p> <p>Establishment of Centres of Specialisation</p>
<p>Health (Medical Services and Public Services And Sanitation)</p> <p>Rehabilitation of Health Facilities</p> <p>Strengthen Kenya Medical Supplies Agency</p> <p>Human Resource Strategy</p> <p>Develop Equitable Financing Mechanism</p> <p>Community Based Information Systems</p> <p>De-Linking Ministry of Health from Service Delivery</p> <p>Scale-up household and community levels malaria interventions</p> <p>Rehabilitation of rural health facilities to offer integrated and comprehensive healthcare</p> <p>Restructure Ministries of Health</p> <p>Develop Human Resources Strategy</p> <p>Fast-track implementation of the Community Strategy by training Community Health Workers (CHWs)</p> <p>Develop a Financing Strategy for the entire health sector</p> <p>Implement Output Based Approach (OBA) in Reproductive Health</p> <p>Channel funds directly to health facilities</p> <p>Implement Environment and Hygiene Policy and Strategy</p> <p>Revitalize Efficacy of the Health Management Information System</p> <p>Strengthen the Capacities of Levels 2 and 3 Health Facilities to Provide Reproductive Health Services</p> <p>Scale-up HIV Behaviour Change Interventions at Household and Community Levels</p> <p>Strengthen Capacity of Levels 2 and 3 to Diagnose and Treat Tuberculosis</p>
<p>Environment</p> <p>Rehabilitation and Protection of Indigenous Forests in Five Water Towers</p> <p>Secure Wildlife Corridors and Migratory Routes</p> <p>Secure Wildlife Corridors and Migratory Routes</p> <p>Waste management system</p> <p>Rehabilitation and Protection of Indigenous Forests in Five Water Towers</p>
<p>Housing</p> <p>Installation of Physical and Social infrastructure in Slums in 20 urban Areas</p> <p>Producing 200,000 housing units annually by 2012 under public private partnerships (PPPs) and other initiatives</p> <p>Establish Housing Technology Centres in Each Constituency</p> <p>Enacting Housing Bill 2006 to legislate for a one-stop Housing Development Approvals Mechanism</p>
<p>Gender, Children and Social Development</p> <p>Women Enterprise Fund</p> <p>Establishment of Consolidated Social Protection Fund</p> <p>Implementation of Disability Fund</p> <p>Representation of People with Disabilities in Decision Making Process</p> <p>Gender Mainstreaming</p> <p>Affirmative action policy</p> <p>Gender Disaggregated Data</p> <p>Affirmative Action Policy</p>

Labour and Employment

Development of the National Human Resource Database
 Development of a National Integrated Human Resource Development Strategy
 Strengthening of Linkages between Industry and Training Institutions
 Development of Eight Micro and Small Enterprise Centres of Excellence
 Development and Implementation of a Diaspora Policy
 Development and Implementation of a National Occupational Safety and Health Policy
 Productivity Measurement and Promotion
 Transformation of the National Social Security Fund

Youth and sports

International Academy of Sports
 Establishment of a Computer Supply Programme
 Youth Empowerment Centres
 International Academy of Sports
 Regional Sports Stadia
 Revitalisation of Youth Polytechnics
 Revision of Education and Training Curriculum
 Increased Subsidies to Youth Polytechnics
 Establishment of a Sports Lottery Fund
 Youth Enterprise Development Fund
 International Centre for Arts and Culture
 One Billion Tree Planting Campaign Under Trees-for-Jobs Programme
 Roads 2000 and Other Labour Intensive Public Projects

7. Mitigation/Adaptation Options

As a Party to the UNFCCC, Kenya is willing to contribute to the achievement of the ultimate objective of the Convention despite its low contribution to the global GHG emissions. There are a number of potential mitigation options, which could meet both objectives of socio-economic development and climate protection. In the First National Communication, following options are listed as potential mitigation options.

Table 3: Mitigation Options for Kenya

<p>Promoting the use of renewable energy</p> <p>Promotion of hydro, wind, biomass, and geothermal energy resources, including mini/micro hydro resources Promotion of solar sources, including solar-based rural electrification projects Development of standards for renewable technology</p>
<p>Improving/promoting energy efficiency and conservation</p> <p>Encouragement of rational use of energy through the promotion of improved energy efficient end use energy conversion devices Promotion and awareness raising on better house keeping measures such as 'switching off light when not needed' and periodical energy audits Promotion of Compact Fluorescent Lamps (CFLs) Support for the usage of fuel efficient cook stoves at the communities</p>
<p>Improving the national electricity system</p> <p>Establishment of a national energy taskforce to articulate the role of energy sector in light of UNFCCC Establishment of adequate energy supplies</p>

<p>Alternative energy sources to broaden the national energy mix and lessen dependence on imported energy</p> <p>Rural electrification</p> <p>Regional power inter-connections</p>
<p>Promoting the use of fuels with low carbon content (fuel switching)</p> <p>Encouraging domestic fuel substitution</p> <p>Increased on-farm wood fuel production</p>
<p>Promoting better transport</p> <p>Encouragement of mass transport</p> <p>Promotion of rail transport</p> <p>Fuel pipeline transport that will reduce the number of trailers that haul oil to neighbouring countries</p> <p>Promotion of non motorized transport</p> <p>Traffic management improving and making traffic lights more effective, construction of bus lanes, pedestrian lanes, bicycle lanes</p> <p>Course on fuel efficiency in driving schools curricula</p> <p>Environmental standard and compulsory inspection of vehicles</p> <p>Taxation and registration fees for vehicles</p> <p>Improvement of telecommunication to reduce commuting by vehicles giving incentives to population/companies to use email, telefax, mobile phones and teleconference to reduce the trips</p>
<p>Improving forest management practices</p> <p>Implementation of sectoral legislation for better environmental management, including land use policy</p> <p>Promotion of forest development technologies together with the increase of the production per unit land area by planting the most appropriate tree species and varieties</p> <p>Promotion of forestry activities aiming that planting rates exceed harvesting rates by activities, such as:</p> <ul style="list-style-type: none"> • Expansion of stands of trees (afforestation, reforestation, agro-forestry) • Expansion of tree planting into marginal agricultural and pasture land • Conservation of existing stands (i.e. protection and maximization in recovery)
<p>Improvements on animal husbandry</p> <p>Use of biogas as an alternative energy source to alleviate fuel-wood shortage and minimize destruction of forests and woodlands</p>
<p>Integrated waste management</p> <p>Community based solid waste management projects</p> <p>Resource recovery by scavengers</p> <p>Private sector involvement in solid waste management</p> <p>Proposed actions – integrated approach to waste management:</p> <ul style="list-style-type: none"> • Minimization of waste production • Waste recycling and reuse maximization • Promotion of safe disposal • Expansion of collection and disposal

In the First National Communication, following projects are listed as part of the mitigation efforts.

Table 4: Mitigation projects proposed in Kenya

Project title	Sector	Duration (month)	Budget (US\$)
Improvement of inventories of greenhouse gas sources and sinks	Environmental management	24	300,000
Public education and awareness raising for sustainable development	Education	36	400,000
Climate change mitigation through development of carbon sinks	Agro-forestry	48	600,000
Promotion of application of biogas technology	Energy	48	750,000
Replacement of wood-fuel boilers for tea drying	Agro-industry	60	20,000,000
Promotion of waste re-use and recycling	Waste management	48	1,500,000
Promotion of solar based rural electrification	Renewable energy	36	1,200,000
Removing barriers to energy use efficiency in the urban transport systems	Urban transport	36	1,200,000
Development of climate change adaptation and mitigation strategies in the wildlife and tourism sector	Wildlife and tourism	36	750,000
Development of climate change adaptation and mitigation strategies in the coastal zone	Coastal zone management	36	750,000
Development of strategies for sustainable adaptation to climate change in the health and public safety sector	Health	36	300,000
Integrated household waste management and process	Waste management	36	4,500,000
Nairobi city traffic flow improvement project	Transport	24	210,000
Education, awareness, training and curriculum development on climate change	Awareness and training	36	300,000

As a response to the challenges posed by climate change to Kenya, the NCCRS has proposed a number of measures meant to curb the adverse impacts of climate change on the country (adaptation measures) as follows:

Table 5: Adaptation Options for Kenya

<p>Health</p> <p>Construction of a large number of nomadic clinics</p> <p>Recruitment of more (about 24,000) technical staff to strengthen public health services across the country</p>
<p>Agriculture</p> <p>Provision of downscaled weather information and farm inputs</p> <p>Water harvesting e.g. building of sand dams for irrigation</p> <p>Protection of natural resource base (soil and water conservation techniques)</p> <p>Research and dissemination of superior (drought tolerant, salt-tolerant, pest and disease resistant) crops</p> <p>Development of early maturing and high yielding crop varieties and adaptation of agricultural technologies</p> <p>Rehabilitation of degraded soils</p> <p>Improved water management and irrigation systems</p> <p>Changes in planting schedules and tillage practices</p>

<p>Water</p> <p>Construction of dams and water pans</p> <p>Protection of water towers, river banks, and water bodies and de-silting of riverbeds and dams</p> <p>Municipal water recycling facilities</p> <p>Building capacity for water quality improvement, and awareness campaign to promote water efficiency measures</p> <p>Integrated water resource management</p>
<p>Fisheries</p> <p>Establishment of shore protection measures</p> <p>Developing financing mechanisms using non-consumptive options for supporting marine ecosystem research and development</p> <p>Encouraging a coastal and watershed-basin management approach linking land-use practices to marine and fisheries resource conservation</p>
<p>Tourism and wildlife</p> <p>Development of a <i>National Wildlife Adaptation Strategy</i></p> <p>Development and enforcement of Green Strategy and Code</p> <p>Branding of Kenya as a Green Destination</p>
<p>Livestock</p> <p>Developing special livestock insurance schemes</p> <p>Breeding of animals that adapt well to climatic variety</p> <p>Promotion of economic livelihood diversification</p>
<p>Physical Infrastructure including transportation and telecommunication networks</p> <p>Ensuring that the infrastructure is climate-proof over its lifespan</p> <p>Factoring a maintenance component into all infrastructural development funds</p> <p>Designing infrastructure that can withstand the prevailing climatic conditions, e.g. structures that can withstand strong winds, tides as well as high temperatures</p>
<p>Social Amenities including human settlements</p> <p>Strengthening disaster preparedness</p> <p>Proper planning of urban settlements which takes into consideration the expected high growth rate of urban population due to climate induced migration from rural areas to urban centres</p> <p>Establishing insurance schemes to support preparedness in regions susceptible to climatic disasters</p>

Reference:

- First National Communication, June 2002
- National Climate Change Response Strategy (NCCRS), April 2010
- The National Environment Management Authority Revised Strategic Plan (2010-2013)
- Kenya Vision 2030
- UNFCCC website (GHG Profile, NAMA, NAPA, CDM)
- The World Bank website on country page for Kenya
- FAO Country Profile for Kenya
- US Department of State, Background Notes
- African Economic Outlook

This summary was prepared based on the data/information available as of September 2011.

2.3.8. コンゴ民主共和国

Democratic Republic of Congo

- **Main streaming mitigation/adaptation actions in the national development strategy**

For the Democratic Republic of the Congo (DRC), the main focus of development policy is recovering from conflicts. DRC has negative GHG emissions in total. Adaptation actions in agriculture and land and ecosystem degradation could support the country to improve socio economic conditions.

- **Summary on climate change related issues in the country**

1. Climate change policy

The DRC ratified the United Nations Framework Convention on Climate Change (UNFCCC) on 9 January 1995, and the Kyoto Protocol on 23 March 2005. The resources and capabilities of the Ministry of Environment, Nature Conservation, and Tourism (*Ministère de l'Environnement, Conservation de la Nature et Tourisme*) which is the main player in the field of environmental protection and climate change, is still limited.

The First National Communication was submitted to the UNFCCC in November 2000, and the second in November 2009.

For the environment sector, the Mining Code (*le Code minier*), promulgated on 11 July 2002, envisaged provisions that sought to ensure its protection, by the means of the Environmental Attenuation and Rehabilitation Plan (*Plan d'atténuation et de réhabilitation de l'environnement*), before the start of any mining activity, and the Environmental Management Plan, which in particular includes the protection of slopes from erosion, the protection of upstream waters and rivers, biological diversity conservation, soil conservation, public healthiness, improvement of the living environment and protection of the human environment. These elements have a direct incidence on climate change.

Furthermore, with regard to forestry reform, a forestry code was promulgated in August 2002 and created provincial forestry advisory boards whose role is to supervise the forestry management of the provinces and other decentralized entities, and to deliver opinions in the context of forest classification or declassification projects.

Meanwhile, research projects that could lead to a control of climate change have not been officially enshrined within the research programmes of the institutions that could best carry them out.

2. National efforts/measures against climate change

The DRC has launched a national process on the REDD at the time of an inter-agency exploration and planning mission in January 2009, with the participation of nine international organisations and a large number of professionals and partners. The objectives of the REDD strategy are twofold: to reduce the emissions relating to deforestation and degradation and to reduce poverty as described in the Growth and Reduction of Poverty Strategy Document (DSCRDP).

The DRC has set up a DNA for the Clean Development Mechanism and now has 7 projects of which 2 have

been registered. One is an afforestation project and the other is a landfill gas project.

3. Sustainable Development and Mitigation

• National inventory of greenhouse gas

The DRC's GHG emissions totalled about 45,999 kt CO₂e in 2003, excluding CO₂ emissions/removals in the LUCF sector.

Table 1: DRC GHG emissions summary

Total National Emissions and Removals	GHG Emissions (kt CO ₂ e)		
	1994	2001	2003
CO ₂ emissions without LUCF	1,447.7	2,793.0	2,645.0
CO ₂ net emissions/removals by LUCF	-183,331.4	-356,450.2	-182,023.5
CO ₂ net emissions/removals with LUCF	-181,883.7	-353,657.2	-179,378.5
GHG emissions without LUCF	44,641.6	46,007.4	45,999.0
GHG net emissions/removals by LUCF	-176,840.2	-353,206.1	-178,779.4
GHG net emissions/removals with LUCF	-132,198.6	-307,198.7	-132,780.4

As presented in the tables below, DRC's GHG emissions from the agriculture sector contributes for 75% of the total (without LUCF) in 2003. In terms of GHG emissions by gas, CH₄ contributes for over 80% of the total GHG emissions (without LUCF) in 2003.

Table 2: GHG emission by sector (without LUCF) for 2003

Sector	tCO ₂ e	%
Energy	3,596.0	7.8%
Energy industries	563.0	1.2%
Man. industries and construction	494.0	1.1%
Transport	833.0	1.8%
Other sectors	940.0	2.0%
Other	766.0	1.7%
Industrial Processes	157.0	0.3%
Mineral Products	157.0	0.3%
Agriculture	34,582.7	75.2%
Enteric Fermentation	1,046.0	2.3%
Manure Management	66.6	0.1%
Rice Cultivation	70.6	0.2%
Agricultural Soils	331.7	0.7%
Prescribed Burning of Savannas	29,328.4	63.8%
Field Burning of Agricultural Residues	3,739.4	8.1%
Waste	7,663.3	16.7%
Solid Waste Disposal on Land	7,663.3	16.7%
TOTAL	45,999.0	100.0%

Table 3: GHG emission by gas (without LUCF) for 2003

	tCO ₂ e	%
CO ₂	2,645.0	5.8%
CH ₄	37,293.5	81.1%
N ₂ O	6,060.5	13.2%
TOTAL	45,999.0	100.0%

• **Summary of Nationally Appropriate Mitigation Action (NAMA) plan**

The DRC has not submitted its NAMA plan. However, as presented in the Section 7 "Mitigation/Adaptation Option" in this summary, concrete mitigation plans has been specified in the National Communication of the country.

4. Adaptation and Vulnerability

• **Vulnerability to climate change**

Water resources

According to a climate change projection models, the annual rain and temperature trends according to the geographical areas is shown below. It could be observed that rainfall would decrease in most areas and temperature would increase in all areas.

Table 4: Annual Average Rain (mm) and Temperature (°c) Trends of the Four Climate Areas

Area	Town/Marker	Years	Rain (mm)	Temperature (°C)
I	Boma / Matadi	2005	1000	25.2
		2050	900	28.4
		2100	850	29.1
II	Kinshasa	2005	1800	25.0
		2050	1840	27.5
		2100	1900	28.2
III	Kindu	2005	1700	25.2
		2050	1650	28.2
		2100	1630	29.1
IV	Lubumbashi	2000	1100	20.4
		2050	1000	23.7
		2100	900	24.7

Although the DRC has potentially an enormous amount of fresh water at its disposal, the population has extreme difficulty in accessing water, apart from a few inhabitants in certain cities. The large majority of the population's vulnerability from limited access to water stems basically from its poverty.

Extreme hydrometric crises, namely strong intensities of rain and extreme spates of rivers, are leading to an increasing number of lost human lives, erosion, destruction of basic infrastructures, houses throughout the country.

Furthermore, the DRC is under increasing pressure from many countries suffering from water stress that is

accentuated by climate change.

Agriculture, Land Use Change & Forests

Among the impacts on the natural balance of the environment that should occur, the following can be identified:

- A change in the natural ecology tending towards the area becoming a savannah;
- A regression of the CO₂ storage capacity in the area;
- A change in the area's floral composition, with its implication on the original biodiversity by a change to the natural habitats, the possible appearance of certain harmful diseases and insects, and a change within the existing symbioses between certain species that are to be found in the area;
- A renewed outbreak of certain human diseases;
- An ever-increasing risk of bush fires following the dryness of the litter in the undergrowth;
- A modification in the production systems of ligneous substances, and of forestry products other than wood;
- Changes to the level of the capacity of the vegetation in place with regard to soil conservation.

At the agricultural production level, the climatic disturbances should have a direct incidence on the populations' food security. The repercussions of climate change should in general lead to a reduction of certain crop yields, even in the event of a minimal temperature rise, owing to the fact that the normal conditions of growth of those crops are close to the thermal tolerance level.

Coastal Areas

The coastal areas are prone to erosions and floods. There are two different kinds of floods: marine flooding and flooding due to the post precipitation spate of the River Congo. The ensuing consequences are:

- Invasion of the mangroves and of certain inhabited sectors;
- Saline intrusion affecting the water tables and the mangrove soil;
- Loss of the biodiversity of the mangrove marine park;
- Material and agricultural production losses;
- Sand deposits (deposits of up to 80cm have been recorded on the Banana-Muanda segment), etc

Impact on Health

It appeared that occurrence of malaria cases in Lower Congo was strongly related to the low precipitation and to a relatively high minimum temperature. Moreover, the projections made up until 2050 on the basis of minimum temperatures show that malaria cases will triple with the temperature increases resulting from climate change.

• **Climate Change National Adaptation Programme of Action (NAPA)**

The DRC submitted its NAPA (*Programme d'Action National d'Adaptation au Changement Climatique de la République Démocratique du Congo; PANA*) in September 2006. The following three projects are indicated as priority area.

Table 5: DRC's NAPA Priority Projects

	Project Title	Project Sector	Cost (USD)
1	Energy related projects	Energy	10,577,520
2	The strengthening of agricultural production capacities: Multiplication of improved seeds of Corn, Rice and Cassava	Food Security	5,658,760
3	Biodiversity conservation and restoration of Mangroves Marine Park	Coastal and Marine ecosystems	239,374

5. Major Industries

Since 2001, the country has been recovering from series of conflicts that occurred through most of the 1990s. The DRC is still a fragile post-conflict country with enormous needs for reconstruction and economic growth, but within the context of a severely constrained fiscal space and weak institutions. Although the vast majority of the country is at peace, socioeconomic conditions are still strained, especially in the eastern provinces. Efforts to build peace and recovery are faced with dire social circumstances. The country's infrastructure has been left badly damaged by the conflicts. Despite progress made by political and economic reforms over the past five years, many communities live hand to mouth with little access to markets to buy or sell goods and little access to public services.

The economic growth stayed around 7 percent in 2010, which was driven mainly by the extractive industries' performance, which was boosted by a steady increase in world commodity prices and by the infrastructure investments made by the government. In the medium term, the economy is expected to grow steadily at around 7 percent per year following increased investment and growth in the extractive industries and the contribution of the civil engineering and service sectors.

6. National development strategy

The World Bank Board of Directors in December 2007 discussed DRC's Country Assistance Strategy (CAS), which will be aligned with the country's Poverty Reduction and Growth Strategy Paper. The objective of the CAS is to lay the foundation for a medium-term poverty reduction effort – strengthening infrastructure, institutions, and policies – and will reflect the five pillars of the Poverty Reduction and Growth Strategy Paper. It will support efforts to:

- Promote good governance and consolidate peace.
- Consolidate macroeconomic stability and economic growth.
- Improve access to social services and reduce vulnerability.
- Fight the spread of HIV/AIDS.
- Promote community dynamics.

7. Mitigation/Adaptation Options

A number of strategies and options for adaptation have been proposed for the DRC.

- The following strategy relates to adapting to the variability of the limnometric heights and the river flows in Kinshasa
 - The evaluation and monitoring of the water resources, particularly those of the River Congo system and its tributaries at the Kinshasa level, as well as the quality of the surface and underground water;

- An evaluation of the impact of this system on the quantity and quality of the underground water for enhanced resource allocation planning;
 - The characterization and development of the watersheds identified in the city of Kinshasa for control of the surface run-off;
 - The protection of the water resources against pollution;
 - Recourse to adaptation infrastructures capable of supporting the projected hydrological variations, and the economic, social and ecological costs of the adopted measures;
 - The establishment of communities on the Kinshasa hill areas, after development, and on the Batéké Plateau in order to protect them from the injurious effects of floods.
- The following adaptation measures are proposed for the Gemena/Kungu/Budjala Region for the Agriculture, Land Use Change and Forests sector
 - The creation of a zoning for land use, in order to limit the areas to be allocated specifically to agricultural activities;
 - The implementation of reforestation programmes in deforested areas;
 - The promotion (i) of the cultivation practices allowing agricultural activities to become relatively sedentary, (ii) improved sowings, and soil enrichment techniques accessible to the peasants;
 - Support for the organization of distribution chains and for a policy for pricing the sale of agricultural products that remunerates the agricultural producers;
 - The promotion of the projects enabling the populations to be reoriented towards economic activities with less impact on the forest ecosystems;
 - The involvement of the local populations in the management of their local forest ecosystems;
 - The supervision of quality for the benefit of peasants in their agricultural activities, the support for agricultural inputs, and the reinforcement of agricultural extension;
 - The promotion of agronomic research for the improvement of the yields of the most widespread crops;
 - The upgrading of the local populations traditional knowledge relating to the conservation of the ecosystems;
 - The rehabilitation of the infrastructures of the roads of agricultural interest.
 - The following adaptation measures are proposed for impacts of climate change on the Muanda Shore:
 - Regulation of mangrove development
 - Coastal area development policy
 - Delineation of building and residential areas
 - Raising population awareness
 - Diversification of activities and rationalization of farmers fishermen

Agriculture:

- Use short cycle varieties, maize, rice and beans in particular
- Develop livestock breeding
- Upgrade alternative crops (peanuts and beans)
- Reinforce soil conservation activities
- Build reservoirs and water retention ponds
- Develop intensive livestock breeding
- Integrated crop protection

Land and Ecosystem Degradation:

- Develop reforestation and soil conservation programmes
- Development of more efficient agro-sylvo pastoral management methods
- Promotion of renewable energies and domestic fuels as substitution for ligneous fuels
- Participative and community management of natural resources by the civil society and the rural communities

● The following adaptation measures are proposed for impacts of climate change on the health sector:

- Setting up of an epidemiological monitoring system such as the development of specific indicators (human, veterinary, environmental, etc) and thresholds of alert
- Installation of a management system for the new diseases brought by global warming, involving clinicians, biologists, epidemiologists and the pharmaceutical industry
- Improvement of the population's access to public and community health services for infectious diseases and non-communicable chronic diseases
- Organisation of a medical-oriented weather forecast system together with an early warning system adapted to climate change in the DRC and the creation of a multidisciplinary research centre on climate and health
- Reinforcement of the medical personnel's professional capacities
- Identification and destruction of the pathogens' hideouts
- Organisation of preventive actions against vectorial diseases
- Reinforcement of the cleansing system
- Organisation of the population's education and training, and the raising of its awareness
- Improvement of the food supply system
- Popularisation of the use of anti-mosquito grids
- Use of impregnated window screen
- Eradication of mosquito deposits
- Mosquito eradication on a national scale
- Reinforcement of the population's nutritional capacities
- The fight against social exclusion and community promotion
- Mapping of the habitat areas at climatic risk

Reference:

- First National Communication, November 2000
- The World Bank's Country Assistance strategy (CAS) for Democratic Republic of Congo, Fiscal 2008-2011
- UNFCCC website (GHG Profile, NAMA, NAPA, CDM)
- The World Bank website on country page for Democratic Republic of Congo
- CIA the World Fact Book

This summary was prepared based on the data/information available as of September 2011.

2.3.9. ザンビア

Zambia

- **Mainstreaming mitigation/adaptation actions in the national development strategy**

Energy and agriculture sectors dominate the Republic of Zambia's GHG emission sources. Drought is a major concern and improved management of water resources as well as promotion of improved crop and livestock management practices should be placed high on the agenda in order to decrease its climate vulnerability. Prevention of forest degradation and promotion of forestation would ensure rational and sustainable management as well as utilization of forest resources. Rural electrification will also help decrease reliance on charcoal stoves, as currently only 10% of the population has access to electricity.

- **Summary on climate change related issues in the country**

1. Climate change policy

Zambia signed the United Nations Framework Convention on Climate Change on 11 June 1992 and ratified it on 28 May 1993.

There are a number of environmentally oriented policies, strategies and action plans already in place that can directly or indirectly contribute to the objectives of the Climate Convention. Followings are examples of these policies, strategies and action plans.

National Environmental Action Plan (NEAP), 1994

National Policy on Environment 2007

Forestry Policy, 1998

National Agricultural Policy, 1995

National Biodiversity Strategy and Action Plan, 1999

Zambia National Action Plan for Combating Desertification, 2002

National Energy Policy, 1994

The First National Communication submitted to UNFCCC in August 2002 stresses that support for the implementation of relevant policies, strategies and action plans in the form of funding, technical assistance, training and technology transfer through the Convention mechanisms is extremely essential to Zambia.

The country is now implementing a project to submit the Second National Communication, funded by the Global Environment Facility (GEF) and United Nations Development Programme (UNDP).

2. National efforts/measures against climate change

The Ministry of Environment and Natural Resources is the focal point for climate change activities in Zambia. The ministry discharges responsibility through the Environmental Council of Zambia (ECZ) which was created in 1992 following enactment of the Environmental Protection Pollution Control Act (EPPCA) of 1990. The ECZ houses the secretariat of the National Climate Change Steering Committee (NCCSC) that was formed to give guidance for the implementation of the Enabling Activities for the Preparation of Initial National

Communication as well as providing policy guidelines in general. More importantly, the NCCSC reviews climate change reports for quality, technical, scientific and policy. The Permanent Secretary of the Ministry of Environment and Natural Resources chairs the NCCSC. The NCCSC is composed of several stakeholders among which are the Ministries of Environment and Natural Resources, Energy and Water Development, Finance and Economic Planning, Transport and Communication, Science and Technology and Vocational Training, and Agriculture Food and Fisheries. Other Stakeholders are the Centre for Energy, Environment and Engineering Zambia Limited, National Council for Scientific Research, Environmental Council of Zambia, Zambia Consolidated Copper Mines (ZCCM), Zambia Electricity Supply Corporation (ZESCO).

The Steering Committee will be responsible for among other things the following broad functions:

- acting as advisor to the government on matters concerning climate change;
- facilitate the co-ordination of the activities of research institutions involved in climate change studies and to avoid duplication;
- review of proposals on climate change and offer critique on climate change study reports from researchers and agencies on mitigation options and measures;
- ensure the implementation of decisions and resolutions made and passed at various conventions relating to climate change studies;
- provision of overall direction to climate change activities, studies, research and policy;
- ensure effective implementation of activities relating to the UNFCCC;
- preparation of position papers on climate change and mitigation status; and
- enhance public awareness.

The Executive Director of ECZ is the National Co-ordinator of Climate Change activities and is assisted by a Climate Change Co-ordinator to carry out co-ordination of various climate change programmes. The programmes on climate change activities are conducted through studies by a national team of experts as shown in the organisation structure below.

Zambia established the Designated National Authority (DNA) for CDM under its Environment and Natural Resources Management Department. To date, the country has developed one sustainable energy cooking stove CDM project supported by RWE Power AG of Germany. The project was registered in January 2010 and is expected to achieve approximately 130,000 tCO₂e of emission reductions per year. The country has two other projects in the CDM pipeline, a mini hydro project currently in Validation stage, developed by Zambia Electricity Supply Corporation and fuel efficient project developed as Programmatic CDM.

3. Sustainable Development and Mitigation

• National inventory of greenhouse gas

The total CO₂ emissions for the year 1994 were 72,710.05 Gg with LUCF being the largest emitter. Methane emissions were exclusively the result of savannah and on-site burning which amounted to 40 per cent and 30 per cent of the total respectively. Managed (plantation) forest and natural forest regeneration on the other hand provided sink for CO₂ emissions to the tune of 71,504 Gg. In other words, Zambia in 1994 was a net CO₂ emitter amounting to 1,206.05 Gg.

Following a general downward trend during 1975-2000, there has been a general increasing trend of GHG

emissions in Zambia in the period 2000-2007. It is expected to increase in the future along with socio-economic development and population growth. Recent figures from the World Bank indicate that CO₂ emissions were 2,869.38 kt in 2007 correspondent to 0.22 ton per capita.

Table 1: Zambia GHG emissions summary

Total National Emissions and Removals	CO ₂ Emissions (Gg CO ₂ e)
	1994
GHG emissions without LUCF	32,770.1
GHG net emissions/removals by LUCF	3,457.9
GHG net emissions/removals with LUCF	36,228.0
CO ₂ emissions without LUCF	2,595.4
CO ₂ net emissions/removals by LUCF	-1,389.3
CO ₂ net emissions/removals with LUCF	1,206.1

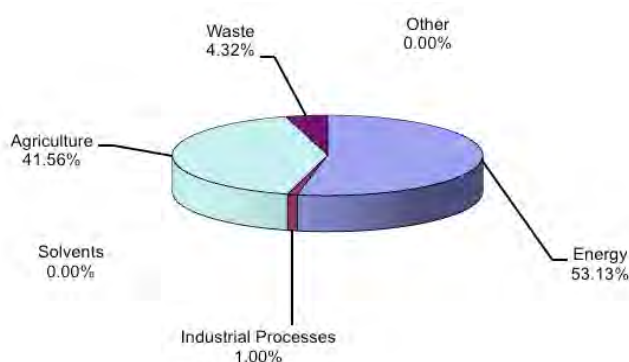


Figure 1: GHG emissions by sector (without LUCF) for 1994

In terms of CO₂ emission, about 53% of total emission came from fossil fuel combustion in the Energy sector. The total CO₂ emission from the Energy Sector is estimated at 17,410.2 Gg CO₂e for 1994.

• Summary of Nationally Appropriate Mitigation Action (NAMA) plan

Zambia has yet to submit a NAMA plan, however has been considering various options for their mitigation action. The details are presented in Section 7 "Mitigation/Adaptation Option" of this summary.

4. Adaptation and Vulnerability

Historically, Zambia has been ravaged by droughts and floods but recent decades have seen the frequency and severity of these climatic hazards increase. The impacts of these droughts/floods have included widespread crop failure/loss, outbreaks of human and animal diseases, dislocation of human populations and destruction of property and infrastructure.

The critical economic sectors are extremely vulnerable to adverse effects of climate change as induced by global warming. Shortening of the growing season and dry spells within the growing season have also been mentioned to be devastating especially for crops.

Zambia has identified the key sectors that are vulnerable to the effects of climate change. The key sectors that were identified in the Initial National Communication which has been adopted from Initial Communication Report, 2001 are listed in the table below.

Table 2: A Summary List of Vulnerabilities of Five Key Socio-economic Sectors

Vulnerability	
Agriculture and Food Security	The major climatic threats affecting this sector are excessive precipitation leading to water logging, erosion and hindrance to field operation, increased frequency of droughts in terms of seasonal, shortening of the growing season, and flash floods – all have negative impacts on food security, livelihoods and adaptive capacity of the vulnerable communities. Drought-induced crop failures may in turn cause serious malnutrition in children. Extreme cases may result in famine and loss of productive assets and lives.
Human Health	Increased frequency of drought results in crop failures and water scarcity leading to increased malnutrition and diarrhea diseases. Increased cases of malaria and major epidemics of cholera and other water-borne diseases are associated with floods and increased temperature regimes.
Natural Resources/Wildlife/Forestry	Drought significantly affect wildlife habitat through changes in rangelands causing desert-type conditions to occur. In addition scarcity of water undermines wildlife health. Further, the regeneration of forest resources are negatively impacted by drought and climatic changes that affect the resilience of forest vegetation types could grossly affect income and welfare of the communities.
Water and Energy	Ground water resources are negatively affected by drought resulting in inadequate recharging, lowering of water tables and drying of boreholes and rivers. Region I especially Southern Province is extremely vulnerable and does in fact experience critical water shortages during drought conditions.

• **Climate Change National Adaptation Programme of Action (NAPA)**

Zambia submitted its NAPA in October 2007. NAPA specifies that the five most prominent mitigation and adaptation measures against flood impacts that the farmers would like to take on their holdings in case of future floods are avoid cultivating, cutting of trees and building houses along river banks; practice sustainable agriculture on the upper land and grow and store sufficient food stocks.

The following are the list of priority project activities under NAPA.

Table 3: Zambia NAPA Priority Projects

	Project Title	Indicative Cost (USD)
1	Strengthening of early warning systems to improve services to preparedness and adaptation to climate change	1,800,000
2	Promotion of alternatives sources of livelihoods to reduce vulnerability to climate change/variability to communities living around GMAs	175,000
3	Adaptation to the Effects of Drought in the context of Climate Change in Agro-Ecological Region I of Zambia	3,000,000

4	Management of critical habitats	1,400,000
5	Promote natural regeneration of indigenous forests	1,000,000
6	Adaptation of land use practices (crops, fish, and livestock) in light of climate change	1,200,000
7	Maintenance and provision of water Infrastructure to communities to reduce Human-Wildlife Conflict	75,000
8	Eradication of Invasive Alien Species	1,000,000
9	Capacity building for improved environmental health in rural areas	3,000,000
10	Climate proofing sanitation in urban areas	2,000,000

5. Major Industries

According to the World Bank, Zambia's GDP for 2010 was \$16,192,857,209. The Zambia Development Agency defines the main contributors to GDP in 2008 as being agriculture (12.2%), mining (8%), manufacturing (10%), and construction (11%). Growth sectors presently being promoted by the Government comprise the mining, agriculture, manufacturing, and tourism sectors. These sectors have experienced exponential growth in recent years, and are expected to continue this trend in future due to the numerous investment opportunities currently available in the country.

The country's economy has historically been based on the copper mining industry. However the Zambian government is undertaking economic diversification to reduce the economy's reliance on the copper industry and exploit other components of Zambia's rich resource base by promoting agriculture, tourism, gemstone mining, and hydro-power.

