African Forest Forum

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Review of land use, land use change and forest sector potential for green economy

A synthesis report for Francophone West and Central African countries

 African Forest Forum P.O. Box 30677 00100 Nairobi GPO KENYA Tel: +254 20 7224203 Fax: +254 20 722 4001 E-mail:exec.sec@afforum.org Website: www.afforum.org. Twitter @ africanff. Facebook / African Forest Forum. LinkedIn / African Forest Forum (AFF).

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Review of land use, land use change and forest sector potential for green economy in Francophone West and Central African countries

Achille E. Assogbadjo and Fifanou G. Vodouhe

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ACRONYMS AND ABBREVIATIONS

AFD	African Development Fund
AFF	African Forest Forum
AfDB	African Development Bank
AVIGREF	Associations Villageoises de Gestion des Réserves de Faune
CASCADE	Crédits carbone pour l'agriculture, la sylviculture, la conservation et l'action contre la déforestation
CBD	Convention on Biological Diversity
CASCADE	Crédits carbone pour l'agriculture, la sylviculture, la conservation et l'action contre la déforestation
CERF	Centre d'Etudes, de Recherches et de Formation Forestières
CNEDD	National Environment Council for Sustainable Development
CO2	Carbon Dioxide
COGERAT	Cogestion des Ressources Naturelles de l'Aïr et Ténéré
COMIFAC	Central Africa Forest Commission
DANIDA	Danish International Development Agency
ECOWAS	Economic Community of West African States
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FCPF	Forest Carbon Partnership Facility
GDP	Gross Domestic Product
GEF	Global Environment Fund
GGGI	Global Green Growth Institute
GGWSSI	Great Green Wall for the Sahara and the Sahel Initiative
GHG	Green House Gas
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
IIED	International Institute for Environment and Development
INRAB	National Institute of Agricultural Researches
ISBA	Biomedical Sciences Institute
LULUCF	Land Use, Land Use Change and Forestry
NAC-NTFP	National Advisory Committee of Non-Timber Forest Products
NTFP	Non-Timber Forest Products
OECD	Organisation for Economic Cooperation and Development
PAFN	Projet Aménagement des Forets Naturelles
PAGEFCOM	Projet d'Appui à la Gestion des Forêts Communales
PANA	Programme d'Action National d'Adaptation aux changements climatiques
PFABO	Produits Forestiers Autres que le Bois
PGFTR	Programme de Gestion des Forêts et Terroirs Riverains
PNCC	Politique nationale en matière de changements climatiques
PNEDD	National Environment Plan for Sustainable Development
PNGDRN	Programme National de Gestion Durable des Ressources Naturelles
R-PINs	Readiness Plan Idea Notes
REDD+	Reducing Emissions from Deforestation and Forest Degradation

STFM	Status of Tropical Forest Management
UNDP	United Nations Development Programme
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme (UNEP)
WAP	W-Arly-Pendjari

EXECUTIVE SUMMARY

This study aimed to assess the green economy potential in the forest sector. It identified and analysed key elements within the forest sector that contribute to green economy, as well as the various parameters that characterise land use and land use changes in three French-speaking African countries (Benin, Gabon, Niger). Data were collected through desk study and field visits in the selected countries.

In each of the selected countries, the forest sector is already playing a leading role in green economy. Indeed, forest trees absorb CO2 emissions, provide resources to local populations, and protect communities from increasingly erratic weather. To make these contributions sustainable, many actions have been undertaken at country level to maintain or increase forest cover. Many afforestation programmes are being implemented and forest management plans have been improved in ways that involve local communities more and increase the benefits they derive from forest resources.

The main causes of deforestation in these countries include agriculture expansion, wood extraction, grazing, hunting and urbanization. None of the countries involved in this study were REDD+ countries at the time of the study; however, the study showed that only Benin expressed interest in being involved in this process while Gabon is opposed to this mechanism. Niger is not opposed to the mechanism and as revealed through this study initiatives are currently underway for the country's involvement in the near future.

All of the three countries have signed many international conventions, action plans and developed very good legislations in the forest sector but their implementation remains limited. To increase forest potential to contribute to green economy there is the need to:

- develop more afforestation programmes with the view to increasing the countries forest cover, and especially so in Benin and Niger;
- consider REDD+, as a strong catalyst for the green economy;
- implement the countries' forest policies and legal frameworks for better local communities' integration into forest management strategies that can improve their improved well-being;
- enhance efforts on conservation and sustainable use of biological diversity, especially with regard to NTFPs;
- promote payments for environmental and ecosystem services;
- strengthen NTFPs value chains to increase their contribution to people's well-being; and
- strengthen the capacity of national managerial staff on the concept of green economy and its facets through social and environmental policymaking and how they could integrate the same into national priorities.

1.INTRODUCTION

Forests generate income and provide employment to millions of people throughout the world, especially in developing countries. The Food and Agriculture Organization (FAO) of the United Nations estimated that the forest industry contributed approximately US$ 468 billion to global GDP (Gross Domestic Products) in 2006 (FAO, 2009). In its 2014 report on the State of the World's Forests, FAO estimated that about 840 million people (12% of the world's population), collected fuelwood from forests. More importantly, in less developed countries, forest products play an important role during food shortages arising from crop failure. A large part of forest dwellers regularly use forest products (timber, fuelwood, food, medicinal plants etc.) for their own subsistence purposes and for income generation. For example, in Africa, about 150 million people live in homes where forest products are the main materials used for walls, roofs, and floors (FAO, 2014a).

Hundreds of millions of people throughout the world use Non-Timber Forest Products (NTFPs), as vital commodities in various forms such as low-cost building materials, fuelwood, food supplements, herbal medicines, or as sources of income. In the recent past, there has been growing international awareness of the importance and the value of NTFPs in rural communities' livelihoods. Specifically, in the tropics, literature shows that people's dependence on these resources is likely to increase (Tewari 2000; Cunningham 2001; Shackleton and Shackleton 2006; Newton 2008).

However, despite the important roles played by forests for the well-being of many people, deforestation and forest degradation continue at an alarming rate (8.5 million hectares of natural forests lost annually during 1990 to 2000; and 6.6 million hectares of natural forests lost annually from 2010 to 2015 (FAO, 2015a). Africa and South America experienced the largest net loss of forests during last decades (FAO, 2011; FAO 2015a). The situation is alarming in countries with less forest cover. For example, in Benin, with 4 311 000 ha of forest cover, the average annual loss of forest was estimated at 70 000 ha from 1990 to 2000, and 50 000 ha from 2000 to 2010 (FAO, 2011, FAO, 2015b). The same trend was observed in Niger (forest area: 1 142 000 ha) where 62 000 ha and 12 000 ha were lost annually during the same periods, respectively. On the other hand, Gabon, a country with the largest primary forest area, in this study, of 14,334, 000 ha (89.3% of its land area covered by forest: 23 000 000 ha) maintained its forest area. As reported in the FAO report a little change was observed in its forest cover from 1990 to 2015 (FAO, 2011; FAO 2015b).

To address forest loss, numerous policies and measures have been developed by the countries to promote sustainable forest management. The measures are aimed at increasing stakeholder's participation in the management process and greater openness to market-based approaches. Although the combination of people's well-being and the natural resources conservation has been fairly successful, the implementation of the measures has faced similar challenges in all the countries. In recognition of the increasingly important role of forests to livelihoods, research and development institutions are still exploring mechanisms to reconcile these two aspects.

This study aimed to analyse and identify key elements within the forest sector that contribute to green economy, as well as the various parameters that characterise land use and land use change with the aim of understanding their management in ways that leave little negative impacts on the ecological and social systems as well as improving livelihoods. The activity was aimed to promote forest use and trade policy while ensuring forest resources are used in a sustainable manner that meets the economic, ecological and cultural requirements of people who depend on them.

The study goal is in line with green economy objectives. Green economy is viewed as a means to successfully combine a nation's economic development policies, gender and sustainable use of natural resources (UNEP, 2012). This concept has received significant attention and was even employed to address the 2008 global financial crisis. The United Nations Environment Program (UNEP) views green economy as one which is low carbon, resource efficient and socially inclusive (UNEP, 2012).

This study was undertaken in three French-speaking African countries (Benin, Gabon, and Niger). More specifically the study:

- carried out a desk study review of the extent and the different pathways of forest contribution to green economy;
- identified the key elements of the forest sector that have potential to contribute to green economy for development of pathways in green economic development in each selected country
- determined the needed change in forest management to optimise forest contribution to green economy in each selected country;
- proposed enabling conditions and regulatory frameworks that can facilitate the forest sector's role in the green economy in each selected country; and
- identified the various parameters that characterise land use, and land-use change, and forestry, in relation to livelihood improvement and information gaps associated with them in each selected country.

1.1. Brief history of the green economy concept

The green economy concept was first used in 1989 by a group of leading environmental economists in a United Kingdom report (Pearce *et al*., 1989). The authors in their book *Blueprint for a Green Economy* argued that because today's economies are biased towards depleting natural capital to secure growth, sustainable development is unachievable. The aim was to advise the United Kingdom government to focus on the implications of sustainable development through the measurement of economic progress and the appraisal of projects and policies. In 1991 and 1994 the authors released sequels to the first one, reports entitled *Blueprint 2: Greening the world economy* and *Blueprint 3: Measuring Sustainable Development* respectively (Allen and Clouth, 2012). The first Blueprint reported on the necessity of the economy to support environmental policy while the sequels extended this message to the problems of the global economy - climate change, ozone depletion, tropical deforestation, and resource loss in the developing world (Allen and Clouth, 2012).

In response to the multiple global crisis in 2008, UNEP championed the idea of "green stimulus packages" and identified specific areas where large-scale public investments could kick-start a "green economy" (Atkisson, 2012). The UNEP vision inspired several governments

to implement significant "green stimulus" packages as part of their economic recovery efforts. Therefore, the concept green economy took important place in national and international debates in the context of the policy responses to multiple global crises.

1.2. Definition of the concept

To date, there is no universal definition of the green economy concept, and different topics/terminologies are used to refer to the same concept; much as the green economy concept has been adopted and promoted by many institutions. The Organisation for Economic Cooperation and Development OECD uses the term “green growth” as opposed to the “green economy” to refer to the same concept, with a greater focus on integrating environmental and social factors into the concept of economic growth (Sustainable Prosperity, 2012). The term “clean economy” is also being used to refer to the same concept in the literature. Green economy definition generally refers to the transition of the current economy towards one that supports “the development and use of products and services that promote environmental protection and/or energy security” (State of Washington, 2009). The green economy has social, environmental and economic aspects and must be considered in the context of sustainable development (Webb and Esakin, 2011).

UNEP’s definition has been largely adopted while a number of non-government organizations and partnerships have also developed their own definition of the concept. UNEP defines the green economy as "one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities. It is low carbon, resource efficient and socially inclusive" (UNEP, 2012). Figure 1 highlights the three pillars of green economy as defined by UNEP. It presents the necessary social, environment and economic integration to achieve sustainability.

