African Forest Forum

A platform for stakeholders in African forestry

Carbon Markets and Trade

A COMPENDIUM FOR SHORT COURSES IN AFRICAN FORESTRY

06

African Forest Forum

A platform for stakeholders in African forestry

Carbon Markets and Trade

A COMPENDIUM FOR SHORT COURSES IN AFRICAN FORESTRY

Correct citation: African Forest Forum. 2019. Carbon markets and trade: A compendium for short courses in African forestry. 84 pp.

African Forest Forum
United Nations Avenue, Gigiri
P.O. Box 30677-00100
Nairobi, Kenya

Tel: +254 20 722 4203
Fax: +254 20 722 4001

Website: www.afforum.org

ISBN 978-9966-7465-6-6

Front cover photos: Natural population of *Borassus aethiopum* Mart. in Niger (left; credit: Enoch G. Achigan- Dako), A gallery forest in the Zio region in Togo (middle; credit: Sognigbé N'Danikou), Forests and payment for ecosystem services (right; credit: AFF).

Back cover photo: Panoramic view on the Tillabery region in Niger. Credit: Enoch G. Achigan-Dako.

Design & Layout: Conrad Mudibo, Ecomedia

Disclaimer

Table of Contents

Abbreviations and Acronyms

AAU	Assigned Amount Units
AFF	African Forest Forum
AFOLU	Agriculture, Forestry and Other Land Uses
C	Carbon
CCBS	Climate, Community and Biodiversity Standard
CCX	Chicago Climate Exchange
CDM	Clean Development Mechanisms
CERs	Certified Emissions Reductions
CH4	Methane
CO2	Carbon dioxide
DOE	Designated Operating Entity
ERPA	Emission Reduction Purchase Agreement
ERUs	Emission Reduction Units
ETS	Emission Trading System/Scheme
EU ETS	European Union Emission Trading System
FCPF	Forest Carbon Partnership Fund
GHG	Green House Gases
IETA	International Emissions Trading Association
JI	Joint Implementation
KP	Kyoto Protocol
MRV	Measurement, Reporting and Verification
NGO	Non-Governmental Organization
PDD	Project Design Document
PES	Payment for Ecosystem Services
PIN	Project Information Note
PP	Project Participants
REDD+	Reduction of Emissions from Deforestation and Forest Degradation
RGGI	Regional Greenhouse Gas Initiative
SFM	Sustainable Forest Management
tCO2e	Tons of carbon dioxide equivalent
UNFCCC	United Nations Framework Convention on Climate Change
VER	Voluntary Emission Reduction
WRCAI	Western Regional Climate Action Initiative
WWF	World Wide Fund for Nature

Acknowledgements

This compendium has been developed through an organic process that initially led to the development of “Training modules on forest-based climate change adaptation, mitigation, carbon trading, and payment for other environmental services”. These were developed for professional and technical training, and for short courses in sub-Saharan African countries. The compendium provides the text required for effective delivery of the training envisaged in the training modules; in other words, it is structured based on the training modules. In this context many people and institutions, including those from government, civil society, academia, research, business, private sector, and other communities, have contributed in various ways in the process that culminated into the development of the compendium. We wish to collectively thank all these individuals and institutions for their invaluable contributions, given that it is difficult in such a short text to mention them individually.

We also appreciate the kind financial support received from the Government of Switzerland through the Swiss Agency for Development and Cooperation (SDC) to implement an AFF project on “African forests, people and climate change” that generated much of the information that formed the basis for writing this compendium. AFF is also indebted to the Swedish International Development Cooperation Agency (Sida) for its support of another AFF project on “Strengthening sustainable forest management in Africa” that also provided inputs into the compendium, in addition to helping facilitate various contributors in putting up this compendium. The issues addressed by the two projects demonstrate the interest of the people of Switzerland and Sweden in African forestry and climate change.