Major export products in the country are copper and cobalt. Zambia also has a number of non traditional exports including ores, slag and ash, sugar and sugar confectionary, dairy products, bird's eggs, natural honey, edible products, copper wire and electricity. The non traditional exports have become of increasing importance to the Zambia economy as the country strives to diversify from its dependence on copper and cobalt, increasing by 9.2 percent between 2006 and 2007 and by 12.2 percent between 2007 and 2008.

The major imports are mineral fuels, oils and product of their distillation. Other import products include boilers, machinery and mechanical appliances, parts, electrical machinery, equipment parts, fertilizers and ores. Despite vast potential and stated commitments to diversification, the mining sector continues to dominate the economy.

6. National development strategy

After reaching the Highly Indebted Poor Country (HIPC) and Multi-donor Debt Reduction Initiative (MDRI) in 2005 and 2006 respectively, Zambia has turned around its image from a country performing considerably below its potential, to a country with good economic management and several years of strong economic growth. However, Zambia's economic growth has not translated into significant poverty reduction, with 59 percent of the population living below the poverty line and 37 percent considered in extreme poverty. Accelerating growth and reducing poverty will necessitate increasing the competitiveness of the Zambian economy by reducing the cost of doing business and ensuring that the rural economy, upon which much of

the population depends for its livelihood, contributes meaningfully to overall growth.

The World Bank's Country Assistance strategy (CAS) for Zambia for fiscal 2008-2011 is closely aligned with the Zambian government's Vision 2030 and Zambia's National Development Plans (ZNDP). The plans are organized around the theme of broad based wealth and job creation through citizenry participation and technological advancement. Specific development goals are to foster a competitive and outward-oriented economy in order to significantly reduce hunger and poverty and reach middle income status.

Frequent floods and droughts have cost Zambia an estimated US\$13.8 billion over the past three decades. In its Sixth National Development Plan, the Government is aware of the need to strengthen climate resilience. It is one of the two pilot countries, with Nepal to qualify for the first phase of the Pilot Program for Climate Resilience, under the new Climate Investment Funds. Approval of the National Water Policy further consolidates the long standing reforms. The pending Water Resources Development Bill will provide much needed updates to the existing 1948 legislation and improve the platform for investments in infrastructure that will increase climatic resilience, support economic productivity and enhance competitiveness. Bank interventions include Country Water Resources Assistance Strategy and Water resources Development Project, PPCR.

Some of the major reform areas that the Government is implementing are briefly discussed below.

Table 4: Key sectors for reform

<p>Agriculture Sector Reforms</p> <p>The Zambian Government has agreed to pilot a fertilizer voucher program in order to increase the involvement of the private sector in fertilizer distribution, while gradually reducing the 50 percent expenditures on fertilizer and increase allocations for research, extension, irrigation and rural roads. Bank interventions include Tracking Study of the Fertilizer Support Program (FSP), Public Expenditure Review, Agriculture Development Services Project, Irrigation Development Project and Livestock Development Project to improve productivity in the smallholder agriculture sector which has been stagnant for the past decade.</p>
<p>Energy Sector Reforms</p> <p>Due to the interventions which include: Increased Access to Electricity Project and IFC Transaction Advice for the Kafue Gorge Lower Project, investor interest has increased significantly in the energy sector, with possibility to increase installed capacity from 1600 MWs to slightly under 3000 MWs over the next 5-6 years. Government has also increased tariffs by 35 percent recently, initializing a move to cost reflective tariffs. In addition, there are measures to improve the efficiency of the publicly owned utility ZESCO. Less than 3 percent of the rural population has access to energy despite the country's significant hydro potential.</p>
<p>Finance and Private Sector Reforms</p> <p>As a result of Support for Economic Expansion and Diversification Project, alongside technical assistance for Non-lending Financial Sector and Non-lending Competitiveness and the Doing Business Reform Team, Doing Business rankings have improved from 99 in 2009 to 90 in 2010, but the investment climate remains challenging. The poor productivity of Zambian firms undermines their ability to generate income and jobs. Government therefore has two programs underway to improve the business environment: The Financial Sector Development Program, now in its second phase, to address market infrastructure, competition, and broaden financial inclusion. The Private Sector Development Reform Program to streamline business registration, licensing, cross border trade, labour reforms and facilitate MSMEs and increase competition in tourism, agriculture and manufacturing.</p>
<p>Transport Sector Reforms</p> <p>Road Sector restructuring remains the most prominent reform in the sector. The Road Sector Investment Program (ROADSIP II) has been well received by donors including IDA. There is substantial improvement in the condition of the paved road network, which has</p>

<p>risen from 58 percent to over 90 percent in good or fair condition. However, further reform work in capacity enhancement is required in the Local Road Authorities.</p> <p>The performance of the railways sub-sector has also been sub-optimal despite the initial reforms that brought about the ongoing concession. Bank interventions, which include RRMP II Project and Railways Diagnostic Study, will enhance efficiency gains in the sector.</p>
<p>Telecommunications Sector Reforms</p> <p>Limited access and the high cost of telecommunications have resulted in Government's recent decision to sell a majority stake in ZAMTEL to the private sector.</p> <p>Efforts are underway to attract a foreign partner in order to further increase competition and to pave the way for ICT development. The Bank has been exploring the possibility of Zambia joining the Regional Communications Infrastructure Program (RCIP) for support in building the fibre backbone and linking Zambia to submarine cables on the East Coast. Non lending TA would also be provided to get Zambia to an Open Access policy environment. Bank Interventions include: RCIP, Non-lending technical assistance to the telecommunications sector.</p>
<p>Mining Sector Reforms</p> <p>Government is in the process of increasing accountability and transparency in the management of mining sector revenues. Zambia is a candidate country for the Extractive Industries Transparency Initiative (EITI) and is also implementing a series of upstream and downstream reforms, including mining taxation, establishing a mining cadastre and strengthening mining audit. Bank interventions include: Grant to support EITI certification; value chain diagnostic of the mining sector; Copperbelt Environment Project; Support for Economic Expansion and Diversification Project and Jobs and Prosperity ESW.</p>
<p>Public Sector Reforms</p> <p>Cabinet has recently approved a new Payroll Policy for civil servants and a Decentralization Policy. Both of these initiatives will need to be gradually phased in over the next three years. Financial management reforms that have been introduced into the Ministry of Finance will be extended to other Ministries to ensure that the new procurement guidelines and laws are implemented throughout Government and will remain urgent priorities. Bank interventions include: Public Expenditure Review and Public Sector Reform Project.</p>
<p>Governance Reforms</p> <p>Government has initiated numerous actions to improve governance including a new Anti Corruption Policy, new Procurement Act, a multi-year program aimed at strengthening integrated financial management through a process of computerization, introducing a single treasury account, strengthening institutions of accountability, and drafting and passing the Freedom of Information legislation. However, numerous implementation challenges remain. Bank interventions include: Public Sector Reform Project; GPF Trust Fund to improve Governance; EITI Grant.</p>

7. Mitigation/Adaptation Options

There are a number of potential mitigation options/ opportunities available to Zambia, which could meet both objectives of socio-economic development and climate protection. In the NAPA, following options are listed as potential mitigation options.

- **Mitigation Options**

A study of mitigation options was designed to identify policies and programmes for reducing GHG emissions in strategic sectors of the Zambian economy. In the energy sector the supply mitigation options included the improvement of the charcoal production process, switching from use of diesel power generators to minihydros, streamlining operations of the petroleum industry and minimising spontaneous GHG emissions from coal mining.

In the domestic sector, the main sources of energy are firewood and charcoal with firewood accounting for 70% of energy demand. Charcoal is used in the urban and peri-urban areas whereas firewood is used in the rural households. In 1990, 0.6 million and 1.3 million tonnes of charcoal and wood were consumed, respectively. The low efficiency of cookstoves calls for the consideration of more efficient charcoal stoves.

Only about 10% of the population has access to electricity. This diffusion rate calls for concerted efforts towards electrification to allow replacement of charcoal stoves with electric stoves. These options are aimed at reducing the pressure on forest degradation and reducing CO₂ emissions from charcoal production.

Mitigation measures for reducing CO₂ emissions in the manufacturing industries have focused on improving boiler operating efficiency as well as converting coal / diesel fired boilers to electric. In the mines reduction of CO₂ emissions, besides fuel switching from diesel to electricity, would be achieved through adoption of new technologies in the smelter operations (e.g. use of flash smelting furnace, ceramic concentrate filters, oxyfuel smelters etc).

In the transport sector, GHG emissions are related to consumption of gasoline and diesel. Pooling transport, running vehicles that are technically efficient and blending fuel with ethanol are examples of recommended measures for reducing GHG emissions.

In agriculture, mitigatory measures focused on reducing CO₂ emissions from chitemene cultivation by promoting usage of organic fertilisers, CH₄ emissions from paddy rice fields through intermittent flooding and N₂O emissions from livestock through feed supplementation.

In the industrial sector, where boilers and furnaces are in use, mitigation options considered are energy substitution and conservation. These mitigation options include substitution of heavy fuel oil- and diesel-fired boilers with electric boilers, extension of the national electric power grid to remote areas to replace diesel generators, and replacement of diesel pumps used for pumping crude oil with electric pumps. In the area of energy conservation, substituting a dry process for cement production is considered.

In the forest sector, the mitigation options considered are afforestation and improved management of natural vegetation, both of which would improve CO₂ uptake.

• **Adaptation options**

Zambia has identified the following potential measures for adaptation.

Table 5: A List of Adaptation Measures for Various Sectors

<p>Agriculture sector</p> <ul style="list-style-type: none"> - Adaptation of crops (cereals, legumes, root and tuber crops, and horticultural crops) to climate change/ variability including promotion of early maturing/drought resistance crops - Develop sustainable and appropriate programmes for both crops and livestock in the face of climate change - Promotion of irrigation and efficient use of water resources - Water harvesting - Use of technologies for fertility improvement and moisture storage (including soil conservation measures)
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<ul style="list-style-type: none"> - Improve post-harvest storage and marketing of produce - Strengthening of early warning systems and preparedness - Development of dams and dip tanks and sustainable supply of feed to mitigate the effects of droughts; - Promotion of Improved crop and livestock management practices - Introduction of well- adapted livestock - Boosting the Zambezi River Water System to increase delivery - Application of GIS/remote sensing in mapping of drought and flood prone areas - Fish breeding to restock the lakes, rivers and dams - Promotion of aquaculture - Using species suitable for aquaculture in vulnerable areas
<p>Human health sector</p> <ul style="list-style-type: none"> - Improved and diversified nutrition and fortified food supplementations for the under-fives and other vulnerable groups. - Improved access to water for better environmental health. - Use of Insecticide Treated Nets (ITNs) and other vector-control measures to prevent malaria. Use of climate-based early warning systems and GIS- mapping of vulnerable localities. - Water treatment for quality control (to prevent waterborne diseases) and climate –proofing of sanitation.
<p>Water and energy sector</p> <ul style="list-style-type: none"> - Use of renewable energies - Efficient use of charcoal and expanded use of ethanol stoves - Inter-Basin Water Transfers - Regional Integration of Electricity Infrastructure from Biomass Sources
<p>Wildlife and forest sector</p> <ul style="list-style-type: none"> - Improved fire management in game reserves - Construction of watering points e.g. boreholes for watering wildlife - Breeding programme for selected species in National Park - Translocation of animals - Community based ranching in order to protect vulnerable species - Culling to maintain sustainable animal populations - Identifying and protecting migratory routes of wildlife - Undertaking protective management measures to protect displaced wildlife populations - Developing small dams, and other storage facilities, to mitigate droughts/flooding, to harvest water and to initiate community-based fish farming and breeding - Improved extension services to ensure sustainable land and forest management - Promotion of community forest management - Forest fire management at the community level - Targeting afforestation and re-afforestation programmes to control siltation of streams and rivers as well as to provide fuel wood to minimize encroachment of the forests - Promotion of community woodlots for the provision of fuel wood and as sources of alternative cash income - Improving energy access and security, especially in rural areas (e.g., through the Rural Electrification Agency, promotion of - Developing and implementing strategies for drought preparedness, flood zoning and mitigation works - Restocking of depleted game areas

Reference:

- First National Communication, August 2002
- Formulation Of The National Adaptation Programme Of Action On Climate Change (Final Report), September 2007
- The World Bank's Country Assistance strategy (CAS) for Zambia, Fiscal 2008-2011
- UNFCCC website (GHG Profile, NAMA, NAPA, CDM)
- The World Bank website on country page for Zambia
- CIA the World Fact Book

This summary was prepared based on the data/information available as of September 2011.

2.3.10. セネガル

Senegal

● **Mainstreaming mitigation/adaptation actions in the national development strategy**

Agriculture forms the backbone of the Republic of Senegal's industry. The main challenge for the country is implementing optimal strategies of sustainable supply of energy resources to combat poverty and reduce the effects of drought. As most of the country's emissions come from the energy sector, diversification of energy sources by promoting renewable energy, and promoting energy efficiency practices would contribute to reducing the country's dependence on imported oil to achieve sustainable economic growth. For agriculture, the other large emitter, solutions can be found to counter the effects of reduced rainfall and resultant drought to contribute, which is the largest problem faced by the country.

● **Summary on climate change related issues in the country**

1. Climate change policy

Senegal ratified the United Nations Framework Convention on Climate Change (UNFCCC) on 17 Oct 1994, and entered into force on 15 Jan 1995. It submitted its First National Communication on 1st December 1997, and subsequently presented the Second National Communication on 16 September 2010.

From 2000 to 2010, the administrative division of Senegal has undergone several changes that led to a decentralization of the state, allowing local authorities to intervene on issues related to the environment, housing, transport and others. Senegal has adopted a system of normative economic planning, based on the definition of five-year development plans that integrate sound environmental management. The following are examples of plans and strategies that have been made by the State:

- the National Action Plan for the Environment
- the National Action Plan for the Fight against Desertification
- the National Strategy for Biodiversity Conservation
- the National Strategy for Sustainable Development

The Environmental Code (Act No. 2001-01 of January 15, 2001) and its implementing decree (Decree No. 2001-282 of 12 April 2001) are the basic legal framework for the prevention and fight against pollution, and protection of environment (air, water and soil).

As part of its decentralization policy, the Government of Senegal has decided to transfer skills in management of natural resources and environment for local authorities encouraging grassroots empowerment.

2. National efforts/measures against climate change

The environment in Senegal is characterized by an arid climate, vulnerability to changes in rainfall and strong pressure on natural resources by those in poverty, so that these already fragile resources have become increasingly scarce. High illiteracy and impoverishment across broad social strata have led to increased pressure on natural resources. The focus is to involve and empower people in managing their lands.

- For the implementation of the UN Framework Convention on Climate Change, the institutional, legal and regulations have been adopted and apply to both strategies, policies, programs and action plans defined to strengthen the commitment of countries in the global effort to protect the environment. The framework is structured as follows:
- A focal point for climate change provided by the Ministry in charge of the Environment through the Directorate of Environment and Classified Establishments (DEEC) which is also the focal point of Operational funds for the Global Environment Facility (GEF). This department also ensures the role of designated national authorities of the Clean Development Mechanism.
- A National Committee on Climate Change (COMNACC), which brings together all stakeholders involved in issues related to climate change (administrative technical services, the private sector, NGOs, civil society, research organizations, associations of local elected officials, universities, etc.), is responsible for monitoring the activities developed within the framework of the implementation of the Convention.
- A focal point of the Intergovernmental Panel on Climate Change (IPCC) in this case the National Agency of Meteorology.

The Letter of Environmental Policy aims to address the need to reconcile conservation and exploitation of natural resources and the environment for sustainable development.

Senegal intends to focus on priority areas of New Partnership for Africa's Development (NEPAD) by implementing the following lines of action: "(i) fight against desertification, (ii) protection of wetlands, (iii) fight against invasive alien species, (iv) improved coastal management, (v) the fight against global warming, (vi) protect cross-border areas; (vii) boost environmental governance, (viii) Achieve the Millennium Development Goals in sanitation, to reduce by half by 2015 the number of people who do not have an adequate sanitation.

The establishment of the Unit for Studies, Planning and Monitoring in the Ministry for the Environment is also part of the country's strategy for management of environmental policy. It carries out pre-evaluation of projects and programs that will be executed, the search for synergy in the actions, encouragement of cooperation and management of external assistance.

With regards to CDM projects, Senegal opened its Designated National Authority (DNA) in February 2005 as an arm of the environment ministry (Direction de l'Environnement et des Etablissements Classés).

Senegal now has 6 projects submitted to UNFCCC of which one project, an energy efficiency project at a sugar mill generating 37,386tCO₂/year, has been registered. Rest of the projects are at validation stage. Types of projects quite vary such as wind power, afforestation/reforestation, fuel switching and methane gas recovery.

The greatest potential lies in small-scale island projects for heat and electricity generation in households and small businesses not easy to afford the cost and time involved in the CDM process. This potential could, however, be exploited using the Programmatic CDM approach and methodologies which take account of avoided deforestation and suppressed energy demand.

3. Sustainable Development and Mitigation

• National inventory of greenhouse gas

GHG emissions in Senegal totalled about 16,882.5kt CO₂e in 2000, excluding CO₂ emissions/removals in the LUCF sector. Recent figures from the German Ministry of Environment indicate carbon emissions alone in Senegal amount to 19,000 kt a year (1.8 t CO₂ per capita) (November 2008), suggesting a sharp increase in overall GHG emissions.

Table 1: Senegal GHG emissions summary

Total National Emissions and Removals	CO ₂ Emissions (kt)
	2000
CO ₂ emissions without LUCF	6,788.9
CO ₂ net emissions/removals by LUCF	-10,555.0
CO ₂ net emissions/removals with LUCF	-3,766.1
GHG emissions without LUCF	16,882.1
GHG net emissions/removals by LUCF	-10,521.6
GHG net emissions/removals with LUCF	6,360.5

As presented in below figure, by sector, Senegal's GHG emissions profile is dominated by emissions from energy contributing 48.5% of the total while by gas, it is dominated by CO₂ contributing 40% of the total CO₂ equivalent emissions in 2000 without LUCF.

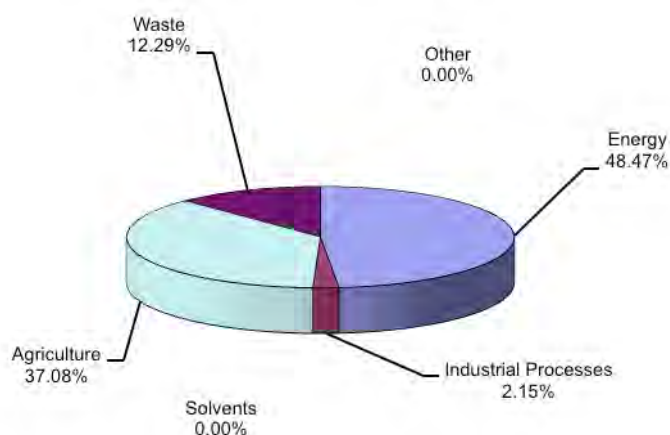


Figure 1: GHG emissions by sector (without LUCF) in 2000

The industrial process that generates the largest quantity of greenhouse gas emissions is the production of cement from clinker. Non-methane volatile organic compounds (NMVOC) emissions and sulfur dioxide (SO₂) are very low compared to emissions of carbon dioxide (CO₂) from the production of cement from clinker.

• Summary of Nationally Appropriate Mitigation Action (NAMA) plan

Senegal has not submitted its NAMA plan. However, as presented in the Section 7 "Mitigation/Adaptation Option" in this summary, concrete mitigation plans has been specified in the National Communication of the country.

4. Adaptation and Vulnerability

• Vulnerability to Climate Change

Although Senegal produces only 0.05 percent of emissions worldwide, it is one of the most vulnerable nations as regards the effects of climate change. While an increase is expected in the number of days with particularly high temperatures and heavy rainfall, forecasts show a drop in average annual rainfall levels. This will severely impact on living conditions for people in the already environmentally fragile Sahel zone. Local pressures from industry and transport are an added problem, especially around Dakar. Forest areas are mostly found in the south and still cover around 20 percent of the country. Approximately 0.7 percent of the country's forests are lost every year to felling, slash and burn activities, and drought. Some 56 percent of the population use firewood for cooking.

Only about a third of Senegalese homes are connected to the electricity grid. Most of the available electricity capacity (550 MW) is supplied by oil-fired power stations. To supply electricity to rural areas, the Senegalese Agency for Rural Electrification (Agence Sénégalaise d'électrification rurale, or ASER) gives concessions to private suppliers. In return for a grant, they must take responsibility for supplying power for a 25-year period.

The Dakar region is characterized by a high water demand and a relatively unfavourable geographical context. The water needs for the population is an almost constant problem for Senegal. With the concentration of the bulk of industrial and horticultural activities in the region of Dakar, the water needs are increasing very rapidly and very often exceed supply. Finding solutions to these problems absorb a large part of public investment. The achievement of the Millennium for Development by 2015 requires new investment in water and sanitation, estimated at 515 billion CFA francs in the National Program for Water Supply and Sanitation of the Millennium.

Agriculture in Senegal is very dependent on the vagaries of climate and soil suitability. The formation of different soil types has been strongly influenced by the model, the climate evolution of the country and its geomorphological history. The current vulnerability is primarily due to the strong dependence of Senegalese agriculture vis-a-vis a rainfall that is scarce over time and whose variability is difficult to predict. The effects of climate change on agriculture are lower yields and production in general.

• Climate Change National Adaptation Programme of Action (NAPA)

Senegal completed its NAPA in 2006, and subsequently submitted it to the UNFCCC, after nearly 18 months of project activities. Despite delays in starting up the process, Senegal completed the required steps in the process fairly quickly and efficiently. The smoothness of the process in Senegal can be attributed to the existence of a cadre of available expertise, well-established coordination and communication mechanisms, and tried and tested consultative processes. Like other countries, Senegal is suffering from a gap in implementation, though this is not unique to the NAPA: a number of plans, laws and regulations are awaiting application due to a lack of resources or, in this case, to delays in the funding mobilization process.

The table below presents the NAPA priority projects of Senegal.

Table 2: Senegal NAPA Priority Projects

	Project Title	Indicative Cost (USD)
1	Implementation of agroforestry in: A) North Region, B) Bassin Arachidier Region, C) South Region: Tambacounda, Kolda, Ziguinchor, D) Niayve Region	11,746,000
2	Sustainable use of water. 1. Revitalization of lowland water system, temporary ponds and artificial lakes in support to the retention basin program. 2. Promoting drip irrigation	6,652,000
3	Protection of the coastal region. 1. Reforestation of coastal sites. 2. Implementation of technical infrastructures. 3. Restoration of mangrove vegetation. 4. Implementation of alternative measures to the exploitation of coastal sand. 5. Implementation of institutional measures	40,624,000
4	Awareness raising and Education	160,000

5. Major Industries

Senegalese agriculture occupies 12% of the country and is the basis of the economy. The agricultural sector employs nearly 70% of the workforce. It contributes 10% to the formation of gross domestic product and accounts for an average of the tenth public investment (Global Environment Fund, 2006). The fishing industry is one of the most important areas of primary sector activity in Senegal. In 1994 the industry accounted for 8.5 percent of the GDP, employed 200,000 persons, provided 27.3 percent of total exports, and earned US\$240 million.

Mining and manufacturing are also key sectors. Mining output in Senegal is primarily calcium phosphates. In 1994 phosphate and phosphate products accounted for 19 percent of total merchandise export earnings, producing US\$162 million in export revenue. Manufacturing is an important component of the secondary sector, accounting for 12.5 percent of GDP. Senegalese industries process a range of commodities that includes food, textiles, wood products, chemicals, construction materials, machinery, equipment, electricity, and water. Food ranks as the most important economic contributor, accounting for 43.1 percent of all industrial manufacturing output.

6. National development strategy

In Senegal, the economic and financial objectives and long-term aim is still the intermediate objectives of the Millennium Development Goals and the satisfaction of social demand. The different areas of intervention will continue to be structured around the guidelines of the Poverty Reduction Strategy (PRS) and the Accelerated Growth Strategy (CAS) which is to make Senegal an emerging country. The CAS is essentially: (i) an acceleration of economic growth, for a qualitative improvement of the structure of the economy to make it more effective in the fight against poverty, and (ii) diversifying sources of growth in order to increase the growth rate of real GDP long-term is over 7% annually.

Under the current Country Assistance Strategy for the period 2007-2010, there are 26 active projects under the World Bank program with total commitments of US\$857 million. The largest share of the portfolio is in education (25%), followed by public administration and law (20%), and transport (16%). In addition, Trust Funded (TF) grants are currently complementing the IDA portfolio with an additional US\$138 million, especially for education and the environment.

A new Country Assistance Strategy (CAS) for the period of fiscal year 2012-15 is currently under preparation. The new CAS recognizes that more efforts are needed to address the challenge of weak governance in Senegal, and introduces a governance filter comprising four core principles to ensure that governance considerations are mainstreamed into programs under international aid organizations by: (i) improve transparency and efficiency in the use of public resources; (ii) increase public sector accountability; (iii) strengthen and modernize the judicial system; and (iv) enhance mechanisms for private sector governance. This focus should help Senegal to close the gap with successful emerging countries.

7. Mitigation/Adaptation Options

In the Second National Communication, following options are listed as potential areas of mitigation options in Senegal.

Table 3: Mitigation Options for Senegal

<p>Energy sector</p> <ul style="list-style-type: none"> - The promotion of improved stoves using charcoal and organic carbon - Promotion of improved stoves using wood fires, and other biomass waste. - Promotion of renewable energy - Improving the management of the system of centralized production of electricity - Centralized production of electricity - Strengthening the weight of natural gas in the fuel balance - Energy efficiency in production - Reduction of technical losses in transmission and distribution of electricity - Use of renewable energy for centralized generation of electricity - The promotion of efficient technologies for charcoal - Energy audits, thermal regulation of buildings, equipment labeling, outreach program of energy-saving lamps
<p>Transport sector</p> <ul style="list-style-type: none"> - Promotion of public transportation - Promotion of the train and boat for transportation of goods - Energy Audit Centres
<p>Agriculture sector</p> <ul style="list-style-type: none"> - Avoid bare fallow: bare soil is subject to erosion and leaching of nutrients - Reduce dependence on fertilizers by adopting alternative farming systems, such as the practice rotation with legume crops - Change grazing management - Promote the production and use of manure composting and improved through the compost - Rehabilitate and restore degraded lands to increase carbon sinks - Improve rice production with minimal flooding
<p>Solid and liquid waste sector</p> <ul style="list-style-type: none"> - The proposed closure and rehabilitation of the landfill Mbeubeuss - Optimizing the use of treatment ponds and the reduction of methane emissions - The technical studies and / or implementation of development projects of biogas in the slaughterhouses of Dakar, Thies, Touba and the site of the future national abattoir
<p>Industrial sector</p> <ul style="list-style-type: none"> - Improvement of the quality of clinker in cement production - The use of certain mineralization (generally fluoride salts (fluorspar))

- Absorption of SO₂ with hydrogen peroxide in the production of concentrated sulphuric acid (SO₂ emissions from the production of sulphuric acid of ICS (Chemical Industries of Senegal))
- Introduction of new technologies for optimal control of processes
- Replacement of the vanadium catalyst with cesium

The adaptation options gleaned from the NAPA report for Senegal are mainly focused on agriculture.

Table 4: Adaptation Options for Senegal

Agricultural and crop sector	
- Improving the efficiency of irrigation water	
- Fight against wind and water erosion	
- Use of short-season varieties in the Dieri	
- Rehabilitation of flood recession cropping	
- Development of forage crops	
- Use of short cycle varieties for millet and cowpea	
- Use of short-season varieties	
- Improvement and restoration of soil fertility	
- Fight against land salinity (dykes and small anti-salt dams)	
- Rehabilitation of traditional crops such as fonio, groundnuts and sesame	
- Dissemination of forage harvesting techniques	
- Use of rice varieties tolerant to salinity and acidity	
- Promotion of organo-mineral fertilization	
- Dissemination of techniques that consume less wood charcoal	
- Domestication of forest fruit	
Grassland and Livestock sector	
- Fattening sheep and cattle	
Forestry sector	
- Establishment of community forests	- Regeneration and protection of Australian pine belt
- Enrichment of natural forests	- Agroforestry techniques
- Fight against bush fires	
Water Resources sector	
- Drainage management in the fight against salinity in the delta lands	- Development of retention ponds and pools

Reference:

- Second National Communication, September 2010
- The World Bank Country Assistance Strategy for Senegal, Fiscal 2007-2010
- UNFCCC website (GHG Profile, NAMA, NAPA, CDM)
- The World Bank website on country page for Senegal
- CIA the World Fact Book

This summary was prepared based on the data/information available as of September 2011.

2.3.11. タンザニア

Tanzania

- **Mainstreaming mitigation/adaptation actions in the national development strategy**

United Republic of Tanzania's economy is largely dependent on agriculture which is its main source of GHG (CH₄) emissions in the country. Unlike other countries in Africa, Tanzania has less source of LUCF. Better practice and adaptation activities in agriculture and livestock sector will heavily contribute to GHG emission reduction as well as economic development. Efficient energy generation practice can be paid more attention in the development strategy.

- **Summary on climate change related issues in the country**

1. Climate change policy

The United Republic of Tanzania ratified the United Nations Framework Convention on Climate Change (UNFCCC) on 17 April 1996, and the Kyoto Protocol on 26 August 2002.

According to the First National Communication submitted to the UNFCCC in July 2003, the main players in the climate change field are the Division of Environment, the Tanzania Meteorological Agency, the Department of Energy, Universities, and non-governmental institutions, and the National Climate Change Steering Committee (NCCSC) under the chairmanship of the Division of Environment.

The National Environmental Policy, promulgated in December 1997, provides the framework for mainstreaming environmental considerations in decision-making processes in Tanzania. It provides guidelines on plans and priority actions, monitoring and evaluation. It further provides for sectoral and cross sectoral policy analysis in order to achieve compatibility among the sectors and interest groups and exploit synergies among them.

2. National efforts/measures against climate change

As part of its national efforts against climate change, Tanzanian government undertook a study on technological options for the mitigation of greenhouse gas emissions. The study was carried out with the support of GTZ and was updated with GEF/UNEP support. The study has explored the various mitigation technologies, their characteristics and costs. Sectors analysed have included energy; industrial; transport; forestry and land-use; agriculture and livestock; household; commercial; and informal energy use.

In terms of CDM, Tanzania has set up a DNA (Designated National Authority) and now has 11 projects of which one project, a landfill gas in Dar Es Salaam has been registered and issued approximately 57,000 CERs. Rests of projects are all under validation. The project type varies from Afforestation/Reforestation, biomass, hydropower, etc.

3. Sustainable Development and Mitigation

- **National inventory of greenhouse gas**

Tanzania developed its GHG inventory in 1993 to 1994, based on data obtained from 1988 to 1990. GHG

emissions in Tanzania totalled about 39,236.7 kt CO₂e in 1994, excluding CO₂ emissions/removals in the LUCF sector.

Table 1: Tanzania GHG emissions summary

Total National Emissions and Removals	GHG Emissions (kt CO ₂ e)	
	1990	1994
CO ₂ emissions without LUCF	3,249.4	3,225.5
CO ₂ net emissions/removals by LUCF	62,975.0	810,454.2
CO ₂ net emissions/removals with LUCF	66,224.4	813,679.7
GHG emissions without LUCF	38,988.8	39,236.7
GHG net emissions/removals by LUCF	90,740.3	913,562.9
GHG net emissions/removals with LUCF	129,729.2	952,799.6

As presented in the tables below, Gambia's GHG emissions from the agriculture sector contributes for 75% of the total (without LUCF) in 1994. In terms of GHG emissions by gas, CH₄ contributes for 55% of the total GHG emissions (without LUCF) in 1994.

Table 2: GHG emission by sector (without LUCF) for 1994

Sector	tCO ₂ e	%
Energy	6,888.6	17.6%
Energy Industries	496.3	1.3%
Man. industries and construction	447.6	1.1%
Transport	1,673.2	4.3%
Other sectors	4,257.3	10.9%
Fugitive emissions	14.2	0.0%
Industrial Processes	370.5	0.9%
Mineral Products	368.5	0.9%
Other	2.0	0.0%
Agriculture	29,730.1	75.8%
Enteric Fermentation	11,932.9	30.4%
Manure Management	588.8	1.5%
Rice Cultivation	2,172.4	5.5%
Agricultural Soils	11,489.3	29.3%
Prescribed Burning of Savannas	2,860.4	7.3%
Field Burning of Agricultural Residues	686.3	1.7%
Waste	2,247.5	5.7%
Solid Waste Disposal on Land	348.8	0.9%
Waste Incineration	1,898.7	4.8%
TOTAL	39,236.7	100.0%

Table 3: GHG emission by gas (without LUCF) for 1994

	tCO ₂ e	%
CO ₂	3,225.5	8.22%
CH ₄	21,634.9	55.14%
N ₂ O	14,376.3	36.64%
TOTAL	39,236.7	100.00%

• **Summary of Nationally Appropriate Mitigation Action (NAMA) plan**

Tanzania has not submitted its NAMA plan. However, as presented in the Section 7 “Mitigation/Adaptation Option” in this summary, the National Communication of the country raises several mitigation options for the country.

4. Adaptation and Vulnerability

• **Vulnerability to climate change**

According to an assessment of vulnerability and adaptation, the mean daily temperature will rise by 3° C – 5° C, and a rise in the mean annual temperature on average by 2° C - 4° C. The study also indicates that there will be an increase in rainfall in some parts while other parts will experience decreased rainfall. The runoff of three major rivers will be altered. As a result of these changes, several sectors will become vulnerable. These sectors include agriculture, water resources, forestry, grasslands, livestock, coastal resources and wildlife and biodiversity.

These changes would adversely affect water supply and socio-economic activities. With respect to agriculture in areas where rainfall will increase, the leaching of nutrients, the washing away of the topsoil and water logging will affect plant development and yield. Climate change favours the occurrence of disease and pests due to the higher temperatures and increased rainfall.

Coffee will most likely be grown successfully where rainfall would increase. Cotton growing areas would be reduced. Maize yield will be reduced by about 33 percent over the entire country. These are some of the impacts on water resources and crop production.

In areas that will get less rainfall, irrigation will be required to substitute for moisture losses due to increased evapo-transpiration. Drought resistant crop varieties will be required. Under such conditions irrigation will most likely tend to be expensive because of reduced river runoff and the vulnerability of shallow wells necessitating the development of deep wells instead.

Climate change will most likely lead to an increase in incidences of malaria diseases across the country. The costs of malaria control would increase depending on vector resistance and their distribution. An assessment of the impact of climate change on malaria has not been undertaken due to limited resources.

• **Climate Change National Adaptation Programme of Action (NAPA)**

Tanzania National Adaptation Programme of Action (NAPA) document is informed by the aspirations National Development Vision 2025 for high and shared growth, quality livelihood, peace, stability and unity, good governance, high quality education and international competitiveness. Since Tanzania's economy is largely

dependent on agriculture, it is deemed that sustainable development can only be achieved when strategic actions, both short term and long term are put in place to address climate change impacts on agriculture and other key economic sectors.

A total of 72 adaptation activities were proposed from all sectors which were reduced to the following 14 project activities as the top most in terms of priorities.