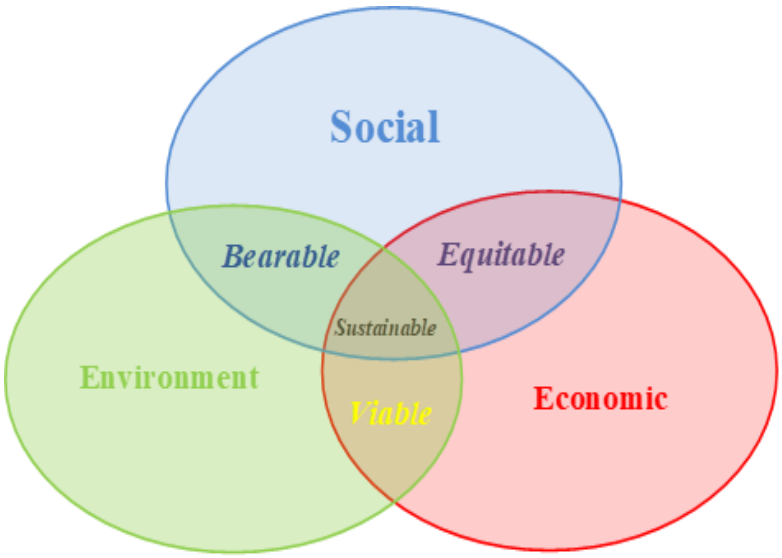

Figure 1: The three pillars of sustainability

Source: Adapted from Gibson, 2006

The OECD defines green growth as “fostering economic growth and development while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies”. On the other hand, ECO Canada points humanity's attention on actor’s intention. It defines the green economy as “the aggregate of all activities operating with the primary intention of reducing conventional levels of resource consumption, harmful emissions, and minimizing all forms of environmental impact” (ECO Canada, 2010). According to ECO Canada, the green economy includes the inputs, activities, outputs and outcomes as they relate to the production of green products and services.

Looking at each of the green economy definitions above, there are different economic, environmental and social aspects considered (Webb and Esakin, 2011), entailing different parameters used to measure the green economy. For the purpose of this report, green economy as defined by UNEP has been adopted. Therefore, green economy in this report is typically understood as an economic system that is compatible with the natural environment, environmentally friendly, ecological, and socially just.

1.3. Forests and green economy

As presented in the International Institute for Environment and Development (IIED, 2015) report, several economic sectors are assumed to greening world economy: sustainable agriculture, cities and buildings, renewable energy, fisheries, forestry, industry, transport, waste management and recycling and water.

Indeed, sustainable forest management plays an essential role in the carbon cycle and provides essential environmental and social values and services, beyond their contribution as a source of wood, such as biodiversity conservation; protection against erosion; watershed protection and employment in often fragile rural areas (UNECE, 2014). According to UNECE, the forest sector has a key role to play in the realisation of green economy objectives. Many of the forest goods and services are compatible with the development of green economy and a large part of the world’s population uses forest outputs to provide food, energy and shelter in less developed countries, but the same uses are also increasing in developed countries that aspire towards greener economies (FAO, 2014a). The main difference between the two is the efficiency and sustainability of these uses. Countries engaged in green economy development should address some of these weaknesses through policy reforms and knowledge and technology transfer, so that the potential for forests to contribute to sustainable development can be realized at a larger scale (FAO, 2014a).

In fact, in some less developed countries many initiatives have been undertaken to fulfil green economy objectives (high use of renewable materials, bioenergy and natural products, and high numbers of people engaged in the production of these materials). However, there is a need to assess the production processes and value chains of the initiatives with the view to enhance their contribution (FAO, 2014a). To green the forest sector, UNEP advocates a number of strategies to promote market-based instruments for a green economy. It highlights five areas of investment opportunity: (1) protected natural areas; (2) payments for environmental services; (3) certification of forest products; (4) forest plantations; and (5) agroforestry, leaving a special place for REDD+ as a strong catalyst for the green economy (UNEP 2012). Indeed, REDD+ activities that increase afforestation, reforestation and sustainable forest management in low-income countries could lead to more income gains in the formal and informal forest sectors. Some potentially mutually beneficial relationships between REDD+ and green economy are shown in Figure 2 (UN-REDD 2014).

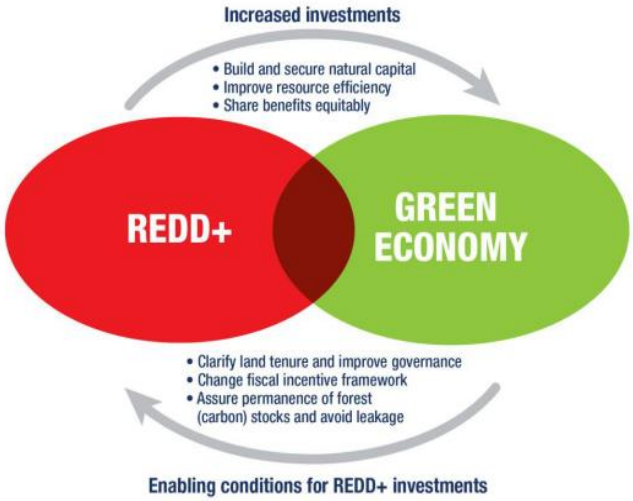

Figure 2: **Some potentially mutually beneficial relationships between REDD+ and green economy**
Source: UN-REDD Program

To achieve green economy objectives many countries throughout the world are implementing several strategies. For example, in Brazil, the government has taken measures to reduce the deforestation of the Amazon forest. In 2003, a presidential decree established an Inter-Ministerial Permanent Working Group to propose and coordinate actions to reduce rates of deforestation in the Amazon. In 2009 the government introduced the concept of community and family forest management into the Brazilian legal system. This aimed at involving more local communities in forest management. These efforts aim to contribute to sustainably managed forests and improved well-being of local communities.

The Global Green Growth Institute (GGGI) offers its services to countries that seek to develop "rigorous green growth economic development strategies". An example of this assistance presented by WRM in its monthly bulletin in 2013 where the GGGI is one of the institutions offering assistance to Peru for "green" development in the Amazon rainforest. The assistance offered includes a number of REDD+ projects. One of the options for the implementation of REDD+ is the establishment of plantations of oil palm – a tree that is undoubtedly green on the outside and, in addition, a "renewable energy" source that can store carbon. Monoculture oil palm plantations destroy biological and cultural diversity. However, they are a profitable investment in which the growth of the trees contributes to "green" and "renewable" growth: perfect symbolism (World Rainforest Movement, 2013). Another "green" component of the projects in Peru is the highly touted practice of "sustainable forest management". This would appear to be a practically unassailable practice from an environmental perspective, since it aims to preserve "standing forests" and would therefore, supposedly contribute to the preservation of biodiversity as well (World Rainforest Movement, 2013). In China, the government supported afforestation (established forest where there was none before) and reforestation (established forest trees where they were removed) efforts to increase forest area and allow people to continuously benefit from forest goods and services. In sub-Saharan Africa, to sustainably improve human well-being through the enhancement of food security, poverty alleviation, and reduction of social inequality, it is imperative to know more about actions undertaken to attain green economy objectives. This was done through this study which focused on three African francophone countries namely Benin, Gabon and Niger.

2. STUDY METHODOLOGY

2.1. Study approaches

The work was carried out through desk study and field visits to the selected countries. A review on the green economy concept was carried out through interviews of staff in national, regional and international institutions involved in sustainable development (see list of institutions and respondents visited in Annex 1). Three field visits were organized within each country (Benin, Gabon and Niger) where formal and informal interviews were carried out with key actors involved in activities linked to green economy. Key contact persons were selected based on their knowledge and their institution's potential role in greening the forest sector. To do this, through desk study representative institutions involved in forest management in each country were identified; and where none or limited data were available key persons in related sectors were contacted. For each country, a questionnaire was addressed to the identified contacts. Subsequently, appointments were made with each of them followed by face to face interviews during the field visits.

2.2. Study area

The work was carried out in Benin, Gabon and Niger. Benin and Niger are located in West Africa while Gabon is in the Central part of the continent (Figure 3). These three countries experience different climatic and demographic conditions (Table 1). Therefore, the study has covered diverse conditions including high climatic and a range of vegetation types (Sahel-parklands, dry forests including woodlands and moist forests). Niger is a Sahelian country with about 540 mm of rainfall per year while Gabon, situated in equatorial zone, receives 2900 mm of rainfall per year. The climatic conditions in Benin fall in between these two extremes. According to country statistics, Gabon shows the best economic development indicator as compared to Niger, one of the most poor African countries (Table 1). The choice of these countries offers the opportunity to assess forest's contribution to green economy objectives from different forest types and climatic conditions. Gabon is covered, in its central part, by closed moist and semi-deciduous forests; while Benin is largely covered by savannah vegetation. Niger, a Sahelian country, has the lowest forest cover.

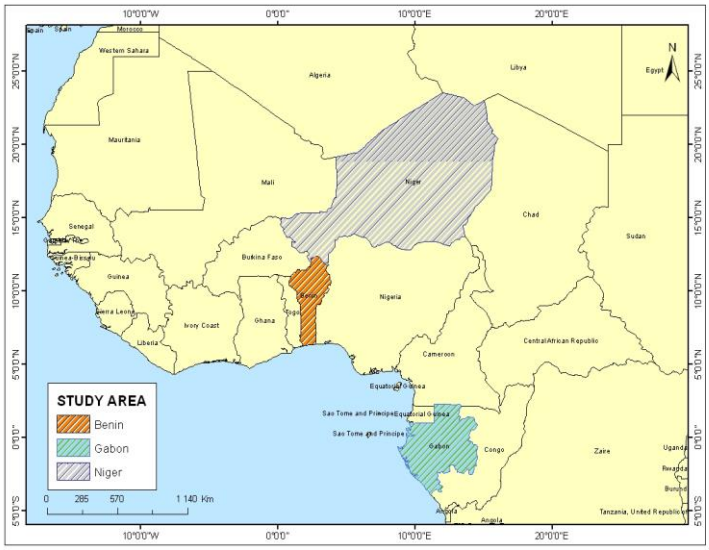

Figure 3: A section map of Africa showing the study area

Table 1:Selected countries' statistics

	Benin	Gabon	Niger	Sources
Climatic conditions				
Rainfall (mm)	1 245	2 900	540	Bénin: http://www.gouv.bj/tout-sur-le-benin/geographie Visited: 29-11-2014 Gabon:http://bch-cbd.naturalsciences.be/gabon/gabondef/contribution/documentsnat/strategienat/part1chapa.htm Visited: 29-11-2014 Niger: http://www.fao.org/ag/AGP/AGPC/doc/counprof/frenchtrad/Niger_fr/Niger_fr.htm Visited: 29-11-2014
Relative humidity (%)	70-90	80-88	50	
Mean temperatures (^{0}C)	23 – 32	21-28	23 - 37	
Demographic statistics				
Population (habitants)	10 160 556	1 672 597	17 466 172	http://www.statistiques-mondiales.com Visited: 29-11-2014
Area (km^2)	112 622	267 667	1 267 000	
Density (habitants per km^2)	87.7	6.1	13.3	
Rate of population growth (%)	2.85	2.15	3.33	
Development indicators				
Human Development Index (2013)	0.476	0.674	0.337	http://www.statistiques-mondiales.com Visited: 29-11-2014
Gross domestic product ($US million in 2011)	7 500	16 800	6 500	

3. FOREST SECTOR CONTRIBUTION TO GREEN ECONOMY IN BENIN, GABON AND NIGER

3.1. Case of Benin

3.1.1. Benin forest cover

Although the country has moderate forest cover of 4 311 000 ha; (i.e., 39% of country land area) (Fig. 4), the forest sector plays an important role in people's well-being, especially in rural areas (FAO, 2015b). In 2011, it contributed USD 108 million to the national economy (i.e., 2.6% of GDP) (FAO, 2011). Also, about one thousand people are directly employed by the forestry sector in the country (FAO, 2011). Forests in Benin are mainly natural, with limited planted forests. The natural forest areas are concentrated mostly within protected areas throughout the country. About 2.7 million hectares of this forest area (i.e., 19 % of the country's land area) is distributed as follows: national parks (843 000 ha), wildlife reserves (420 000 ha) and reserved forests (1 436 500 ha) (FAO, 2011).