We are also grateful to the lead authors, the contributors mentioned in this compendium and the pedagogical expert, as well as reviewers of various drafts of the compendium.

We hope that the compendium will contribute to a more organized and systematic way of delivering training in this area, and eventually towards better management of African forests and trees outside forests.

Preface

African forests and trees support the key sectors of the economies of many African countries, including crop and livestock agriculture, energy, wildlife and tourism, water resources and livelihoods. They are central to maintaining the quality of the environment throughout the continent, while providing international public goods and services. Forests and trees provide the bulk of the energy used in Africa. Forests and trees are therefore at the centre of socio-economic development and environmental protection of the continent.

Forests and trees outside forests in Africa are in many ways impacted by climate change, and they in turn influence climate. Hence, African forests and trees are increasingly becoming very strategic in addressing climate change. The great diversity of forest types and conditions in Africa is at the same time the strength and the weakness of the continent in devising optimal forest-based responses to climate change. In this regard, given the role of forests and trees to socio-economic development and environmental protection, actions employed to address climate change in Africa must simultaneously enhance livelihoods of forest dependent populations and improve the quality of the environment. It is therefore necessary for Africa to understand how climate change affect the inter-relationships between food, agriculture, energy use and sources, natural resources (including forests and woodlands) and people in Africa, and in the context of the macro-economic policies and political systems that define the environment in which they all operate. Much as this is extremely complex, the understanding of how climate change affect these inter-relationships is paramount in influencing the process, pace, magnitude and direction of development necessary for enhancing people's welfare and the environment in which they live.

At the forestry sector level, climate affects forests but forests also affect climate. For example, carbon sequestration increases in growing forests, a process that positively influences the level of greenhouse gases in the atmosphere, which, in turn, may reduce global warming. In other words, the forests, by regulating the carbon cycle, play vital roles in climatic change and variability. For example, the Intergovernmental Panel on Climate Change (IPCC) special report of 2018 on the impacts of global warming of 1.5 ^{o}C above pre-industrial levels underscores the significance of afforestation and reforestation, land restoration and soil carbon sequestration in carbon dioxide removal. Specifically, in pathways limiting global warming to 1.5 ^{o}C, agriculture, forestry and land-use (AFOLU) are projected with medium confidence to remove 0-5, 1-11 and 1-5 $GtCO_2\,yr^{-1}$ in 2030, 2050 and 2100, respectively. There are also co-benefits associated with AFOLU-related carbon dioxide removal measures such as improved biodiversity, soil quality and local food security. Climate, on the other hand, affects the function and structure of forests. It is important to understand adequately the dynamics of this interaction to be able to design and implement appropriate mitigation and adaptation strategies for the forest sector.

In the period between 2009 and 2011, the African Forest Forum sought to understand these relationships by putting together the scientific information it could gather in the form of a book that addressed climate change in the context of African forests, trees, and wildlife resources. This work, which was financed by the Swedish International Development Cooperation Agency (Sida), unearthed considerable gaps on Africa's understanding of climate change in forestry, how to handle the challenges and opportunities presented by it and the capacity to do so.

The most glaring constraint for Africa to respond to climate change was identified as the lack of capacity to do so. AFF recognizes that establishment and operationalization of human capacities are essential for an effective approach to various issues related to climate change, as well as to improve the quality of knowledge transfer. For example, civil society organisations, extension agents and local communities are stakeholders in implementing adaptation and mitigation activities implicit in many climate change strategies. In addition, civil society organisations and extension agents are more likely to widely disseminate relevant research results to local communities, who are and will be affected by the adverse effects of climate change. It is therefore crucial that all levels of society are aware of mechanisms to reduce poverty through their contribution to solving environmental problems. Training and updating knowledge of civil society organisations, extension service agents and local communities is one of the logical approaches to this. Also professional and technical staff in forestry and related areas would require knowledge and skills in these relatively new areas of work.