- i. Increase irrigation by using appropriate water efficient technologies to boost crop production in all areas
- ii. Alternative farming systems and relocation of water sources including wells along the low lying coastal areas
- iii. Develop water harvesting and storage programs for rural communities particularly those in dry lands
- iv. Community based catchments conservation and management programs
- v. Explore and invest in alternative clean energy sources e.g. Wind, Solar, bio-diesel, etc.
- vi. promotion of application of cogeneration in the industry sector
- vii. A forestation programmes in degraded lands using more adaptive and fast growing tree species
- viii. Develop community forest fire prevention plans and programmes
- ix. Establishing and Strengthening community awareness programmes on preventable major health hazards
- x. Implement sustainable tourism activities
- xi. Enhance wildlife extension services and assistance to rural communities in managing wildlife resources
- xii. Water harvesting and recycling
- xiii. Construction of artificial structures, e.g., sea walls, artificially placing sand on the beaches and coastal drain beach management system
- xiv. Establish good land tenure system and facilitate sustainable human settlements

Basing on these activities project Profiles were prepared as indicated in the section below.

Table 4: Tanzania's NAPA Priority Projects

	Project Title	Cost (USD)
1	Improving food security in drought-prone areas by promoting drought-tolerant crops	8,500,000
2	Improving Water availability to drought-stricken Communities in Central part of the country	800,000
3	Shifting of Shallow Water Wells Affected by Inundation on the Coastal Regions of Tanzania Mainland and Zanzibar	3,300,000
4	Climate change adaptation through participatory reforestation in Kilimanjaro mountain	3,300,000
5	Community Based Mini-hydro for Economic Diversification as a result of Climate Change in Same District	620,000
6	Combating Malaria Epidemic in Newly Mosquito-infested areas	650,000

5. Major Industries

Growth in gross domestic product (GDP) has been between 5 and 7 percent in recent years, underpinning better development results. The drivers of growth over the past decade have been mining, construction,

communications, and the financial sector. Manufacturing, transport, and tourism have also posted solid growth rates. The service sector constitutes 47 percent of total value-added in the economy, compared to 36 percent in 1990.

About 80 percent of Tanzanian households depend on agriculture as their primary economic activity. The large degree of dependency on this sector renders the economy particularly vulnerable to adverse weather conditions and unfavourable prices in international primary commodity markets.

6. National development strategy

A new Country Assistance Strategy for Tanzania (CAS) which outlines planned support to Tanzania over the FY12-FY15 period was discussed by the World Bank Board of Executive Directors in June 2011. The CAS reflects government's development priorities as discussed in Tanzania's development strategy (MKUKUTA II), covering the FY10/11-FY14/15 period.

World Bank Group support to Tanzania will focus on the following four strategic objectives:

Objective One: Promote Inclusive and Sustainable Private-Sector Led Growth. WBG will support the government to improve the conditions for the private sector by strengthening the financial sector and by expanding the broadband network. To improve income in the agriculture sector, Bank support will help farmers to adopt more productive agricultural techniques and will include construction of agricultural infrastructure. To make economic growth sustainable, the Bank will support the government in protecting and managing its natural resources by financing climate adaptation measures, improving land management practices, as well as governance.

Objective Two: Build Infrastructure and Deliver Services. The CAS extends the existing partnership with government in building infrastructure and in delivering services from infrastructure to release constraints to growth. Expected results include more people with access to more reliable electricity, increased share of roads in good condition, and more people with access to good water. Municipal services such as waste collection, street lighting, and urban transport will be improved.

Objective Three: Strengthened Human Capital and Social Safety Net. WBG's strategic focus will be to build a healthy and skilled population base that is better prepared for the changing economy, while reducing vulnerability. In education, expected results are increased secondary enrolment and completion rates, with particular attention to girls' schooling. To decrease maternal mortality, expected health care results include a higher percentage of deliveries taking place in health facilities. To protect the most vulnerable, the CAS aims to increase the income of targeted beneficiaries.

Objective Four: Promote Accountability and Good Governance. The World Bank will support selective interventions where it has a comparative advantage, such as public financial management, public service reform, and decentralization. Expected results will include increased share of timely transfers to participating LGAs, improved performance of MDAs and service delivery, as well as increased budget transparency at local and central levels.

7. Mitigation/Adaptation Options

• Mitigation Options

The First National Communication specifies that a number of technological and other options for the mitigation of greenhouse gases in Tanzania have been identified in various sectors including energy, forestry and land-use, agriculture and livestock, industry, household energy use and transport. The table below presents concrete list of targeted mitigation area of the country.

Table 5: Tanzania's GHG Mitigation Options

Sector	Option	Description
Energy Supply	<ul style="list-style-type: none"> (i) Technological <ul style="list-style-type: none"> • Advanced electricity generation technologies • Efficiency improvements • Charcoal production • Coal mining • Renewable technologies (ii) Non-Technological <ul style="list-style-type: none"> • Energy pricing policy • Regulations and standards • Bonus and penalty 	<ul style="list-style-type: none"> • Install 230 MW of combined-cycle power plants instead of simple cycle gas turbines • Interconnecting to neighbouring countries by the year 2000 • Installation of gas power by the year 2000 • Increase the efficiency of existing power generation systems by repowering and improving transmission and distribution systems • Improve the conversion efficiency of charcoal kilns • Optimize methane release from coal mines • Use solar collectors, photovoltaics, wind turbines, and biomass energy sources • Energy pricing policy which stimulate the efficient development and utilization • Regulations and standards to safeguard the environment and property against the misuse of energy and accidents • Bonus and penalty schemes in the form of direct rewards, or indirectly in the form of tax rebates, tax holidays, or loan interests
Industry	<p><i>Cement Production</i></p> <ul style="list-style-type: none"> • Production management • CO₂ recovery system • Fuel switching • Production mix <p><i>Pulp and Paper</i></p> <ul style="list-style-type: none"> • Efficiency improvements • Recovery of CO₂ <p><i>Other Industries</i></p> <ul style="list-style-type: none"> • Energy efficiency improvements 	<ul style="list-style-type: none"> • Install automatic control systems for reducing the amount of fuel used and improving production efficiency • Install CO₂ recovery systems. Recovered CO₂ can be used for other industrial applications • Substitute natural gas for fuel oil in two production plants • Produce blended cements such as pozzolanic cements, blast furnace slag cement, and Portland cements in order to reduce the amount of fuel used for calcination and the amount of lime used per unit of cement produced • Optimize the recovery boiler in order to reduce both the amount of lime and energy used • Recover CO₂ from calcination by the absorption of CO₂ • Improve efficiency in existing plants through maintenance, improved steam production and management, improvements to motor drive systems, cogeneration, and power factor correction
Transportation	<ul style="list-style-type: none"> • Vehicle efficiency • Improve system efficiency • Modal split • Urban transport • Fuel substitution 	<ul style="list-style-type: none"> • Improve the technical efficiency of vehicles • Improve traffic flows, increase vehicle load factors, improve vehicle maintenance, traffic operations, training and management • Rehabilitate and expand the rail system • Implement city trains in Dar es Salaam • Use of Compressed Natural Gas (CNG) Vehicles*
The Household and Service Sector	<ul style="list-style-type: none"> • Electrical appliances • Cookstoves • Waste management • Fuel switching 	<ul style="list-style-type: none"> • Improve the efficiency of electrical appliances • Increase the efficiency of biomass cookstoves • Waste management including landfills and waste water treatment • Population to switch from woodfuel to charcoal or kerosene, or liquefied petroleum gas (LPG) and electricity • Switch from conventional rural electrification using diesel generator sets or grid power extension to centralised solar electrification
Agriculture and Livestock	<ul style="list-style-type: none"> • Agricultural practices • Livestock husbandry 	<ul style="list-style-type: none"> • Reduce methane and carbon emissions through better practices related to fertilizer application, rice cultivation, and the loss of organic carbon from cultivated soils • Better husbandry, including better breeding and feeding practices
Land-Use and Forestry Sector	<ul style="list-style-type: none"> • Forest management • Grasslands and rangelands 	<ul style="list-style-type: none"> • Maintaining existing stocks through forest protection and conservation; and expanding carbon sinks by means of afforestation, reforestation, and enhanced natural regeneration and agroforestry practices • Maintaining or increasing carbon sequestration through better soil management and sustainable agricultural practices

• **Adaptation Options**

Suggested below are adaptation measures for each sector.

<p>Agriculture Sector</p> <hr/> <p>Maize</p> <ul style="list-style-type: none"> · Increase irrigation to boost maize production in all areas · Grow short-season and drought-resistant crops · Adjust farming areas · Change crop rotation practices · Increase the use of manure and fertilizer · Control pests, weeds, and diseases · Make better use of climate and weather data, weather forecasts, and other management tools <p>Coffee</p> <ul style="list-style-type: none"> · Follow standard agronomic practices <p>Cotton</p> <ul style="list-style-type: none"> · Follow standard agronomic practices
<p>Grasslands/Livestock Sector</p> <hr/> <p>Reactive adaptation measures:</p> <ul style="list-style-type: none"> · Change land use patterns <p>Option:</p> <ul style="list-style-type: none"> - Make management changes: <ul style="list-style-type: none"> · management for proper range use · range management for livestock production · manipulation of range vegetation - Make infrastructural changes <p>Anticipatory adaptive measures:</p> <ul style="list-style-type: none"> · Infrastructural development · Research and development · Education of farmers · Input costs and product pricing
<p>Forestry Sector</p> <hr/> <ul style="list-style-type: none"> · Reduce the rate of deforestation · Protect the existing forests · Introduce new tree species or strengthen the conservation of the existing species · Change or improve the use of forests and forest products
<p>Water Sector</p> <hr/> <ul style="list-style-type: none"> - Supply management: increase capital investment in reservoirs and the infrastructure - Demand management: reduce the water demand by investigating new water-saving technologies and changing the patterns of use - Conservation in the domestic sector:

<ul style="list-style-type: none"> · Reduce the use of water for bathing and toilet flushing · Reuse cooking water · Repair leaks · Reduce use of water for washing cars · Harvest rainwater - Conservation in the agricultural sector: <ul style="list-style-type: none"> · Encourage night-time irrigation · Introduce closed conduits · Reuse drainage water · Use waste water/effluents - Conservation in the industrial sector: <ul style="list-style-type: none"> · Encourage the recycling of water
<p>Coastal Areas</p> <hr/> <ul style="list-style-type: none"> · Protect important areas · Construct sea walls · Implement building regulations · Regulate urban growth <p>Protecting the coastline of Dar es Salaam would cost TSh 270 billion; protecting the whole coastline of Tanzania would require TSh 9 trillion.</p>
<p>Health Sector</p> <hr/> <ul style="list-style-type: none"> · Control malaria transmission. A comprehensive malaria control programme need to be in place · Making use of an environmental barrier, chemicals, and biological barriers and chemotherapy · Environmental management and Environmental manipulation is directed at reducing or eliminating the breeding sites · Anti malarial drugs are aimed at the various stages of the development cycle of the parasite
<p>Wildlife and Biodiversity</p> <hr/> <ul style="list-style-type: none"> · Development and implementation of management plans for protected and conserved areas. · Community Based Management (CBM) programmes in areas surrounding the national parks and game reserves

Reference:

- First National Communication, July 2003
- UNFCCC website (GHG Profile, NAMA, NAPA, CDM)
- The World Bank website on country page for Tanzania

This summary was prepared based on the data/information available as of September 2011.

2.3.12. チャド

Chad

● **Mainstreaming mitigation/adaptation actions in the national development strategy**

With largely agrarian economy and low level of land use activities, the Republic of Chad is net carbon sink, resulting in negative GHG emissions. As one of the Least Developed Countries (LDCs), Chad's priority lies with economic development and in terms of climate change, adaptation. Adaptation actions in water and land management as well as infrastructure development could support the country to improve socio economic conditions.

● **Summary on climate change related issues in the country**

1. Climate change policy

The Republic of Chad ratified the United Nations Framework Convention on Climate Change (UNFCCC) on 7 June 1994, and the Kyoto Protocol on 18 August 2009.

According to the First National Communication (*Communication nationale initiale*) submitted to the UNFCCC in October 2001, the main players in the climate change field are the High National Committee for the Environment (*le Haut Comité National pour l'Environnement*), Agency for Domestic Energy and Environment (*L'Agence pour l'Energie Domestique et l'Environnement*) under the joint sponsorship of the Ministry of Mines, Energy and Petroleum (Ministère des Mines, de l'Energie et du Pétrole) and the Ministry of Environment and Water (*Ministère de l'Environnement et de l'Eau*).

Various laws are promulgated for environmental protection, protection of forests, fish and wildlife, and water resources management.

2. National efforts/measures against climate change

Actions to be taken by the Chad government are in the field of forest and land use change, agriculture and livestock, energy, industry, transport, and industrial and municipal solid waste.

In terms of CDM, Chad has set up a DNA (Designated National Authority) but does not have any registered projects or projects under validation.

3. Sustainable Development and Mitigation

• National inventory of greenhouse gas

Chad developed its GHG inventory in from June 1997 to December 1998. GHG emissions in Chad totalled about 8,021.1 kt CO₂e in 1993, excluding CO₂ emissions/removals in the LUCF sector.

Table 1: Chad GHG emissions summary

Total National Emissions and Removals	GHG Emissions (kt CO ₂ e)
	1993
CO ₂ emissions without LUCF	309.7
CO ₂ net emissions/removals by LUCF	-46,441.4
CO ₂ net emissions/removals with LUCF	-46,131.7
GHG emissions without LUCF	8,021.1
GHG net emissions/removals by LUCF	-46,198.1
GHG net emissions/removals with LUCF	-38,177.0

As presented in the tables below, Chad's GHG emissions from the agriculture sector contributes for 91% of the total (without LUCF) in 1993. In terms of GHG emissions by gas, CH₄ contributes for 86% of the total GHG emissions (without LUCF) in 1993.

Table 2: GHG emission by sector (without LUCF) for 1993

Sector	tCO ₂ e	%
Energy	309.7	3.9%
Other	309.7	3.9%
Agriculture	7,299.0	91.0%
Manure Management	4,939.2	61.6%
Rice Cultivation	1,680.0	20.9%
Agricultural Soils	3.3	0.0%
Prescribed Burning of Savannas	672.2	8.4%
Field Burning of Agricultural Residues	4.4	0.1%
Waste	412.4	5.1%
Solid Waste Disposal on Land	294.6	3.7%
Other	117.8	1.5%
TOTAL	8,021.1	100.0%

Table 3: GHG emission by gas (without LUCF) for 1994

	tCO ₂ e	%
CO ₂	309.7	3.86%
CH ₄	6,937.6	86.49%
N ₂ O	773.9	9.65%
TOTAL	8,021.1	100.00%

• **Summary of Nationally Appropriate Mitigation Action (NAMA) plan**

Chad has submitted a Note Verbale regarding its NAMA in August 2010.

Table 4: Chad's proposed NAMA activities

Sector	Activities
Energy	1. Promotion of renewable energies 2. Energy efficiency in urban and rural communities
Forestry	1. strengthening reforestation policy 2. REDD+
Agriculture	1. Forage seed multiplication and extension 2. raising the level of farmers 3. Manufacturing of compost and organic fertilizers
Transport	1. Development of less pollutant mode of transportation 2. Promotion of the use of biofuels

4. Adaptation and Vulnerability

- **Vulnerability to climate change**

According to studies on climate scenarios, changes in rainfall patterns may not be significant but increase in annual average temperature ranging from 0.8 ° C in the south, 1.2 ° C in the centre and 1.3 ° C in the north, may occur. With little variation in rainfall, their uneven distribution in time and a possible increase of evaporation caused by rising temperatures, weather conditions less favourable than those currently prevailing may occur. These conditions may affect wood resources, water resources and rural development sectors.

- **Climate Change National Adaptation Programme of Action (NAPA)**

The following projects are suggested in the NAPA.

Table 5: Chad's NAPA Priority Projects

	Project Title	Cost (USD)
1	Retention of surface water for agriculture and feeding of livestock	1,800,000
2	Diversification and intensification of cultures in Sudanese and Sahelian areas	1,200,000
3	Improvement and promotion to the general public of cultural calendars	1,000,000
4	Improvement of information, education and communication on adaptation to climate change	1,100,000
5	Construction of infrastructure for the defence and conservation of soils as a mean to develop agricultural activities	1,100,000
6	Enhancement of intercommunity pastoral areas	1,500,000
7	Improvement of the quality of seasonal forecasts for rain fall and surface water flow and their integration into an overall strategy for assessing vulnerability	1,700,000
8	National observatory for climate change adaptation policies	1,600,000
9	Food bank for livestock	1,000,000
10	Reduction of climate change related vulnerability of the populations/management of climate change induced risks	2,000,000

5. Major Industries

Chad's growth rates since 2003 have been largely driven by evolutions in the oil sector, and the economy is currently heavily dependent on oil. However, oil supply is declining—down from 177 thousand barrels per day in 2005 to 120 thousand barrels per day in 2010¹, and Chad's oil reserves are limited, even when considering new fields under development. A critical challenge for the country and its decision-makers will therefore be to gradually reduce the dependence on oil and reduce the non-oil primary deficit which is 31.2% of non oil GDP in 2010.

6. National development strategy

The World Bank has not drawn up a Country Assistance Strategy for Chad since 2004-06. The Chad Government presented their Poverty Reduction Strategy Paper (PRSP) in June 2003. The document assesses the extent of poverty in Chad, defines the causes, outlines the strategy to eradicate poverty, and describes the plan for implementing the PRSP.

The poverty reduction strategy aims to reduce poverty to below half the estimated 1995 level by 2015, in line with the Millennium Development Goals. Other strategic priorities are listed below:

- Improve political, judicial, economic and social governance
- Ensure strong and sustained growth
- Improve human capital, including HIV/AIDS prevention and mitigation
- Improve living conditions of vulnerable groups
- Restore and safeguard ecosystems.

The Chad PRSP will be implemented in three stages between 2003 and 2015. It includes proposed indicators and targets for monitoring and evaluating its progress and effectiveness.

7. Mitigation/Adaptation Options

• Mitigation Options

The First National Communication specifies that a number of options for the mitigation of greenhouse gases in Chad have been identified in various sectors including forests and land use change, agriculture and livestock, energy, transport and industry and waste.

Table 6: Chad's GHG Mitigation Options

Sector	Measures
Forest and land use change	<ol style="list-style-type: none">1. Management of natural resources2. Bush fire countermeasures3. forest creation4. Conservation and enhancement of biodiversity5. Fire wood saving and its substitution by other energy sources6. Protection and restoration of soil
Agriculture & Livestock	<ol style="list-style-type: none">1. Intensification of agriculture by:<ul style="list-style-type: none">- Soil conservation and restoration technology- Conservation and development of water resources2. Intensification of the system by:

	<ul style="list-style-type: none"> - Integration of agriculture and livestock - Adoption of an improved and diversified animal husbandry
Energy	Use of fuels with low carbon content (gas)
Industry	<ol style="list-style-type: none"> 1. electrical interconnections 2. use of renewable energies (solar and wind) 3. electricity by hydro power 4. Use of cleaner fuels in industries (gas, biomass)
Transport	<ol style="list-style-type: none"> 1. Use of better quality fuel 2. Use of cleaner vehicles and in good condition.
Industrial, household and municipal waste	<ol style="list-style-type: none"> 1. energy recovery 2. agricultural use

• Adaptation Options

Suggested below are adaptation measures for each sector.

Table 7: Chad's Adaptation Options

<p>Timber and Water Sector</p> <hr style="border-top: 1px dashed black;"/> <p>Timber Resources:</p> <ul style="list-style-type: none"> - reforestation, dissemination of improved stoves and substitution to other fuels from firewood and charcoal <p>Water Resources:</p> <ul style="list-style-type: none"> - research on physical, biological, social and cultural data which enables effective planning and rational management of water - strengthening the monitoring network weather, erosion, water runoff, sedimentation and quality of surface water - the integration of management strategies for water resources in the overall system of the country's economy - the construction of dams runoff for irrigation; - the construction of dikes and dams to regulate water flow; - the development of lowland ponds and marshes as mentioned in the orientation plan
<p>Agro pastoral Sector</p> <hr style="border-top: 1px dashed black;"/> <ul style="list-style-type: none"> - planting of hedgerows (eg. Acacia) for firewood and as fertilizers - improved use of fallows (with legume and grasses or with animal grazing) - Use of organic materials processed (compost, manure) - Introduction of industrial crops less sensitive to water stress - Improved forage

Reference:

- First National Communication, August 2001
- UNFCCC website (GHG Profile, NAMA, NAPA, CDM)
- The World Bank website on country page for Chad

This summary was prepared based on the data/information available as of September 2011.

2.3.13. ブルキナファソ

Burkina Faso

- **Mainstreaming mitigation/adaptation actions in the national development strategy**

Burkina Faso is one of the most economically vulnerable countries in Africa. It is heavily dependent on agriculture, livestock and forestry, with cotton being the main source of income for the country. Sink capacity is decreasing due to heavy dependence on fuel wood. Promoting improved agricultural practices, research climate resistant varieties and looking into diversifying its crops would contribute to the move away from a monoculture industry. Conservation efforts in forestry and strengthening institutional as well as public capacity in order to protect forests would also be important agenda.

- **Summary on climate change related issues in the country**

1. Climate change policy

Burkina Faso signed the United Nations Framework Convention on Climate Change (UNFCCC) on 12 June 1992 and ratified it on 2 September 1993. The Convention entered into force on 21 March 1994. It submitted its First National Communications to the UNFCCC on 16 May 2002.

The government recognizes that the reduction of GHG emissions is interrelated to food and social security. The priority areas identified are:

1. The creation of an institutional framework;
2. Management of natural resources: agricultural land, pastoral resources, water, forests;
3. Rational management of energy resources;
4. The development of skills and capacities;
5. The sub-regional and international cooperation.

2. National efforts/measures against climate change

Burkina Faso has established a National Strategy for Implementation of the Framework Convention on Climate Change, which is not only a policy document, but also treated as a planning tool for concrete action on the ground. The implementation of the Framework Convention on Climate Change and the Kyoto Protocol in Burkina Faso is based on pressing issues of institutional capacity building, human and technological awareness and broadening public information, as well as overall strategy for integrated management of multidisciplinary programs.

The implementation work of this national strategy, coupled with that of National Action Programme to Combat Desertification and National Strategy on Biological Diversity are all taken as essential towards the achievement of sustainable development.

The responsibilities for climate change by various ministries are coordinated as follows:

- Ministry of Environment Management Office
Coordination of plans and programs environmental management, resources, forest and water; improving quality of life
- Ministry of Energy
Implementation of energy policy; promotion of renewable energy and energy savings
- Ministry of Economy and Finance
Coordination of sectoral policies
- Ministry of Agriculture
Improving agricultural productivity
- Ministry of Animal Resources
Improving animal productivity
- Ministry of Scientific Research and Higher Education
Research and development on productivity and the environment; research and development on developing potential renewable energy from agricultural and industrial residues
- Ministry in charge of Transportation
Implementation of sector strategy on transportation
- Ministry of Health
Implementation of the health strategy

Burkina Faso established its DNA in 2006. However it has not undertaken any CDM projects so far. A scoping study launched by UNDP Burkina Faso in collaboration with the Designated National Authority (DNA) of Burkina Faso in 2007 shows that the total CO₂ mitigation potential of the agriculture, forestry, waste, energy and transport sectors of the country is approximately 15 million tonnes of CO₂ between then and 2015, distributed among sectors. Crudely assuming a price of \$10 per tonne of CO₂e, this represents a revenue potential of over \$150 million. Despite this significant mitigation (and investment) potential, there are still no CDM projects registered in Burkina Faso. The country continues to face a number of challenges including: (i) institutional capacities, relationships, and practices to promote CDM projects are not sufficiently developed to create an enabling environment; (ii) limited knowledge of ways to access carbon finance amongst DNA members, the public sector, private companies, NGOs, local investment banks and business institutions; (iii) limited financing options to cover up-front project capacity needs; (iv) lack of information and analysis relating to greenhouse gas reduction opportunities.

3. Sustainable Development and Mitigation

• National inventory of greenhouse gas

GHG emissions in Burkina Faso totaled about 902Gg CO₂e in 1994, excluding CO₂ emissions/removals in the LUCF sector.

Table 1: Burkina Faso GHG emissions summary

Total National Emissions and Removals	CO ₂ Emissions (Gg)
	1994
CO ₂ emissions without LUCF	902
CO ₂ net emissions/removals by LUCF	-1,482.0
CO ₂ net emissions/removals with LUCF	-580.0
GHG emissions without LUCF	5,968.2
GHG net emissions/removals by LUCF	-1,388.7
GHG net emissions/removals with LUCF	4,579.5

As presented in below figure, by sector, Burkina Faso's GHG emissions profile is dominated overwhelmingly by emissions from agriculture contributing 78.89% of the total.

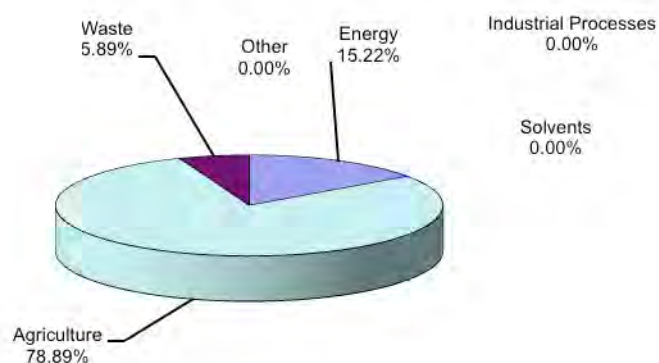


Figure 1: GHG emissions by sector (without LUCF) in 1994

Latest data from the World Bank for the year 2007 indicates that CO₂ emission per capita was 0.1 ton.

• **Summary of Nationally Appropriate Mitigation Action (NAMA) plan**

Burkina Faso has not submitted its NAMA plan. However, as presented in the Section 7 "Mitigation/Adaptation Option" in this summary, the National Communication of the country raises several mitigation measures for the country.

4. Adaptation and Vulnerability

• **Vulnerability to Climate Change**

According to the 4th Assessment report by the International Panel on Climate Change (IPCC), Sub-Saharan Africa is considered to be extremely vulnerable to the effects of climate change. For instance for Burkina Faso, climate models suggest that its mean temperature may increase by 0.8°C by 2025 and 1.7°C by 2050, and

annual rainfall could decline by 3.4% in 2025 and 7.3% in 2050.

Burkina Faso has a poverty headcount ratio that is actually worsening, from 44.5% of the population at the national poverty line in 1994, to 46.4% in 2003. This, coupled with the increasing threat from climate change, compounds the country's vulnerability.

In the National Communications a study on vulnerability / adaptation to climate change was conducted within three (3) strategic areas:

- Agriculture;
- Forestry;
- Water resources.

Agriculture

Agriculture is seen as a priority area as the main industry of the country, but one that already suffers from the periodic droughts. The following options are considered as adaptation options:

1. As for cultivated crops, efforts should continue in the selection varieties that adapt to new climatic conditions;
2. For production techniques, special emphasis should be placed on the intensification of cotton production. It is obvious that with the deteriorating weather conditions, cotton production will be more unreliable in the extensive system than today.
3. The various techniques for collecting run off water and recovery of degraded lands which are otherwise well controlled by populations of the northern areas of the country, should be introduced on a large scale in the cotton zone. Irrigation would also be considered as a supplement wherever possible.
4. Socio-economic - the current effort of cotton production is justified by the fact that it is a major foreign exchange earner for the country. But if the changing climate conditions require, diversification of crops must be considered in order to not depend on a monoculture industry. Crops such as gum Arabic, shea almonds, cow peas, sesame and peanuts are options.

Forestry

In the case of forest resources, the availability of sufficient quantities of fuel wood is a major concern in view of climate change. Thus, given the high cost operational management of forests on the one hand, and unfavourable climatic conditions predicted on the other, wood from managed forests will not be enough not ensure a steady supply for people in proximity to urban centres.

The adaptation options are:

- A reinforcement of socio-institutional participatory approach for the management of forestry areas;
- Integration of forestry areas;
- A higher income through the introduction of income-generating activities

Water resources

For Burkina Faso, a country highly dependent on natural resources, a change in climate change would be detrimental to the strategic objectives of self-sufficiency and food security. Water supplies, according to

rainfall variability and evapotranspiration, have an influence on the duration and nature of the growing season.

Two possible scenarios were envisaged in the study:

- Climate change cause excess water;
- Climate change creates a water deficit.

The current management of water resources includes the development and adoption of a preventive strategy for adaptation to climate change. However, the lack of flood warning system makes it difficult to implement it. In order to limit the impact of the continued decline of the resource, the following establishment of systems are deemed necessary:

- Reduce the number of losses (through evaporation and filtration) of lakes and reservoirs;
- Increase storage capacity.
- Rationing and the increasing the price of drinking water are also considered.

• **Climate Change National Adaptation Programme of Action (NAPA)**

The table below presents the NAPA priority projects of Burkina Faso.

Table 2: Burkina Faso NAPA Priority Projects

Priority Project Number	Priority Project Title	Indicative Priority Project Cost(USD)
1	Mitigating vulnerability to Climate Changes through the strengthening of a prevention and food crisis management system	400,000
2	Securing cereal production through the promotion of supplemental irrigation in the following areas: North Region (Oudalan Province) and Centre-North region (Namentenga Province)	408,660
3	Restoration and management of Oursi pond	275,000
4	Fodder production and development of fodder stocks for livestock in the Sahelian Region of Burkina Faso	330,000
5	Rehabilitation, sustainable management of natural vegetation, and valorisation of Non-timber Forest Products in the Eastern region of Burkina Faso	700,000
6	Control of sand encroachment/mud silting in the river basins of Mouhoun, Nakanbé and Comoé	352,000
7	Implementation of irrigated crops in Gourma, Namentenga, Tapoa and Sanmatnga regions	443,300
8	Protection of pastoral-suited regions in the Sahelian and Eastern regions	320,000
9	Securing agricultural production through the use of appropriate technological packages in the South-East and East regions	297,924
10	Promoting community-based fauna management in the Mouhoun region	810,000
11	Implementation of safety zones and backup devices to control pollution of underground and surface water catchment infrastructures (lakes, wells, boreholes) in the cotton belts	330,000

	of Burkina (Mouhoun, South-West, Comoé and the Eastern part of Nakanbé)	
12	Promoting the use of energy saving equipment (improved stoves, M'Bora stew pan) and renewable energy-based technologies (pressure-cooker, water heater and solar dryers, etc.)	1,230,000

5. Major Industries

Burkina Faso's economy is largely dominated by agriculture, livestock production and forestry. These three sectors occupy nearly 85% of the population and produce nearly two-thirds of its wealth. The main factors of production are land and human capital. GDP growth therefore depends predominantly on agricultural production which is largely linked to weather conditions, particularly given that mechanization and fertiliser use are relatively low. Agriculture is also the primary source of employment and income for nearly 85% of the population.

According to the World Bank, Burkina Faso's GDP for 2010 was \$8,820,312,674. Burkina Faso's economy relies predominantly on the performance of the cotton sector (23% of exports in 2009, 32% in 2008). This makes the economy particularly vulnerable to fluctuating cotton prices and to the impact of climate changes. Despite the increase observed in gold exports (42% of exports in 2009 and 53% in 2010) the economy remains vulnerable.

The country's economy is dependent on cotton exports and vulnerable to exogenous shocks, though over the last two years mining is becoming increasingly important in the economy. Between 2000 and 2010, Burkina Faso maintained an average growth rate of over 5.2 % per annum. According to the IMF, annual growth rate contracted from 5.2% in 2008 to 3, 2% in 2009 as a result of a series of exogenous shocks: climate shock, energy crisis, fluctuating commodity prices and global financial crisis. The economy recovered in 2010 (7 % of economic growth) due to a substantial increase in gold exports and increase in the metal's prices on international markets. Economic growth is targeted at 5.8 % in 2011.

6. National development strategy

Burkina Faso is a low-income, landlocked, Sub-Saharan country with limited natural resources and population estimated at 14 million inhabitants. The country ranked 161th out of 169 countries in UNDP's Human Development Index in 2010.

After a comprehensive assessment of the ten-year implementation of the PRSPs, the authorities of Burkina Faso prepared, through a participatory process, involving key stakeholders (central and local administration, civil society, donors, parliament, etc.), the Strategy for Accelerated Growth and Sustainable Development (SCADD). The SCADD targets a 10 percent per annum economic growth rate to reduce poverty to 35 percent between 2011 and 2015. The SCADD has four strategic pillars:

- Pillar 1: Accelerated growth.
- Pillar 2: Human capital development and social protection.
- Pillar 3: Improving the governance environment.
- Pillar 4: Cross-cutting priorities and themes of development policies and programs.

Stronger private sector investments, public private partnerships and development of growth poles are key elements of the SCADD's implementation. A new M&E framework was designed to help assess the impact of the SCADD on growth acceleration and poverty reduction.

The 2010-2012 Country Assistance Strategy was endorsed by the World Bank in September 2009. It is well aligned with the current Government's development strategy. The CAS's underlying principles are: transformation of the Burkinabe economy, adaptability to a global context marked by crisis, selectivity of the Bank's interventions, and lastly, a strong focus on results and efficiency.

The 2010-2012 CAS provides for a total engagement of 485 million US Dollars supporting the Strategy's two thematic pillars: i) Reducing economic vulnerability and promoting growth through economic transformation and ii) Sharing growth through improved service delivery.

The strategy has three cross-cutting themes of focus:

- Capacity building;
- Demography;
- Governance and anti-corruption

7. Mitigation/Adaptation Options

In the First National Communications, following options are listed as potential mitigation options.

Table 3: Mitigation Options for Burkina Faso

<p>Energy sector</p> <ul style="list-style-type: none"> - Sound management of electricity. The actions selected are: <ul style="list-style-type: none"> · Promote awareness of energy efficiency; · The substitution of incandescent bulbs with those of low consumption; · The promotion of energy-efficient refrigeration equipment.
<p>Forestry sector</p> <ul style="list-style-type: none"> - The action to slow the current trend of deforestation by protecting the classified forest of Maro; - The implementation of the option of reforestation / regeneration of the classified forest of Gonsé; - The development of local forest communities through development of the forest activities; - The fight against bush fires by opening and maintaining a network firewalls; - The organization of pastures; - The regeneration of derelict sites; - The definition of areas for regeneration of wildlife

Mitigation options for the other two sectors, namely agriculture and water resources, may be summarized as follows in the absence of any specific studies:

- Implement cash crops instead of cotton;
- Search more resistant varieties;
- Develop and implement a coherent management of water resources

The adaptation options gleaned from the NAPA report for Burkina Faso are outlined below.

Table 4: Adaptation Options for Burkina Faso

<p>Agricultural and crop sector</p> <ul style="list-style-type: none">- Diversify the sources of economic growth through the promotion of other sectors such as fruits and vegetables;- Continue the selection and improvement of crop varieties;- Promote the intensification of cotton production through the use of appropriate farming techniques with the systematic use of organic manure;- Promote research and development and seek funding for its implementation;- Promote alternative products to offset the shortfall in the cotton sector;- Integrate agro-meteorological information;- Establish incentives for better use of by-products of cotton;- Reorganize the financing of the cotton sector.
<p>Forestry sector</p> <ul style="list-style-type: none">- Strengthen measures to protect forests while promoting a participatory approach by increasing awareness, training and organization of populations of villages surrounding forests;- Enlist local people in conservation efforts and resource forestry;- The promotion, support and advice to groups of loggers so they can manage their autonomy;- The transfer of populations living illegally in the forests in order to reduce human pressure on the natural environment;- The promotion of conservation measures of wood;- Promotion of measures on alternative energy;- The mobilization of financial resources for the implementation of activities;- Strengthening institutional capacity.