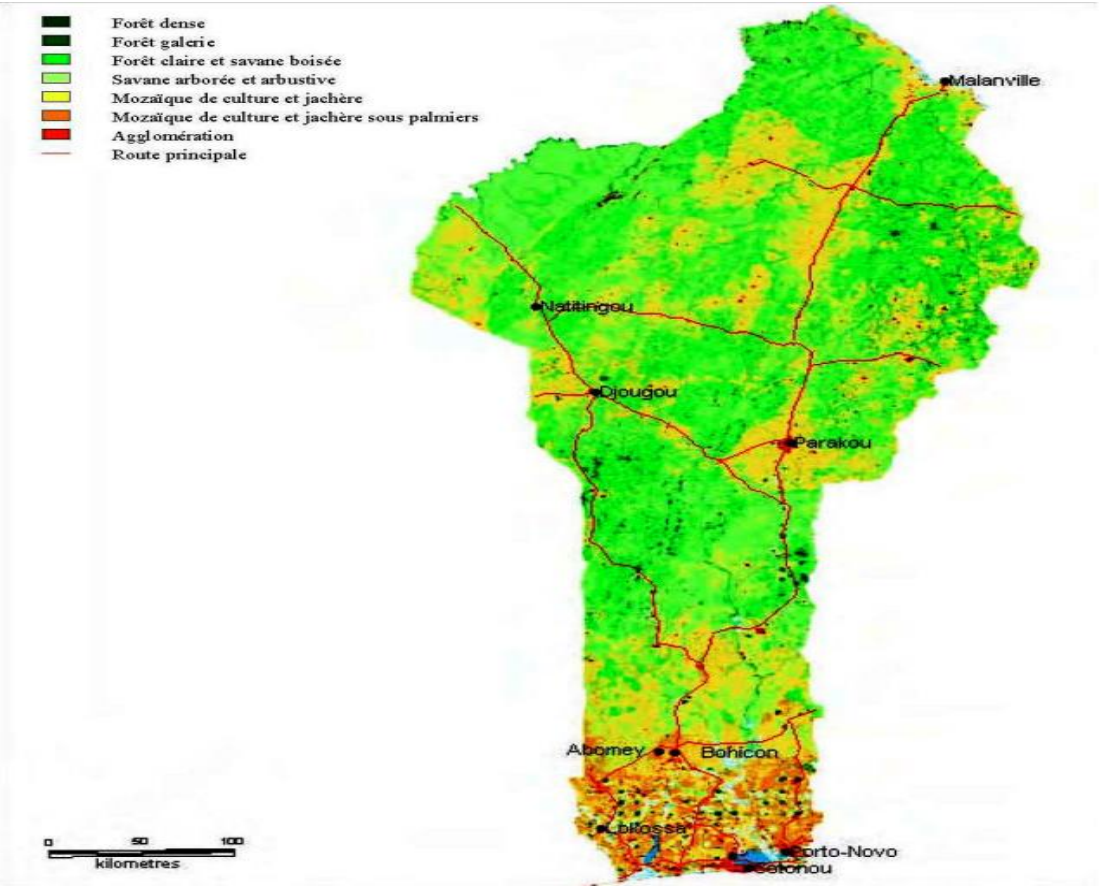

Figure 4: Benin forested areas
Source: Mapping services IFN 2007

The planted forest areas are mostly of teak (*Tectona grandis*), an economically important forest species in the country mainly in the southern part (Aoudji et al., 2012). A flora census carried out in 2008 showed that plantation forests, covered an area of 223 521 ha (i.e., 1.8% of country land area), were dominated by exotic species such as teak and acacia (80 000 ha), oil palm (90 000 ha), cashew and other afforestation species (PNGDRN, 2008). Despite its moderate cover, the forest sector has a great potential to contribute to the green economy objectives in the country, and some projects have been developed to realise the objectives.

3.1.2. Forests contribution to mitigate climate change effects

Climate change mitigation is one of the most important aspects where the forest sector could play an important role in implementation of green economy principles in Benin. Indeed, forests with their flora may contribute to resilience, absorbing CO_2 emissions, providing resources to local populations, and protecting communities from increasingly erratic weather. The carbon stock in living forest biomass in Benin was estimated at 263 million tons in 2010, equivalent to 58 tons/ha (FAO, 2011).

To increase forest contribution towards mitigating climate change effects, many national policies have been developed and implemented at the national level to address the negative effects of climate change. Thus, to ensure sustainable forest management, conservation actions were developed under different projects carried out throughout the country. For example, many afforestation, tree planting, local communities' initiatives and sensitization activities were developed under a project PGFTR (Programme de Gestion des Forêts et Terroirs Riverains: Forests and Riparian Area Management Program) implemented from 2003 to 2013 (FAO, 2011). Another project; the Communal Forest Management project (PAGEFCOM) implemented from 2005 to 2011 has four objectives that contribute to the sustainable management of forest resources, and local communities' incomes and improved livelihoods. The implementation of this project helped to develop community forests managed by local authorities but implemented by local communities.

To involve more local people in management of national parks, different development programmes were implemented around each of the villages surrounding the two parks in the country (W and Pendjari national parks). Also the villagers association of wildlife management (Associations Villageoises de Gestion des Réserves de Faune: AVIGREF) was established.

To reduce people's dependence on forests for firewood supply, the Benin government, in collaboration with African Development Funds (AFD), implemented the second stage of the Fire-Woods Project from 2002 to 2011. Under this project, 2, 515.214 ha of village and private forests were established, as well as 2, 231.65 ha of State plantations. To better control fuel wood harvest, the project established about 86 rural fuel wood markets in 2009. These markets specifically were to involve market actors in classified forest conservation, especially in the area where charcoal production is an important economic activity. This constitutes a major new approach in participatory forestry management that generates local income and reduces poverty in Benin. Since 2010, Benin government has continued to support the implementation of the National Action Programme for climate change Mitigation (PANA: Programme d'Action National d'Adaptation aux changements climatiques).

3.1.3. Benin forest potential in REDD+ implementation

At the time this study was carried Benin was not a REDD+ country participant; however, the country had already expressed its interest to be involved in Forest Carbon Partnership Facility (FCPF) in 2014. CASCADE project allowed the country to develop institutional expertise and

increased actors' capacities in commercial plantation development, community afforestation, and biofuel production, with the view to create new opportunities for participating in Millennium Development Program and voluntary carbon market. In collaboration with GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit), the country developed in one of its protected areas a sustainable hunting tourism program. This program, developed within Pendjari National Park in the northern part of the country, allows park administration officials to use part of the fees paid by tourists for the hunting permits to finance protected area conservation activities (Klein *et al.,* 2013). Therefore, most of the income earned from hunting fees stays within the region and benefits the park's local communities. This increases local people's awareness of park activities, particularly its biodiversity conservation objective (Vodouhe *et al*., 2010).

3.1.4. Benin forest management policies to increase forest contribution

Greening the forestry sector implies managing it to sustainably produce a wide range of benefits to society while significantly reducing environmental risks and ecological scarcities. Therefore, it has to meet critical livelihood needs of local communities by providing a stream of fuelwood, construction materials and Non-Timber Forest Products including medicinal plants. To reach these objectives in Benin, different management plans were consecutively implemented at the national level. The country defined its forestry policy in 1994 based on the 93-009 law relating to forests and accompanied by priority action plans. The current management policy aims at allocating to local communities the authority to manage forest resources under their jurisdiction. Management under the current policy contrasts with former methods and attempts to give local populations more control on the management plans.

Since 2002, the country developed its national strategic plan for biodiversity which focuses on conservation and sustainable use of biological diversity. The main objective was to contribute to the country's sustainable development and poverty reduction through better management of biological diversity.

In line with Benin's vision "Alafia 2025", the strategic guidelines of Benin development and the growth strategy for poverty reduction (SCRP 3; 2011-2015),(Republic of Benin, 2011) the current vision of Benin forestry policy on the horizon 2025 is: "A green Benin where forestry resources are sustainably managed for people, ecological, socio-economic and cultural needs and contribute to poverty reduction, food security and climate change mitigation" (MEHU, 2012). This is markedly in contrast to former policies. Current management strategies take into consideration communities' perspectives and allow for local control and management, access and benefit-sharing. Through these strategies, the country has improved its forest management and increased local communities' awareness.

Benin, as a member of the Economic Community of West African States (ECOWAS), has adopted the revised treaty of this organisation. This treaty in its Act 20 obliges each country to protect, maintain and improve regional environment. It also invites countries to cooperate in the case of a natural disaster with respect to this treaty. Many national and regional policies, strategies and programs were created to contain deforestation and desertification.

3.1.5. Sustainable resource use, biodiversity conservation and poverty reduction

In Benin, most of the people, mainly in rural areas, depend on forest resources for food, medicine and income (Vodouhe *et al*., 2009). About 172 species are used as food plants (Codjia *et al*., 2003) and income from NTFPs accounts for 39 % of total household income and had a strong equalizing effect on it (Heubach *et al*., 2011). Women, the main users of NTFP,

continue to increase their collection and sale of NWFPs to generate income for their children's education, health care services, and to access food during the hungry pre-harvest period for crops (Schreckenberg *et al*., 2002). Based on these realities, sustainable use of NTFPs should play more important role in forestry sector's contribution to green the country's economy.