It was on this basis that AFF organized a workshop on capacity building and skills development in forest-based climate change adaptation and mitigation in Nairobi, Kenya, in November 2012 that drew participants from selected academic, research and civil society institutions, as well as from the private sector. The workshop identified the training needs on climate change for forestry related educational and research institutions at professional and technical levels, as well as the training needs for civil society groups and extension agents that interact with local communities and also private sector on these issues. The training needs identified through the workshop focused on four main areas, namely: Science of Climate Change, Forests and Climate Change Adaptation, Forests and Climate Change Mitigation, and Carbon Markets and Trade. This formed the basis for the workshop participants to develop training modules for professional and technical training, and for short courses for extension agents and civil society groups. The development of the training modules involved 115 scientists from across Africa. The training modules provide guidance on how training could be organized but do not include the text for training; a need that was presented to AFF by the training institutions and relevant agents.

Between 2015 and 2018, AFF brought together 50 African scientists to develop the required text, in the form of compendiums, and in a pedagogical manner. This work was largely financed by the Swiss Agency for Development and Cooperation (SDC) and with some contribution from the Swedish International Development Cooperation Agency (Sida). In this period eight compendiums were developed, namely:

1. Basic science of climate change: a compendium for professional training in African forestry
2. Basic science of climate change: a compendium for technical training in African forestry
3. Basic science of climate change: a compendium for short courses in African forestry
4. Carbon markets and trade: a compendium for technical training in African forestry
5. Carbon markets and trade: a compendium for professional training in African forestry

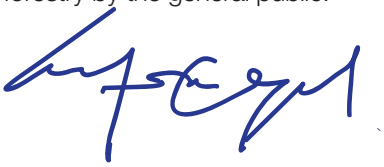
6. Carbon markets and trade: a compendium for short courses in African forestry
7. International dialogues, processes and mechanisms on climate change: compendium for professional and technical training in African forestry
8. Climate modelling and scenario development: a compendium for professional training in African forestry

Another notable contribution during the period 2011-2018 was the use of the training module on "Carbon markets and trade" in building the capacity of 574 trainers from 16 African countries on rapid forest carbon assessment (RaCSA), development of a Project Idea Note (PIN) and a Project Design Document (PDD), exposure to trade and markets for forest carbon, and carbon financing, among others. The countries that benefited from the training are: Ethiopia (35), Zambia (21), Niger (34), Tanzania (29), Sudan (34), Zimbabwe (30), Kenya (54), Burkina Faso (35), Togo (33), Nigeria (52), Madagascar (42), Swaziland (30), Guinea Conakry (40), Côte d'Ivoire (31), Sierra Leone (35) and Liberia (39). In addition, the same module has been used to equip African forest-based small-medium enterprises (SMEs) with skills and knowledge on how to develop and engage on forest carbon business. In this regard, 63 trainers of trainers were trained on RaCSA from the following African countries: South Africa, Lesotho, Swaziland, Malawi, Angola, Zambia, Zimbabwe, Mozambique, Tanzania, Uganda, Kenya, Ethiopia, Sudan, Ghana, Liberia, Niger, Nigeria, Gambia, Madagascar, Democratic Republic of Congo, Cameroon, Côte d'Ivoire, Burkina Faso, Gabon, Republic of Congo, Tchad, Guinea Conakry, Senegal, Mali, Mauritania, Togo and Benin .

An evaluation undertaken by AFF has confirmed that many trainees on RaCSA are already making good use of the knowledge and skills gained in various ways, including in developing bankable forest carbon projects. Also many stakeholders have already made use of the training modules and the compendiums to improve the curricula at their institutions and the way climate change education and training is delivered.

The development of the compendiums is therefore an evolutionary process that has seen the gradual building of the capacity of many African scientists in developing teaching and training materials for their institutions and the public at large. In a way this has cultivated interest within the African forestry fraternity to gradually build the capacity to develop such texts and eventually books in areas of interest to the continent, as a way of supplementing information otherwise available from various sources, with the ultimate objective of improving the understanding of such issues as well as to better prepare present and future generations in addressing the same.