Reference:

- Burkina Faso First National Communication, May 2002
- UNFCCC website (GHG Profile, NAPA, Designated National Authorities, CDM)
- UNDP – AFRICAVIEWPOINT: <http://www.undp.org/africa/africaviewpoint/2009-march.pdf>
- The World Bank databank for Burkina Faso: <http://data.worldbank.org/country/burkina-faso>

This summary was prepared based on the data/information available as of September 2011.

2.3.14. マラウイ

Malawi

- **Mainstreaming mitigation/adaptation actions in the national development strategy**

Republic of Malawi is one of the Least Developed Countries (LDCs). Although Malawi is a net emitter of GHG, mainly methane emissions from Land Use Change and Forestry (LUCF) sector, its priority lies not with mitigation but adaptation to climate change. Malawi's vulnerability to impacts of climate change is attributed to socio-economic challenges. By linking mitigation actions with improvement of socio-economic aspects of the society, Malawi can succeed in addressing both mitigation and adaptation needs. As such, Malawi has identified improvement of household fuel and lighting, making use of renewable energy as well as improvement in agricultural techniques as potential measures.

- **Summary on climate change related issues in the country**

1. Climate change policy

The Republic of Malawi signed the United Nations Framework Convention on Climate Change (UNFCCC) in June 1992 at Rio de Janeiro, Brazil, during the United Nations Conference on Environment and Development (UNCED).

In spite of low national capacities, Malawi has undertaken measures to implement the UNFCCC. In 1994 Malawi finalised the National Environment Action Plan (NEAP), which outlines measures and priorities to promote sustainable use of the environment. Furthermore the following strategic measures are now in place:

1. A legal framework (Environment Management Act, 1996) for environmental management;
2. An Environmental Policy (1996);
3. Environmental Impact Assessment (EIAs) guidelines and procedures for development activities/projects;
4. Mainstreaming of environmental education and conservation in institutions.

2. National efforts/measures against climate change

Malawi is a Least Developed Country (LDC), hence reducing emissions of Greenhouse Gases is not an obligation under the UNFCCC. However, the reduction of GHG emissions and the enhancement of sinks provide opportunities and challenges for the socio-economic development of the country. Thus Malawi undertook mitigation analysis in Energy, Agriculture and Forestry. The opportunities could be the exploring and acquisition of new climate friendly technologies that could enhance the national development. Malawi has established a National Sustainable and Renewable Energy Programme (NSREP) to increase access to and efficient use of renewable energy for the rural, peri-urban and urban populations. In the study the Comprehensive Mitigation Analysis Process (COMAP) and the GACMO models were utilised.

Malawi established Designated National Authority (DNA) for CDM under its Environmental Affairs Department. To date Malawi has not developed a CDM project.

3. Sustainable Development and Mitigation

• National inventory of greenhouse gas

Based on both 1994 and 1990 GHG inventories (Table 1), Malawi is a net emitter of CO₂. The greatest contribution of emissions arises from the Land Use Change and Forestry (LUCF) sector (71%), followed by the Energy sector (15%) and Agriculture (13%) as shown in Figure 1.

Table 1: Emissions GHG Summary for Malawi

Total National Emissions and Removals	CO ₂ Emissions (kt)	
	1990	1994
CO ₂ emissions without LUCF	669.3	719.3
CO ₂ net emissions/removals by LUCF	19,879.5	17,512
CO ₂ net emissions/removals with LUCF	20,548.7	18,231.3
GHG emissions without LUCF	8,044.6	7,070.3
GHG net emissions/removals by LUCF	19,900.7	17,515.5
GHG net emissions/removals with LUCF	27,945.2	24,585.9

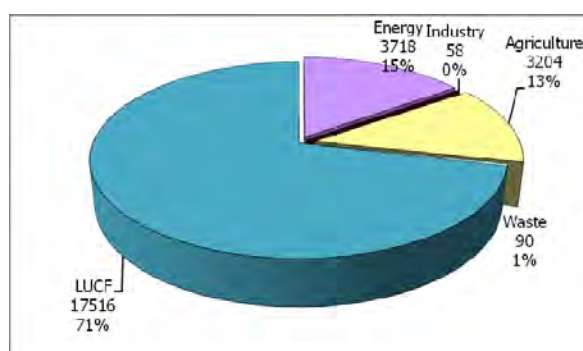


Figure 1: Total GHG emissions (ktCO₂e) and contribution to the total (%) by source in 1994

Malawi's GHG emissions profile is dominated by emissions from LUCF. The Energy sector contributes to 3,718 ktCO₂e or 15% of the country's total GHG emissions. Agricultural emissions, 3,204 ktCO₂e or 13% of the country's total GHG emissions are mainly from enteric fermentation of livestock. Waste and industry contributes to less than 0.5% of the total, each.

• Summary of Nationally Appropriate Mitigation Action (NAMA) plan

Malawi has not submitted its NAMA plan. However, as presented in the Section 7 "Mitigation/Adaptation Option" in this summary, the National Communication of the country raises several mitigation options for the country.

4. Adaptation and Vulnerability

• Vulnerability to climate change

Malawi's vulnerability to climate change arises mainly from socio-economic, demographic and climatic factors. These include slim economic base, limited agroprocessing facilities, over-dependency on rain-fed agriculture and biomass energy, inadequate health facilities, poverty exacerbated by drought, floods, natural

disasters and population pressure.

Malawi experiences a variety of extreme weather events that have recently increased in frequency of occurrence and intensity resulting in loss of life and damage to infrastructures and buildings. El Niño and La Niña phenomena cause local floods and droughts. Severe droughts occurred in the 1991/1992 and 1994/1995 growing seasons (November-April). There were floods in the 1999/2000 and 2000/2001 rainy seasons. In the 1991/92 drought, rivers in many catchments dried up and the Shire River water levels became precariously low threatening hydro-power generation downstream.

Landslides occur during prolonged torrential rains mainly in the southern parts of the country. In the 1992/1993 rainy season, landslides caused a loss of over 500 lives and severe damage to socio-economic structures in Mulanje - Phalombe areas. Tornado - type wind systems have increased in frequency during the rainy season. This has resulted in loss of life and damage to building structures especially in rural communities where building standards are very low.

Particular weather systems cause outbreaks of pests such as armyworm and diseases like cholera and malaria leading to illness, loss of life and reduced agricultural productivity.

- **Climate Change National Adaptation Programme of Action (NAPA)**

Five urgent activities were identified, and developed into project concepts or activities. These are given in order of priority as follows:

Table 2: Malawi NAPA Priority Projects

	Project Title	Sector	Cost (USD)
1	Improving community resilience to climate change through the development of sustainable rural livelihoods:	Multi-sectoral (Agriculture, water, fisheries, wildlife and health)	4,500,000
2	Restoring forests in the Shire River Basin to reduce siltation and the associated water flow problems	Forestry	2,000,000
3	Improving agricultural production under erratic rains and changing climatic conditions	Agriculture	3,000,000
4	Improving Malawi's preparedness to cope with droughts and floods	Disaster prevention	8,000,000
5	Improving climate monitoring to enhance Malawi's early warning capability and decision making and sustainable utilization of Lake Malawi and lakeshore areas resources	Fisheries, agriculture, health	5,430,000

5. Major Industries

The economy is predominately agricultural with about 80% of the population living in rural areas. Agriculture, which has benefited from fertilizer subsidies since 2006, accounts for more than one-third of GDP and 90% of export revenues. The performance of the tobacco sector is a key to short-term growth as tobacco accounts for more than half of exports.

6. National development strategy

Malawi Growth and Development Strategy (MGDS) sets out the Government's economic growth and development priorities for the next five years (2006/07 - 2010/11). The strategy seeks to achieve the aspirations of Malawi as defined in Vision 2020 and the Millennium Development Goals. The strategy builds on the Malawi Poverty Reduction Strategy (2002), the Malawi Economic Growth Strategy (2003), and integrates a number of new sector strategies, policies and emerging issues, such as land reform, public/private partnerships, etc. The MGDS is organized around five themes (Sustainable Economic Growth; Social Protection; Social Development; Infrastructure Development; and Good Governance). Each theme specifies medium-term outcomes and strategies to achieve them, including a prioritized and costed action plan. The document has a strong focus on results, which has been supported by the World Bank. (CAS FY)

7. Mitigation/Adaptation Options

In the First National Communication, mitigation options were categorized into technology-based and market-based mitigation options. The technology-based mitigation options are outlined in the following table:

Table 3: Technology-based Mitigation Options

Technology	Baseline Case	Alternative Options
1. Wood fuel stoves	<ul style="list-style-type: none"> _ 3-stone _ Metal (charcoal stove) 	<ul style="list-style-type: none"> _ Improved mud stove _ Ceramic stove
2. Biogas	<ul style="list-style-type: none"> _ Paraffin for lighting _ Firewood for cooking 	<ul style="list-style-type: none"> _ Use biowastes to produce biogas for lighting and cooking
3. Lighting	<ul style="list-style-type: none"> _ Paraffin _ Incandescent lamps 	<ul style="list-style-type: none"> _ Electricity (rural electrification) _ Compact fluorescent lamps
4. Renewable energy (solar)	<ul style="list-style-type: none"> _ Firewood for cooking and water heating _ Paraffin for lighting _ Conventional electricity for lighting and powering of electricity equipment 	<ul style="list-style-type: none"> _ Solar cookers _ Solar water heaters _ Solar PV

The market-based mitigation options considered include energy pricing, fiscal incentives, regulations, and demand side management (DSM).

The socio-economic sectors addressed in the vulnerability and adaptation assessment are Water, Agriculture, Forestry, Fisheries and Wildlife. Future studies should include the Human Health, Energy, and Transport sectors should be undertaken as well as training to strengthen local human capacity.

Table 4: Adaptation Options for Malawi

<p>Water Sector</p> <p>Adaptation Measures for Droughts</p> <ul style="list-style-type: none"> _ Construction of more dams to retain surface runoff during the rainy season, as nearly 24% of annual rainfall is lost as surface run-off; _ Increased sustainable utilisation and monitoring of groundwater resources; _ Conjunctive use of surface and groundwater resources; _ Sustainable agricultural practices including soil and water
--

- _ Proper water use to improve water conservation;
- _ Expansion of rainfall harvesting techniques;
- _ Leakage monitoring and control in piped networks to avoid water loss;
- _ Public awareness campaigns for water conservation measures

Adaptation Measures for Floods

- _ Construction of upstream storage dams for purposes of mitigating flood hazards;
- _ Construction of dykes, canals or bunds to re-direct or divert flows to minimize flood damages, although this is generally very expensive;
- _ Increased afforestation in catchment areas to cover areas not yet considered;
- _ Extension of the installation of telemetry flood forecasting and warning systems to other flood prone areas for timely evacuation of people;
- _ Delineation of flood prone areas with flood zoning maps and the development of appropriate adaptation strategies and measures;
- _ More public awareness campaigns;
- _ Improved wetlands conservation measures ; and
- _ Effective early warning systems.

Fisheries Sector

- a) To Develop a policy to determine levels of metal concentrations of contaminants and appropriate standards, more especially for lake Malawi which is an international water body;
- b) Adopt sustainable uses of the water weed such as compost, ingredients of animal feed, and biogas production;
- c) Strengthen the National Aquaculture Centre to be able to produce tilapia and catfish for restocking programmes in cases of extreme drought;
- d) Establish a fish gene bank to maintain the genetic diversity of fish population.
- e) Develop a Lake Malawi monitoring system to provide climatic and hydrological data at various points to support fisheries resources production; and
- f) Strengthen good agriculture and land use practices around water bodies.

Forestry Sector

- _Seed bank for drought resistant species
- _Silviculture Research
- _Forest management

Wildlife resources

In the case of extreme changes in climate, compounded by animal populations that are at or near carrying capacity, conventional wildlife management techniques such as translocation, provision of artificial water supplies, and culling could be used. These measures have neither been prioritised nor costed in the present assessment due to lack of financial support.

Agricultural Sector

Adaptation options for Crops Sub-sector

- (a) Change in land use
 - _Changes in cultivated land area in line with projected climate change;
 - _Changes in crop types;
 - _Changes in crop location;
- (b) Changes in crop management strategies
 - _Use of irrigation water and fertilizers;
 - _Control of pests, weeds, parasites, and diseases;
 - _Soil drainage and erosion control;
 - _Farm infrastructure; and
 - _Crop husbandry practices.

Adaptation options for Livestock Sub-sector

- (a) Introduction of native pastures/grasses tolerant to drought such as local Ntchisi panicum;
- (b) Better breeding and feeding practices;
- (c) Switch from cattle to small stock adapted to marginal conditioned such as goats, sheep etc; and
- (d) Improved animal husbandry practices.

Reference:

- Malawi Initial National Communication, December 2003
- UNFCCC website (GHG Profile, NAMA, NAPA, Designated National Authorities, CDM)
- CIA World Fact Book website on country page for Malawi
- The World Bank website on country page for Malawi
- Africa Adaptation Programme: <http://www.undp-aap.org/countries/malawi>

This summary was prepared based on the data/information available as of September 2011.

2.3.15. マリ

Mali

- **Mainstreaming mitigation/adaptation actions in the national development strategy**

The Republic of Mali's economy is largely dependent on agriculture, which is the main source (87%) of GHG (CH₄) emissions. Considering the emissions from Land Use Change and Forestry (LUCF), Mali is net carbon sink mainly due to abandonment of managed lands and changes in biomass stock. Better practices and adaptation activities in agriculture and livestock will contribute to GHG reduction as well as to the economic development. The community-based woodland management and the use of agricultural residues as energy sources can play a role in the economic development through extending access to energy, while mitigating the growth of GHG emissions. Energy efficiency measures also have to be taken into account while the country develops its industrial and services sectors.

- **Summary on climate change related issues in the country**

1. Climate change policy

In November 2000, the Government of Mali ratified the United Nations Framework Convention on Climate Change (UNFCCC). The country has ratified other international Conventions related to environment protection and sustainability such as the Biodiversity Convention, and the Desertification Convention.

Mali has not yet developed specific climate change policies and legislation. National climate change policies will be formulated consistent with Mali's poverty reduction strategy, thus facilitating the mainstreaming of these policies into district and national development plans. However, the Government has developed some programmes related to environmental issues such as:

- National programme of land use (*Programme national d'aménagement du territoire*);
- National programme of natural resources management (*Programme national de gestion des ressources naturelles - PNGRN*);
- National programme of water resources conservation (*Programme national de maîtrise des ressources en eau*);
- National programme for quality of life improvement (*Programme national d'amélioration du cadre de vie*);
- National programme of new and renewable sources of energy (*Programme national de développement des ressources en énergies nouvelles et renouvelables*);
- National programme for environmental information management (*Programme national de gestion des informations sur l'environnement*);
- National programme for post conventions (*Programme national de suivi des Conventions*);
- National programme for research to combat desertification and environmental protection (*Programme national de recherche sur la lutte contre la désertification et la protection de l'environnement*); and
- Programme for environmental education, information and communication (*Le programme d'information, d'éducation et de communication en environnement*).

2. National efforts/measures against climate change

Mali established the Designated National Authority (DNA) for CDM under its Agency for Environment and Sustainable Development (*Agence de l'Environnement et du Développement Durable - AEDD*). To date, the country has developed one reforestation CDM project and one hydropower CDM project.

The Mali *Jatropha Curcas* Plantation CDM project was implemented with the partnership of rural communities, Déguessi Vert, Novartis and Eco-Carbone. The project purpose is to restore deforested and degraded land in the Republic of Mali by empowering rural communities to adopt sustainable forestry practices through *Jatropha curcas* plantation. The project had its Validation terminated in March 2008.

The Félou Regional Hydropower CDM project is sponsored by the governments of Mali, Mauritania, and Senegal, a governmental organization, Société de Gestion de l'Energie de Manantali (SOGEM). The project purpose is to generate zero emissions hydroelectricity from a run-of-river hydroelectric installation on the Senegal River in Mali. The project was registered on May 2010 and is expected to prevent the emissions of 188,282tCO₂e per year, during seven year the credit period it estimated prevent total of 1,317,971tCO₂e.

3. Sustainable Development and Mitigation

• National inventory of greenhouse gas

The Mali greenhouse gas (GHG) emissions inventory evaluates GHGs emissions for the base year 1995 in the following sectors: energy, agriculture, land use change and forestry (LUCF), industry and waste management. GHGs included in the study were carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbonates (HFC), perfluorocarbonates (PFC), and sulphur hexafluoride (SF₆).

Table 51 shows that the total GHG emissions, not including LUCF, were 8,666.2 ktCO₂e. The LUCF alone contributed to net GHG removal of 9,748.1ktCO₂e due to Changes in Forest and Other Woody Biomass Stocks that contributed to removals of 24,602.9ktCO₂e and the Abandonment of Managed Lands that contributed to removals of 13,643.7ktCO₂e, while forest and grassland conversion emitted 21,900.7 ktCO₂e. Therefore, the result of the inventory, including LUCF, is the net removal of 1,081.9ktCO₂e.

Table 1: Mali CO₂ emissions summary

Total National Emissions and Removals	CO ₂ Emissions (kt)
	1995
CO ₂ emissions without LUCF	954.6
CO ₂ net emissions/removals by LUCF	-10,828.9
CO ₂ net emissions/removals with LUCF	-9,874.3
GHG emissions without LUCF	8,666.2
GHG net emissions/removals by LUCF	-9,748.1
GHG net emissions/removals with LUCF	-1,081.9

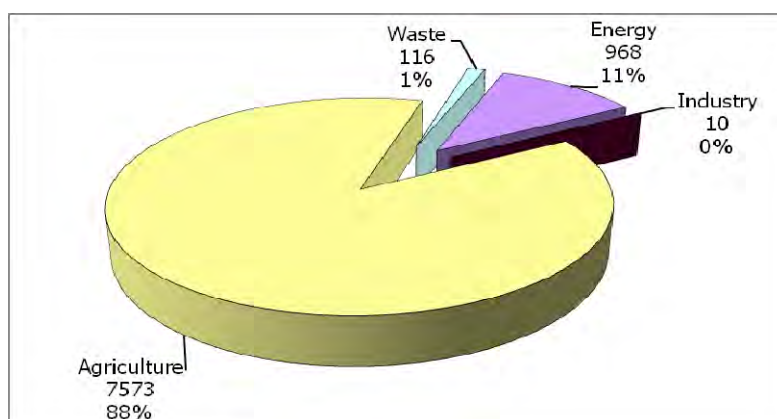


Figure 1: Total GHG emissions (ktCO₂e) and contribution to the total (%) by sector in 1995 (without LUCF)

As presented in Figure 1, agriculture is the largest source, being responsible for net emissions in the order of 7,573 ktCO₂e or 88% of the country's total GHG emissions. The second largest source is energy, whose contribution is 968 ktCO₂e or 11% of the country's total GHG emissions. The Waste sector emits 116 ktCO₂e or 1% of the total.

• **Nationally Appropriate Mitigation Action (NAMA) plan**

Mali has not submitted its NAMA plan. However, as presented in the Section 7 "Mitigation/Adaptation Option" in this summary, the National Communication of the country raises several mitigation options for the country.

4. Adaptation and Vulnerability

Mali is a country with agro-forestry-pastoral activities in which the population is 95% oriented to the primary sector. These activities are highly dependent on climate conditions. The sectors most vulnerable to climate change are agriculture water resources, health and well being, fishery resources, changes in land use and forestry, biodiversity.

Mali has developed the National Adaptation Programme of Action on Climate Change (NAPA). The goal of NAPA is identify and prioritize national needs so that effective implementation measures may be put into place to combat the adverse effects of climate change.

Climate Change National Adaptation Programme of Action (NAPA)

The Mali NAPA process identified and prioritized nineteen adaptation activities. These projects have been organized in a hierarchy of importance of which guarantee food security is the main target to be achieved by implementing adequate management measures in the agriculture, livestock and fisheries. The NAPA projects are listed in order of priority in Table 2.

Table 2: Mali NAPA projects in order of priority

	Project Title	Sector	Indicative Cost (USD)
1	Agricultural extension of improved food crop varieties adapted to climate change	Food security	300,000
2	Agricultural extension of animal and plant species with the highest adaptation potential to climate change	Food security	350,000
3	Promotion of income-generating activities and development of mutual assistance	Food security	350,000
4	Rehabilitation of aquaculture sites in Mali	Food security	25,760,000
5	Promoting cereal stocks	Food security	500,000
6	Promoting the use of meteorological information to improve agricultural production and contribute to food security	Cross sectoral	2,000,000
7	Low land Improvement	Terrestrial ecosystems	2,000,000
8	Implementation of drilling equipped with solar- or wind driven systems	Water resources	1,500,000
9	Energy Promotion from <i>Typha australis</i>	Energy	2,000,000
10	Contribution to barrier removal for the promotion of the use of solar energy in Mali	Energy	1,500,000
11	Implementation of a runoff water harvesting system and restoration of water points (backwater, ponds and lakes)	Water resources	280,000
12	Sensitization and organization of the population for the preservation of natural resources (elaboration of local conventions on reforestation and agroforestry)	Education and capacity building	2,000,000
13	Management of brush fire in Mali	Terrestrial ecosystems	3,000,000
14	Intensification of soil conservation actions and composting	Terrestrial ecosystems	1,500,000
15	Intensification of fodder crop	Food security	500,000
16	Elaboration of a technological package of training for the population with simple adaptation practices to climate change	Education and capacity building	500,000
17	Promotion of fodder stock for livestock	Food security	220,000
18	Promotion of <i>Jatropha</i> oil	Energy	5,000,000
19	Implementation of an information system on climate change risk-related diseases	Health	500,000

Source: Adapted from National Adaptation Programmes of Action

5. Major Industries

Among the 25 poorest countries in the world, Mali is a landlocked country highly dependent on gold mining and agricultural exports for revenue. Economic activity is largely confined to the riverside area irrigated by the Niger River and about 65% of its land area is desert or semi desert. Industrial activity is concentrated on processing farm commodities.

According to the Mali section of World Factbook published by the Central Intelligence Agency (CIA), GDP in 2010 was US\$ 16.77 billion. For the same year, agriculture, industry, and services represented 39%, 21.6%, and 39.3% of the GDP respectively.

The agriculture sector main products are cotton, millet, rice, corn, vegetables, peanuts; cattle, sheep, goats. Other major industries include food processing; construction; phosphate and gold mining.

The country exports commodities are cotton, gold, livestock, which are mainly exported to China. The import commodities are petroleum, machinery and equipment, construction materials, foodstuffs, textiles, which are mainly imported from Senegal and France.

6. National development strategy

Mali's development strategies are focused mainly on education, agriculture and energy sectors. The International Development Association (IDA) supports Mali in providing equitable access to quality education as one of the measures to promote sustainable growth and alleviate poverty. IDA also supports Mali in implementing strategies and projects to strengthen the agriculture sector such as:

- *Fostering agricultural productivity* by scaling up sustainable water and natural resources management practices
- *Biodiversity protection* through the GEF Gourma project: The project aims to reduce biodiversity degradation trends and, in some cases, reverse the actual trend in key conservation areas and project sites in the Gourma.
- *Regional projects*: (i) the Niger River Basin project, which aims to develop and implement sustainable measures for reversing trends in land and water degradation through collaborative decision-making in the Niger River Basin; (ii) the Africa Emergency Locust Project, which aims to reduce the vulnerability of the concerned countries to future infestations by supporting prevention strategies, early warning systems, reaction, and mitigation strategies, at both the national and regional levels; and the (iii) Africa Stockpiles Program, which supports the governments of Mali, Tanzania, and the Kingdom of Morocco to dispose of the publicly-held obsolete pesticide stocks at selected sites and supports actions to help prevent the future accumulation of new stocks of obsolete pesticides.

In the energy sector, main strategy is expanding access to energy to help achieve economic growth. In this sense the Household Energy and Universal Access Project was designed to help Mali develop (i) a multi-layered approach to rural energy and (ii) a community-based woodland management to ensure sustainable wood fuel supply and fuel substitution initiatives.

7. Mitigation/Adaptation Options

Table3 presents the most important mitigation options according to the FNC.

Table 3: Mitigation options for Mali

<p>Energy sector</p> <ul style="list-style-type: none"> - Energy efficiency - Promotion of new and renewable sources of energy - Import of electricity from neighbouring countries - Use of residues and agricultural by-products as fuel
<p>Transport sector</p> <ul style="list-style-type: none"> - Adequate management of transportation routes - Awareness, training and information to driver - Good management of vehicles - Promotion of mass transport - Taxation and registration fees for vehicles - Development of new technology for biofuels
<p>Forestry sector</p> <ul style="list-style-type: none"> - Improve crops techniques avoiding deforestation (intensive agriculture) - Intensify reforestation through sensibilisation and incentives - Limiting the desert by dune fixation and reforestation
<p>Agriculture sector</p> <ul style="list-style-type: none"> - Improved water management in irrigated areas - Mass production and adoption of fertilizer nitrogen fertilizer substitution such as organic manure, the NTP and other organic fertilizers
<p>Livestock sector</p> <ul style="list-style-type: none"> - Use of biogas as an alternative energy source to switch fuel-wood

The adaptation options described in the FNC are focused on provide more efficient water resource management. Table4 summarizes the adaptation options.

Table 4: Adaptation options for Mali

<p>Agriculture</p> <ul style="list-style-type: none"> - Implement a meteorological centre to provide climate forecast information - Provide rural assistance (provide daily records of rainfall, water balance, forecasts and other information)
<p>Water Resources</p> <ul style="list-style-type: none"> - Implementation of water supply system to rural and urban population - Construction of dam and wells - Flood protection - Pollution protection (monitoring of water quality and implementation of programs against river pollution) - Develop research and improve education - Promote the use of superficial and ground water

Reference:

- Mali Initial National Communication, November 2000
- UNFCCC website (GHG Profile, NAMA, NAPA, Designated National Authorities, CDM)
- The World Bank website on country page for Mali
- CIA World Fact Book website on country page for Mali

This summary was prepared based on the data/information available as of September 2011.

2.3.16. 南アフリカ共和国

South Africa

- **Mainstreaming mitigation/adaptation actions in the national development strategy**

The Republic of South Africa is a highly industrialised country with a large manufacturing sector as well as mineral extraction sector. Coupled with the country's reliance on coal, the main source of GHG emissions of the country is from the energy sector. South Africa's GHG emissions per capita are par with that of industrialised nations and its contribution to global warming is high. Among the mitigation measures already under plan, increasing efficiency and the use of cleaner fuel in energy and industry sectors will contribute to GHG emissions reduction as well as technological development. Introducing efficient equipment in households will also lead to rural development.

- **Summary on climate change related issues in the country**

1. Climate change policy

In August 1997 the Government of the Republic of South Africa ratified the United Nations Framework Convention on Climate Change (UNFCCC).

A climate change response strategy is being finalised to address the climate change issues in the country. Policies and measures to combat the effects of climate change are being developed within the context of the national priorities, which are: the alleviation of poverty; the provision of basic services for all South Africans; equity; employment creation; and economic growth. Policies have also been initiated to meet the environmental rights enshrined in the Constitution of the Republic of South Africa, which states that all South Africans have the right to a healthy environment and the right to protect their environment.

The population of South Africa is expected to increase by 2025 to a total of 62 million. A steady growth in the Gross Domestic Product (GDP) is projected due to the benefits of globalisation and the resultant creation of employment, higher fixed investment, and lower interest rates. The Department of Environmental Affairs and Tourism has developed a number of policies and strategies and formulated environmental legislation with the objective of facilitating sustainable that will ensure that significant impacts on the environment are avoided, minimised or mitigated in sectors such as energy, transportation, mining, agricultural, biodiversity, waste, forestry, health and water resources sectors.

2. National efforts/measures against climate change

National government is responsible for ensuring that effect is given to the provisions of the United Nations Frameworks Convention on Climate Change (UNFCCC). Many different government departments at all levels of government are responsible for activities relevant to the Convention, and play a role in implementing climate change policy and providing information regarding the impact of climate change on the sector or area for which they are responsible. To avoid fragmented administration of the Convention, the government has designated the Department of Environmental Affairs and Tourism to be the lead department responsible for co-ordination and the implementation of South Africa's commitments in terms of the Convention.

The National Committee on Climate Change (NCCC) was established to act as an advisory body to the Minister of Environmental Affairs and Tourism. Representatives from relevant government departments, as well as members representing business and industry, mining, labour, community based organisations and environmental non-governmental organizations constitute the NCCC. The functions of the NCCC include advising the Minister through the Director General of the Department of Environmental Affairs and Tourism on:

- Positions to be taken in international meetings, and preparation of the briefing papers.
- Legislation that may be required to give effect to the Convention.
- The allocation of international donor funding designated for climate change mitigation.
- The implementation of the Convention.
- The ratification and subsequent implementation of the Protocols.
- The impact of climate change considerations on sustainable development.
- The incorporation of climate change issues into government legislation and policies.
- Participation of South Africa on bilateral or multi-lateral UNFCCC initiatives or mechanisms.

South Africa established Designated National Authority (DNA) within the Department of Minerals and Energy to oversee the Clean Development Mechanism (CDM). To date, South Africa has developed 20 registered projects and 36 projects under validation. The projects are expected to achieve approximately 9,619.9ktCO₂ per year.

3. Sustainable Development and Mitigation

• National inventory of greenhouse gas

The total emissions for each sector, calculated as CO₂ equivalents shows that the energy sector contributes 260,886 ktCO₂, which represents 75% of the total emissions in 1990 and 297,564 ktCO₂ in 1994, representing 78%. Agriculture contributed 11.6% and 9.3%, industrial processes 8.9% and 8.0%, and waste 4.4% and 4.3% to the total emissions during 1990 and 1994, respectively.

Table 1: South Africa GHG emissions summary

Total National Emissions and Removals	CO ₂ Emissions (kt)	
	1990	1994
CO ₂ emissions without LUCF	280,931.8	315,957.2
CO ₂ net emissions/removals by LUCF	-16,982.4	-18,616.0
CO ₂ net emissions/removals with LUCF	263,949.4	297,341.3
GHG emissions without LUCF	347,349.4	379,837.2
GHG net emissions/removals by LUCF	-16,982.4	-18,616.0
GHG net emissions/removals with LUCF	330,367.0	361,221.2

• Summary of Nationally Appropriate Mitigation Action (NAMA) plan

In response to Copenhagen Accord, South Africa submitted its NAMA in January 29, 2010. South Africa reiterates that it will take nationally appropriate mitigation action to enable a 34% deviation below the 'Business As Usual' emissions growth trajectory by 2020 and a 42% deviation below the 'Business As Usual' emissions growth trajectory by 2025. The extent to which this action will be implemented depends on the

provision of financial resources, the transfer of technology and capacity building support by developed countries.

4. Adaptation and Vulnerability

Potential changes in climate may have significant effects on various sectors of South African society and the economy. South Africa's Initial National Communication identifies sectors with highest vulnerability to climate change and studies suitable adaptation measures to offset adverse consequences.

Table 2: Vulnerability and Adaptation in South Africa

<p>Health Sector</p> <p><u>Vulnerability :</u></p> <p>An increase in the occurrence of strokes, skin rashes and dehydration, and an increase in the incidence of non-melanoma skin cancers. Indirectly, climate change affects also ecological systems: for example, incidents of diseases transmitted by water such as cholera may increase. Vector borne diseases may also be affected by changes in climatic conditions.</p> <p>The potential increased infection rates of malaria and schistosomiasis in South Africa were investigated in greater detail due to the potential significant impact of these diseases on public health.</p> <p><u>Adaptation :</u></p> <p>Although some monitoring and forecasting for disease warning systems are in place already, climate change needs to be considered in future prevention programmes and monitoring programmes. The use of bed nets and personal protection, which have proved successful in preventing mosquito bites, will have to be increased. Treatment facilities and prevention measures will need to be extended. Increased control of the areas affected by these diseases by the use of spraying programmes and other conventional control measures will also be required to combat the spread of the diseases.</p>
<p>Water Resources</p> <p><u>Vulnerability :</u></p> <p>South Africa's rainfall is erratic in distribution and variable between years. Most of the country is arid and subject to droughts and floods. South Africa's industrial, domestic and agricultural users are highly dependent on reliable water supplies. Since water-supply infrastructure takes years to develop and is designed to last for decades, water resource planners need to consider the possibility of future climate change. Even without climate change, it is predicted that South Africa will have fully utilised its surface water resources by about 2030. A reduction in the amount or reliability of rainfall, or an increase in evaporation (due to higher temperatures) would exacerbate the lack of surface water resources.</p> <p><u>Adaptation :</u></p> <p>A number of adaptation options have been identified to limit the effect that climate change may have on water resources. These can be divided into strategic resource management issues, drought relief measures, design of water infrastructure and communication.</p>
<p>Rangelands</p> <p><u>Vulnerability :</u></p> <p>A general aridification of rangelands over southern Africa</p> <p><u>Adaptation :</u></p> <ul style="list-style-type: none"> -An improved monitoring and forecasting system for fire hazard and droughts -Alternative land use and a decreased dependency on ranching -Strengthening of the interim Disaster Management Centre, as highlighted in the National Disaster Management White Paper(1998)

Agriculture

Vulnerability :

Under the climate scenario that predicts a hotter drier climate, maize production will decrease by approximately 10 to 20%. Crop decreases will be most serious in the more marginal areas, although the higher production levels predicted in the east would possibly offset yield decreases in the marginal western regions.

Speciality crops grown in specific environmentally favourable areas may also be at risk, since both rainfall and temperature effects may cause changes in areas suitable for specialized production.

Adaptation :

- Change in agricultural management practices, such as a change in planting date, row spacing, planting density and cultivar choice, and other measures, which would counteract the effects of, limited moisture.
- Seed banks that maintain a variety of seed types that preserve biological diversity and provide farmers with an opportunity to diversify.
- Many current agricultural practices, such as conservation tilling, furrow dyking, terracing, contouring, and planting vegetation as windbreaks, protect fields from water and wind erosion and assist in retaining moisture by reducing evaporation and increasing water infiltration.

Forestry

Vulnerability :

The South African forestry industry is highly sensitive to climate change. Currently, only 1.5% of the country is suitable for tree crops, and much of this area is relatively marginal. In addition to the effects of climate change, factors such as land availability, water demand, as well as environmental and socio-economic conditions will also affect the forestry sector. Shifts in the optimum tree growing areas could impact on the profitability of fixed capital investments, such as saw mills and pulp mills.

Adaptation :

More temperature tolerant cultivars within the current tree species could be selected, but it is more probable that more lucrative uses for the land, such as sub-tropical fruits, may compete for the land currently under tree plantations. Genetic engineering could be used to develop more heat- and drought-resistant hybrids, which would allow the forestry industry to counter the threat of climate change and also to maintain current production areas.

Biodiversity

[Plants]

Vulnerability

A reduction of the area covered by the current biomes by between 38 and 55% by the year 2050

Adaptation

To maintain the current vegetation, the existing plant cover will have to be managed, since successful regeneration will become more difficult in some areas.

[Animal Taxa]

Vulnerability

Species distribution changes were analysed for birds, mammals, reptiles, butterflies, and other invertebrates in South Africa.