The Centre d'Etudes, de Recherches et de Formation Forestières (CERF), created in 2010 by decree No 2010-639 of 31 December 2010, has as its mission to contribute to the implementation of the country's national forest policy and advance knowledge in the forestry sector. The Centre comprises of the following sections:

- agroforestry and forestry service,
- management and biodiversity service,
- forestry economics, wood technology and NTFPs promotion service which is mandated to undertake the following:
    - carry out research on profitability of innovative technologies in forestry sector,
    - elaborate tools to assess forestry sector contribution to national economy,
    - carry out research on the profitability of different kinds of forestry plantation management,
    - study technological characteristics of indigenous and exotic forestry species,
    - conduct NTFP census and research on NTFP valorisation.

Different institutions work closely on NTFP use in the country, mainly through research activities. For example, the National Institute of Agricultural Researches (INRAB), which is in charge of natural resources preservation, also has responsibility to contribute to better use of NTFPs. However, its activities are usually limited to domesticated species (FAO, 2014b). The Applied Biomedical Sciences Institute (ISBA) contributes to NTFP use through therapy, development of traditional medicine products, traditional pharmacopeia and valorisation of medicinal plants knowledge.

People locally promote the sustainable use of NTFPs by cultivating the most important species in their farmland. The most important reasons, which motivate households to conserve woody species on farmland are contribution to food, medicine and in response to declining trees in the wild (Vodouhe *et al*., 2011). A total of 43 wild edible trees were found in the traditional agroforestry systems of Benin during the flora survey (Assogbadjo *et al*., 2012).

Although, the green economy concept is still in its infancy stage in Benin, these actions already comprise the beginnings of its establishment.

3.1.6. Constraints to building green economy through the forestry sector

Despite forests potential contributions to green growth in Benin as presented above, some dysfunctions persist that prevent this sector from satisfactorily contributing to the green economy objectives in the country. According to FAO (2011), 38.3% of GHG emissions in the country come from land-use change and forestry. Between 2000 and 2010, Benin lost an average of 50 000 hectares of forest per year (1% annual deforestation rate). Figure 5 shows the decline of carbon stock in living forest from 1990 to 2010. Since 1990, Benin's forest capacity to stock carbon decreased mainly due to deforestation. Despite the developed protection strategies, forest areas are still being destroyed (50 000 -70 000 ha per year) due to agriculture (Figure 6), wood extraction (Figure 7), grazing (Figure 8) and hunting.

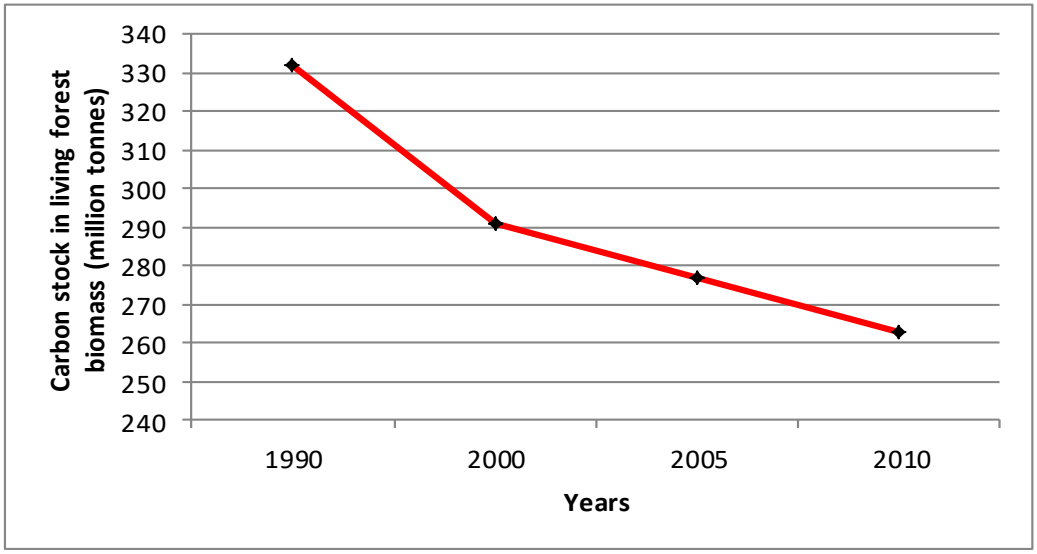

Figure 5: Decrease of carbon stock in living forest biomass in Benin
Source: FAO 2011

Figure 6: Yam farm within Trois Rivière forest in Benin
Source : Picture from Adjakpa (personal communication)

Figure 7: Woods extracted from Trois Rivière forest in Benin
Source : Picture from Adjakpa (personal communication)

Figure 8: Cattle grazing of forest land in Benin
Source : Picture from Adjakpa (personal)

The vegetation has been considerably modified by human activities and large areas of high-canopy forest have been cleared (FAO, 2011; Figure 9).

Figure 9: Forest land cleared for human in Benin
Source : Picture from Adjakpa (personal communication)

Most of the country's land area is either covered by savannah resulting from the regeneration of cleared forests; or made up of natural Sudanian-type stands.

With regard to the contribution of forest goods to human well-being, their uses remain traditional while limited efforts have been undertaken to improve the same. For example, the use of non-timber forest products is continuously on the increase as people continue to harvest them from natural vegetation and this increases the risk of overexploitation of most of them. Moreover, despite the importance of these resources in improving incomes, especially among poor people, no actions are taken to make them more profitable, for example through value addition. The increasing urbanization in the country and the growing demand of natural products represent a great opportunity to improve NTFPs contribution to the incomes of communities relying on them.

3.1.7. Actions needed to optimise forest contribution to green economy

Undoubtedly, for the green economy perspectives some urgent actions are needed to reverse shortcomings highlighted above. Indeed, to contribute to mitigation of adverse climate change effects, there is need to develop actions to reduce deforestation and forest degradation. Knowing that forest lands are mainly cleared for agricultural purposes, there is a need to promote intensive crop production technologies. Around some protected areas (Pendjari National Park and W park), some actions are currently implemented in this way by involving local communities in organic crop production. Organic agriculture is known to be less extensive and more profitable where the market is available. Strategies encouraging farm land expansion to increase agricultural production, mainly cotton, should be avoided. On the other side, to limit logging in natural forests more effective afforestation programs are needed in the country. In Benin, although the general policy as elaborated in many action plans and laws encourage environmental conservation, its implementation remains limited. For example, with regard to the Nagoya protocol, which promotes equitable sharing of benefits arising from genetic resources use, the government of Benin has not implemented its own juridical system, despite the availability of texts of law linking protection and natural resources management in its national legislation.

Although at the time of collecting data for this study the country was not implementing any REDD+ activities (reducing emissions from deforestation and forest degradation through conservation of forest carbon stocks, sustainable management of forests and enhancement of forest carbon stocks in developing countries) implementation mechanisms for some of its four components/pillars would be very important for the country. Also, the introduction of schemes on payments for environmental services could be one option to develop in order to promote and better value other ecosystem services made available by the forest sector.

Considering the fact that in the country protected areas play an important role in biodiversity conservation, there is a need to strengthen the management of these areas through activities that increase local communities' wellbeing. For example, there could be identified activities that could diversify protected areas dwellers' sources of revenue and reduce their dependence on protected areas resources. Further, those responsible for environment management in the country have to develop climate change mitigation or adaptation actions that could reduce climate change effects on forest resources. These actions could be implemented in ways that would lead to a reduction of deforestation or increase forest rehabilitation in the areas where it is disappearing. Currently forest areas are destroyed at alarming rate (50 000 -70,000 ha per year) and the country would compensate this loss by supporting afforestation and reforestation programmes.

Afforestation and reforestation could significantly increase employment especially in rural areas where forests are habitually cleared for agriculture, wood extraction, grazing and hunting. The labour required for afforestation (land preparation, seedling purchase, transportation and planting) is about 133 person-days per hectare (*Unpublished data*). Therefore, if the Benin forest sector were to for example decide to restore one tenth of the 70 000 ha of forests lost each year, this will be an important opportunity to provide employment to 3103 workers, especially in rural areas. Currently, in Benin, forest sector contributes to 1 000 direct and indirect employment/jobs. Assuming that the country plans to increase its reforestation/afforestation effort by 10% each year over 30 years, this action will generate about 564 631 green jobs employment opportunities (Figure 10).

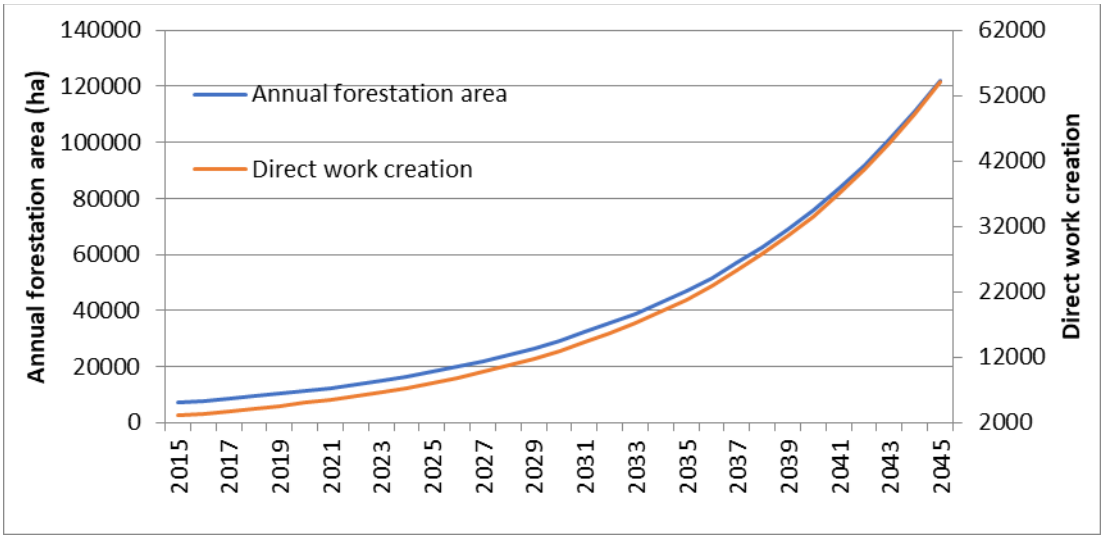

Figure 10: Estimation of total new green jobs, which will be created by increasing reforestation and afforestation in Benin

Knowing that such forest jobs are more seasonal than full-time jobs, the actual number of workers hired (on a short-term basis) would be much higher than the number of average employment opportunities mentioned above. Moreover, knowing that such forest activities are closely linked to other economic sectors, the implementation of this initiative will boost employment by creating more indirect green jobs in these sectors (for example seed nurseries and technical training).

Based on FAO (2011) estimation, by implementing this afforestation programme, Benin will increase its carbon stock potential by adding 73 million tons by 2030, in addition to its current conservation effort. This can be achieved by investing US$ 1 018 883 180 over 30 years, (US$ 800 for one ha plantation) for afforestation and/or reforestation the country; and this can eventually earn the country about US$ 3 024 000 000* on the carbon market[1] in the 30 year period.