We therefore encourage the wide use of these compendiums, not only for educational and training purposes but also to increase the understanding of climate change aspects in African forestry by the general public.



Macarthy Oyebo
Chair, Governing Council of AFF

Godwin Kowero
Executive Secretary-AFF

Chapter 1. Introduction to Payment for Ecosystem Services

"Ecosystem services are benefits humans obtain from nature"

1.0 Chapter overview

This training session introduces payment for ecosystem services (PES). Ecosystem services are benefits humans obtain from nature. The session defines ecosystem services, explains types of ecosystem services, and briefly describes the different classes of ecosystem services. The session further explains the basic concepts of PES, describes different types of PES schemes and provides examples of successful PES programs within the three most common groups of ecosystem services implemented in Africa. Potentials and risks associated with PES are also discussed.

Objectives

By the end of this session, the learner should be able to:

- describe ecosystem services;
- Describe payment for ecosystem services;
- Explain types of payment for ecosystem services schemes;
- Analyse potentials and pitfalls in payment for ecosystem services.

1.1 Ecosystem services

Before delving into PES, it is necessary to understand what "ecosystem services" are, where they come from, and their value to humans. This will help us better understand the basis and purpose for PES.

Ecosystem services are the benefits that people obtain from ecosystems. An ecosystem can be defined as a unit of nature comprising a community of living things (plants, animals and microorganisms) together with the non-living factors of the environment (soil, water and climate) with which they interact. A forest is an example of an ecosystem that provides a variety of tangible and intangible ecosystem services (Figure 1). The tangible products are mainly goods such as fruits and nuts, timber, medicinal plants, etc.. Intangible ones are services linked to natural processes such as C sequestration, or to human perception such as recreational use of land. Intangible ecosystem services are difficult to quantify or value. But estimates can be made best on the charges levied on those utilizing the services.

We therefore see that ecosystems provide a variety of goods and services that support life on earth and that satisfy material and non-material human needs. Some services benefit humans directly; for example, food. Others benefit indirectly by influencing the functioning of the natural environment; for example, nutrient cycling supports soil fertility leading to improved crop and production.

Exercise questions (20 minutes)

Figure 1. Forests and ecosystem services

Analyse figure 1 above carefully and carry out the following activities:

- Identify ecosystem services in the photograph;
- What ecosystem services are suggested by the photograph?
- Explain the derivation of any three of the services you suggest from the ecosystem in figure 1.

1.2 Concepts of payment for ecosystem services (PES)

Payment for ecosystem services (also known as payment for environmental services) is a generic term referring to provision of incentives or rewards for undertaking practices that conserve, enhance or restore a defined environmental benefit. The goal of PES is to allow an environmental benefit to occur where it would not have occurred, while at the same time meeting livelihood needs. There is growing interest in PES programs in Africa, driven by the attention of businesses, governments, and NGOs to environmental issues.

The Five-Point criteria by Wunder (2005) are often used to define PES, highlighting the following four major principles:

- the principle of voluntariness: participants are not forced to, beneficiaries agree to pay and providers agree to participate;
- the principle of fairness: costs and trade-offs incurred in provision of ecosystem services call for shared responsibility and collective approach in management of ecosystems;
- the principle of conditionality: the investment must lead to improvement of an eco-system service; and,
- the principle of pro-poor: PES programs should not do harm but improve the well-being of participants.

Accordingly, PES is a *voluntary* transaction for a well-defined ecosystem service, with at least one *buyer*, at least one *seller*, and based on the *condition* that the buyer(s) only pays if the provider(s) continue to deliver the defined ecosystem service over time (Wunder, 2005). However, some PES programs do not adhere to principles such as voluntariness and conditionality; for example, where buyers are required to do so by legislation.