Adaptation

The establishment of a species inventory and a distribution monitoring network would focus attention on potential detector species as a point of departure and highlight areas most likely to be susceptible to climate change (namely, the western arid zone and the escarpment areas).

[Marine]

Vulnerability

Predicted rise in sea level will not have a substantial effect on the marine biodiversity, although in extreme cases the zones of the rocky shores may be displaced and estuaries may be affected. However, the predicted rise in temperature would have an effect on the sea surface temperature and this would result in the migration of species residing along the coast. In addition, the changes in sea temperature may increase the intensity and frequency of upwelling events and cause alterations of near shore currents, which are expected to have the most significant impact on South African rocky shores.

Adaptation

The establishment of a biodiversity monitoring network would identify those species that will be impacted on by the climate change and may assist in the identification of species that could be used as indicator species.

5. Major Industries

According to the South Africa section of World Factbook published by the Central Intelligence Agency (CIA), the industrial sector is responsible for 30.8% of the GDP and 26% of the labour force. The country's diverse manufacturing industry is a world leader in several specialized sectors, including motor vehicles and parts, railway rolling stock, synthetic fuels, and mining equipment.

The agriculture sector contributes about 2.5% of the GDP, 9% of labour force. The products and the crops most important of South Africa's agriculture are corn, wheat, sugarcane, fruits, vegetables; beef, poultry, mutton, wool and dairy products. South Africa has developed many irrigation schemes and is a net exporter of food. Services sector is responsible for 66.7% of GDP and employs 66% of the labour force. The export from South Africa is composed of gold, diamonds, platinum, other metals and minerals, machinery and equipment.

6. National development strategy

South Africa's development strategy faces a number of significant challenges, including accelerating growth and sharing its benefits more broadly, extending opportunities to all and improving the coverage of delivery of public services.

To help address these challenges, the South African government has launched a Medium Term Strategic Framework (MTSF) for 2009 to 2014 with ten priorities:

- more inclusive economic growth, decent work and sustainable livelihoods
- economic and social infrastructure
- rural development, food security and land reform
- access to quality education
- improved health care
- the fight against crime and corruption
- cohesive and sustainable communities
- improving public service delivery
- sustainable resource management and use
- support for the creation of a better Africa.

7. Mitigation/Adaptation Options

As a non Annex I Party, South Africa is not obliged to reduce the emissions of greenhouse gases. Nonetheless, possible mitigation options for GHG emissions and how South Africa could develop cost-effective GHG mitigation strategies are examined as below.

Table 3: Mitigation options for South Africa

<p>Energy Sector</p> <ul style="list-style-type: none"> - Demand side management - Cleaner generation mix -Import of refined products -Synthetic fuel production feed stock change from coal to gas
<p>Residential and Commercial</p> <ul style="list-style-type: none"> -Replace incandescent lights -Efficient wood/coal stove -Solar water heaters -Thermal Efficient Buildings <p>Conversion to gas as an energy source</p>
<p>Transport Sector</p> <ul style="list-style-type: none"> - Fuel tax - Energy efficiency improvements
<p>Mining sector</p> <ul style="list-style-type: none"> -Higher extraction ratios underground and ash filling -Extraction of remnant pillars -Removal of emitted methane
<p>Agriculture sector</p> <ul style="list-style-type: none"> -Enhanced livestock productivity through herd optimization and improved feed -Reduced burning of agricultural residues -Reduced fire frequency -Afforestation

Table 4: Adaptation options for South Africa

<p>Biodiversity</p> <ul style="list-style-type: none"> -Improvement in quality of information on plant and animal diversity -Causal links between climate change and plant and animal distribution -National conservation strategy -Bio-monitoring network in areas of high biodiversity and high predicted climate change. -Vegetation and animal management policies: Future management will need to be more opportunistic, taking advantage of rare good rainy seasons and managing droughts with extreme caution - Focused ex-situ conservation: e.g. seedbanks and botanical gardens, especially for agricultural, horticultural and domestic species. - Plant translocation action and direct intervention: the rescuing and planting or breeding of certain species from the wild - Tolerating loss: It will be impossible to conserve all species in the face of climate change, a mechanism for prioritizing intervention decisions will be crucial. Cost-benefit analysis development taking into account species ecological redundancy/equivalency, potential importance and genetic variation and uniqueness. -Screening species for potential invasiveness

<p>Health</p> <ul style="list-style-type: none"> - Improved personal protection devices and strategies such as bed nets and house spraying - Monitoring system – environmental parameters - Environmental control of snail hosts of schistosomiasis -Climate based spatial disease models
<p>Forestry</p> <ul style="list-style-type: none"> - Genetic engineering to produce new tree hybrids which are drought and heat resistant - Shifting the geographical location of the tree planting areas - Carbon sequestration marketing - Tailor land use planning i.e. better planning and monitoring of land use patterns
<p>Rangeland</p> <ul style="list-style-type: none"> - Monitoring and forecasting of fire hazards and droughts - Promotion of nitrogen containing supplements due to declining levels of nitrogen in forage - Disease outbreaks may increase: Veterinary Health Services would need to be aware of the diseases which may become a problem - Drought management to recognise droughts as part of a highly variable climatic system
<p>Water resources</p> <ul style="list-style-type: none"> -Plan and co-ordinate use of river basin -Infrastructure changes to allow for increased capacity -Conserve water (many methods can be used to conserve water, some of which are in place already e.g. Water pricing policy) -Use interbasin transfers -Maintain options to develop new dam sites, which are currently very limited in S.A -Improve quantity and quality of drinking water by reducing water pollution
<p>Agriculture</p> <ul style="list-style-type: none"> -Changed planting dates -Healthy and drought resistant crops need to be promoted as well as the growing of a variety of crops -Government aid for subsistence / marginal farmers -Altered irrigation methods by improving flexibility in water-use in order to allow for decreases in available water and changed precipitation patterns -Improved information network regarding farming practices e.g. conservation tilling, furrow dyking, terracing, contouring, and planting vegetation to act as windbreaks

Reference:

- South Africa Initial National Communication, December 2003
- UNFCCC website (GHG Profile, NAMA, CDM)
- The World Bank website on country page for South Africa
- U.S. Department of state: <http://www.state.gov/r/pa/ei/bgn/2898.htm>
- CIA the World Fact Book

This summary was prepared based on the data/information available as of September 2011.

2.3.17. モロッコ

Morocco

● **Mainstreaming mitigation/adaptation actions in the national development strategy**

The Kingdom of Morocco's economy is one of the most advanced in the African continent, with CO₂ emissions per capita of 1.49 metric tons. The sink capacity of Morocco in the Land Use Change and Forestry (LUCF) sector is decreasing rapidly due to deforestation mainly for agricultural and energy use. Better practice and adaptation activities in the energy and forestry sectors will heavily contribute to GHG emission reduction, increase sink capacity, and promote economic development. Particular focus should be placed on rational use of energy and development of renewable energy / cogeneration, and reforestation plans.

● **Summary on climate change related issues in the country**

1. Climate change policy

Morocco signed the United Nations Framework Convention on Climate Change (UNFCCC) during the Earth Summit held in Rio de Janeiro in June 1992 and ratified it in December 1995. Immediately following the Rio Summit Morocco created and added to its existing governmental departments a new department in charge of the Environment.

Concerning climate change, the Department of Environment has set up the administrative bodies listed below. It did so on the basis of the recommendations of the Conference of Parties to the UNFCCC and its subsidiary bodies, taking advantage of the experience of other countries. These administrative bodies are:

- A Climate Change Unit, in charge of coordination and follow up of Morocco's commitment vis-à-vis the Convention;
- A National Committee for Climatic Change (CNCC), set up in 1996 and made up of representatives of ministerial Departments and national institutions involved in CC issues;
- An Information Centre on Sustainable Energy and Environment (CIEDE) in 2000
- A National Scientific and Technical Committee (CNST-CC), in 2001, made up of national experts and set up as a national equivalent to IPCC;
- A unit in charge of CDM.

A national strategy of environmental protection and sustainable development was elaborated and adopted in 1995. It specifies the objectives for the years 2005 and 2020 as well as the priorities for environmental action. The National Action Plan for the Environment (PANE) established within the framework of the UNDP's Capacity 21 program, aims at implementing the principles of this National Strategy. Programs have thus been developed in the sectors of water and soil resources, forestry, watersheds, energy, coastal areas, oases, etc. Two programs have been the focus of special attention since 1996: The Action Program for the Protection of Biological Diversity and the Action Plan for Combating Desertification. These programs have been elaborated within the framework of the related Conventions.

The plan for combating desertification represents an important component of the 2020 strategy for rural

development set up by the Department of Agriculture.

The Second National Communication submitted to UNFCCC in November 2010 stresses that in order for Morocco to cope with climate change impacts and to fulfil the obligations required by the Convention, it is necessary to have the available resources likely to foster capacity building systemically, institutionally and individually. More particularly, priority is accorded to areas such as vulnerability and adaptation, systematic monitoring, safety precautions and data banks, restriction of GHG emissions, appropriate development mechanism, technology transfer and synergy among the Conventions.

2. National efforts/measures against climate change

Morocco has set up several initiatives to combat climate change, among them systematic observations and data banks to monitor climate change and its impacts, scientific and technical research by academic institutions, and stimulating public awareness and capacity building.

Morocco participated in UNCED in 1992 and is a signatory to UNFCCC. The country ratified the Convention in April 1994. Subsequently, Morocco ratified the three Rio Conventions: UNFCCC and CBD in 1995, and the UNCCD in 1996.

In order to implement the three Rio Conventions – namely, the Convention on Biological Diversity (CBD), the UN Framework Convention on Climate Change (UNFCCC), and the UN Convention to Combat Desertification (UNCCD) – Morocco undertook to develop and coordinate its environmental institutions. Through this process, Morocco has also sought to build its institutional, human, technological, and financial capacities.

The primary national strategy currently underway to pursue low-carbon opportunities to achieve economic and social national aims is the National Plan of Priority Actions (PNAP in French: Plan National d'Actions Prioritaires). The development of the PNAP was launched by His Majesty King Mohammed VI on April 15, 2008. The PNAP represents a holistic approach to the country's energy needs, seeking to enhance energy security and increase access, while at the same time lowering CO₂ emissions. In a great number of cases, the actions included (e.g., increase in renewable energy and energy conservation) achieve all goals simultaneously. The PNAP measures are to be implemented by 2012. The PNAP is a comprehensive national program representing the efforts and contributions of the ten major Ministries at the national level, among them Ministry for Energy, Mines, Water and the Environment, Ministry of Equipment and Transport, Ministry of Agriculture, and the Ministry of Industry, Commerce and New Technologies. It also holds formal partnerships with the national electric utility, L'Office National de l'Electricité (ONE), the Centre for Development of Renewable Energy (CDER) as well as local officials and municipalities.

With regards to CDM projects, Morocco has so far 20 projects submitted to UNFCCC of which 8 projects are registered and 2 issued CER. The amount of CER issued has been nearly 330 thousands CERs. The wind power projects occupy one third of the project portfolio. The others are as diverse as solar, bagasse generation, and landfill gas recovery. As for projects under Validation, there are several in the pipeline including fuel switching, wind power, and waste water treatment.

As the host of the Seventh Conference of the Parties to the Climate Change Convention (COP 7) in Marrakech, Morocco demonstrated that in matters of climate policy, it is one of Africa's most committed countries.

3. Sustainable Development and Mitigation

• National inventory of greenhouse gas

GHG emissions in Morocco totalled about 44,394.0kt CO₂e in 1994, excluding CO₂ emissions/removals in the LUCF sector.

There generally is an increasing trend of GHG emissions in Morocco in the period 1990-2000. It is expected to increase in the future along with socio-economic development and population growth. Recent figures from the World Bank indicate that CO₂ emissions were 46,367.92 kt, equivalent to 1.49 ton per capita in 2007, compared to 1.12 ton per capital in 1994.

The sink capacity of Morocco in the LUCF sector is decreasing rapidly due to deforestation mainly for agricultural and energy use.

Table 1: Morocco GHG emissions summary

Total National Emissions and Removals	CO ₂ Emissions (kt)	
	1994	2000
GHG emissions without LUCF	44,394.0	59,699.7
GHG net emissions/removals by LUCF	-4,511.0	3,644.5
GHG net emissions/removals with LUCF	39,883.0	63,344.2
CO ₂ emissions without LUCF	28,364.0	33,550.8
CO ₂ net emissions/removals by LUCF	-4,511.0	3,637.0
CO ₂ net emissions/removals with LUCF	23,853.0	37,187.8

The inventory results attest to Morocco's very low contribution to the greenhouse effect amplification in comparison to industrialized countries.

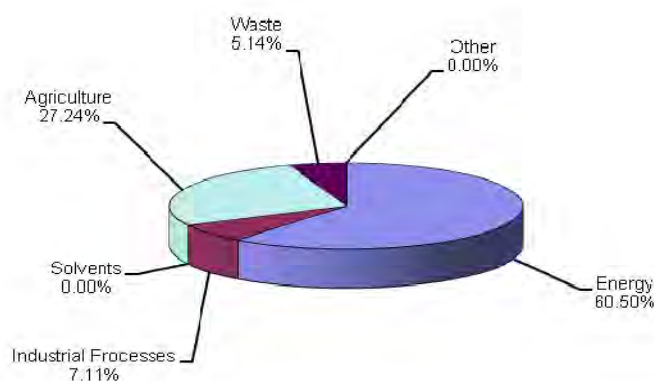


Figure 1: GHG Emissions by Sector (without LUCF) in 1994

In terms of CO₂ emission, about 60% of total emission came from the Energy sector, and energy industry sub-sector is the main emitter of CO₂ within this sector. The total CO₂ emission from the Energy Sector is estimated at 26,839kt for 1994. Figure 1 shows the sectoral share of CO₂ emissions from fossil fuel combustion for 1994. Mineral products account for 100% of emissions within the Industrial Processes sector.

• **Summary of Nationally Appropriate Mitigation Action (NAMA) plan**

In response to Copenhagen Accord, Morocco submitted its NAMA in January 2010. Morocco's NAMA is composed of various individual projects aim at implementation up until 2020. In particular, a large share of emission reductions potential is expected in energy generation with renewable sources such as hydro, wind and solar. Other reduction potential focuses on transport, industry, agriculture, waste, forestry, and construction.

Table 2: Morocco Proposed NAMA activities according to NAMA January 2010

Type of Activity	Planned Action	Capacity/scale
Hydro power projects development	100+ projects to be completed from 2009 to 2030	340 MW
Solar power projects development	5 projects to be completed from 2015 to 2020	2,000 MW
Wind power projects development	Projects to be completed from 2012 to 2030	5,000 MW
Promotion of solar heated boilers	First phase by 2012, second phase by 2020	2,140k m ²
Combined cycle power plant	By 2010	870 MW
Improvement of power plants efficiency through optimization of maintenance plan	n/a	n/a
Natural gas import plan	Make 20% of national consumption from natural gas by 2020	n/a
Nuclear power plants	Projects to be completed 2020-2030	2,000 MW
Public lighting optimization plan	Launch in 2009	n/a
Distribution of energy efficient light bulbs	22.7 million units by 2010	n/a
Promotion of energy-saving labelling for domestic appliances	n/a	n/a
Improvement of monitoring and invoicing of energy	n/a	n/a
Obligation for energy vendors to achieve energy savings through energy certificates	n/a	n/a
Various plans for promotion and development concerning road and rail transport in urban areas	n/a	n/a
Installation of wind turbines in industrial centres	Three projects by 2012	50 MW
Energy efficiency in industry programme in partnership with Centre of Development of Renewable Energy	n/a	n/a
Rehabilitation of uncontrolled waste and methane emissions from dumps	2008-2023	n/a

Evaluation of GHG emissions from waste water treatment plant	2020-2030	n/a
Improvement in agricultural yield	n/a	n/a
Reforestation	By 2030	1 million ha

4. Adaptation and Vulnerability

• Vulnerability to Climate Change

In Morocco, the examination of the three decades from 1970 to 2000 show revealing signs of climate change: the frequency and intensity of droughts, unusually devastating floods, the decrease in the snow cover period on the peaks of the Rif and the Atlas mountains, the modification of spatial, temporal rainfall distribution, changes of itinerary and passage dates of migrating birds, the appearance of certain species of birds in the Rabat region that only used to be seen in the south of Marrakech, etc.

Some of these natural manifestations have had a heavy toll on Morocco, at social, economic and environmental levels. The primary concern of the country today is to predict with scientifically acceptable uncertainty margins potential impacts of climate change foreseen by IPCC on vital sectors of the country: water, agriculture, forestry, animal husbandry (agro forestry), coastlines and health. The partial study of vulnerability to climate change impacts carried out within the framework of the preparation of Morocco's Initial Communication to the UNFCCC provides some projections for the year 2020 for some determining variables: qualitative variables for the environmental sector in the socioeconomic context, and quantitative variables for the water and agriculture sectors.

• Adaptation programs and activities

The First National Communication of Morocco presents the following projects to combat vulnerability to the climate change in the country in particular in the sectors of water and agriculture. Besides these, projects for other vulnerable sectors (such as the coastline, forest or precarious human establishments) also need to be identified and developed in the future. But, it is clear that the Moroccan economy, which is still caught up in the problems of development and struggles against poverty, cannot withstand the costs of such projects without sacrificing the major components of its social and economic development programs (Education, health, basic infrastructures, rural development, etc.).

5. Major Industries

According to the World Bank, GDP for 2010 was \$91,196,031,840. The services industry is the backbone of the Moroccan economy. The sector contributes about 55.1% of the GDP. Services, including government and military expenditures, account for about one-fourth of Morocco's GDP. Government spending alone, despite an ongoing effort on the part of the government to sell much of its assets to private concerns, accounts for fully half of the service economy. Since the mid-1980s tourism and associated services have been an increasingly significant sector of the Moroccan economy and by the late 1990s had become the country's largest source of foreign currency. During that time the Moroccan government committed significant resources — by way of loans and tax exemptions — to the development of the tourist industry and associated services.

The manufacturing sector produces light consumer goods, especially foodstuffs, beverages, textiles,

matches, and metal and leather products. Heavy industry is largely limited to petroleum refining, chemical fertilizers, automobile and tractor assembly, foundry work, asphalt, and cement. Many of the processed agricultural products and consumer goods are primarily for local consumption, but Morocco exports canned fish and fruit, wine, leather goods, and textiles, as well as such traditional Moroccan handicrafts as carpets and brass, copper, silver, and wood implements.

The mining sector is one of the pillars of Morocco's economy. It represented a turnover of USD 2.7 billion in 2005, including MAD² 2.17 billion in exports and 20% of energy consumption. It also employs about 39,000 people with an estimated MAD 571 million in salaries (2005). The Kingdom produces a number of minerals and metals, most importantly, phosphates, silver and lead.

Morocco possesses 75 percent of the world's phosphate reserves. It is the world's first exporter (28% of the global market) and third producer (20% of global production).

6. National development strategy

With the Country Assistance Strategy (CAS) with Morocco ending in 2009, the World Bank has begun preparation for the new Country Partnership Strategy³ (CPS 2010-2013).

On May 19, 2005, the World Bank adopted the CAS for the period 2005-2009. Developed in partnership with the Moroccan government for the 2005-2009 period, it was based on extensive consultations with various development actors. It also serves as a guide and framework for the World Bank's support to the country's development.

The goal of the Country Assistance Strategy (CAS) for the period 2005-09 was to help Morocco meet its key development challenges, notably: Accelerate employment-generation and sustainable economic growth, and reduce poverty and marginalization. The CAS will focus upon four objectives:

- improve competitiveness and the investment climate;
- increase access to basic services by poor and marginalized groups;
- improve the efficiency of the education system; and
- improve water management and access to water services and sanitation.

To assist Morocco in its efforts to increase energy security and reduce its vulnerability to oil price shocks, a fully government owned fund, called Fond de Développement de l'Energie ("FDE") is being set up. It currently has \$1 billion, consisting of contributions of \$500 million from the Kingdom of Saudi Arabia, \$300 million from the United Arab Emirates and \$200 million from the Hassan II Fund. Its legal status and operational priorities are set out in the Finance Act of 2009. Coordination is delegated to the Ministry of Energy, Mines,

7. Mitigation/Adaptation Options

In the First National Communication, the choices of the sectors with mitigation potential was analyzed on the basis of reference scenario and the sectoral analysis by category of the emission sources taking into account

² USD1= MAD 8.3858 (as of 6 October 2011)

³ CPS 2010-2013 has not been made public at the time of this summary preparation.

the technology potential and development objectives. Options for Mitigation in Morocco are presented in the table below.

Table 3: Mitigation Options for Morocco

Energy sector	<ul style="list-style-type: none"> - Rational use of energy in the industrial sector - Rational use of energy in administrations and public buildings - Upgrading of boilers in industrial and tertiary sectors - Beet pulp drying with overheated steam in Doukkala sugar factories - Development of cogeneration <p>Spreading the use of enhanced boilers in socio-economic sectors (i.e. Turkish baths and public ovens)</p> <p>Establishment car clinics for motor vehicles</p> <p>Heat trapping systems in Safi and Jorf Lasfar chemical facilities</p>
Alternative fuels	Development natural gas use in industrial sector
Renewable energies	<ul style="list-style-type: none"> Funding of decentralized rural electrification projects Development of solar energy use to heat water Desalination of seawater using wind energy in Tan Tan Production of power energy using wind energy Increase in the number of hydro electrical power plants Development of renewable energy
Development of forests	<ul style="list-style-type: none"> Support to the reforestation programme Plan Development of agro-forestry Rehabilitation of stripped mining sites in Khouribga
Biogas recovery from waste	<ul style="list-style-type: none"> Recovery of biogas from the wastewater treatment units of Benslimane and Agadir Recovery of biogas from solid waste dumps of Mediouna and Marrakech
Building materials substitution	<ul style="list-style-type: none"> Partial substitution for clinker using fly ashes from thermal power stations Use of damp phosphate instead of dry phosphate rock in the Jorf Lasfar chemical facility Partial substitution for black phosphate rock with light phosphate in Youssoufia

Climate change impacts on the Moroccan society and economy can be eased if adaptation programs are carried out as soon as possible, especially in the most vulnerable sectors. The first diagnosis of Morocco's vulnerability to the climate change impacts highlighted a dozen adaptation projects in the sectors of water and agriculture as well as seven accompaniment projects.

Their design still needs to be worked out and their costs assessed. Likewise, projects for other vulnerable sectors (such as the coastline, forest or precarious human establishments) have to be identified and worked out. But it is clear that the Moroccan economy, which is still caught up in the problems of development and struggles against poverty, cannot withstand the costs of such projects without sacrificing the major components of its social and economic development programs (education, health, basic infrastructures, rural development, etc.)

The first diagnosis of Morocco's vulnerability to the climate change impacts highlighted a dozen adaptation projects in the sectors of water and agriculture as well as seven accompaniment projects. These projects, whose title and brief specification are given in the table below, are classified according to their types.

Table 4: Adaptation Options for Morocco

<p>Water</p> <p>“Water savings in irrigation”</p> <p>This projects seeks to reduce water losses in some distribution networks and optimize consumption to adapt it to the needs of different crops</p>
<p>Alternative Water Use</p> <p>“Implementation of a pilot irrigation scheme for the use of treated wastewater in irrigation”</p> <p>The demonstration project, located in the ORMVA of the Haouz, is equipped with an urban wastewater treatment unit and uses recycled water in irrigation. Extending the project to cover other Moroccan cities is in consideration.</p> <p>“Brackish water use in the Irrigation of the Low Moulouya”</p> <p>The project will seek to identify salinity-tolerant plant species and to develop techniques adapted to using brackish water for irrigation.</p>
<p>Water resource protection</p> <p>“Limitation of perimeters to protect potable water facilities ”</p> <p>The project will focus on protecting water tables against pollution risks, while ensuring steady supply of potable water to the cities of Tangier, Azilal and Sidi El Mokhtar (Chichaoua province).</p> <p>“Treatment of effluents from drinking water production facilities”</p> <p>These effluents are a source of pollution to the recipient environment and therefore present a potential health hazard to the nearby populations. The project aims to install six drinking water production plants.</p> <p>“Establishment of sanitary landfills”</p> <p>The project seeks to implement a controlled waste dump for household solid wastes in the city of Guelmim. The Oued Seyyad well field, which supplies both Guelmim and TanTan with drinking water, is threatened by pollution originating from uncontrolled household refuse deposits. The project needs to be implemented in all cities that do not have such facilities.</p>
<p>Harvesting new water resources</p> <p>“Collection and use of storm water”</p> <p>This project aims to introduce appropriate technologies for collecting and storing storm water in rain fed areas (arid and semi arid zones).</p> <p>“Sea water desalination”</p> <p>This project aims to supply the coastal cities located along the Agadir Tarfaya axis with drinking water. This area, endowed with a huge tourism potential, often suffers from lack of water resources.</p>
<p>Dry farming</p> <p>“Restructuring and development of Oases”</p> <p>The project seeks to maintain agricultural activities of the populations living in oases and to restore the date palm heritage.</p> <p>“Extension of olive oil plantations”</p> <p>Among the vegetative species best adapted to marginal zones, the olive tree represents an asset for all countries in the Mediterranean basin. The project aims to expand olive tree plantation in favourable areas</p>

of Morocco.
<p>Adaptation of farming techniques</p> <p>“Supplemental irrigation”</p> <p>This project proposes to carry out the required land development activities, especially in rainfed cereal crop areas to ensure supplemental irrigation (70-100 mm) to save crops from seasonal drought occurring at the end of growth cycles.</p>
<p>Supporting projects</p> <p>“In-depth research on the CC impacts on water and agriculture”</p> <p>“Establishment of a research centre for CC impacts”</p> <p>“Modeling of climate projections in the Maghreb”</p> <p>“ Establishment of a climate databank”</p> <p>“Development of the agro-meteorology network”</p> <p>“Tapping of deep water tables in western High Atlas”</p> <p>“Mapping of major water tables prone to pollution”</p>

Reference:

- Second National Communication, November 2011
- Climate Investment Funds, Investment Plan for Morocco, October 2009
- The World Bank’s Country Assistance strategy (CAS) for Morocco, Fiscal 2005-2009
- UNFCCC website (GHG Profile, NAMA, NAPA, CDM)
- The World Bank website on country page for Morocco
- CIA the World Fact Book

This summary was prepared based on the data/information available as of September 2011.

2.3.18. レソト

Lesotho

- **Mainstreaming mitigation/adaptation actions in the national development strategy**

The economy of the Kingdom of Lesotho is service oriented. The country is a low industrialized country and agriculture is a major source of livelihood for 80% of the population. The main GHG emissions sources are from soil conversion under Land Use Change and Forestry (LUCF) and from enteric fermentation under agriculture sector. As the land is an important resource for the country, the government aims to promote poverty alleviation and economic growth by implementing better agriculture and land use practices, as well as promoting afforestation/reforestation activities and generation of renewable energy from forest biomass, while contributing for GHG emissions reduction. Technology transfer is a key issue for the implementation of these measures.

- **Summary on climate change related issues in the country**

1. Climate change policy

Lesotho has ratified the United Nations Framework Convention on Climate Change (UNFCCC) on March 1995. Besides, the country has ratified other international Conventions and Protocols related to environment protection and sustainability such as the Biodiversity Convention, the Desertification Convention and the Montreal Protocol.

According to the First National Communication, published on April 2000, Lesotho has not developed a national climate change policy. However there are some sector-specific policies and measures in the areas of environment, waste management, energy, land use, agriculture, health and sanitation, which contribute to climate change mitigation. As an example, according to the Country Strategy Paper (2008-2012) one of the measures to promote economic growth and diversification is to expand the use of clean energy and partial replacement of non-renewable energy sources. Following this strategy, Lesotho is implementing the *Rural Electrification Project*, which basically consists on a) the rehabilitation of the 2MW Mant'onyane mini hydropower station and b) the installation of 350 home solar systems as part of the Mphaki Pilot Project.

As emphasized in the First National Communication, the country still faces severe challenges in the implementation of its policies because of lack of resource and institutional constraints. Therefore, although Lesotho is aware of its vulnerability to climate change and its obligations under the UNFCCC the implementation of mitigative and adaptative policies are strongly dependent on the support from other countries.

2. National efforts/measures against climate change

Lesotho established the Designated National Authority (DNA) for CDM under its Ministry of Natural Resources. To date, the country has developed only one energy efficiency CDM project.

This CDM project was implemented by Solar Lights, a company based in Lesotho, and the atmosfair GmbH, a German carbon offset organization. The project purpose is to disseminate efficient fuel wood stoves and heat retaining polypropylene boxes in several districts of Lesotho, at subsidized prices. The project is under

validation since November 2010 and is expected to prevent the emissions of 394,659 tCO₂e until 2021. It is estimated that a single system is able to avoid 39,466 tCO₂e per year.

Although the country has developed only one project directly related to GHG emissions reduction, according to the African Development Bank portfolio of projects, there are eight ongoing projects which are under the national development strategy that may indirectly contribute to climate change mitigation and adaptation by providing poverty alleviation and better livelihood conditions including rural electrification and road infrastructure development.

3. Sustainable Development and Mitigation

• National inventory of greenhouse gas

The Lesotho greenhouse gas emissions (GHGs) inventory evaluates GHGs emissions for the base year 1994 and considers the following four categories of inventories: energy, agriculture, land use change and forestry, and waste management. The GHGs which were considered in the study included carbon dioxide (CO₂), carbon monoxide (CO), methane (CH₄), nitrous oxide (N₂O), nitrogen oxide (NO_x) and non-methane volatile organic compounds (NMVOC). The total GHG emissions for this inventory year, including LUCF, are 3,080.87 Gg of carbon dioxide equivalent (CO₂e). Table 1 shows Lesotho GHG emissions by inventory category.

Table 1: Lesotho GHG emissions by inventory category

Total National Net GHG Emissions	GHG Emissions base year 1994		
	Gg of CO ₂ e	% (without LUCF)	% (with LUCF)
Net GHG emissions from Energy Sector	827.22	45.4	27
Net GHG emissions from Agricultural Sector	938.51	51.6	30
Net GHG emissions from Waste	54.57	3.0	1.8
Total (without LUCF)	1,820.30	100	-
Net GHG emissions from LUCF	1,260.57	-	41
Total (with LUCF)	3,080.87	-	100

As presented in Table, land use change and forestry is the largest source, being responsible for net emissions in the order of 1,260.57 Gg of CO₂e or 41% of the country's total GHG emissions. The second largest source is agriculture, which contribution is 938.51Gg of CO₂e or 30% of the country's total GHG emissions, most of these emissions come from enteric fermentation. Energy is the third emitter with a contribution of 827.22Gg or 45.4%, although it was the second highest emitter of CO₂, mainly from the combustion of biomass fuels. The least contribution comes from waste, a source of 54.57Gg of CO₂e or 1.8% of the total.

• Summary of Nationally Appropriate Mitigation Action (NAMA) plan

Lesotho has not submitted its NAMA plan. Priority is given to adaptation actions due to the country poverty conditions and consequent high vulnerability to climate adverse events.

4. Adaptation and Vulnerability

- **Vulnerability to climate change**

Lesotho is a small, landlocked country, under a poor economic situation, considered by UNFCCC as a least developed country extremely vulnerable to climate changes.

The main environmental problems in Lesotho are drought, land degradation, desertification and loss of biodiversity which currently already threaten the country, in special the agriculture sector. This is very critical since 85% of the population directly depends on the agriculture.

Lesotho has developed the National Adaptation Programme of Action on Climate Change (NAPA). The goal of NAPA is identify and prioritize national needs so that effective implementation measures may be put into place to combat the adverse effects of climate change.

- **Climate Change National Adaptation Programme of Action (NAPA)**

The Lesotho NAPA process identified and prioritized eleven adaptation activities which will be implemented in the various vulnerability zones. These projects have been organized in a hierarchy of importance of which development and improvement of livestock production and the development of crop based livelihood are the most important activities to be implemented.

Table 2 presents NAPA priority projects of Lesotho.

Table 2: Lesotho NAPA Priority Projects

	Project Title	Sector	Indicative Cost (USD)
1	Improve Resilience of Livestock Production Systems Under Extreme Climatic Conditions in Various Livelihood Zones in Lesotho	Food security	2,980,000
2	Promoting Sustainable Crop Based Livelihood Systems in Foothills, Lowlands and Senqu River Valley	Food security	4,235,000
3	Capacity Building and Policy Reform to Integrate Climate Change in Sectoral Development Plans	Cross sectoral	1,260,000
4	Improvement of an Early Warning System Against Climate Induced Disasters and Hazards	Water resources	920,000
5	Securing Village Water Supply for Communities in the Southern Lowlands	Wetlands Ecosystem	1,170,000
6	Management and Reclamation of Degraded and Eroded Land in the Flood Prone Areas (Pilot Project for Western Lowlands)	Terrestrial ecosystems	966,000
7	Conservation and Rehabilitation of Degraded Wetlands in the Mountain Areas of Lesotho	Terrestrial ecosystems	690,000
8	Improvement of Community Food Security Through the Promotion of Food Processing and Preservation Technologies	Food security	620,000
9	Strengthening and stabilizing ecotourism based rural livelihoods	Tourism	NA
10	Promote Wind, Solar and Biogas Energy Use as a Supplement to	Energy	NA

	Hydropower Energy		
11	Stabilizing Community Livelihoods which are Adversely Affected by Climate Change Through Improvement of Small Scale Industries	Cross Sectoral	NA

Source: Adapted from National Adaptation Programmes of Action

5. Major Industries

Lesotho is surrounded by South Africa. The geographical position of the country leads to a significant integration of its economical system with South Africa.

Lesotho's economy is based on water and electricity sold to South Africa, manufacturing, earnings from the Southern African Customs Union (SACU), agriculture, livestock, earnings of laborers employed in South Africa. The country also exports diamonds, wool, and mohair.

The main natural resource of Lesotho is the water. The country provides water from the Orange River system to South Africa's Free State Province and greater Johannesburg area, which features a large concentration of South African industry, population, and agriculture. Further, this natural resource has an important role for Lesotho electricity generation, which is almost completely self-sufficient in the production of electricity. The country generates approximately \$24 million annually from the sale of electricity and water to South Africa.

Agriculture is predominant in the western lowlands of Lesotho. The main products from agriculture are: corn, wheat, sorghum, pulses, barley, peas, beans, mushrooms, wool, mohair and livestock. Almost 50% of the population earns some income through crop cultivation or animal husbandry while only 11% of the country is arable land.

Main Lesotho industry types are: textiles, apparel assembly, food, beverages, handicrafts, construction, and tourism. The textiles sector is currently the largest employer in the manufacturing sector.

According to the World Bank, in 2010, Lesotho GDP was \$2.1 billion and GDP per capita was \$1,080. For the same year, agriculture, industry and services represented respectively 7.1%, 34.6% and 58.2% of the GDP.

Lesotho growth rate was 2.4% in 2010 and it is expected to be lower for 2011 mainly because the government is aiming to reduce the country budget deficit by reducing expenditure. Budget deficit was increase due to higher imports to meet requirements for projects in the construction sector, compounded by continued low Southern Africa Customs Union (SACU) revenues.

6. National development strategy

Lesotho's national plans are focused on poverty alleviation, since the wide prevalence of poverty is the most relevant reason for the country's vulnerability to climate change. Therefore a lot of programmes have been designed for poverty alleviation.