3.2. Case of Gabon

3.2.1. Gabon forest cover

Gabon is one of the African countries reported to have the highest percentage of their land area covered by forest, at 89.3 % of the country's land area (FAO, 2015b; Fig. 11). Forest resources are very important in the country's economy where wood products represent 60% of exported goods (Gumbo, 2010; FAO 2011b). For example, in 2008, the country produced 534 000 m^3 of woodfuel and exported 2 178 000 m^3 and 62 000 m^3 of roundwood and sawnwood, respectively (FAO, 2011).

The country has three major forest types: (i) evergreen rainforest occurring in the west, which has been heavily harvested, degraded and in some areas reduced to secondary forest characterised by the abundance of *Aucoumea klaineana* and *Dacryodes buettneri*; (ii) the central Gabonese forest, covering most of the country, which is very similar to the closed moist forest found from Liberia to the Congo Basin, with many of the same tree species found throughout (*Canarium schweinfurthii*, *Lophira elata*, *Entandrophragma*, *Khaya spp* and *Triplochiton scleroxylon*); and (iii) a semi-deciduous forest type occurring in the northeast, characterized by a predominance of Maranthaceae (rattan) in the sub-layer and by a dominance of trees such as *Terminalia superba*, and *Millettia laurentii* (STFM, 2005). Gabon ecosystem has an exceptional diversity, which plays an important role in the country's socioeconomic development. Estimates of vascular plant species vary widely from 7,000 to 75,000 (Sosef *et al*., 2007), while for fauna, there are 749 bird species (Vande Weghe, 2006) and 121 and 845 reptiles and fish species, respectively.

A large part of Gabon's forest is natural. Planted forests cover about 25,000 hectares. The government plans to raise the area of planted state forest to 100,000 hectares and to promote the establishment of an additional 100,000 hectares of private plantations, but planting rates are currently small. Agro-industrial plantations include about 11,000 hectares of rubber and some small plots of oil palm and coconut (STFM, 2005).

[1] Carbon value was calculated based on carbon market statistics in South Africa (R120 per ton CO2; Promethium Carbon, 2014)

With a low overall population density, and 60% of the population living in urban areas, there is little anthropogenic pressure on forest resources FAO (2005). FAO (2011, and 2015) estimated rate of change in forest area at less than 1% from 1990 to 2015.

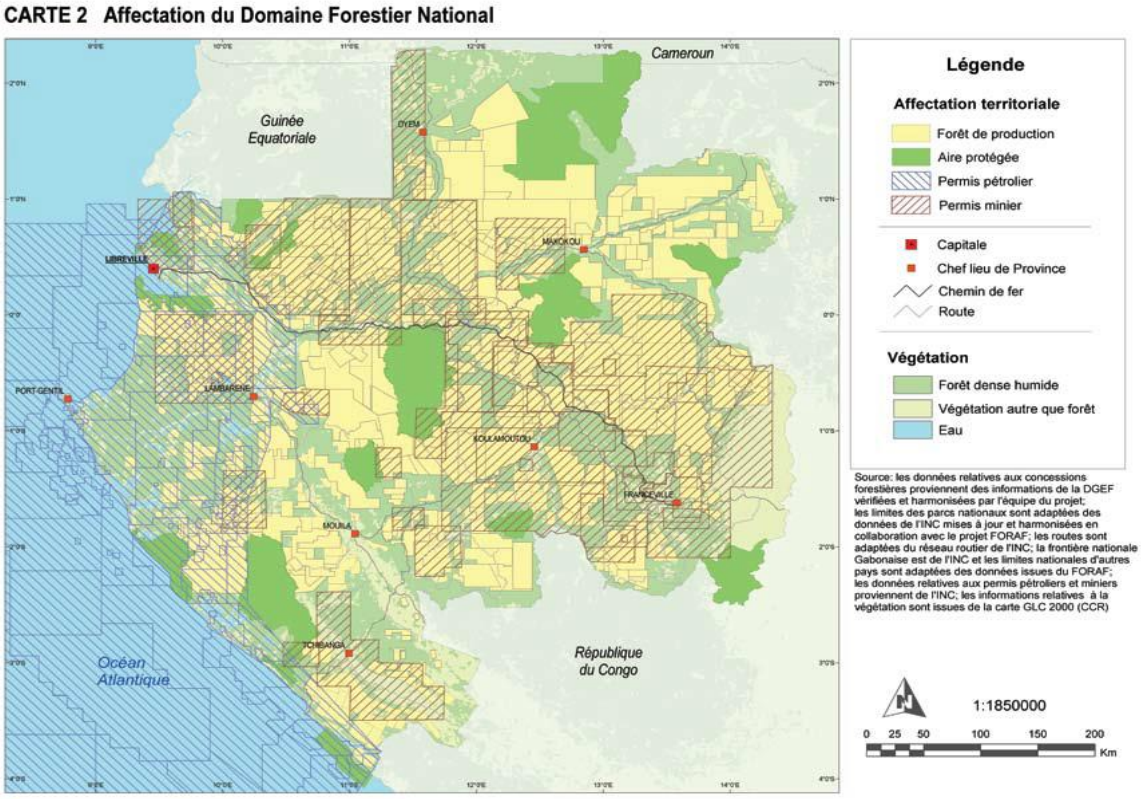

Figure 11: Gabon forested areas
Source : Atlas forestier interactif du Gabon (2000)

3.2.2. Forests contribution to mitigate climate change effects

The carbon stock in living forest biomass in Gabon is about 2 710 million tons in 2010 (i.e., 123 tons/ha) (FAO, 2011), and the country experienced less than 1% change in its carbon stock from 1990 to 2010. Based on these results and knowing the importance of forests in the country's economy, there is a need to develop strategies for their sustainability. To reach this objective, many national policies have been developed and implemented to increase the forest potential to stock carbon in living forest biomass. As part of an afforestation policy implemented by the Gabonese authorities, wood exploitation was regulated by developing many laws. Indeed, Gabon has rich potential for additional carbon sequestration and greenhouse gas (GHG) reduction. The country's commitment to natural resource development led to the signing in 1998 of the UN Framework Agreement on Climate Change and the ratification in December 2005 of the Kyoto Protocol. A National Council on Climate Change was established in 2010 to draw up a National Climate Plan.

3.2.3. Gabon forest potential in REDD+ implementation

Now, Gabon is one of the 37 countries from Asia, Africa, Latin and Central America that have been selected into the Readiness Mechanism based on their Readiness Plan Idea Notes (R-PINs). Readiness Mechanism is one of the two separate mechanisms supporting Forest

Carbon Partnership Facility (FCPF). FCPF is a World Bank program whose goal is to assist developing countries in their efforts to reduce emissions from deforestation and forest degradation (REDD+) by providing value to standing forests. According to FAO (2011), Gabon shows low deforestation and degradation rates, and this puts the country in favorable standing for REDD+ and carbon finance mechanism. Thus, with its already low deforestation and degradation rate the country could play a leading role in carbon finance mechanism in Africa. This is a good indicator of green economy. However, the country is not ready to adopt the REDD+ mechanism if the carbon market will continue to function as already established.

3.2.4. Gabon forest management policies to increase forest contribution

Since its first forest policy (1996), Gabon authorities attempted to increase and optimize the forest sector's contribution to economic and social development. Similarly, in 2001, Gabon updated its Forest Code (Law No 16/01 of 2001) to improve forest governance and management (http://risk.forestlegality.org/countries/647/laws). The main goals of the 2001 Forest Code are to foster: (i) the sustainable development of forests; (ii) the industrialization of the Gabonese timber sector; (iii) the sustainable conservation of natural resources, and (iv) greater local stakeholder involvement in the management of Gabon's natural resources.

Thus, Gabon's current forest legislation aims to increase and optimize the contribution of the forestry sector to economic and social development and to promote a more diversified and efficient wood industry through a significant reduction in the export of logs and an increase in the local processing of wood products. This strategy is a good option to green the country's economy. By promoting local processing, the goal of the forest sector is to involve more local people in forest goods processing, thereby increasing the benefits local communities derive. Therefore, the current legislation also promotes the development of new forest harvesting rules, the introduction of means to monitor forest harvesting, the reform of timber licences to secure wood supplies to local industries, the imposition of a progressive transformation tax on local forest production, and, finally, the progressive reduction of log exports from 75% of production in 1996 to 50% by the year 2005 (STFM, 2005).

To green its economy, Gabon has adopted a national-level legislation supporting investment promotion and the establishment or enhancement of forest funds. Since 2007, the country has introduced taxes from timber or other sales revenues dedicated to re-investment for longer-term benefit such as roads or forest-management planning (FAO, 2014a).

On 11th November 2011, Gabon ratified the Nagoya Protocol on access to genetic resources and the justice and equitable sharing of benefits arising from genetic resources used. The implementation of this protocol will offer great transparency and legal certainty for genetic resource users and will create a framework to promote genetic resource use and associated traditional knowledge. The development of these legal frameworks will, if effectively implemented, promote equity in access to forest resources as implied in green economy principles.

Gabon is a member of Central Africa Forest Commission (COMIFAC), an intergovernmental organisation guided by Central African presidents. This organisation is in charge of affiliated countries forests and environment policies development and harmonization. It helps countries in this part of the continent to have common vision on sustainable management and conservation of their forestry resources, so as to contribute to promote green economy objectives, among others.

3.2.5. Sustainable resource use, biodiversity conservation and poverty reduction

With very low demographic and agricultural pressure, the deforestation rate in Gabon is about 1% per year (FAO, 2011a, FAO 2015b). Forest resource users in Gabon rely mainly on timber logging. About 60 high value species are harvested from natural forests. The most harvested species is *Aucoumea klaineana* (FAO, 2010). Figure 12 presents Gabon's roundwood production from 1961 to 2013. As shown in the figure, until 2010, most of the roundwood produced was exported.

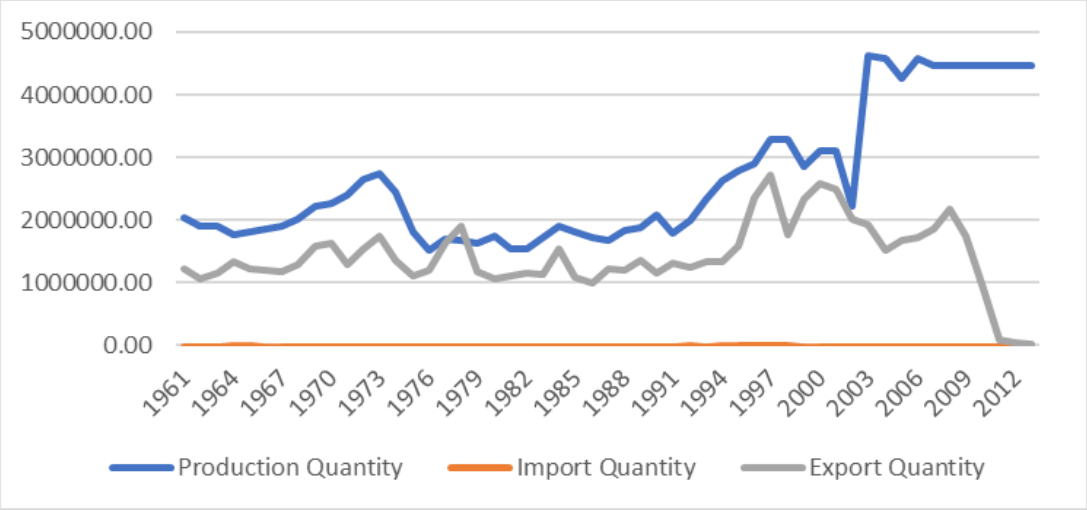

Figure 12: Evolution of roundwood production and trade (1961- 2013)
Source: Forestry Statistics, July 2014, https://gabon.opendataforafrica.org/upelxc/gabon-fao-stat-forest-production-and-trade

As regards production of NTFPs there is limited data on the amount harvested in the country. Their use remains traditional, and statistics at country level are not available to quantify their contribution to human well-being. Nevertheless, NTFPs play an important role in the life of local communities. According to Steel (1994) bushmeat consumption in the country is about 17.2 kg/individuals/year; and mainly from poaching. Other research findings on game meat in Gabon are reported by Katharine Abernethy, K. and Obiang, A. N (2010).