Payments made for ecosystem services can be based on a particular service, e.g., C sequestration; or bundles of ecosystem services, e.g. C sequestration plus biodiversity conservation. The payments can be in cash or in kind; upfront or periodic; given to individuals or groups. Whichever mode, payments are only given to land managers or land owners who are actively generating the ecosystem service. Let us now turn to the initiatives that lead to payment of ecosystem services.

1.3 Initiatives leading to payment for ecosystem services

The concept of PES was crafted after recognition of a global development trajectory where increasing human population leads to increased demand for food (MA, 2005). Feeding the world's growing population requires increasing agricultural production. This has mainly been done by opening virgin lands to agricultural use or increasing productivity of existing farms. The result is the degradation of the environment and/or loss of the same products and services being sought. An example is the loss of biodiversity associated with the spread of agricultural technologies (Foley et al., 2005).

Advances for environmental protection and enhancement of ecosystem services provision were developed after increasing awareness of the potentials of ecosystems and conse-quences of their degradation. One such innovation is PES, promoted as a market-based mechanism to prevent situations where production of a particular ecosystem service leads to degradation of the ecosystem and loss of other ecosystem services. PES is designed to achieve this by pricing benefits derived from the ecosystem, and incentivizing landholders to conserve their land or enhance provision of environmental benefits.

Box 1. How does PES work?

PES works by paying or rewarding those undertaking specific activities for conserving environ-ment in an ecosystem. Think of a situation in Africa where communities who neighbour the forest area that also serves as wildlife park. In this forest, there is rampant animal poaching that has resulted to migration of key animal species that attract tourists. The community decides to undertake some measures that minimize poaching in order to conserve wild animals and overall biodiversity.

What kind of measures do you think such a community can undertake to improve conservation of the forest and wildlife park?

How can PES be designed in such a situation?

PES can be used to discourage environmentally negative practices among community members in this area.

Global initiatives and key studies have shaped the development of PES through time. Global initiatives include the Convention on Biological Diversity (CBD), the UN Framework Convention on Climate Change (UNFCCC), and the Ramsar Convention. The main pro-grams negotiated under the UNFCCC are the Clean Development Mechanism (CDM) of the Kyoto Protocol (KP) and Reducing Emissions from Deforestation and forest Degradation (REDD). A surge of interest in ecosystem services is attributed to the Millennium Ecosystem Assessment (MEA, 2005), which identified 32 kinds of ecosystem services. Many of these are related to watershed services, C sequestration and biodiversity conservation.

1.4 Classification of ecosystem services

Ecosystem services are the benefits people obtain from different aspects of ecosystems, including benefits that are tangible and those that are not. There are several schemes for classifying ecosystem services, the most widely used and well-known typology is the one developed by the Millennium Ecosystem Assessment, which classifies ecosystem services into four categories (Table 1) (MEA, 2005), thus:

- provisioning services (e.g. products such as food, water, timber, fuel, fibre);
- regulating services (i.e. benefits arising from the regulation of ecosystem processes, e.g. climate regulation, natural hazard regulation, water quality and purification, floods, disease, wastes);
- supporting services (e.g. nutrient cycling, primary production, soil formation); and,
- cultural services (i.e. non-material benefits such as recreational, spiritual, aesthetic services).

Table 1: Ecosystem services

Category	Ecosystem service	Explanation
Provisioning services	Food	Food products derived from plants, animals and microbes
	Fibre and fuel	Materials including wood, jute, cotton, hemp, silk, and wool. Biological materials providing sources of energy e.g. wood, dung
	Genetic resources	Genes, genetic information used for animal and plant breeding and biotechnology
	Biochemical/natural medicines	Medicines, biocides, food additives such as alginates, dyes
	Ornamental resources	Animal and plant products (e.g. skins, shells, and flowers) are used as ornaments. Whole plants used for landscaping and ornaments
	Fresh water	People obtain fresh water from ecosystem. Fresh water in rivers is also a source of energy
Regulatory services	Pollination	Ecosystem changes affect the distribution, abundance, and effectiveness of pollinators
	Pest and disease regulation	Ecosystem changes affect the abundance of human pathogens and disease vectors and the prevalence of crop/livestock pests and diseases
	Climate regulation	Ecosystems influence climate both locally and globally. At a local scale, for example, charges in land cover can affect both temperature and precipitation. At the global scale, ecosystems play an important role in climate by either sequestering or emitting GHGs