The Government of Lesotho is committed to develop the five-year National Development Plan (NDP) for 2012/13-2016/17, supported by UNDP. The plan is expected to be in place for the fiscal year 2012/13. The most recent national framework document is the Poverty Reduction Strategy (PRS) 2004/05-2006/07, which was further extended up to April 2011. The PRS reflect Lesotho's priorities and strategies for poverty reduction, within the following four key pillars of policy objectives: (i) accelerating shared and sustainable

economic growth; (ii) human development; (iii) protecting and enabling disadvantaged groups; and (iv) good governance.

Table3 indicates the priority areas of actions for each key pillar.

Table 3: PRS in Short

PRS Pillars	PRS Priority Areas of Action
I: Accelerating shared & sustainable economic growth	<ul style="list-style-type: none"> ▪ Private sector development ▪ Tourism ▪ Mining & quarrying ▪ Agriculture ▪ Economic infrastructure ▪ Protecting & conserving environment
II. Human development	<ul style="list-style-type: none"> ▪ Education & training ▪ Healthcare ▪ HIV & AIDS epidemic ▪ Social infrastructure
III. Protecting and enabling disadvantaged groups	<ul style="list-style-type: none"> ▪ Women's empowerment ▪ Youth & children's issues ▪ Other disadvantaged groups ▪ Food insecurity
IV. Good governance	<ul style="list-style-type: none"> ▪ Improving public service delivery ▪ Deepening democratic institutions ▪ Justice, safety & security

Source: Country Strategy Paper (2008-2012)

In line with Lesotho PRS, the African development Bank and African Development Fund prepared the 2008-2012 Country Strategy Paper (CSP) for Lesotho. It focuses on the following goals:

- (i) Improving service delivery through the establishment of an effective public sector and sound fiscal policy management including improved transparency and accountability in public financial management.
- (ii) Increased access to electricity from 13% in 2008 to 25% in 2015.
- (iii) Adapting and improving training to produce workers with marketable skills.

The first Poverty Reduction Support Programme (PRSP I) in Lesotho was approved in November 2009. It results from Lesotho Government request and discussions held with previous Bank missions. PRSP I is in line with the Lesotho PRS and the Bank's Country Strategy Paper for Lesotho (2008-2012).

The PRSP I is currently ongoing and its objective is to support the implementation of the first pillar of the CSP 2008-2012. The secondary objective is to strengthen the second pillar of the CSP 2008-2012.

Under the PRS, Lesotho has a portfolio of eight ongoing projects, including the PRSP I as listed below.

- Poverty Reduction Support Programme
- Rural Electrification Project
- Support to Health Reforms Program
- Likalaneng-Thaba Tseka Road ProjectTransport
- Likalaneng - Thaba Tseka Road Upgrading Project (Supplementary Loan)
- Education Quality Enhancement Project (Education III)
- Highlands National Resources and Rural Income Enhancement
- Institutional Support to Ministry of Finance and Ministry of Public Works and Transport

7. Mitigation/Adaptation Options

The FNC state a number of potential mitigation and adaptation options/ opportunities, which could meet both objectives of socio-economic development and climate protection. The energy and forestry sectors were considered in order to assess mitigation options for Lesotho. Table 4 lists these options.

Table 4: Mitigation Options for Lesotho

Energy
<p>Promotion of renewable energies</p> <p>Enlarge the exploitation of energy from renewable resources mainly via the development and dissemination of hydropower plants and solar technologies such as: solar cookers, solar water heaters, solar dryers, and photovoltaic systems. This is a relevant measure for the climate change mitigation since Lesotho has a high potential to enlarge its electricity generation. (Lesotho has a potential energy supply of 1260 GWh/y which is more than 6 times its electricity demand).</p>
<p>Improving/promoting energy distribution network</p> <p>Provide clean energy to underserved communities, through the implementation of the rural electrification programme. As the main energy source in rural communities is forest biomass, the rural electrification may contribute to reduce deforestation rates and the resulting GHG emission.</p>
<p>Energy conservation</p> <p>Improve building designs and develop heat conserving, energy-efficient technologies. This may result in lower fuel consumption and resulting GHG emission reductions.</p>
Forestry
<p>Reforestation of indigenous forest</p> <p>Promote reforestation to contribute with poverty alleviation, livelihood security, environmental protection, and enhancement of women's participation development. This measure may contribute to climate change mitigation through the CO₂ removal from atmosphere to the growing forest which is stored as above/below ground biomass</p>
<p>Afforestation of Gullies and Degraded Lands</p> <p>Provide fuel wood for rural communities from renewable source, to generate sources of income through the sale of trees, stabilize the soil, and improve the biodiversity. This measure may contribute to reduce native forestry deforestation rate and resulting GHG emissions.</p>
<p>Rehabilitation of Wetlands</p> <p>Promote afforestation of degraded wetlands to preserve the ecosystem and the surrounding habitat and improve the biodiversity. This measure may contribute to climate change mitigation through the CO₂ removal from atmosphere to the growing forest which is stored as above/below ground biomass.</p>

Lesotho adaptation options assessment considered three priority sectors: Agriculture, Water and Sanitation

and Land Use Change and Forestry. Table 5 lists these adaptation options.

Table 5: Adaptation Options for Lesotho

Agriculture
<p>Crop Diversification</p> <ul style="list-style-type: none"> -Crop intensification (increase farm outputs) through changes in the crop calendar by introducing more cropping seasons, adoption of new crop rotations, inter-cropping, the use of improved genetic material (high yielding, composite, disease and drought resistant varieties), introduction of integrated plant nutrition systems, and introduction of pest control and post-harvest loss management systems. -Expand the seedling production capacity for fruits and vegetables; -Strengthening coordination lines between research and extension services in the promotion of high-value crops; -Improvement and expansion of the fresh produce market infrastructure.
<p>Irrigation Development</p> <ul style="list-style-type: none"> -Articulation of a national irrigation policy and investigation of the irrigation potential offered by the Lesotho Highlands Water Project; -Assessment of irrigation infrastructure and equipment in 13 existing projects with a view to restructuring and revitalizing both currently operational and dormant irrigation schemes; -Expansion of the area under irrigation by 500 hectares over a period of 5 years with emphasis on high pressure, low technology irrigation systems; -Harnessing and expansion of the underutilized but successfully tested gravity-fed irrigation schemes countrywide; -Design and implementation of institutional capacity building programmes through short-term/in-service and long-term training programmes.
<p>Intensive Livestock Production</p> <ul style="list-style-type: none"> -Promote intensive livestock production in the lowlands to guarantee the farmer a steady income in future, particularly under vulnerable conditions due to climate change.
Water and Sanitation
<p>Rural Water Supplies</p> <ul style="list-style-type: none"> -Construction of gravity-fed systems and hand pumps to provide safe water to rural population aiming to improve its health and well-being status.
<p>Urban Water Supply and Sewerage</p> <ul style="list-style-type: none"> -Provide safe, affordable, and potable water supply and sewerage collection and disposal services on a full cost recovery basis.
Land Use and Forestry
<p>Environmental Legislation</p> <ul style="list-style-type: none"> -Establish a set of environmental legislation in order to secure the right of all to a clean and healthy environment, and to obligate a reciprocal duty for every citizen to safeguard and enhance their environment; -Establish the institutional framework that would respond, in a coordinated and systematic manner, to prevailing and emergent environmental problems; -Develop a comprehensive codification of laws relating to the protection and management of the ecosystems and natural resources and set up a cross-sectoral environmental regulatory framework to standardize decision-making principles.

<p>Land Use Planning</p> <ul style="list-style-type: none"> -Promote the efficient utilization of land resources through the formulation and implementation of update and integrated land use plans; -Empower rural communities and their land allocation committees with skills to improve existing settlements, control settlements expansion, and maintain a balance between agricultural production and demands for non-agricultural land uses.
<p>Land Reform</p> <ul style="list-style-type: none"> -Simplify land reform laws, translate these into the local language, and mount nationwide educational and awareness campaigns; -Streamline the bureaucratic procedures that are involved in the processing of land leases, and make a clear definition of agency responsibilities in the implementation of land laws; -Assess the feasibility of introducing land taxes and develop lease laws in order to promote a rapid commercialization of the land; -Develop an alternative social security system for those that are adversely affected by the land reform process.
<p>Range Management and Adjudication</p> <ul style="list-style-type: none"> -Reduction of livestock numbers while increasing rangelands carrying capacities, livestock productivity, and marketing efficiency to absorb increased off-takes; -Intensification of culling and breed improvement programmes.
<p>Conservation of Natural Resources</p> <ul style="list-style-type: none"> -Protect dam catchment areas through grassing, afforestation, and rehabilitation of degraded lands; -Design and implement resource management and conservation courses for government personnel and participating communities; -Improve the current forest nurseries and if necessary, establish new ones; -Review the legal framework within which conservation activities could be implemented more effectively.

Reference:

- Lesotho First National Communication, April 2000
- UNFCCC website (GHG Profile, NAPA, Designated National Authority, CDM)
- African Development Bank Country Strategy Paper (2008-2012)
- African Development Bank Lesotho project portfolio:
www.afdb.org/en/countries/southern-africa/lesotho/2/
- African Economic Outlook: www.africaneconomicoutlook.org/en/countries/southern-africa/lesotho/
- The World Bank website on country page for Lesotho
- U.S. Department of state: <http://www.state.gov/r/pa/ei/bgn/2831.htm>
- CIA the World Fact Book

This summary was prepared based on the data/information available as of September 2011.

3. 政策対話

3.1. 政策対話の開催

2011年10月31日から2日間、都内で「アフリカの気候変動対策・支援に関する政策対話」と題した国際会議が開催し、アフリカ各国の気候変動交渉官及び日本政府関係者が一堂に会した。

日本は、アフリカの開発をテーマとする国際会議「アフリカ開発会議（TICAD）」を通じてアフリカ支援を行っており、その中で地域が抱える気候変動の影響に対する脆弱（ぜいじゃく）性に着目し、気候変動対策を一つの柱として支援を行っている。政策対話では、アフリカ地域から幹部クラスの気候変動交渉官を招き、各国において低炭素成長や気候変動に適応できる持続可能な開発（low-carbon growth, resilient development）に必要な支援のほか、11月28日から南アフリカ・ダーバンで開催される「第17回国連気候変動枠組条約締約国会議（COP17）」など、今後の国際交渉で望まれる協議の観点などについて、幅広く意見交換を行った。

尚、COP17における日本政府主催サイドイベントにおいて、我が国は、「アフリカ・グリーン成長戦略－低炭素成長と気候変動に強靱な開発に向けて」の骨子案（添付1参照）を発表した。

この度発表された骨子案は、本年5月にセネガルのダカールで開催された第三回TICAD閣僚級フォローアップ会合において、我が国とアフリカ諸国との間でアフリカの低炭素成長に関する戦略を策定することが合意されたものである。

また、当該戦略に入れるべき要素として、これまでのアフリカ諸国及びTICAD共催者等との意見交換の結果を踏まえ作成された。今後は、2012年に開催予定の第5回アフリカ開発会議（TICAD IV）閣僚級フォローアップ会合にてアフリカ・グリーン成長戦略の中間報告を公表し、2012年秋に東京で開催予定の世銀・IMF総会の際に最終報告を公表することとなっている。

尚、COP17においては、本政策対話の成果についてとりまとめた資料が配布された（添付2参照）。

3.2. 政策対話のアジェンダ及び参加者リスト

添付3及び4参照。

3.3. 政策対話の議事録

「アフリカ気候変動対策支援に関する政策対話」の主な議事を次章にとりまとめる。尚、本政策対話の成果についてはCOP17においても発表された。

3.3.1. 開会式

発言者	<p>開会挨拶 平松 賢司 外務省地球規模課題審議官 黒川 恒男 独立行政法人国際協力機構理事</p> <p>政策対話全体のガイダンス 唐澤 独立行政法人国際協力機構理事気候変動対策室長</p>
参加者	アフリカ 17 カ国の気候変動交渉官・在京大使館関係者
発言	<ul style="list-style-type: none"> 外務省の平松 賢司地球規模課題審議官（大使）は開会の挨拶において、アフリカ諸国にとって気候変動は死活的な問題であり、我が国としてもアフリカと共に問題の解決に 貢献したいと表明するとともに、今回の政策対話には、アフリカとの協力強化、わが国の気候変動対策に関する取り組みの紹介、COP17 に向けた意見交換の三つの狙いがあり、活発な意見交換が行われることを期待すると述べた。 黒川恒男 JICA 理事は、アフリカは最も気候変動に 脆弱な地域の一つだが、将来の開発パターンを低炭素、持続可能なものにするチャンスでもあり、TICAD の取り組みがアフリカ各国の気候変動対策に貢献することへの期待を述べるとともに、政策対話を気候変動に関する幅広い問題に対し、出席者が異なった見方、概念、知識を共有し、気候変動に対して取り 組むための良い機会だ、と位置付けた。

3.3.2.セッション 1: 【対話 2】 アフリカのグリーン成長に向けて

議事進行	経済産業省
参加者	<p>アフリカ 17 カ国の気候変動交渉官・在京大使館関係者 鎗目雅 東京大学大学院新領域創成科学研究科教授 小田兼利 日本ポリグル株式会社代表取締役会長 唐澤雅幸 独立行政法人国際協力機構気候変動対策室長 佐川武志 豊田通商株式会社海外地域統括部新興市場室部長職 堀田隆之 三洋電機株式会社渉外部部長</p>
発表内容	<ul style="list-style-type: none"> 信谷室長から日本の先進技術を用いた気候変動対策及びグリーン成長について発表 鎗目准教授からグリーン成長に向けた技術革新の機会と課題について発表 堀田部長から三洋電機のソーラーランタンの紹介 小田会長から水浄化 BOP についての紹介及び実演 佐川部長から地方電化について発表 唐澤室長から気候変動に対する JICA 取組みについて発表 <p>発表資料（添付 5-10）</p> <p>【対話 2】 -1: Contribution for Tackling Climate Change and Promoting Green Growth By Advanced Japan's Technology（経済産業省 信谷室長）</p> <p>【対話 2】 -2: Encouraging Sustainability Innovation in Africa: Opportunities and Challenges for Green Growth（東京大学 鎗目教授）</p>

- 【対話 2】 -3: Shining ray of hope to save lives – Solar Lantern (三洋電機 堀田部長)
- 【対話 2】 -4: Retrospect and Prospect of Nippon Poly-Glu's BOP Business in Bangladesh (日本ポリグル 小田会長)
- 【対話 2】 -5: Food for Thought on Rural Electrification (豊田通商 佐川部長職)
- 【対話 2】 -6: JICA's operation responding to Climate Change (JICA 唐澤室長)

質疑応答

1. ガンビア

- ・ 小水力の費用予測にメンテナンス費用は入っているか。(佐川部長への質問)
- ・ ソーラーランタンは一台いくらか。(堀田部長への質問)

⇒ 佐川部長の応答

- ・ 入っている。初期投資コストの5%という前提が正しいかは議論の余地はある。

⇒ 堀田部長の応答

- ・ 60ドル。ケニアでいくらなら売れるか調査中であり、30ドルなら妥当という話を聞いている。

2. セネガル

- ・ 日本の石炭火力を世界に広めるにはどうしたらいいのか。
- ・ ODAの使用は避けたい。(信谷室長への質問)

⇒ 信谷室長の応答

- ・ 簡単な答えはないが、ODAや日本企業の海外進出を助ける他のツールがある。一般論だが具体的な案件があれば様々なツールを用いて支援ができると思う。
- ・ 一般論の話は難しいので、まずは具体的な技術の特定から始めるべき。

3. エチオピア

- ・ 適応は喫緊の問題。
- ・ エチオピア、アフリカの問題は二酸化炭素削減よりも開発であり、GDP成長。
- ・ 今回紹介されたものを含めて素晴らしい技術はあるが、アフリカでは普及されておらず、なぜ普及されていないかを問題視すべき。原因としては、資本のコスト、最終消費者の支払能力不足、利子の高さが考えられるため、原因を取り除き技術が日本から移転されることをJICAにも期待したい。

⇒ 唐澤室長の応答

- ・ 初期段階での障害を取り除くためのFSを今年行っており、まだパイロットプロジェクトだが対応している。
- ・ 幾つかのセクターでは、アフリカ開発銀行を通じた中小企業向け譲許的融資スキームがある。

4. マリ

- ・ 技術移転が進まない一番大きな原因はファイナンスへのアクセスが少ないことである。

<p>5. ウガンダ</p> <ul style="list-style-type: none"> ・ 戦略的ファイナンスは問題。製品のマーケティングや販売だけでなく技術移転にも目を向けるべき。(槍目教授へのコメント) ・ 気候変動問題は全体論 (holistic) でとらえず、案件毎、地域別など、部分でとらえることも必要なのではないか。(信谷室長へのコメント)

3.3.3.セッション 1: 【対話 3】 アフリカに対するレディネスサポート

議事進行	財務省
参加者	アフリカ 17 カ国の気候変動交渉官・在京大使館関係者 石井菜穂子 財務省副財務官
発表内容	
<ul style="list-style-type: none"> ・ 石井副財務官から”Readiness support for Africa”に沿って発表。 <p>発表資料 (添付 11) 【対話 3】 -1: Readiness support for Africa (財務省 石井副財務官)</p>	
質疑応答	
<p>1. アルジェリア</p> <ul style="list-style-type: none"> ・ プレゼン 2 頁目の地図で北アフリカが含まれていないが、日本のサポート対象でないということか。 <p>⇒ 石井副財務官からの応答</p> <ul style="list-style-type: none"> ・ プレゼンは世銀の資料を用いたが、世銀区分では北アフリカは別枠になっているため省かれてしまった。サポート対象となる。 	
<p>2. エチオピア</p> <ul style="list-style-type: none"> ・ 「地域開発」(regional development) とあるが、より小さい地域、草の根レベルに焦点をあてるべき、特に適応。 ・ レディネスに関するファイナンス面のサポートは、プロジェクト毎のアプローチではなく経済全体、地域全体のサポートが望ましい。 ・ 対象国はオーナーシップと政治的コミットメントの両面から選ぶことが重要。 ・ 経済援助は当該国に直接行われる方が望ましく、世銀などの機関を通すとそれらの要件を充たす必要があり無駄が多い <p>⇒ 石井副財務官からの応答</p> <ul style="list-style-type: none"> ・ 個別プロジェクトより戦略へのサポートを行うべき、というのは同意だが、対象国によって開発の度合いは異なるため力点は国によって異なる。 	
<p>3. ガンビア</p> <ul style="list-style-type: none"> ・ アフリカ諸国はすでに準備(ready)ができています。しかしながら、プレゼン資料では準備(readiness)のために様々な要求がなされており、資金を手にするまでの手続きが多く煩雑だという印象。 	
<p>4. マラウイ</p> <ul style="list-style-type: none"> ・ 日本はアフリカから非常に遠く、認識の差はやむを得ないが、アフリカは準備がで 	

きている。日本は地域金融機関を通さず直接サポートしたほうが効果的であり日本のプレゼンス向上となる。

⇒ **石井副財務官からの応答**

- ・ アフリカのレディネスについては差があり、対応も異なる。資料では日本のアプローチを一般化して説明しているが、レディネス に関して支援を行う用意がある。
- ・ 地域経済コミュニティ・地域金融機関への不信感は認識したが、場合によってはその意義もあると思われる。

3.3.4.セッション 1: 【対話 4】 適応と緩和の為のキャパシティ・ビルディング

議事進行	環境省
参加者	アフリカ 17 カ国の気候変動交渉官・在京大使館関係者 関谷毅史 環境省地球環境局国際連携課国際地球温暖化対策室長 林信濃 (財) 地球環境戦略研究機関適応チーム副ディレクター 赤木純子 国立環境研究所地球環境研究センター温室効果ガスインベント リオフィス (GIO) 特別研究員 水野勇史 環境省地球環境局市場メカニズム室国際企画官 木村繁 (財) 日本エネルギー経済研究所研究理事
発表内容	<ul style="list-style-type: none"> ・ 林副ディレクターからアジアでの適応の事例として Asia Pacific Adaptation Network (APAN) の紹介 ・ 赤木企画官から日本国のインベントリについての紹介 ・ 水野企画官によるアフリカでの GHG 削減の MRV に関するキャパビル事例の紹介 ・ 木村理事よりエネルギー統計と 気候変動について <p>発表資料 (添付 12-15)</p> <p>【対話 4】 -1: Asia Pacific Adaptation Network (APAN) and its implication to Africa (地球環境戦略研究機関 林副ディレクター)</p> <p>【対話 4】 -2: Inventory Development Status in Asia (国立環境研究所 赤木特別研究員)</p> <p>【対話 4】 -3: Capacity Building Project for Measurement, Reporting and Verification (MRV) of Greenhouse Gas (GHG) Emission Reduction in Africa (環境省 水野企画官)</p> <p>【対話 4】 -4: Energy Statistics and Climate Change Issue (日本エネルギー経済研究所 木村理事)</p>
質疑応答	<p>1. ケニア</p> <p>1) 日本国のインベントリについて</p> <ul style="list-style-type: none"> ・ アジアでのインベントリ開発の経験から、一般にインベントリ開発には何人くらいの人員が必要か。 ・ アフリカの排出は非常に少ないことを考慮し、最低限のインベントリとはどうあるべきか。またインベントリの開発を義務付ける法的制度が必要だと考えるか。 ・ インベントリを開発する上で、官民協力関係の経験を聞かせてほしい。

2) 二国間メカニズムについて

- 二国間メカニズムは国際的に合意されているか。ダーバン COP での結果次第のものか。
- 水野企画官のプレゼン中の市場メカニズムに関するキャパビリティとは、どのメカニズムにも対応可能であるか、日本のメカニズムのみを対象にしているか。
- この日本の二国間メカニズムに関する法制度は既に国内では施行されているのか。京都議定書から日本が外れた後、マーケットの需要があることが前提であるがどのようにこのメカニズムを維持していく予定か。

⇒ 赤木特別研究員、関谷室長の応答

- 様々な分野から相当数の知見のある人員が関与した。日本国には京都議定書に基づき政府がインベントリの設置することを義務付ける法律がある。

⇒ 水野企画官の応答

- 日本国が行うキャパビリティは様々なマーケットメカニズムに対応可能なものを行っている。キャパビリティが完了した後の、活用はそれぞれの国の方針によるものであり、日本国が強制するものではない。

2. ブルキナファソ

- 国によって Energy Balance Table(EBT)に差があるが、なぜか? もう少し詳しく説明してほしい。
- IEA Energy Balance によるとどの国が最も EBT の値が高いかを教えてほしい。(木村理事へのコメント)

⇒ 木村理事の応答

- 配布資料作成時には国によってはデータがない国もあり、今答えられないので、後ほど確認し、連絡する。

3. エチオピア

- 「MRV キャパビリティを受けた後、知見の利用方法はそれぞれの国にまかせる」とは、キャパビリティが終わったらそれで終わりか? 二国間市場メカニズムというのはもともと排出量の少ないアフリカではなく、多量排出国で、削減の余地が大きい国にとってのインセンティブが多いのではないか。二国間メカニズムとは積極的な排出削減の手法としての位置づけを目指しているのか、CDM のように受動的な手法として位置づける予定か。(水野企画官へのコメント)

⇒ 水野企画官の応答

- 二国間メカニズムは様々な関係者に公平にベネフィットがあるものにしていき、確実な GHG の削減につながるものにしていきたい。

4. ガンビア

- 日本のインベントリの説明か、アジア全体のインベントリの説明かがわかりにくい。
- 日本のインベントリでは対象となる GHG は 10 種類か。
- 排出係数は IPCC のデフォルト値を使用しているのか、国独自の値を利用しているのか。

か。(赤木特別研究員への質問)

- ・ 環境十全性を重視し、CDM の弊害を考慮した新しい市場メカニズムの開発は重要であることに共感する。この新しいメカニズムでの需要抑圧 (suppressed demand)、PoA、地域的分布に関しての位置づけが知りたい。(水野企画官への質問)

⇒ **赤木特別研究員の応答**

- ・ インベントリの説明は日本についての説明をしたものである。
- ・ 対象となる GHG は 10 種類で、排出係数は IPCC のデフォルト値を使用している。

⇒ **水野企画官の応答**

- ・ 二国間メカニズムではスタンダードベースラインのコンセプトを検討している。

5. ウガンダ

- ・ APAN のファイナンスのソースはどこか。(林副ディレクターへの質問)
- ・ MRV を厳しくすると削減ポテンシャルという本来の目的からはずれてしまう可能性はないか。(水野企画官への質問)

⇒ **林副ディレクターの応答**

- ・ ファイナンスのソースは IGES と ADB である。

⇒ **水野企画官の応答**

- ・ 二国間メカニズムをまだ実施していないが恐らく、CDM に類似しているものになるのではないか。

6. マラウイ

- ・ 本プレゼンテーションでは、データ整備を伴う省エネと低炭素技術促進スキーム (スライド 3) をアフリカに適用することをご提案いただいているということか。そうであれば難しいのではないか。または同様のスキームを実行するための支援をいただけるということか。(木村理事への質問)

⇒ **木村理事の応答**

- ・ アフリカ諸国にはデータがない国があるので、データへのアクセスを充実させるためのキャパビリティは可能かもしれない。現在 IEA はアフリカでは 10 カ国をカバーしている。

3.3.5.セッション 2: JICA による気候変動対策とアフリカにおける活動

議事進行	JICA
参加者	アフリカ 17 カ国の気候変動交渉官・在京大使館関係者 畝 独立行政法人国際協力機構アフリカ部部长 加藤 独立行政法人国際協力機構アフリカ部次長 吉澤 独立行政法人国際協力機構アフリカ部企画役 富本 独立行政法人国際協力機構アフリカ部専門員 江島 独立行政法人国際協力機構地球環境部部长

	<p>唐澤 独立行政法人国際協力機構気候変動対策室長 稲田 独立行政法人国際協力機構気候変動対策室企画</p>
<p>発表内容</p>	
<ul style="list-style-type: none"> ・ 地球環境部江島部長が冒頭挨拶。 ・ アフリカ部副部長、加藤次長より、TICAD プロセスに基づく JICA のアフリカ支援、特に気候変動分野の支援について説明。 ・ 気候変動対策室唐澤室長より、低炭素で気候変動への対応力がある経済・社会づくりに向けたアフリカの課題と JICA の支援について説明。 <p>発表資料（添付 16-20）</p> <p>セッション 2 -1: スピーチペーパー 2nd Session: Measures to address Climate Change in Developing Countries (JICA 江島部長)</p> <p>セッション 2 -2: JICA’s Assistance to Africa and Climate Change Challenges (JICA 副部長、加藤次長)</p> <p>セッション 2 -3: Low-carbon and Climate Resilient Development in Africa (JICA 唐澤室長)</p> <p>セッション 2 -4: JICA Climate Finance Impact Tool (JICA Climate-FIT) Draft Ver.1.0 Outline of Mitigation Measures (参考資料)</p> <p>セッション 2 -5: JICA Climate Finance Impact Tool (JICA Climate-FIT) Draft Ver.1.0 Outline of Adaptation Measures (参考資料)</p>	
<p>コメント・質疑応答</p>	
<p>コメント</p> <p>1. エチオピア</p> <ul style="list-style-type: none"> ・ 別添資料を用いエチオピアが策定中の Climate Resilient Green Economy (CRGE) Strategy について説明。エチオピアでは気候変動対策の計画づくりや優先順位付けの準備が出来ており、支援するパートナーを探している状況であると主張。 <p>2. マリ</p> <ol style="list-style-type: none"> 1) TICAD のコミットメントと気候変動分野の短期支援（鳩山イニシアティブ）のコミットメントでダブルカウントがないようにすることが重要。 2) 短期支援など様々な支援プログラムの形成過程で途上国の関与がみえない、オーナーシップの確保が必要。 3) （実施機関を経由せず直接途上国の機関に資金を流す）ダイレクト・アクセスが資金支援の基本。途上国の実施機関、金融機関の育成が急務。 <ul style="list-style-type: none"> ・ アフリカでの低炭素で気候変動への対応力がある計画づくりにあたっては、包括的なものを作ると優先順位がみえなくなるので、現在あるものを積み上げていき、資金支援を得ていく現実的なアプローチが求められる。 ・ アフリカではキャパシティ・ビルディングが課題になっているが、短期間では解決できない問題であるとの認識をもった方がよい。 <p>3. ケニア</p> <ul style="list-style-type: none"> ・ TICAD V が日本のアフリカに対する気候ファイナンスの主要なコミットメントであると理解してよいか、と質問。JICA 現地事務所とは連携が良好であると発言。 ・ ケニアでの気候変動対策の取組として、2010 年に策定した国家気候変動適応戦略を 	

実施するためアクションプランの作成を進めていることを説明。

- あわせて、同戦略の 8 つの柱（電力を中心とした 2030 年に向けた戦略づくり、低炭素社会実現のための政策・規制、国家適応計画、国家緩和計画、技術力向上、MRV など成果評価、日本政府が UNDP を経由して支援している AAP 等を使った情報管理・キャパビル支援、国内の気候変動関連記入システムの整備）及び国内関係者間の調整メカニズムを紹介。
- 4. ガンビア**
- 説明を聞く限り TICAD IV は大きな成果をあげたようだが、アフリカは東部と南部だけではなく中部、西部、北部があるので、より包括的 (inclusive) なアプローチが必要と指摘。
 - ガンビアは 70 キロにおよぶ海岸線を有しており、海面上昇対応をはじめとして、RRSPI, II に相当する 2015 年までの中期戦略、2020 年までの長期戦略の両方において気候変動対策を重視。具体的な取組としては、1) 0.8 メートルの海面上昇で大部分が浸水被害を受けると分析されている首都バンジュールの対応策に関する F/S 策定 (2008 年に策定したものを EU の支援で改訂中)、2) 再生可能エネルギーを中心として電化率の向上をはかるプログラムの計画・実施 (AfDB の支援を受けた NAMA の策定など)。

質疑応答

1. セネガル

- アフリカ各国の環境省は TICAD についてよく知らない。情報共有の強化が必要。
- 日本は途上国支援を行う支援体制が充実しているが、受け手であるアフリカ各国の体制は不十分であり、強化が必要。

2. 南ア (在京大使)

- 2013 年半ば頃に予定される TICAD V に向け、在京大使の間でアフリカが TICAD V から本当に欲しているものが何かを議論していること、TICAD の共催者である AU と密接に情報交換していることを説明。

3. マラウイ

- 気候変動交渉官は、会議の席で先進国からの支援が来ていないと指摘するが、単に支援が来ていることを知らない可能性がある。JICA が、途上国の関係省庁を一堂に集めて最近の支援状況を説明する機会を設けるようにしてはどうか。

4. マリ

- 気候変動対策支援ツールに関心がある。他にも関心をもつ参加者が多いと思う。報告書全文を提供願いたい。

⇒ 敵部長の応答

- TICAD V では "inclusive" をテーマの 1 つに設定することを検討中。
- TICAD が日本の気候変動対策支援のプラットフォームとなるかどうかは、今後の協議次第 ("it depends")。TICAD で気候変動対策を優先課題として採択するのであれば、

各国において外務省、財務省、計画省に対して気候変動をメインストリーム化するようにプッシュしてほしい。

- マラウィが指摘したように調整プロセスは大事。日本としては、調整プロセスを通じて、アフリカが具体的にどのようなキャパビル支援を必要としているか学んでいくことができると考えている。
- COP17 の成果については悲観的な見方が多いが、2001 年にドーハで行われた WTO 会合では、同様に悲観的な見方が支配的だったにもかかわらず、わずか2 日間の交渉で途上国に対するキャパビル支援策をまとめた「WTO Development Agenda」が採択され、ドーハの奇跡と言われた。ダーバンの頭文字はドーハと同じ「D」であり、ダーバンでも同様の展開がみられることを期待する。

⇒ 唐澤室長の応答

- JICA のキャパビル支援はあらゆる階層を対象に行っている。気候変動対策の実施にあたっては、草の根レベルの支援が重要。
- アフリカの気候変動対策に関する準備状況は、エチオピアのように包括的な戦略を準備している国もあれば、計画づくりに支援が必要な国もあり、各国によって大きく異なり、支援ニーズも多様であると理解。
- JICA の気候変動対策支援ツールの概要資料は配付されたファイルに入っており、ウェブで公開している。

⇒ 富本専門員の応答

- オーナーシップは重要。日本や先進国が支援するのは皆さんの戦略や計画。
- アフリカ向け支援は、日本の TICAD だけではなく、欧米諸国もたくさん行っている。これらの支援がどのように MDG の達成に貢献しているかを把握することが重要。
- JICA のツールについて話題に出たが、ツールはなるべく簡素化し、共通のものを作っていくことが求められる。

4. 視察プログラム

4.1. 視察プログラムの概要

政策対話終了後、アフリカからの招聘者を対象とし、日本の最先端の低炭素・環境技術の現場への視察プログラムが組まれた。訪問先は下記に示す 3 施設で、参加者はいずれの見学においても非常に高い関心を示し、活発な質疑応答も行われた。

日	時間	訪問先
2011 年 11 月 2 日	10:50-12:10	浮島太陽光発電所、かわさきエコ暮らし未来館（東京電力）
	14:20-15:50	磯子石炭火力発電所（J-POWER）
	16:30-18:00	東京臨海エコ・プラント（高俊興業株式会社）

4.2. 視察先における主な説明内容と質疑

4.2.1. 浮島太陽光発電所、かわさきエコ暮らし未来館

先方対応者
東京電力株式会社 ・ 立花氏（フェロー） ・ 本田氏（技術部電源計画グループ） ・ 佐々木氏（技術部電源計画グループ） ・ 杉村氏（企画部調査グループ） 川崎市 ・ 福芝氏（環境局地球環境推進室長） ・ 長谷川氏（環境局地球環境推進室担当課長）
主な説明内容
東京電力より浮島太陽光発電所及び扇島太陽光発電所の概要について説明。その後浮島太陽光発電所内を見学。 - 浮島太陽光発電所は東京電力と川崎市の合弁事業で、2011 年 8 月より運用を開始。所在地は神奈川県川崎市川崎区浮島町。面積は 11ha で、発電出力は 7MW、年間発電電力は 7,400MWh であり一般家庭約 2,100 件の電力に相当。川崎市の埋立地に建設し、東京電力が運営している。パネルはシャープ製の単結晶シリコンで、約 38,000 枚を使用。年間約 3,100t の CO2 削減に貢献している。 - 隣接している扇島太陽光発電所も東京電力と川崎市の合弁事業で、2011 年 12 月より運用開始予定。所在地は神奈川県川崎市川崎区扇島。面積は 23ha で、発電出力は 13MW、年間発電電力は 13,700MWh であり一般家庭約 3,800 件の電力に相当。東京電力の所有地に建設し、浮島同様東京電力が運営している。パネルは京セラ製の多結晶シリコンで、約 64,000 枚を使用し、年間約 5,800t の CO2 削減に貢献している。