To regulate the NTFPs sector the country, in 2011, created an institution called PFABO: Produits Forestiers Autres que le Bois, which works closely with the National Advisory Committee of NTFPs (NAC-NTFP). The five strategic axes of the national strategy of NTFPs are: 1) strengthening of the knowledge base on NTFPs, their sustainable management and utilisation; 2) development and implementation of institutional and regulatory framework on NTFPs; 3) economic diagnostic and control of traceability of NTFP; 4) strengthening of institutional and human capacities for NTFPs sector development and; 5) implementation of a conducive environment for investment in the sector.

3.2.6. Constraints to building green economy through the forestry sector

With very low demographic pressure, Gabon continues to experience low change in its natural forest cover. Timber logging is the most important forest activity in the country and this overshadows the potential role that could be played by NTFPs sector in people's well-being. Indeed, little attention is given to these products; however, since 2011 the central government has tried to put more emphasis on them. The little attention given to these products could

explain the lack of information on their contribution to people's well-being. Moreover, no action has been taken to increase the profitability of NTFPs, especially in terms of value addition. For the sustainable use of NTFPs in their livelihood support, there is a need to carry out research activities on them.

With its position not to adopt the REDD+ mechanism, the country will not benefit from the carbon markets, and therefore stands to miss a good economic opportunity to improve human wellbeing through trade in and incomes from forest carbon; as well as possibility to increase awareness on forests and their biodiversity conservation.

3.2.7. Actions needed to optimise forest contribution to green economy

In Gabon, the introduction of schemes of payments for environmental services may be one option to develop in order to promote and improve values of other ecosystem services made available by forests. Indeed, to raise Gabon's population support for sustainable use of its biodiversity, those responsible for management of such resources need to develop measures for payment of environmental services, as incentives that can secure their protection. Further, since timber logging is the most important forest activity in the country, there is a need to institute forest products' certification.

Also, given its vast natural forest potential, Gabon authorities could continue to evaluate adoption of the REDD+ mechanism in order to benefit from forest carbon trade, which could help the country to improve human wellbeing from forest carbon revenues, as well as increase peoples' awareness about forest and its biodiversity conservation.

Considering the current forest cover in Gabon, the country could increase green jobs creation by improving forest tourism and related forest management programmes. Indeed, tourism in Gabon is still in its infancy, and the tourism sector suffers from several constraints. One of the big constraints faced by tourism in the country is the scarcity of skilled labour. This situation could be addressed during creation of green jobs, most likely by the forest sector and private actors in the tourism industry.

On the other hand, and based on FAO (2011) estimation, involving the country in trading forest carbon could be an opportunity to generate revenues for its development.

3.3. Case of Niger

3.3.1. Niger forest cover

Among the three countries involved in this study, Niger is reported to have the lowest percentage (i.e., 1%) of its land area covered by forest (FAO, 2011). Niger is a Sahelian country, and according to an FAO (2011) , the forest area was about 1 204 000 ha in 2010. Its flora had 2 761 species in 2013 (CBD, 2014) versus 2 274 species in 1998 (Saadou, 1998). The forest is the main source of energy, with the wood energy sector as the most developed area of forest sector. For example, in 2008, the country produced 9 432 000 m^3 of woodfuel, all of which was consumed locally. Also, in 2008, the country also produced 411 000 m3 of roundwood, 4 000 m3 of sawnwood; and all of which was consumed locally (FAO, 2011). Incomes earned from sales of wood energy are invested in many development areas by central and local governments. Also, the forest sector plays an important role in people's wellbeing by providing food, fodder and medicinal plants. In Niger, formerly forested lands are

plagued with soil loss and desertification. The Sahara Desert, which already covers two-thirds of the country, is expanding at a rate of 200,000 hectares annually. In an effort to slow the desert encroachment, the government planted more than 60 million trees between 1985 and 1997 (www.mongabay.com).

Despite its difficult climatic condition, the country's flora contains many useful species. In the north Sahelian zone, the woody component is dominated by species such as *Faidherbia albida, Balanites aegyptiaca, Ziziphus mauritiana, Vachellia raddiana, Vachellia nilotica, Vachellia seyal*, *Guiera senegalensis* and *Annona senegalensis*. In the south Sahelian zone, the common species are *Tamarindus indica, Ficus spp*., *Parkia biglobosa*, *Borassus aethiopum*, *Hyphaene thebaica*, *Bombax costatum* and *Vitellaria paradoxa*.

3.3.2. Forests contribution to mitigate climate change effects

Despite its limited forest cover, the forest sector has an important role to play to mitigate adverse climate change effects in Niger. Forest lands are mainly converted to agricultural use, firewood production and urban development. Classified forests are therefore increasingly degraded, and more than 50% have lost their vegetation potential As a result, the forest capacity to stock carbon is decreasing. An assessment of climate change in 2009 revealed that land use change and forestry contributed 55.62% to gas emissions in the country, followed by agriculture/feeding (34.60%), energy (8.51%), wastes (1,21%) and industries (0.06%) (PNCC, 2013). The carbon stock in living forest biomass was about 37 million tons in 2010 (i.e., 31 tons/ha) (FAO, 2011).

FAO (2011 and 2015b) report that Niger has recorded forest loss of 3.7% over the period 1990 to 2000, 1% over the period 2000 to 2010 and 1.1% over the period 2010 to 2015. To reverse this trend and develop a green economy in Niger many activities have been initiated. In order to maintain and enhance the contribution of forests to mitigate the effects of climate change, Niger government and national NGOs have developed and implemented, at the national level, many environmental projects. Numerous afforestation projects on tree planting, and sensitising and providing support to local communities have been developed in collaboration with international organisations and development banks such as DANIDA, AfDB and EU. For example, DANIDA has assisted Niger government to carry out two projects: "Projet Énergie II (1990-1996)" and "Projet Energie Domestique (1999-2003)". The African Development Bank (AfDB) has financially supported the country from 2000 to 2006 to implement the Natural Forest Management project (Projet Aménagement des Forets Naturelles: PAFN).

Many projects have been implemented to support the sustainable forest management in Niger. From 2006 to 2011, the Global Environment Fund (GEF) provided funds through United Nations Development Programme (UNDP) for the project entitled Projet de Cogestion des Ressources Naturelles de l'Aïr et Ténéré (COGERAT). The objective of the project was to strengthen Aïr and Ténéré surrounding communities' role in natural resources management within these reserves. To support the country to develop strategies to face climate change effects, UNDP-Japan funded the "Project Appui à l'Adaptation aux Changements Climatiques" to strengthen the country's partnership and sectorial network development. Further, in 2010-2014, GEF funded a regional project to support sustainable biodiversity conservation within transboundary park W-Arly-Pendjari (WAP). Niger and Benin are both involved in this project. WWF has, from 2009 to 2011, funded the project "Appui à la Conservation de la Diversité du Site Ramsar du Moyen Niger".

3.3.3. Niger forest potential in REDD+ implementation

At the time this study was undertaken, Niger was not listed as a REDD+ country, so there was no information available on the country's intention to be involved in Forest Carbon Partnership Facility (FCPF). The country was not a participant in the CASCADE (Crédits carbone pour l'agriculture, la sylviculture, la conservation et l'action contre la déforestation) project which provides for capacity building of institutions and experts for development of commercial plantation, community forestry, bio carburant producing with the view to create new opportunities for participating in Millennium Development Program and voluntary carbon market.

3.3.4. Niger forest management policies to increase forest contribution

In 1995 the country engaged in participatory and iterative process of elaboration of a National Environment Plan for Sustainable Development (PNEDD). Adopted in 2000, this document serves as the national environment baseline framework for sustainable development. The coordinating institution for the plan is the National Environment Council for Sustainable Development (CNEDD) which was created in 1996. The objectives of CNEDD are similar to those of the Nigerien policy in the area of environment sustainable development; i.e.: "to expand the development options of Niger and make them sustainable for future generations", and "to create favourable conditions for improving food security, finding a solution to energy crisis, improving health conditions and economic development of communities" (PNCC, 2013).

With regard to forestry sector contribution to green economy, the Nigerien authorities responsible for forest resources management agencies could still strengthen strategies for sustainable utilisation of forest resources while significantly reducing environmental risks and ecological scarcities. Through the law 2004-040 of 8 June 2004 local communities have been authorised to develop forest management plans, undertake forestry inventory, and levy taxes on use of NTFPs. For example, taxes levied on wood transport earned the country about US$ 2 672 871 (Nyare *et al.,* 2012). Taxes on NTFPs are still under discussion and experimentation; for example, community levy in one of the country's municipality earned about US$ 57 814 during two years experimentation. This initiative is aimed at allowing local communities to use part of the money obtained to finance community infrastructural development, thus contributing to the main objective of the country's sustainable development and poverty reduction through the management of biological diversity. Appreciating the importance of biodiversity loss, the country signed (1992) and ratified (1995) the Biodiversity Convention.

3.3.5. Sustainable resource use, biodiversity conservation and poverty reduction

In Niger, 90% of rural people's basic needs are dependent on biological resources through agriculture, livestock, forest resources, fishing and aquaculture (CNEDD, 1998). They mainly rely on forest resources for food, medicines, building materials, fuelwood, cosmetic products, arts and income. For illustrative purposes, 468 species (i.e., 21 % of species identified in the country) are used as food, medicines, building materials, art and cultural goods (Saadou, 1998). From these species, 210 are mainly used by people during food shortages. Concerning animal feeding, 235 species are used as fodder throughout the country. The revenue earned from community forest management help local people to increase food availability, to build their cereal bank and to improve agricultural production.

However, all of these products are harvested from natural vegetation and given their importance in local communities' well being, there is a need to make them sustainable. Indeed,

environment degradation and over exploitation of forest resources whose causes are mostly attributable to anthropogenic pressures have significant impact on the needy, especially in rural areas where subsistence livelihoods and employment are directly related to natural resources.