Category	Ecosystem service	Explanation
	Air quality regulation	Ecosystems contribute and extract chemicals from the atmosphere, influencing many aspects of air quality
	Water regulation	The timing and magnitude of runoff, flooding and aquifer recharge can be strongly influenced by changes in land cover
	Erosion regulation	Vegetative cover plays an important role in soil retention and the prevention of landsides
	Natural hazard regulation	The presence of coastal ecosystems (e.g. mangroves and coral reefs) can reduce the damage caused by hurricanes or large waves
	Water purification/ soil remediation/ waste treatment	Ecosystems can be a source of impurities but also can help filter out and decompose organic wastes introduced into ecosystems. They can also assimilate and detoxify com-pounds through biological processes
Supporting services	Primary production, photosynthesis	Primary production is the assimilation of energy and nutrients by biota. Photosynthesis produces oxygen required by most living organisms
	Soil formation and retention	Because many provisioning services depend on soil fertility, the rate of soil formation influences human well-being in many ways
	Nutrient cycling	Approximately 20 nutrients essential for life, including nitrogen and phosphorus, cycle through ecosystems
Cultural services	Spiritual and religious values	Many religions attach spiritual and religious values to ecosystems or their components
	Education and inspiration	Ecosystems and their components and processes provide the basis for both formal and informal education in many societies. They provide a rich source of inspiration for art, folklore, national symbols, architecture, and advertising
	Recreation and ecotourism	People often chose where to spend their leisure time based in part on the characteristics of the natural or cultivated landscapes
	Cultural diversity and heritage	The diversity of ecosystems is one factor influencing the diversity of cultures. Many societies place high value on the maintenance of historically important landscapes (‘cultural landscapes’) or culturally significant species
	Aesthetic values	Many people find beauty or aesthetic value in various aspects of ecosystems
	Sense of place	Many people value the ‘sense of place’ that is associated with features of their environment, including aspects of the ecosystem

Source: Millennium Ecosystem Assessment (2005)

1.5 Economic opportunities for ecosystem services

Ecosystem services are generally little known, misunderstood or simply taken for granted by decision-makers, private companies or local authorities. As a result, they are rarely con-sidered by markets due to lack of information or awareness of consumers or lack of effective incentives that would encourage land users to adopt sustainable or ecological practices. It is in this context that the PES attempts to fill this gap by internalizing the benefits, thereby creating appropriate incentives for the delivery of environmental services. Currently, four types of ecosystem services are targeted by PES:

- Ecosystem services related to biodiversity;
- Ecosystem services related to water resources (watersheds);
- Ecosystem services related to C; and,
- Ecosystem services related to the beauty of the landscapes mainly associated with the aesthetic or cultural value granted to some natural sites.

1.6 Stakeholders in payment for ecosystem services

The two major actors in PES are the sellers who generate ecosystem services and the buyers who pay for ecosystem services. The sellers are private landholders, administrators of public land and individuals or groups in the case of communal land. Buyers are entities that want to offset their C footprint[1] or entities simply interested in seeing an improvement in the management of the environment. The buyers can be the actual users of the services or other entities such as government, NGOs, or agencies that procure the services on behalf of the end users (Engel et al., 2008). An example of a buyer who is an actual user is an electricity generating plant that pays upstream dwellers to conserve a watershed, or downstream dwellers that pay upstream dwellers to conserve a forest.