- 東京電力はこれら 2 つの太陽光発電所以外に、山梨県甲府市にも 10MW の太陽光発電所を運営している。
- 両発電所では、有機質土壌改良材を使用し、太陽光を遮る雑草や土埃を立ちにくくする工夫をしている。また一般的に太陽電池パネルの設置角度は 15 度から 30 度が最適とされているが、風圧荷重等の調査を行った結果、両発電所で最も効率的な角度は 10 度であることが判明したことから、10 度で運用している。
- パネルのメンテナンスは基本的に必要ない。発電所は無人であり、設置されたカメラで撮影した映像を、ここから数キロ離れたテクニカルオフィスまで飛ばして、そこで従業員が監視している。
- 発電所内では、川崎市の緑化基準に基づき敷地内に植樹を行っている。
- 両発電所のウェブサイトでは、現在の発電電力や気温、日射強度などを 5 分ごとに更新して見られるようになっている。
- 日本では、2011 年 8 月現在、電力会社が保有するメガソーラーは全国 21 地点で建設中または運用中であり、約 100MW の発電出力を誇る。また 2020 年までに全国 30 地点、140MW まで拡大する予定。

川崎市より、かわさきエコ暮らし未来館について説明。その後かわさきエコ暮らし未来館内を見学。

- 2011 年 8 月 6 日に開館。見て、聞いて、触って学べる環境学習施設であり、川崎市が運営している。今日まで、国内外から 7,000 人を超える見学者を受け入れた。

質疑応答

- 1kw/h あたりの発電コストはどれくらいなのか。石炭よりも高いのか。(ケニア Mr. Ali Daud MOHAMED)
→太陽光発電は一般的には 1kw/h あたり 40 円から 50 円。石炭はもっと安い。(東京電力)
- 発電した電力はどこに売っているのか。(ウガンダ Dr. Mackay OKURE)
→東京電力が発電事業者なので、東京電力が使っている。(東京電力)
- 消費者に対して太陽光発電に係る電力コストの追加負担を求めているか。(ケニア Mr. Ali Daud MOHAMED)
→現状は消費者へのコスト負担は実施していない。(東京電力)
- 事前に損益等の分析は行っているのか。(ウガンダ Dr. Mackay OKURE)
→もちろんやっている。ただこのプロジェクトは収益を追求することだけを目的に運用しているわけではなく、再生可能エネルギーの活用推進という CSR の観点を強く意識した運用を行っている。(東京電力)

4.2.2. 磯子石炭火力発電所

先方対応者
電源開発株式会社 ・ 入江氏（経営企画部地球環境室長） 磯子石炭火力発電所 PR 館 ・ 池杉氏（PR 館館長） 他 2 名
主な説明内容
電源開発より、磯子石炭火力発電所の概要について DVD と口頭で説明。その後発電所内を見学。 - 所在地は神奈川県横浜市磯子区新磯子町 37-1。 - 昭和 40 年代に旧 1 号機、旧 2 号機（発電出力はともに 26.5 万 kW）の運転を開始。当時から環境保全対策に力を入れてきたが、平成 14 年に稼動した新 1 号機（60 万 kW）、また平成 21 年に稼動した新 2 号機（60 万 kW）は、タービン内の水蒸気の温度と圧力を極限まで高める超々臨界（USC：Ultra Super Critical）の採用により、エネルギー効率と環境への付加を一層低減することができ、世界最高水準のエネルギー効率を実現した。発電効率は 43%（HHV）であり、横浜市の電力需要の約 4 割を賅っている。 - 新発電設備の主蒸気は 600℃、再熱蒸気温度は新 1 号機で 610℃、新 2 号機で 620℃。 - 活性コークスを使用した ReACT(Regenerative Activated Coke Technology)という技術を採用することで、NOx と Sox などの汚染物質を一括除去できる仕組み。 - NOx と Sox の排出はそれぞれ 0.05g/kWh、0.02g/kWh であり、世界最高水準の日本の平均である 0.2g/kWh、0.1g/kWh よりも低い。 - セルフ・アンローダー船（石炭船）から陸揚げされた石炭を貯蔵するサイロは、クローバー型のサイロを採用。1つのサイロが 4 槽に仕切られているため、限られた敷地に 4 炭種の貯蔵が可能。 - 発電所の総面積は約 12ha。 - 新発電設備工事期間中も、電力供給を維持するため、旧発電設備を運転しながら新 1 号機を建設し、新 1 号機の運転開始後に旧発電設備を撤去するビルドスクラップ&ビルド方式を採用。 - 超々臨界よりも更に発電効率の高い IGCC（Integrated coal Gasification Combined Cycle（石炭ガス化複合発電））のパイロットプラントを中国電力と共同で広島県にて計画している。

質疑応答
<ul style="list-style-type: none"> - (発電所内の監視センターのモニターを見て) SOx と NOx のモニターはあるが、CO2 のモニターはなぜないのか。(マラウィ Mr. Evans Davie NJEWA) →CO2 に関しては規制がないため、モニターしていない。(電源開発) - 発電所の監視体制はどうなっているのか。(ザンビア Ms. Mwiche KABWE) →10 人をチーム分けし、3 シフトで監視体制を組んでいる。(電源開発) - 発電に利用する石炭はどの国から購入しているのか。(モロッコ Dr. Hamid RHIOUANI) →主にオーストラリアとインドネシアから購入している。(電源開発) - 従来式と比べて、コストはどれくらい違うのか。(マリ Mr. Seyni NAFO) →難しい質問。初期投資だけで言えば、10% くらい従来式よりも高いが、トータルで見れば、一概に従来式よりもコストが高いとは言えないかもしれない。(電源開発)

4.2.3. 東京臨海エコ・プラント

先方対応者
高俊興業株式会社 <ul style="list-style-type: none"> ・ 葛西常務取締役 ・ 林氏 (工場長) ・ 森田氏
主な説明内容
東京都のスーパーエコタウンの概要について DVD にて、また高俊興業について口頭で説明。その後工場内を見学。 <ul style="list-style-type: none"> - スーパーエコタウン事業とは、循環型社会への変革を推進することを目的に、東京臨海部の都営地において、民間事業者等が主体となり廃棄物処理・リサイクル施設の整備を進める国の都市再生プロジェクト。 - 現在、東京都の 9 つのリサイクル会社が選定され、各社がそれぞれ食品、がれき、情報機器、建設混合、PCB 等を専門とするリサイクル事業を行っている。当社の臨海エコプラントを含め、7 社が大田区城南島で事業を行っている。 - 当社は、建設混合廃棄物のリサイクルを行っており、建設物の解体等で発生する廃棄物を中間処理施設である当社によって再資源化を図り、最終廃棄物を最小化している。 - 当社が請け負う廃棄物全体の 90% 以上のリサイクル率を実現している。つまり当社にトラック 100 台分の建設混合廃棄物が運ばれてきた場合、90 台分の廃棄物はリサイクルされ、残りの 10 台分が最終処分場に行くことになる。 - 当社が行う廃棄物の分別は、木、紙、廃プラ、金属、繊維、がれき類に分けられる。

- 当社は廃棄物の収集運搬、保管も行っており、運搬車両を 170 台保有している。
- 1 日にトラック約 350 台分の廃棄物を処理できる能力がある。具体的には 2,400 m³の廃棄物を 6 時間から 7 時間で処理できる。

質疑応答

質疑

- 事業の利益はどのぐらい出ているのか。(エチオピア Mr. Dessalegne Mesfin FANTA)
→あまり儲かっているとはいえないが、民間企業であり、当然利益は出ている。建設会社からリサイクル料金を徴収し、処理している。(高俊興業)
- 政府や自治体から補助金は出ているのか。(エチオピア Mr. Dessalegne Mesfin FANTA)
→補助金はない。企業努力のみで運営している。(高俊興業)
- リサイクル料金は重さ、量のどちらによって決めているのか。(エチオピア Mr. Dessalegne Mesfin FANTA)
→基本的には量によって決めているが、重量で決める場合も稀にある。今後、建設資材も分別がよりシンプルにできるものに改良されていくと考える。それに伴い、当社の運営方針も変えていかなければならないと思う。(高俊興業)

感想・コメント

- 本日の視察先の中では、自国にとって最も実用的な内容であり、非常に興味深い技術だった。(マリ Mr. Seyni NAFO)
- アフリカでは大量に廃棄物が出ていることから、日本の技術が活かせると思う。是非アフリカへの投資も投資してもらいたい。(ケニア Mr. Ali Daud MOHAMED)
→建設混合廃棄物のリサイクル技術については日本一の技術を持っていると自負している。今後機会があれば、ぜひ考えたい。(高俊興業)

「アフリカ・グリーン成長戦略—低炭素成長と気候変動に強靱な開発にむけて」（入れるべき要素案）

2011年5月1～2日にセネガルのダカールで開催したTICAD閣僚級フォローアップ会合においてアフリカ低炭素成長・持続可能な開発戦略の策定が合意された。アフリカにおける持続可能な低炭素成長を促進する中長期的な共通ビジョンを構築する本戦略の策定にむけて、日本はアフリカ諸国と緊密に協力していく意向。このことは世界のグリーン経済への移行に対する日本の積極的な貢献にもつながる。2013年以降、日本を始めとした国際的なパートナーの間で、アフリカへの支援や投資を行うにあたって本戦略が有益な指針となることにより、シナジー効果が促進されることを期待する。今後、2012年の第4回TICADフォローアップ会合において本戦略に関する中間報告を行い、また、2012年中の適当な機会に最終報告を行う予定である。

1 アフリカにおける気候変動問題の課題と機会

(1) 現在、気候変動問題は、アフリカにとって主要な開発課題の1つである。特に、脆弱国において重大な負の影響を与えており、特にアフリカにおいては同問題への対応が持続的な開発と人間の安全保障の実現のために必要不可欠な要素となっている。同時にアフリカには再生可能エネルギー等グリーン成長分野に大きな潜在力があり、当該分野における投資も増えている。

アフリカ諸国政府は、国際社会の支援を活用しつつ、気候変動分野での脆弱性を克服し、「気候変動に強靱な(climate resilient)」経済成長を目指すとともに、再生可能エネルギー分野を含むグリーン成長により、その成長を加速することが重要である。

(2) 気候変動分野において、アフリカ各国は地域特性、開発の優先度、社会・文化的な要素等から多様な開発ニーズを有しており、国別の開発戦略を策定した国も多い。一方、気候変動問題は1カ国では対応できない課題も多く、多数国間で共通の課題に取り組むことが不可欠であり、域内の協力関係も構築されつつある。このような地域・国を超えた協力が適応・緩和双方の分野で強化される必要がある。

(3) 本戦略はアフリカ諸国のオーナーシップに基づき、各国の優先順位に留意しつつ、アフリカ諸国とその開発パートナーとの間で、地域に共通する中長期的なビジョンを構築し、持続的で包括的な経済成長を促進することを目指す。

2 低炭素成長戦略（目標と方針）

<目標>

アフリカ諸国による「アフリカ・グリーン成長」（適応+緩和）を支援

アフリカ諸国の適応分野での課題を克服すると同時に、緩和分野における取組を推進しグリーン成長を実現する。

<方針>

(1) 適応と緩和を統合した形で検討

- ・気候変動起因の問題がアフリカの開発を阻害する要因となっているため、適応分野の課題にはできるだけ速やかに対応することを目指す。
- ・低炭素社会としてのアフリカの自然環境を保全しつつ、バランスのとれた経済成長を実現するために、各分野において気候変動に配慮した開発を進める。
- ・各国が策定したNAMA s, NAP s, 及び地域ごとのニーズにも留意しつつ、セクター別及び分野横断的課題の検討を行う。
- ・開発度合いが異なるアフリカ諸国の状況にあわせた適切な技術を移転する。

(2) オーナーシップの強化

- ・気候変動関連の方策・実施における高いレベルでの国ごとのオーナーシップの強化
- ・さまざまなステークホルダーの関与を促進する。
- ・既存の国別／国境を越えた／地域的な戦略やイニシアティブとの補完性を確保する。

(3) 国際社会と民間部門のパートナーシップの強化

- ・この戦略を民間企業とも幅広く共有することにより、公的セクターと民間セクターの連携が一層促進されるとともに、公的な支援を触媒とした民間投資呼び込みの可能性を増加させる。
- ・官民連携を強化し、雇用創出、特に若い世代の雇用促進に繋げる。

(4) 将来の気候資金のために、開発パートナー間での調整の向上

- ・この戦略をアフリカ諸国及び各開発パートナー（ドナー、NGO等）が指針の1つとして活用することで、本分野における既存のイニシアティブからの知見に基づき、各国・地域が個別に実施している政策、計画の調和、及びバイとマルチの支援の連携が促進される。
- ・将来の気候変動分野における長期資金（緑の気候基金を含む）による支援においても、（アフリカ諸国が支援を受ける場合に、）国際社会が本戦略を活用することを期待する。
- ・各国・地域レベルでのセクター間の連携が促進される。

3 低炭素成長戦略における個別セクターの取組

(1) エネルギー分野

- ・エネルギー・サービスの欠如は産業の発達を阻害し、医療サービスや教育を受ける機会を制限し、貧困化の固定につながる。一方、経済成長の過程ではエネルギー需要が著しく増大するため、エネルギーの安定供給の確保とともに環境への適切な配慮が必要。
- ・水力、太陽光・太陽熱、地熱、バイオマス、風力など、再生可能エネルギーの活用と電

力網の整備によるエネルギーアクセスの向上を図ることを検討。

- ・省エネを通じたエネルギーの効率的な利用促進策を検討。

(2) 農業分野

・気候変動の影響に強い食料安全保障体制を実現する観点から、食料の一層の増産と農業生産性の向上をはかることが急務。

- ・このため、気候変動に適応するための品種改良、灌漑、畜産、収穫管理システム、栽培技術など農業技術や農業インフラの向上／強化を検討。

(3) 森林分野

・アフリカは世界で最も森林の減少率が高い地域の1つ。アフリカにおける深刻な森林減少は干ばつや洪水といった自然災害の規模と頻度を増幅し、農業にも悪影響を与える可能性がある。

- ・森林減少を抑えるために、REDD+プロジェクトの取組促進等の方途を検討。

(4) 防災分野

・本年のアフリカの角における干ばつの例にもあるとおり、アフリカにおいて近年大規模な自然災害が発生しており、社会・経済システムに深刻な影響を与えている。また、貧困層が大きな被害を受けることで大量の難民が発生し、二次的被害が長期化する問題もある。

- ・洪水・干ばつ・沿岸浸食・地滑り等の自然災害が発生した場合に遅滞ない緊急支援の実施を確保するとともに、将来の災害に備えた対処能力向上等の方途を検討。

(5) 水分野（含む、衛生分野）

- ・水と衛生の問題は、人の生命に関わる重要な問題であり、気候変動の影響も大きい。

・清潔な水を供給できる給水施設や衛生施設（含む、廃棄物処理施設）の整備、アクセスの改善、および水資源（含む、地下水）管理に関する人材育成等の方途について検討。

(6) 運輸分野

・持続的な経済成長のためには運輸インフラの整備が必要であり、各国の国内インフラのみならず、各地において広域インフラの整備がすすんでいる。

- ・環境に配慮し、自然災害の発生も念頭においたクリーンで効率的な運輸インフラ整備の方途を検討。

(7) 分野横断的な課題

・セクター横断的な課題として、ジェンダーにも配慮しながら、人材の育成、組織の機能強化、データの収集や知識の共有・蓄積、気候変動分野における内外関係者間の政策対話の促進が必要とされている。この観点から、アフリカ各国による低炭素成長の策定に資する技術協力を積極的に検討。

- ・また、気候変動分野における資金調達メカニズムの確立と環境技術の活用の観点から、CDM及び二国間オフセット・クレジット制度のアフリカにおける活用の促進及びそれに関連する能力向上等の方途を検討する。

- ・一部のセクターにおいては一層の民間資金の活用が持続可能な経済成長、技術移転の観

点から有益であり、公的資金を触媒とした民間資金の呼び込み、BOP事業の導入が必要とされている。具体的な取組の一つとして、日本がすでにアフリカ諸国で実施している Lighting（電化支援等）、Lifting（産業基盤整備等）、Linking（通信網整備等）の3つのLを旗印としたプロジェクトを今後も継続していく。

・気候変動対策において一般市民やコミュニティレベルでの理解が重要であり、気候変動対策に関する啓蒙活動や広報を促進する。

JICA's Cooperation toward a Low-Carbon and Climate Resilient Development in Africa

Policy Dialogue on Measures and Assistances to Address Climate Change in Africa

hosted by the Government of Japan and organized by JICA
October 31 - November 2, 2011 / Tokyo, Japan

- **Two-day Policy Dialogue** and **Site Visit** to learn Japanese cutting-edge low-carbon, climate resilient technologies (mega-solar power plant, ecological township, etc.)
- **Representatives from 17 African country** and government officials, academics, business leaders and researchers in Japan attended the meeting
- Dialogue held in the context of the **fourth Tokyo International Conference on African Development (TICAD IV, May 2008)** co-organized by the Government of Japan, UN, UNDP and the World Bank
- Given that the continent is considered to be the most vulnerable to climate change and variability, the **importance of agricultural resilience and disaster risk management was emphasized.**
- JICA and the participants agreed on the importance of **strengthening collaboration to tackle with climate change in the future TICAD processes.**



Challenges for Africa

- Capacity development for data collection & analysis of vulnerability
- Vision for resilient development (climate-smart agriculture, efficient water use, etc.)
- Access to finance and investment

Toward Climate Resilient Community



Many vulnerable African communities need both structural (evacuation facilities, etc.) and non-structural (training) actions to adapt

Challenges toward a climate resilient community

- Registration of residents to community flood management organizations
- Construction of evacuation facilities (wells, buildings, warehouse, etc.)
- Programs for raising awareness (radio programs, student education, etc.)

Toward Climate Resilient Agriculture

In many African countries, economy and livelihood structures are highly dependent on rain-fed agriculture.



Potentially very vulnerable to climate change and variability: food security could be threatened.

Challenges toward a climate resilient agriculture

- Expansion of irrigated fields
- Exploitation of wet low-lands (that does not require large-scale investment)
- Agricultural diversification for minimizing risks
- Development of value chain and marketing
- Realization of higher agricultural productivity

Assistance to Africa through **TICAD** Process

Under the overall objective to foster a vibrant Africa, TICAD IV, held in Yokohama, Japan, in 28-30 May 2008, addressed the following three priority areas:

1. Boosting **economic growth**
2. Ensuring “human security”, including the achievement of the **Millennium Development Goals (MDGs)** and the consolidation of **peace and good governance**
3. Addressing environmental issues and **climate change**

Adaptation

- Measures against natural disasters
 - Measures to combat desertification
- [Case]
- Kenya: Water Supply and Hygiene Improvement Project in Host Communities of Dadaab Refugee Camps
 - Kenya: Community-Based Flood Disaster Management in the Nyando River Basin
 - South Africa: Prediction of Climate Variations and its Application in the Southern African Region

Mitigation

- Support for developing and effective framework beyond 2012
 - Promote CDM and support DNA
 - Support sustainable forest management in response to REDD
- [Case]
- Kenya: Olkaria Geothermal Power Plant
 - Egypt: Gulf of El Zayt Wind Power Plant Project
 - Kenya: Olkaria-Lessos-Kisumu Transmission Lines Construction Project
 - Zambia: Increased Access to Electricity Services Project
 - Burundi, Malawi, Ghana, Gabon, Egypt, Djibouti, Lesotho: The Project for Introduction of Clean Energy by Solar Electricity Generation System
 - Kenya, Uganda, Ghana, Ethiopia, Cote d'Ivoire, DRC: Forest Preservation Programme

Water and Sanitation

- Effective water resources management
 - Access to safe and sanitation facilities
- [Case]
- Morocco: Loan: Rural Water Supply Project
 - Tanzania: The Study on Rural Water Supply in Tabora Region
 - Ethiopia: The Project for Rural Water Supply in Tigray Region

Education for Sustainable Development

Tokyo International Conference on African Development (**TICAD**)

TICAD is a policy forum for African development which the Government of Japan initiated in 1993 with other co-organizers including UN, UNDP and the World Bank.

1993 TICAD I adopted Tokyo Declaration

1998 TICAD II adopted Tokyo Agenda for Action

2003 TICAD III adopted TICAD Tenth Anniversary Declaration

2008 TICAD IV adopted Yokohama Action Plan (YAP)

2013 TICAD V

Agenda

Day 1 – Monday, October 31, 2011

Time	Event
9:00	Registration
Opening	
10:00	Opening Remarks Mr. Hiramatsu, Ministry of Foreign Affairs; and Mr. Kurokawa, JICA
10:15	General Guidance about the Dialogue Program Mr. Karasawa, JICA
1st Session: Low Carbon Growth and Sustainable Development Strategy	
10:30	<u>Dialogue 1</u> : Low Carbon Growth and Sustainable Development Strategy Chair: Mr. Noke, Ministry of Foreign Affairs
12:00	Lunch hosted by the Ministry of Foreign Affairs (Venue: 1 st Floor, Crystal Hall)
13:30	<u>Dialogue 2</u> : Toward the Green Growth in Africa by Inclusive Cooperation between Multiple Stakeholders Key Note Speech: Mr. Nobutani, Ministry of Economy, Trade and Industry Dr. Yarime, The University of Tokyo Panel Discussion: Dr. Yarime (moderator, Univ. Tokyo), Mr. Hotta (Sanyo Electric), Mr. Karasawa (JICA), Mr. Nobutani (METI), Mr. Oda (Nippon Poly-Glu) and Mr. Sagawa (Toyota Tsusho)
15:00	Coffee Break (Venue: 3 rd Floor, Chidori)
15:15	<u>Dialogue 3</u> : Readiness Support towards Green Climate Fund Chair: Ms. Ishii, Ministry of Finance
16:15 - 17:45	<u>Dialogue 4</u> : Capacity Building for Adaptation and Mitigation Facilitator: Mr. Sekiya, Ministry of the Environment Presentation: Mr. Hayashi, IGES Ms. Akagi, GIO, NIES Dr. Mizuno, Ministry of the Environment Mr. Kimura, IEEJ
18:30	Bus leaves hotel for dinner
19:00	Reception & Dinner hosted by the Ministry of Foreign Affairs

Day 2 – Tuesday, November 1, 2011

Time	Event
9:00	Registration
2nd Session: Measures to Address Climate Change in Developing Countries	
10:00	JICA's Approach to Climate Change and Its Activities in Africa Key Note Speech: Mr. Ejima, JICA Mr. Tambo, JICA Presentation: Mr. Kato, JICA Mr. Karasawa, JICA
11:00	Coffee Break (Venue: 3 rd Floor, Fujinami)
11:15	Discussion Chair: Mr. Karasawa, JICA
12:30	Lunch hosted by JICA (Venue: 1 st Floor, Crystal Hall)
3rd Session: Toward COP17	
14:00	Discussion towards COP17 and Summary of Policy Dialogue Chair: Mr. Yamada, Ministry of Foreign Affairs
15:30	Coffee Break (Venue: 3 rd Floor, Chidori)
15:45	Discussion towards COP17 and Summary of Policy Dialogue (continued) Chair: Mr. Yamada, Ministry of Foreign Affairs
17:00	Closing Remarks By the Ministry of Foreign Affairs
17:15	Bus leaves hotel for dinner
18:00	Reception & Dinner hosted by the Ministry of Finance

List of Participants

	Organization	Name	Title	31-Oct	1-Nov	
Overseas Participants	Algeria	Mr. Merzak BELHIMEUR	Ambassador, Director General for International Economic Relations and Cooperation, Ministry of Foreign Affairs	○	○	
	Burkina Faso	Dr. Augustin KABORE	UNFCCC National Focal Point, Permanent Secretariat of the National Council for Environment and Sustainable Development	○	○	
	Cape Verde	Mrs. Deotina CARVALHO	Counselor, Ministry of External Relations	○	○	
	Chad	Mr. Mahamat ABDOULAYE ISSA	Director of Environmental Education and Sustainable Development, Ministry of Environment and Water Resources	○	○	
	Ethiopia	Mr. Dessalegne Mesfin FANTA	Deputy Director General, Environmental Protection Authority	○	○	
	Gabon	Mr. Rodrigue ABOUROU OTOGO	Director of Environmental Law / UNFCCC National Focal Point, Ministry of Ecology and Sustainable Development	○	○	
	Gambia	Ms. Fatou GAYE	Principal Climate Change Officer and Gender Focal Point, Ministry of Forestry and	○	○	
	Kenya	Ms. Fatuma Mohamed HUSSEIN	UNFCCC Desk Officer, National Climate Change Secretariat, Ministry of Environment and Mineral Resources	○	○	
			Mr. Ali Daud MOHAMED	Permanent Secretary, Ministry of Environment and Mineral Resources	○	○
	Lesotho	Ms. Malehloa JOCKEY	Climate Change Negotiator, Lesotho Meteorological Services	○	○	
	Malawi	Mr. Evans Davie NJEWA	Environmental Officer & UNFCCC Focal Point, Environmental Affairs Department	○	○	
	Mali	Mr. Seyni NAFO	Mitigation & MRV Coordinator / AGN Spokes person, African Group of Negotiators	○	○	
	Morocco	Dr. Hamid RHIOUANI	Head of Statistical Surveys and Data Collection, Department of Environment	○	○	
	Senegal	Mr. Ndiaye Cheikh SYLLA	Director of Environment and Classified Establishments, Ministry of the Environment and Nature Protection	○	○	
	Uganda	Dr. Mackay OKURE	Chair, Mitigation Thematic Group, Uganda Climate Change Forum	○	○	
	Zambia	Ms. Mwiche KABWE	Acting Manager, Planning and Information Management, Zambia Environmental Management Agency	○	○	
	Embassies in Tokyo	Algeria	Mr. Sid Ali	Ambassador	○	
Burkina Faso		Mr. Lambert Alexandre	Charge d'Affaires a.i.	○		
Ethiopia		Mr. MARKOS Tekle	Ambassador	○		
Gabon		Mr. Francois PENDJET BOMBILA	Charge d'Affaires a.i.	○	○	
Kenya		Mr. Benson Henry Ouma OGUTU	Ambassador	○		
Lesotho		Mr. Richard RAMOELETSI	Ambassador	○		
Malawi		Mr. Reuben	Ambassador	○		
Mali		Mr Taoule KEITA	Charge d'Affaires a.i.	○		
Morocco		Mr. Samir ARROUR	Ambassador	○		
			Mr. Lahoucine RAHMOUNI	First Counsellor	○	○
			Mr. Mohamed CHOURAK	Deputy Chief of Mission	○	
Senegal		Mr. Jean Antoine	Second Counsellor			
South Africa		Mr. Gert Johannes GROBLER	Ambassador	○	○	
			Mr. Hilton MNISI	First Secretary	○	○
United Republic of Tanzania	Mrs. Jilly Elibariki MALEKO	Minister Counsellor		○		
Zambia	Kennedy M.	Counselor		○		

添付 4. 政策対話参加者リスト

	Organization	Name	Title	31-Oct	1-Nov	
Government of Japan	Ministry of Foreign Affairs	Mr. Kenji HIRAMATSU	Ambassador, Director-General for Global Issues	○		
		Mr. Akira YAMADA	Deputy Director-General, International Cooperation Bureau		○	
		Mr. Masaki NOKE	Deputy Director-General, International Cooperation Bureau	○		
		Mr. Takehiro KANO	Director, Climate Change Division, International Cooperation Bureau			
		Mr. Junya NAKANO	Senior Negotiator for Climate Change Division, International Cooperation Bureau	○	○	
		Mr. Takashi KITAMURA	Climate Change Division, International Cooperation Bureau	○	○	
		Mr. Masayuki UEZONO	Climate Change Division, International Cooperation Bureau	○		
		Ms. Yoko UMEOKA	Climate Change Division, International Cooperation Bureau		○	
		Mr. Bumpei SUGANO	Climate Change Division, International Cooperation Bureau			
	Ministry of Finance	Ms. Naoko ISHII	Deputy Vice Minister for International Affairs	○	○	
		Mr. Hideaki IMAMURA	Director, Development Issues, International Bureau			
		Mr. Wataru TANIO	Section Chief, Development Institutions Division, International Bureau			
		Ms. Asami KAWANO	Development Institutions Division, International Bureau	○	○	
	Ministry of Economy, Trade and Industry	Mr. Kazushige NOBUTANI	Director, Global Environmental Affairs Office, Industrial Science and Technology Policy and Environment Bureau	○		
		Mr. Toshitaka KITAMURA	Deputy Director, Global Environmental Affairs Office			
		Mr. Takashi KONO	International Negotiator on Global Environmental Affairs		○	
		Mr. Yosuke NAKAYAMA	Chief Administrator, Global Environmental Affairs Office	○		
		Ms. Megumi HORIUCHI	Chief Administrator, Global Environmental Affairs Office			
		Mr. Soichiro SEKI	Deputy Director-General for Global Environmental Affairs		○	
		Mr. Izuru KOBAYASHI	Director for Climate Change, Global Environmental Affairs Office		○	
		Ms. Ai KAMIYAMA	Global Environmental Affairs Office, Industrial Science and Technology Policy and Environment Bureau		○	
	Ministry of the Environment	Mr. Shigemoto KAJIHARA	Councillor, Minister's Secretariat		○	
		Mr. Takeshi SEKIYA	Director, Office of International Strategy on Climate Change, Global Environment	○	○	
		Mr. Yuji MIZUNO	Senior Planning Officer, Office of Market Mechanisms	○		
		Mr. Michihiro OI	Negotiator of Climate Change, Office of International Strategy on Climate Change, Global Environment Bureau	○	○	
		Ms. Atsuko NISHIKAWA	Deputy Director, Environmental Cooperation Office			
		Mr. Yusuke NAKAMURA	Deputy Director, Office of Low-Carbon Society Promotion, Global Environment	○		
		Mr. Koji YAMADA	Deputy Director, Office of International Strategy on Climate Change, Global Environment Bureau	○	○	
	International Organizations	World Bank	Ms. Mika IWASAKI	Senior Communication Officer	○	
		UNDP Tokyo Office	Mr. Koji YAGI	Deputy Director	○	
Ms. Naoko TAKASU			Programme Management Specialist		○	

添付 4. 政策対話参加者リスト

	Organization	Name	Title	31-Oct	1-Nov
Non-government Participants	Institute for Global Environmental Strategies (IGES)	Mr. Shinano	Deputy Director of Adaptation Team	○	
		Mr. Koji FUKUDA	Researcher	○	○
	The Institute of Energy Economics, Japan (IEEJ)	Mr. Shigeru KIMURA	Senior Research Fellow	○	
		Mr. Edito S. BARCELONA	Senior Researcher	○	
	National Institute for Environmental Studies (NIES)	Ms. Junko AKAGI	GHG Inventory Expert, Greenhouse Gas Inventory Office of JAPAN (GIO), Center for Global Environmental Research	○	
	Nippon Poly-Glu Co., Ltd.	Mr. Kanetoshi ODA	Chairman and CEO	○	○
	Sanyo Electric Co., Ltd.	Mr. Takayuki HOTTA	Manager, Government Relations Department, Cooperate Planning H.Q.	○	
	Toyota Tsusho Corporation	Mr. Takeshi SAGAWA	Project General Manager, Emerging Countries Group, Global Business Planning	○	○
	Graduate School of Frontier Sciences, The University of	Dr. Masaru YARIME	Associate Professor, Graduate Program in Sustainability Science (GPSS)	○	
	The Bank of Tokyo-Mitsubishi UFJ, Ltd.	Mr. Masahiko KON	General Manager, Middle East-Africa, Global Planning Division	○	
Mr. Yosuke WATANABE		Manager, Information Strategies Office, Global Planning Division	○		
Organizer	Japan International Cooperation Agency (JICA)	Mr. Tsuneo KUROKAWA	Vice President	○	
		Mr. Ichiro TAMBO	Director General, Africa Department		○
		Mr. Shinya EJIMA	Director General, Global Environment Department		○
		Mr. Ryuichi KATO	Deputy Director General, Africa Department		○
		Mr. Masayuki KARASAWA	Deputy Director General, Group Director for Environmental Management, and Director, Office for Climate Change, Global Environment Department	○	○
		Mr. Kei YOSHIZAWA	Deputy Director, Office for TICAD Process, Africa Department	○	
		Mr. Hiroshi ENOMOTO	Deputy Director, Office for Climate Change, Global Environment Department	○	
		Mr. Kyosuke INADA	Advisor, Office for Climate Change, Global Environment Department	○	○
		Mr. Yukichi USUI	Assistant Director, Office for Climate Change and 1st/2nd Environmental Management Division, Environmental Management Group, Global Environment Department	○	○
		Ms. Junko MORIZANE	Climate Change Officer, Office for Climate Change, Global Environment Department	○	○
		Mr. Kenji UTSUNOMIYA	Office for Climate Change, Global Environment Department	○	○
		Mr. Komei YAMAGUCHI	Office for Climate Change, Global Environment Department	○	○
		Mr. Kiichi SHIRAKAWA	Office for Climate Change, Global Environment Department	○	○
		Mr. Ikufumi TOMIMOTO	Visiting Senior Advisor		○
		Ms. Aya OKADA	Media Division, Office of Media and Public Relations	○	○
Press	Kyodo News	Ms. Maya KANEKO	Reporter, World Services Section International Department	○	
	The Asahi Shimbun	Mr. Tetsu KOBAYASHI	Science Writer	○	
		Mr. Yoshikazu HIRAI	Staff Writer	○	
	The Mainichi Newspapers	Mr. Hajime EGUCHI	Staff Writer, Science & Environment News Department		○
Japan Broadcasting Corporation (NHK)	Mr. Yosuke IKEGAWA	Senior Reporter, News Reporting Center Economic News Division News Department	○		

Contribution for Tackling Climate Change and Promoting Green Growth By Advanced Japan's Technology

October, 2011

Ministry of Economy, Trade and Industry
The Government of Japan

Overview of Japan's Low-Carbon Technology and Potentiality of Contribution

Iron and Steel

➢ By applying the best practice of iron and steel plants in Japan to that of the world's plants, it is estimated to be reduced **130 million tons** of CO₂ which is equivalent to Japan's 20% emission.

Potential reduction of CO₂ by applying BAT (Best Available Technology)

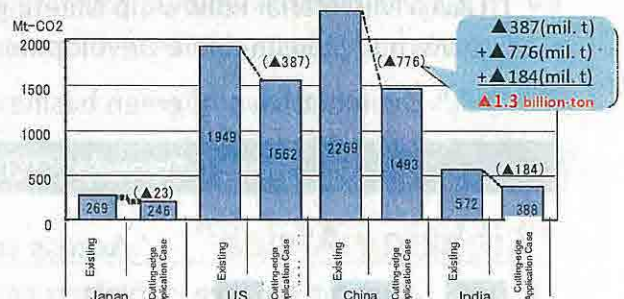


Source: The Institute of Energy Economics Japan

Coal Power Generation

➢ By applying the best practice of coal-fired power plants in Japan to that of the US, China and India, it is estimated to be reduced **1.3 billion tons** of CO₂ which is equivalent to Japan's total emission.