Non-Timber Forest Products (NTFPs) play an important role in Nigerien life by providing subsistence products and incomes to many people. Despite the importance of these products, there is limited statistical data available on them. Indeed, apart from gum arabic (Figure 13), there is no realistic data available in the country on NTFPs production, consumption or commercialization.

The most organised NTFP is gum arabic. There are about 50 gum trees planters throughout the country and the main focus of the Niger government is to promote export of the products. This sector is currently more organized through the Professional Association of Arabic Gum. Also, the sector has benefited from financial assistance of World Bank through a project bio-carbon whose goal was to grow 6 000 gum trees for the purpose of increasing and promoting gum production in the country. Other NTFPs have also benefited from indirect assistance through different programs and projects (WAP, Corridor Project, PAPE).

Figure 13: Gum Arabic

Tourism activities were developed in W Park and giraffe zone and these activities generate significant revenues to central government, local communities and the private sector. For example, in 2008, W Park in Niger generated USD 40 160 while giraffe zone generated about USD 27 000. About 50% of this income was given to local communities.

The sustainable use of natural resources in Niger should play a more important role in forestry contribution to people's wellbeing and therefore to green economy. To achieve this objective, in the implementation of the Convention on Biological Diversity (CBD), the country aims to work for a society that is aware of the role and challenges linked to biological diversity and committed to its responsibilities towards future generations. Generally, the national strategy aims at preserving the multiple functions of biological diversity for their sustainable use with

the view to secure the household wellbeing. Three specific objectives of the convention are: i) ensure the conservation of biological diversity; ii) the sustainable use of components of biological diversity; and iii) the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources, transfer of relevant technologies, and funding (CBD, 2014). In 2007, Niger adopted its Accelerated Development Strategy of Poverty Reduction whose focus is promoting the central role of sustainable use of biological diversity in accelerating the country's economic growth.

Niger, as a West African country, has adopted ECOWAS recommendation to link environment and natural resources management. In addition, the country is a member of Great Green Wall for the Sahara and the Sahel Initiative (GGWSSI). This initiative aims at improving local communities' wellbeing through a healthy management of ecosystems within Sahelo-Saharan zones, a sustainable use of natural resources, containing the encroaching desert, and reducing local people's poverty. The geographical zone for the intervention of this initiative in Niger is within Isohyets 100 mm in the north and 500 mm in the southern part as shown on Figure 14. This initiative offers a valuable opportunity to green Niger's economy.

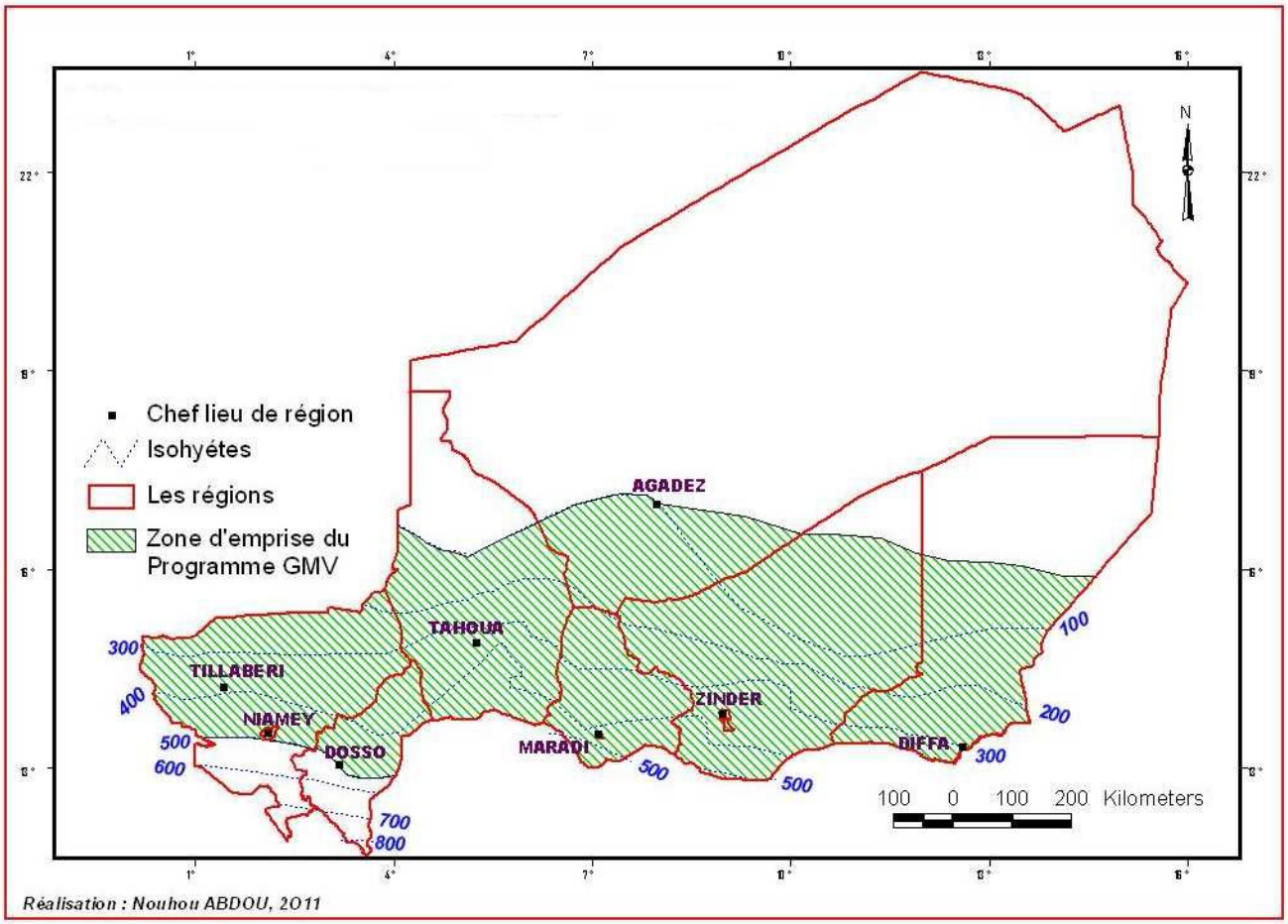

Figure 14: GGWSSI intervention area in Niger

3.3.6. Constraints to building green economy through the forestry sector

As a Sahelian country, Niger is facing degradation of its productive potential as a result of a globally unfavourable climatic situation, especially over the last two decades, and the increasing pressure on land due to high population growth at 3.3% (CEDC, 2004). In addition, people and livestock disturb the balance between human beings and nature, further putting pressure on the environment. The bad management of fragile ecosystems in arid zones has led to a gradual desertification process (CEDC, 2004) that is attributed to agricultural development and increasing demand for firewood. Thus, according to CEDC (2004), the major environmental issue in Niger appears to be desertification.

Concerning the NTFPs sub-sector, it appeared not receive any financial assistance of the forestry sector in Niger at the time this study was undertaken; apart from Gum Arabic. Little attention is accorded to NTFPs in forest management plans. Only Gum Arabic was benefiting from financial assistance from central government to undertake rehabilitation of existing stands, the establishment of new stands and the involvement of the private sector. Thus, despite economic and social importance of NTFPs, there is no data at national level on their contribution to people's well-being and no actions have been carried out to increase their value addition and profitability. For these products to be sustainably used, with the view to increase their role in people livelihoods, there is a need for research on them. Apart from wood products, other forest products that contribute to people's well-being remain traditional, and limited actions have been undertaken to improve them.

On the other hand, since the country was not undertaking the REDD+ initiative, this denied local people from benefitting from trade in forest carbon plus other associated benefits . However, the introduction of scheme for payment for environmental services could be one option to promote and enhance the value of other ecosystem services made available by the forest sector.

Niger has a legal framework on environment comprising about 317 texts, of which 283 are at national level and 34 at international level (PNEDD, 1998). Despite this legal framework and the existing institutional framework, the following constrain its implementation:

- the non-operational status of certain legal texts,
- conservation and sustainable use of biological diversity are ranked low in the country's economy,
- the weak profiling, in the national legislation, of Article 15 of the Biological Diversity Convention (i.e., "just and equitable sharing of benefits derived from genetic resources")
- the insufficient support for research and valorization of traditional knowledge on biological diversity uses.

3.3.7. Actions needed to optimise forest contribution to green economy in Niger

Niger has to develop actions to maintain and increase its forest cover areas. Thus, in addition to the Great Green Wall Initiative, the country has to expand afforestation programs, for example through agroforestry, and promote sustainable use of resources from protected areas for additional incomes to local communities. This could reduce their dependence on these biodiversity areas. Action is also needed to mitigate climate change effects.

With regard to expansion of forest area, the tree planting rate in the country is about 5000 ha per year. Niger with its large surface has a great potential to increase forested areas. This could be done through the Great Green Wall Initiative. By increasing its forested areas, the country's potential to benefit from green economy s will be increased, for example by providing people, especially in rural areas, with green jobs. The average labour requirements for afforestation in Niger (land preparation, seedling purchase, transportation and planting) is about 153 person-days per hectare (*Unpublished data*), therefore increasing the current afforestation effort by 10% each year over 30 years could provide important employment opportunities. Assuming that the country plans to increase its reforestation/afforestation effort by 10% each year over 30 years, this action will generate about 463 956 green jobs (Figure 15). Knowing that forest jobs are more seasonal than full-time jobs, the actual number of workers hired (on a short-term basis) would be much higher than the number of average full-time positions mentioned above. Moreover, knowing that forest activities are closely linked to other economic sectors, the implementation of this initiative will further increase employment by creating more indirect green jobs in these sectors (for example in seed nurseries and technical training).

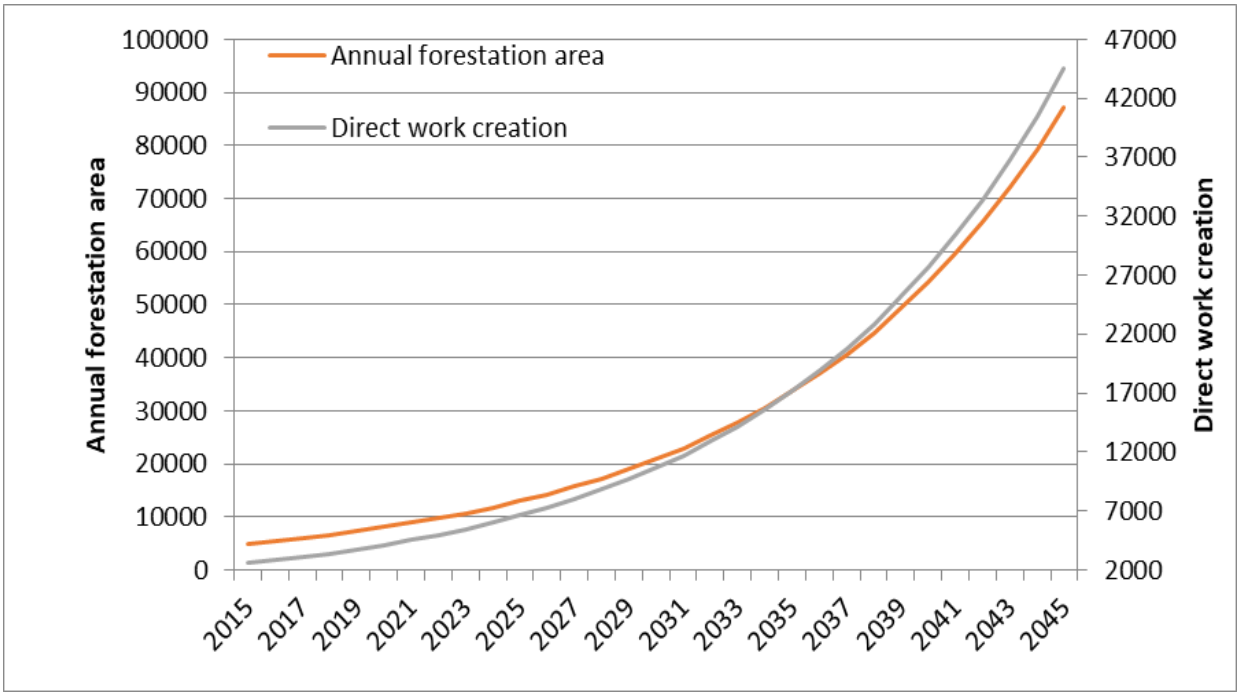

Figure 15: Estimation of total new green jobs, which will be created by increasing reforestation/afforestation effort in Niger

Considering the country's current carbon stock potential (31 tons/ha; FAO, 2011), Niger could increase its carbon stock potential by adding 28 million tons by 2030 by implementing the proposed afforestation programme.

3.CONCLUSIONS AND RECOMMENDATIONS

In each of the selected countries, many initiatives have been undertaken on green economy and the forest sector is already playing a good role in the implementation of the green economy principles. From the equatorial region to Sahelian zone, several green economy related programmes have been developed to enhance sustainable forest management and protect the environment.

Currently, the forest cover in the three countries is estimated at 27,765,000 ha with the carbon stocking capacity of 3,010 million tons in 2010 (FAO, 2011). This represents a high potential to contribute to achieving the green economy objectives. Apart from Gabon, the two other countries experience a relatively high deforestation rate. The main deforestation and degradation causes in these countries are agricultural expansion, wood extraction, grazing, hunting and urban infrastructural development. The loss of vegetation cover is higher in Niger due to harsh climatic conditions and high demographic rate (3.33%). However, unlike Niger, Gabon has a low overall population density, little anthropogenic pressure on forest resources and a rich potential for additional carbon sequestration and therefore greenhouse gas (GHG) reduction. Although timber logging is the most important factor characterizing land use change in Gabon, the annual deforestation rate in this country is very small, actually less than 1%.

The three countries have signed many environment related international conventions, laws, action plans, and have also developed reasonably good legislation to maintain and increase forest cover; however, the implementation of all these remain limited, and therefore constrain increasing the countries' forest sector roles in green economy.

Gabon's large forest cover has good potential to play an important role in greening the country's economy by for example stocking carbon in living biomass and trading in forest carbon. However, the country was not participating in any REDD+ activities at the time this study was undertaken. According to FAO (2011) report, only 15% of the country area is not covered by forest. In contrast, Benin was noted to have expressed in the Forest Carbon Partnership Facility as the beginning of the country's integration into the REDD+ initiative.

Benin and Niger have more scope for implementation of afforestation and reforestation programmes that could provide the countries with the opportunities to generate green jobs, in addition to incomes to many rural people and possibly decrease their dependence on existing natural forests. This could be an investment area of private sector actors, in collaboration with or facilitated by the forest sector in those countries. Also, private actors could consider investing in tourism, especially in Gabon where significant opportunities exist. This would be another important opportunity to harness the country's forest potential in the context of green economy.

Table 2: highlights some ideas on how these three countries can improve the contribution of their forestry sectors to green economy development.

Key considerations	Benin	Gabon	Niger
Key elements of the forest sector that have potential to contribute to green economy and develop pathways in green economic development	➢ Forests potential to stock carbon in living forest biomass estimated at 263 million tons in 2010 ➢ Benin is not REDD+ country participant but has expressed its interest to be involved in Forest Carbon Partnership Facility in 2014 ➢ Sustainable hunting tourism program which allows park administration to give local communities part of the fees paid by tourists for the hunting permits ➢ Income from NTFPs accounted for 39 % of total household income	➢ The carbon stock in living forest biomass in Gabon was about 2,710 million tons in 2010 ➢ The country experienced less than 1% change in its carbon stock from 1990 to 2010 ➢ Based on the country statistics, Gabon has a great potential for additional carbon sequestration and greenhouse gas (GHG) reduction ➢ NTFPs play important role in household well-being	➢ Carbon stock in living forest biomass was about 37 million tons in 2010 ➢ Revenue from community forests management help local people to increase food availability, to strengthen their cereal banks and to improve agricultural production ➢ In 2008, touristic activities in W Park in Niger generated US $ 40,160 while giraffe zone generated about US $ 27,000. About 50% of these incomes were paid to local communities
The needed change in forest management to optimise forest contribution to green economy	Promote the implementation of different action plans and laws already signed	Profile better sustainable use of NTFPs in Gabon forestry legislation	➢ Facilitate the implementation of the country's legal framework ➢ Increase the profile of conservation and sustainable use of biological diversity in the country's economy ➢ Sufficiently consider, in the national legislation, Article 15 of the Convention on

Key considerations	Benin	Gabon	Niger
			Biological Diversity (i.e., “fair and equitable sharing of benefits derived from genetic resources”) ➢ Increase emphasis on research and valorization of traditional knowledge on biological diversity uses
Enabling conditions and regulatory frameworks that could facilitate forest sector’s role in the green economy	➢ Add value to forest goods to increase their contribution to people’s well-being ➢ Institute mechanisms for payment for forest ecosystem services ➢ Improve benefits derived from forest resources by local communities	➢ Increase priority given to NTFPs in order to enhance their contribution to peoples’ incomes ➢ Reconsider the country position about the REDD+ mechanism ➢ Introduction of schemes of payments for environmental services in order to value other forest ecosystem services	➢ Increase afforestation and reforestation programs ➢ Institute mechanisms for payment for forest ecosystem services ➢ Participate in the REDD+ mechanism
Various parameters that characterise land use, and land-use change, and forestry, in relation to livelihood improvement	Forest areas are still being destroyed for agriculture, timber exploitation, grazing and hunting	Timber logging is the most important factor characterizing land use change in Gabon	Forest lands are mainly encroached for agriculture, firewood production and urbanisation.
Actions to address the identified gaps associated with land use, and land-use change,	➢ Encourage organic agriculture (less extensive and could be more profitable) ➢ Discourage agricultural strategy that encourages	➢ Implement the government afforestation policy ➢ Regulate better timber exploitation through more binding laws that are also	➢ Promote afforestation programs to contain deforestation ➢ Avoid forest destruction for agriculture ➢ Make available other

Key considerations	Benin	Gabon	Niger
	farm land expansion to forests in order to increase crop production, like cotton	enforced.	cheaper and alternative sources of energy for households, instead of relying almost exclusively on fuelwood

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ANNEX 1: LIST OF INSTITUTIONS AND KEY RESOURCE PERSONS CONTACTED IN BENIN, GABON AND NIGER

COUNTRY	FULL NAMES	INSTITUTION	PHONE	EMAIL
BENIN	Akpona Hugues	Direction Générale des Forêts et Ressources Naturelles (DGFRN)	(00229)97571458	akpona@gmail.com
	Kidjo Ferdinand	Centre National des Réserves de Faune (CENAGREF)	(00229)97177111	fkidjo@yahoo.fr
	Fatondji Léon	Direction Générale des Forêts et Ressources Naturelles (DGFRN)	(00229)95958528	fantlysa@yahoo.fr
	Akouehou Gaston	Centre d'Etude et de Recherche Forestière /DGFRN	(00229)97367678	akouehougas@yahoo.fr
	Sinsin Brice	Université d'Abomey-Calavi	(00229) 97016136	bsinsin@gmail.com
GABON	Ahimin Olivier	International Tropical Timber Organisation (ITTO)	(00241) 07952956 (00241)06362829	ahiminolivier@yahoo.fr
	Ngoungoulou Ferdinand	Université OMAR BONGO	(00241)04462143 (00227)03159095	fngoungoulou@yahoo.fr
	Ngoye Alfred	Institut National de Recherche Agronomique & Forestière	(00241)05231951 (00241)06647539	affredngoye@yahoo.fr
	Wata Issoufou	Centre Nationale Surveillance Ecologique Environnmental	96974110	Iwatasama2005@yahoo.fr
	Ngoyi M. Bayani	Direction de l'Environnement et de la Protection de la Nature du Gabon	(00241)04130739	scoutgabon@yahoo.fr
	Mikissa Jean	Université Omar	(002241)	jbmikissa@gmail.com

COUNTRY	FULL NAMES	INSTITUTION	PHONE	EMAIL
	Bruno	Bongo	03420907	
NIGER	Nouhou Hassane	ONG ORDEVI Gunguey Ma Zaada	(00227)96492515 (00227)90182333	nouhouhassane@yahoo.fr
	Goussmane Moussa	Conseil National de l'Environnement pour un Développement Durable (CNEDD)	(00227)20722559 (00227)96228779	imgousmane@yahoo.fr
	Bello N. Ibrahim	Direction Nationale de la Faune, Chasse et Aires Protégées	(00227)96495562 (00227)94101198	belloibrah@yahoo.fr
	Abdoulkarimou Saidou	Université de Zinder	(00227)96812204	saidoul01yahoo.fr
	Ali Mahamadou	Ministère de L'Environnement, de la Salubrité Urbaine et du Développement Durable	(00227)96967267 (00227)90321010	alimahamadou@yahoo.fr
	Harouna Oumarou	Ministère de L'Environnement, de la Salubrité Urbaine et du Développement Durable	(00227)96879865 (00227)94626021	harouna.oumarou@yahoo.fr
	Ibro Adamou	Ministère de L'Environnement, de la Salubrité Urbaine et du Développement Durable	(00227)96965910 (00227)94736926	ibroadamou@yahoo.fr
	Hamissou Halilou Malam Garba	Direction Nationale de la Faune, Chasse et Aires Protégées	(00227)96531543 (00227)941088965	Hamissou66@yahoo.fr

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For more information please contact:

The Executive Secretary
African Forest Forum
c/o World Agroforestry Centre (ICRAF)
United Nations Avenue, Gigiri
P.O.Box 30677-00100, Nairobi, Kenya
Phone: +254 20 722 4000, Fax: +254 20 722 4001
Email: exec.sec@afforum.org; Website: www.afforum.org