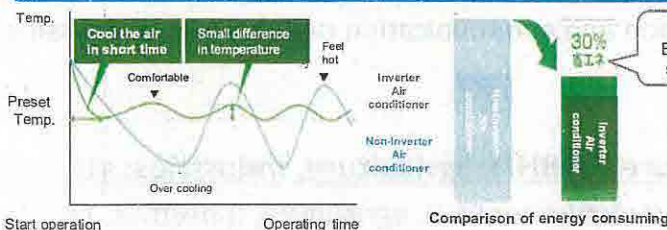
CO₂ Emission from Coal Power Plant in 2004*



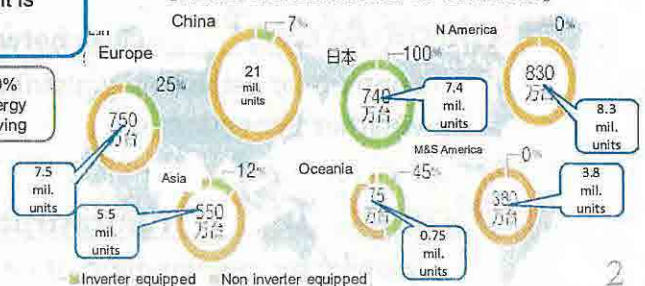
Source: The Institute of Energy Economics Japan

Home Electrical Appliance (Air Conditioner)

➢ By improving efficiency of all air-conditioners in the world as efficient as Japan's air-conditioners which is equipped with inverter controller, it is estimated to be reduced **100 million tons** of CO₂.



【Market Share for inverter air-conditioner】



Examples of Japan's Low-carbon Technology

Ultra Super Critical (USC) Coal-Fired Power Plant



Isogo thermal power plant where utilize the USC
 ✓USC is operated under a high pressure and high temperature to achieve improved thermal efficiency.
 ✓It contributes not only to reduce greenhouse gases, but also to saving fuel.

Solar Power



Ukishima photovoltaic station (Kawasaki City)
 ✓ Maximum power output 7,000kW
 ✓ Estimated annual energy production: 7.4 million kWh
 ✓ Estimated CO2 reduction: 3,100t/year



Bio Energy Power Plant in Tokyo

✓In Tokyo's eco-town plan, waste power generating plays a important role.
 ✓Bioenergy Company accepts food waste from greater Tokyo are and use it as fuel (methane gas) for power generating by utilize "methane fermentation technology"
 ✓Daily power generation is around 24,000kwh. It would cover 2,400 families.

3

Back Ground of the "3L" project

- ✓ COP17 is "The Africa's COP", an opportunity to re-attract of Japanese business community to Africa.
- ✓ Green business is a key measure against global warming and also a key for sustainable development.
- ✓ TICAD Ministerial Follow-up Meeting in May agreed on developing "Low-Carbon Growth and Sustainable Development Strategy in Africa"
- ✓ "3L" is the initiative of green business led by Africa and Japan.

Three Concepts "3L"

"Lighting Africa" : Access to Electricity and Energy

Support for access to electricity and energy using low-carbon lighting equipment and renewable resources.

"Linking Africa" : Links between Countries, Cities and Villages

Support for establishing distribution and communication networks, and accessing weather information.

"Lifting Africa" : Infrastructure for BHN, agriculture, industries, etc.

Support for development of infrastructure for BHN, agriculture, industries, etc.

4

NEDO's FS Projects Announced on 20th OCT ~Geothermal Power Generation~

- Conduct feasibility studies on geothermal power generation in Great Rift Valley and develop methodologies for the measurement for GHG emission reduction.

Lifting Africa

Project Area

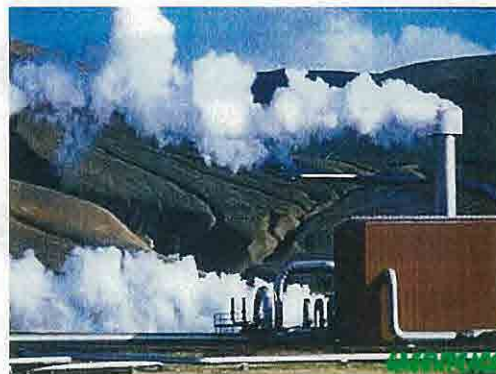
- ✓ Great Rift Valley Area
(Particularly, Ethiopia, Djibouti and Rwanda)

Technologies which will be applied

- ✓ Geothermal power generating

Project Members (consortium)

- ✓ Deloitte (Preliminary Research for whole great valley area)
- ✓ Mitsubishi Heavy Industry (Djibouti)
- ✓ Marubeni Corporation & Mitsubishi Research Institute (Ethiopia)
- ✓ Sumitomo Corporation (Rwanda)



5

NEDO's FS Projects Announced on 20th OCT ~Electrification in Off-grid Area (1)~

- Conduct feasibility studies on electrification in off grid area in Kenya by utilize renewable energies such as solar power, mini hydro power generation, and so on. Also develop methodologies for the measurement for GHG emission reduction.

Lighting Africa

Linking Africa

Project Area

- ✓ Kenya

Technologies which will be applied

- ✓ Solar power
- ✓ Hydro power
- ✓ Wind power etc.

Project Member

- ✓ NTT Data Institute of Management Consulting



6

NEDO's FS Projects Announced on 20th OCT
~Electrification in Off-grid Area (2)~

➤ Conduct feasibility studies on electrification in off grid area in Mozambique by utilizing biomass (jatropha seeds oil) generation and solar power generation to replace diesel generation system. Also develop methodologies for the measurement for GHG emission reduction.

Lighting Africa

Linking Africa

Project Area

- ✓ Mozambique

Technologies which will be applied

- ✓ Biomass
- ✓ Solar power etc.

Project Members (consortium)

- ✓ EX Research Institute
- ✓ Okinawa Enetech
- ✓ Nippon Biodiesel Fuel



Jatropha seeds will be bio fuel
 Picture from Wikipedia

NEDO's FS Projects Announced on 20th OCT
~ Energy-Saving in Factory (Steel Sector)~

➤ Conduct feasibility studies to identify applicable energy-saving technologies to steel sector in South Africa. Also develop methodologies for the measurement for GHG emission reduction.

Lighting Africa

Project Area

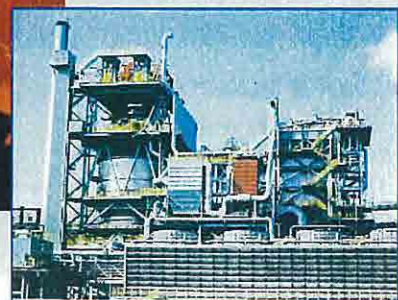
- ✓ South Africa

Technologies which will be applied

- ✓ Energy-Saving Technologies in steel sector such as:
 - Coke Dry Quenching (CDQ)
 - Top- pressure Recovery Turbine (TRT)

Project Members (consortium)

- ✓ Nippon Steel Cooperation
- ✓ JP Steel Plantech Co.



CDQ Plant

NEDO's FS Projects Announced on 20th OCT
 ~ Energy-Saving in Factory (Car Production)~

➤ Conduct feasibility studies on introducing cogeneration in painting process in an automobile factory to generate both heat and electricity to replace gas based heat generating system. Also develop methodologies for the measurement for GHG emission reduction.

Lifting Africa

Project Area

✓ South Africa

Technologies which will be applied

- ✓ Cogeneration
- ✓ Waste Heat Recovery (Power Generation)
- ✓ Supplying Surplus Electricity to Local Power Company

etc.

Project Practitioner

✓ Hitachi



Report on the Japanese Energy & Environmental Business Delegation to South Africa organized by JETRO

- JETRO dispatched a Japanese Energy & Environmental Business Delegation which is comprised of 14 Japanese organization including SMEs to South Africa between 16th and 22nd of this October.
- During the period, JETRO held business matching forums in order to promote business matching between South African companies and the Japanese members in Johannesburg and Cape Town.
- The delegation made courtesy call on South African government's agencies and visited companies.
- Through the mission, more than 80 business talks were held and the delegation members acknowledged the great potential for development of new business in South Africa.

Overview of business matching forum

[Venue and date]
 -Johannesburg (18th, Oct)
 -Cape Town (21st, Oct)

[Number of participants]
 Around 150 people (both side)

Destinations

[Government Agencies]
 Department of Environmental Affairs (MEA)
 Department of Science and Technology (DST)

[Companies]
 ESKOM (Wind Power Station)
 SAB Miller (Beer Plant)



Courtesy visit to MEA (10/17 Pretoria)



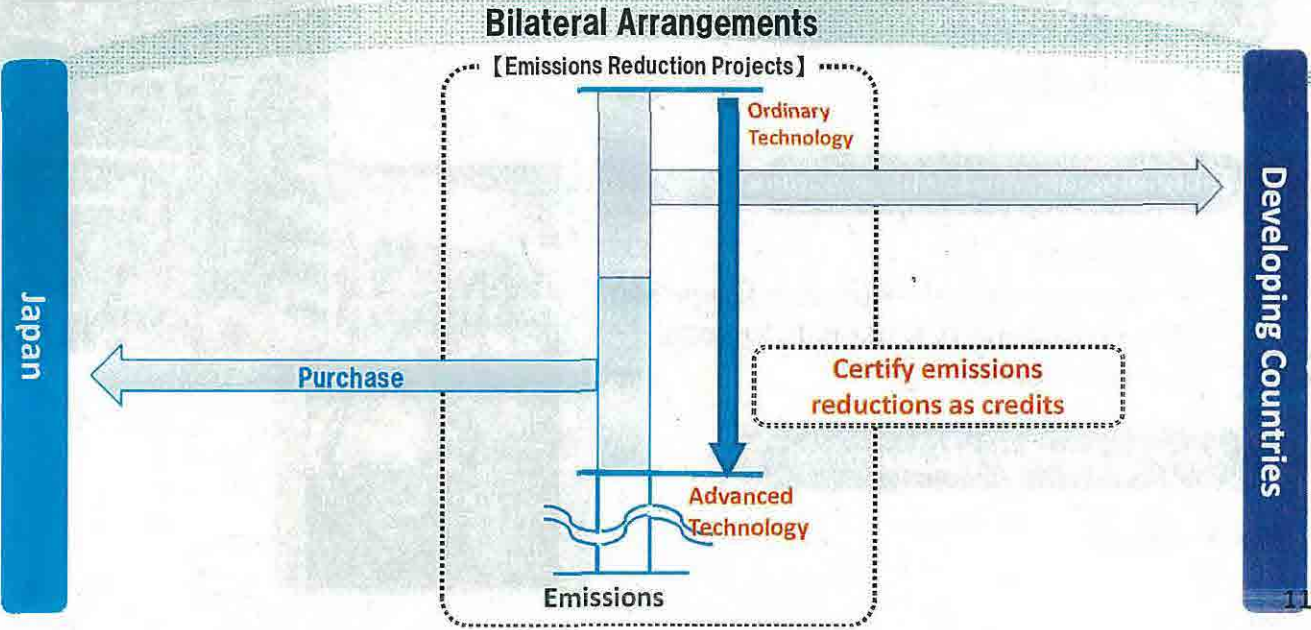
Business Matching Forum (10/18 Johannesburg)



ESKOM Wind Power Generation(10/21 Cape town)

Image of Bilateral Offset/Credit Mechanism

- Evaluate the contribution for emissions reduction through the use of low-carbon technologies, and certify it as credits based on bilateral arrangements.
- This mechanism would enable wider applicability of low-carbon technologies (e.g. USC power plants, CCS), simplified procedure for the issuance of credits, and strategic bilateral cooperation.
- **This mechanism is not allowed under the Kyoto Protocol, but the Cancun Accord opens a way for each country to design its own mechanism.** We can pursue and develop the possible options on new mechanisms, that would complement the current CDM.



Future Plan

November 28th
To
December 9th

•Organizing “Japan Pavilion” as a COP17 side-event (Exhibition)

- Show contribution by Japanese industry with cutting-edge low carbon technologies to sustainable development of Africa under the “3L Project”.
- More than 20 Japanese major and vital venture companies will exhibit their low carbon technologies and products at “Green Pavilion” near the main conference venue of COP 17.



FY 2012

- Continuation of project organization in mitigation area (Details to be announced)
- Project organization in adaptation area (Details to be announced)
- Continuing discussion with potential countries to introduce Bilateral Offset-Credit Mechanisms
- Preparation of an interim progress report for the next TICAD Ministerial Meeting and preparation for TICAD V in 2013, in which experiences of feasibility study of the 3L projects will be important part.

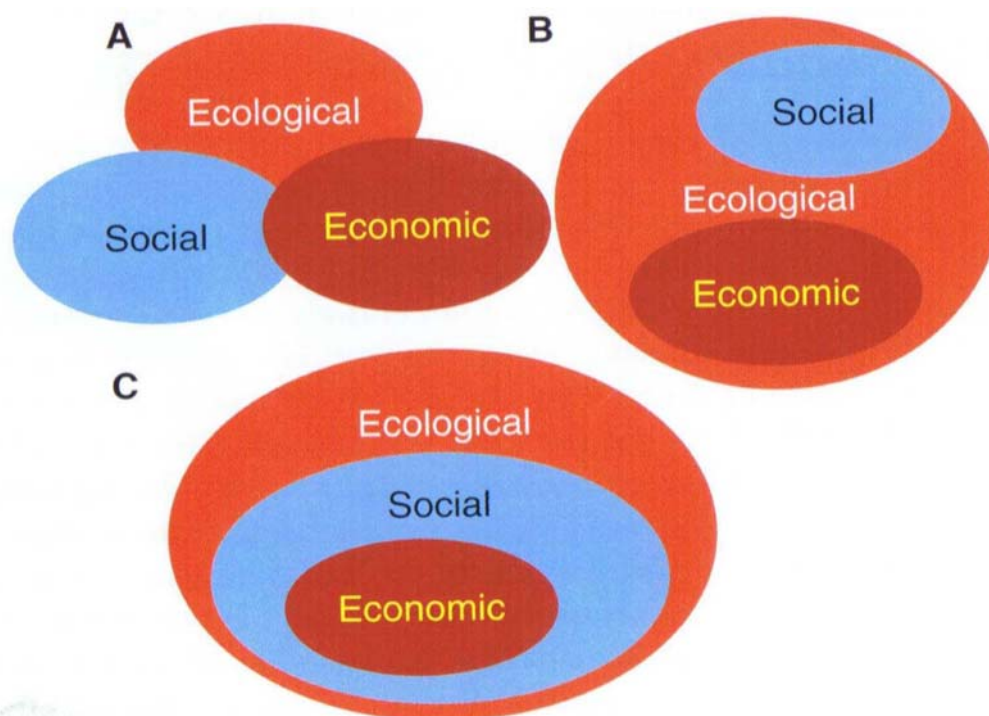
Encouraging Sustainability Innovation in Africa: Opportunities and Challenges for Green Growth

YARIME Masaru 鎗目 雅
Graduate Program in Sustainability Science (GPSS)
Graduate School of Frontier Sciences
The University of Tokyo
yarime@k.u-tokyo.ac.jp

*Toward Green Growth in Africa by Inclusive Cooperation between Multiple Stakeholders
Policy Dialogue on Climate Change in Africa 2011
Tokyo, October 31, 2011*

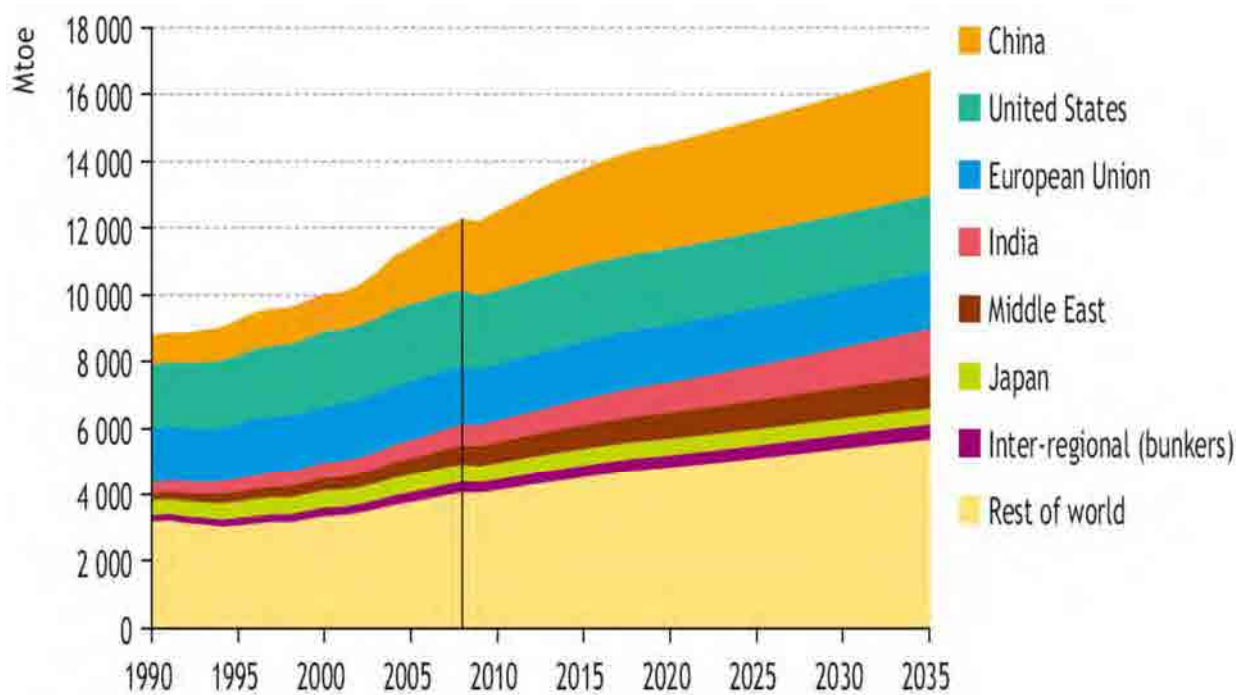


Integration of Ecological, Economic, and Social Dimensions of Sustainability



Voinov (2008)²

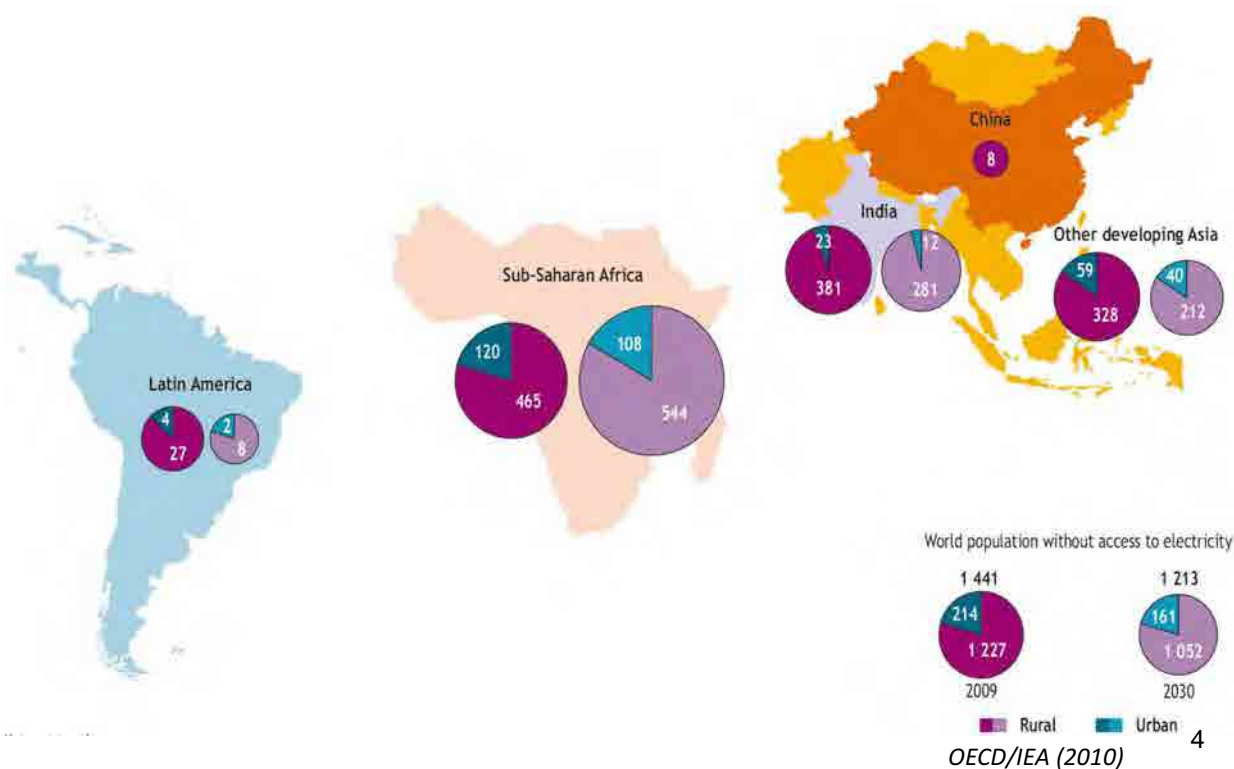
World Primary Energy Demand by Region



OECD/IEA (2010)

3

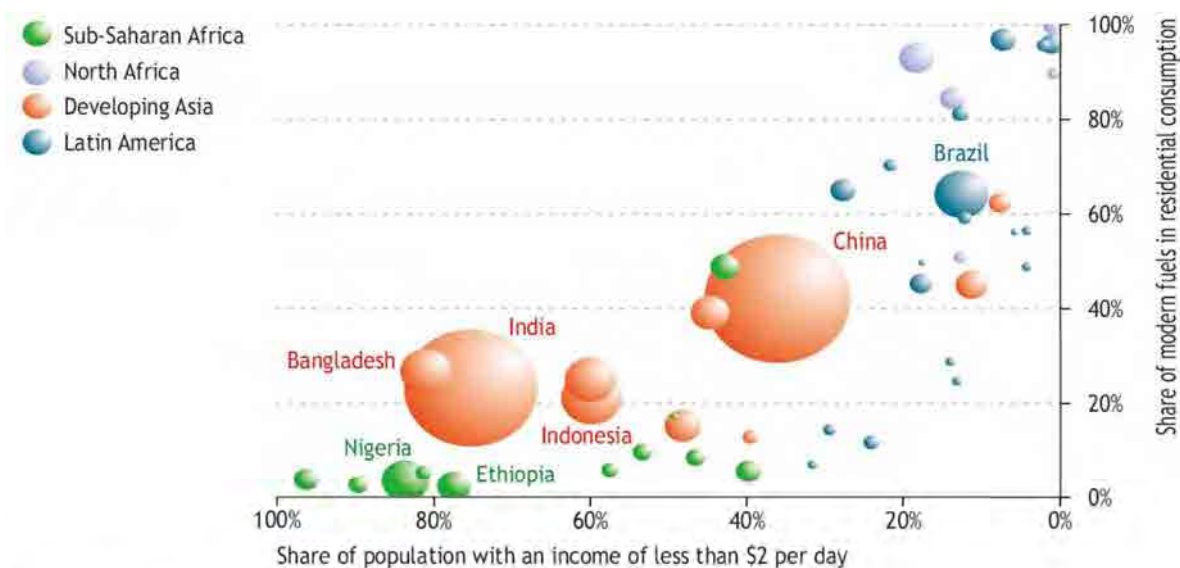
Population without Access to Electricity in Rural and Urban Areas (in million)



OECD/IEA (2010)

4

Household Income and Access to Modern Fuels in Developing Countries



*Modern fuels exclude traditional biomass.

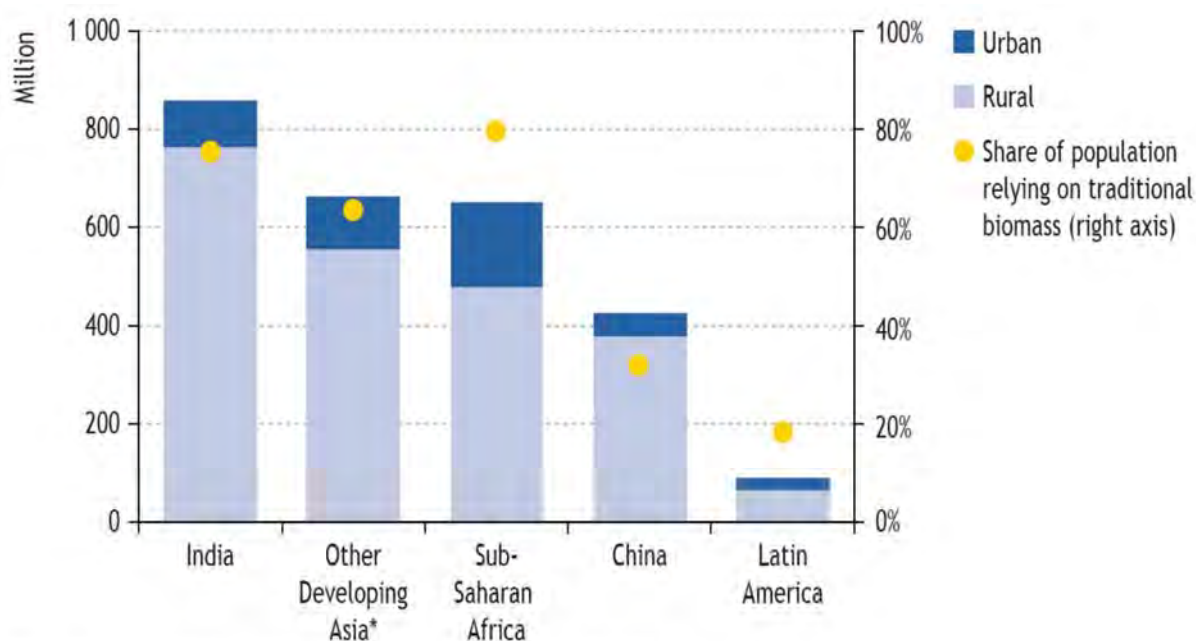
Note: The size of the bubble is proportional to population.

Sources: Consumption of modern fuels: IEA data and analysis; and poverty rate: <http://data.worldbank.org/indicator/SI.POV.2DAY>.

OECD/IEA (2010)

5

Population Relying on Traditional Use of Biomass as Primary Cooking Fuel



*Includes developing Asian countries except India and China.

OECD/IEA (2010)

6

Inventor Countries for Climate Change Mitigation (2000-2005)

Country	Rank	Average % of world inventions	Average % of world's high-value inventions	Country's top three technology fields (decreasing order)
Japan	1	37.1	17.4 (2)	All technologies
United States	2	11.8	13.1 (3)	Biomass, insulation, solar
Germany [†]	3	10.0	22.2 (1)	Wind, solar, geothermal
China	4	8.1	2.3 (10)	Cement, geothermal, solar
South Korea	5	6.4	4.4 (6)	Lighting, heating, waste
Russia	6	2.8	0.3 (26)	Cement, hydro, wind
Australia	7	2.5	0.9 (19)	Marine, insulation, hydro
France [†]	8	2.5	5.8 (4)	Cement, electric and hybrid, insulation
United Kingdom [†]	9	2.0	5.2 (5)	Marine, hydro, wind
Canada	10	1.7	3.3 (8)	Hydro, biomass, wind
Brazil	11	1.2	0.2 (31)	Biomass, hydro, marine
The Netherlands [†]	12	1.1	2.1 (12)	Lighting, geothermal, marine
Total	—	87.2	77.2	

Source: Authors' calculations, based on PATSTAT data.

^aTogether, the twenty-seven countries of the European Union (EU27) represent 24% of the world's inventions.

^bHigh-value inventions are defined as inventions that have been patented in at least two countries.

Dechezleprêtre, Glachant, Hascic, Johnstone, Ménière (2011) ⁷

Rate of Export of Inventions by Inventor Country (2000-2005)

Inventor country	Rate of export of inventions (%)
The Netherlands	89.9
United Kingdom	60.3
France	46.1
Germany	56.1
Canada	56.9
United States	42.3
Korea	24.5
Japan	21.7
Australia	15.8
China	6.8
Brazil	6.9

Source: Authors' calculations, based on PATSTAT data.

Dechezleprêtre, Glachant, Hascic, Johnstone, Ménière (2011) ⁸

Case of the Diffusion of Solar Lanterns in Africa



9

Creating Values for Sustainability with Solar Lanterns

- Environmental
 - Reducing CO₂ emissions by replacing fuels (e.g. kerosene) used for lighting
 - Reducing emissions of harmful substances such as soot and carbon monoxide for improvement in health conditions
- Economic
 - Reducing expenditures for buying fuels (kerosene), instead using that part of income for other purposes (e.g. food, education for children)
 - Providing opportunities to local entrepreneurs for starting new business activities
- Social
 - Enabling children to study in the evening
 - Enabling women to perform routine household work during power outages

10

Collaboration with Stakeholders in Society

- Private Sector (Sanyo Electric)
 - Producing solar LED lanterns and providing facilities and equipment for local partners
- Local Entrepreneurs
 - Initiating rental business with charging stations for lanterns
- Local NGOs
 - Creating channels for distribution of the products
- Microfinance Institutions
 - Providing financial resources
- International Organization (UNDP)
 - Supporting a feasibility study on the introduction of solar LED lanterns to Kenya
- Japanese Government (JICA)
 - Supporting a pilot project for introducing lanterns in Africa
- Kenyan Government
 - Creating demands through public procurement and establishing legal and institutional environments
- Academia (University of Tokyo and University of Nairobi)
 - Conducting a sustainability assessment of the impacts of the products on environmental, economic, and social aspects

11

Possible Functions of Partners in Academia and the Public Sector

- University and research institutes
 - Collection of data and information for identifying and exploring local needs (location, scale, etc.)
 - Evaluation of the effectiveness of the technologies actually used in local conditions
- Governments and international organizations
 - Ensuring long-term, sustained demands for products
 - Reliable and credible information on technologies
 - Providing legitimacy and neutrality with signaling
- Non-governmental organizations
 - Sharing and disseminating information in the local context
 - Establishment of networks of relevant actors at local communities

12

Challenges in Establishing a Social Business Model for Sustainability Innovation in Africa

- Competition on the local market from industrialized as well as emerging countries
- Strategic integration of corporate social responsibility (CSR) and core business competences for addressing societal needs as well as exploring business opportunities
- Partnerships with reliable and competent local stakeholders for establishing distribution channels and microfinance services
- Stable institutions (e.g. taxes and tariffs on solar lanterns) for providing a favorable environment for investment
- Financial schemes effective for reaching populations with low incomes
- Accurate and timely assessment of sustainability impacts with transparency, objectivity, and practicality

SANYO

Shining ray of hope to save lives
Solar Lantern



A MEMBER OF THE PANASONIC GROUP
SANYO Electric Co., Ltd.
October 31, 2011

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Current Status in un-electrified area

SANYO

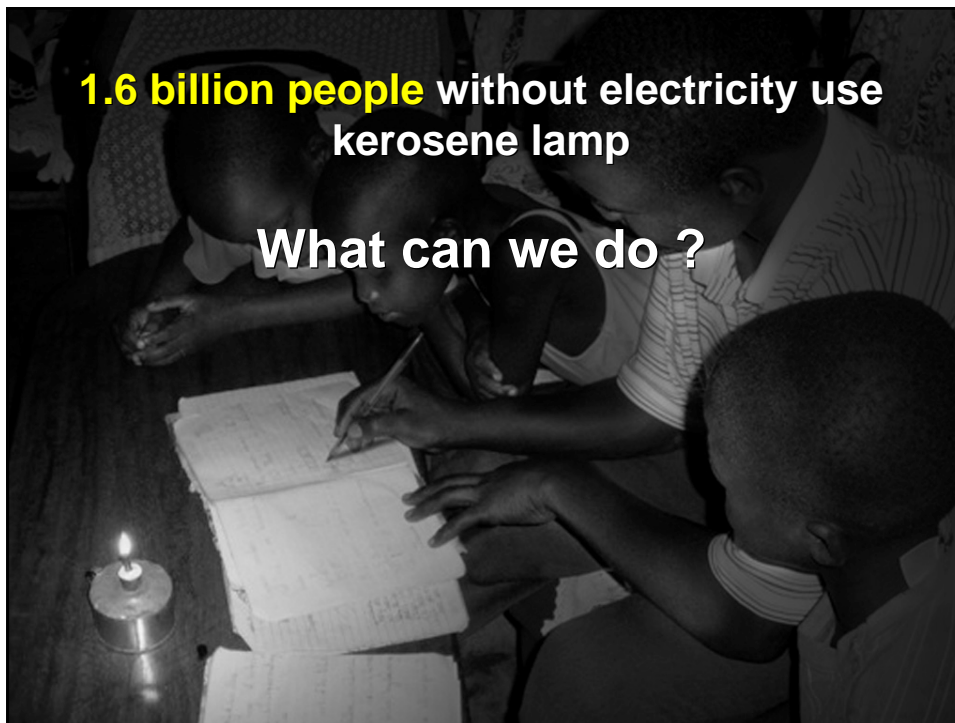
Harmful Smoke



Fire



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Sanyo's core technology for Energy Solution **SANYO**

HIT Photovoltaic Module

Large-capacity Li-ion battery

Consume Green Power Efficiently

SANYO Kasai Green Energy Park

Create energy

Store energy

Manage energy

Save energy

Create brand new energy solution integrating three Tech field

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Solar lantern




ENL-L1EX-N-S-3W

3W solar charger
5 hour / 20 hours lighting
Ni-MH rechargeable battery
Free Style (Stand / Hang / Bring)



NL-L660PV3

3W solar charger
52 hour / 26 hours lighting
High Intensity Max. 350Lux at 30cm
Free Style (Stand / Hang / Bring)
USB output for mobile appliance

Product Concept


- Safe

No harmful smoke
No fire
- Clean

Free Energy Cost
CO2 emission reduction
- Easy

Easy Operation
Free style (Stand/Hang/Bring)
- High quality

High reliability
Japanese latest technologies



76tCO₂/yr
(1000units)



School



Home






Shop

6
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Difficulties of BOP Business **SANYO**


TO BREAK THROUGH HURDLES

1. Establish the good relationship with **reliable local partner**
2. Utilize **micro-finance** mechanism
3. **Reach the BOPs** who spread geographically over the country
4. Realize the **sustainability** by doing **private business** and contributing to **social development** at the same time

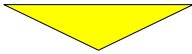


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UNDP GSB Program **SANYO**



Conducted Feasibility Study together with UNDP in Kenya
(Period : Oct. 2010~Jan. 2011)



Positive Feed-back from F/S

UNDP kindly proposed the followings :

- ① Try the pilot sales in the very limited area for marketing
- ② Give the financial/technical support to local partner
- ③ Establish the strategy, aiming at limited market segment
- ④ Get IFC approval for Lighting Africa Program
- ⑤ Reduce sales price
- ⑥ Work together with micro-finance institutes

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JICA Preparatory Survey for BOP Business Promotion **SANYO**

Conducting Pilot Project in Kenya, applying for JICA Preparatory Survey for BOP Business Promotion

A map of Kenya with several locations circled in red: Kisumu, Nyeri, Embu, and Nairobi. The map also shows major geographical features like Lake Victoria, Lake Tanganyika, and the Indian Ocean, as well as neighboring countries like Sudan, Ethiopia, Somalia, and Tanzania. A yellow text box is overlaid on the map with the text: "Conducting Pilot Project in Kenya, applying for JICA Preparatory Survey for BOP Business Promotion".

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Social Impact **SANYO**

Training interviewers

A group of men are sitting around a table under a thatched roof, engaged in a training session. They are looking at documents and talking to each other.

Interview

Two men are sitting on the ground under a thatched roof, engaged in an interview. There are some items on the ground, including a bag and a container.

In Collaboration with

THE UNIVERSITY OF TOKYO
UNIVERSITY OF NAIROBI
A world-class university committed to scholarly excellence

Solar Panel installed on roof top

A close-up photograph of a solar panel mounted on a corrugated metal roof.

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SUSTAINABILITY

Thank you very much for your kind attention

11

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