PES develops if agreements are designed to be beneficial for all parties. In Box 1, downstream people may not agree to a payment that does not match what they used to receive before a change of activity or a payment that is lower than the cost of maintaining the forest. The principle of conditionality (mentioned in Section 1.2 on Concepts of payment for ecosystem services) ensures that the ecosystem service produced is sufficient to compensate buyers' investment, and that sellers actually comply with their contracts.

In between the sellers and the buyers are intermediaries who help to set up PES programs (Namirembe and Jindal, 2012; Greiber, 2009). These intermediaries include regulators, brokers, NGOs, researchers. Intermediaries play the following roles:

- provide the link between buyers and sellers;
- facilitate negotiation among all stakeholders;
- develops and administer contracts, allocates funds and facilitate payments;
- can implement the PES program;

1 Carbon footprint here refers to the total amount of GHG caused by activities of an entity within a given timeframe

- can buy ecosystem services from land owners before supplying them to end users; and,
- participate in formulating new policies.

The government is a key stakeholder in PES programs. The roles played by governments determine the success or the failure of PES schemes.

Sellers

They are environmental service providers.

For example:

- Land owners, e.g. of forest, agricultural land owners, or wetlands;
- Private agencies e.g. industries;
- Members of cooperatives e.g. farmers;
- Municipalities;
- Large-scale investors.

Brokers

They provide a link between sellers and buyers.

For example:

- Regulators;
- Brokers;
- Project developers e.g. NGOs;
- Researchers.

Buyers

They pay for environmental services.

For example:

- Privates companies such as airlines, courier's services, bottling companies, mining companies, flower export firms, banks;
- Governments;
- Event organizers, for example the world cup;
- Musicians and film makers.

Role of government

- Introduce PES into existing legal or policy frameworks;
- Enforce contractual agreements development between buyers and sellers;
- Clarify property rights;
- Governments can buy, sell or acts as brokers;
- Contribute to monitoring, reporting and verifying environmental services;
- Sets goals for environmental services; and
- Define responsibilities of various stakeholders in policies.

Stakeholders in payment for ecosystem services.
Sources: Hauck & al., 2016; Demeyer and Turkelboom, 2014

1.7 Types of payment for ecosystem services

We have explained the basics of ecosystem services, introduced PES and described the various actors in PES. Now we will examine different types of PES schemes and then describe the three most common groups of ecosystem services implemented in Africa, including how the PES happen, its importance and specific challenges.

PES schemes vary depending on payment type, ecosystem services involved, and the end goal of the purchase. This theme describes three types of PES schemes (public schemes, private schemes and trading schemes) based on the types of buyers and financial arrangements (Greiber, 2009, 2011; Vonada et al., 2011). We consider these types of PES to represent the major domains in which different PES programs within forestry may fall.

1.7.1 Public schemes

These are schemes administered by public entities such as the state or local governments. Government agencies directly pay land owners to implement activities that produce or enhance an ecosystem service. Some of the features of public PES schemes include:

- they are government-driven and therefore country specific;
- governments or government agencies are the main or only buyers;
- they are generally large in scope; and,
- the state provides legitimacy.

1.7.2 Private schemes

There exist self-organized private deals between end users and providers of ecosystem service. The end-users are mostly individuals and groups, such as conservationists, farmers' associations, cooperatives or private companies, who depend on, or who wish to conserve an ecosystem for the service they gain. Some of the features of private PES schemes include:

- end-users and providers of ecosystem services are private entities;
- there is little (if any) government involvement, participating only as an intermediary;
- end-users of ecosystem services deal directly with providers of those services; and,
- voluntary markets (described below in trading schemes) are included in this category.

1.7.3 Trading schemes

These are formal markets with open transaction between buyers and sellers. There are two types of trading schemes for ecosystem services:

- **regulatory** transactions: these are payment schemes developed in response to statutory legislation; an example is the transfer of emission permits under the cap-and-trade scheme; and,
- **voluntary** transactions: these are payment schemes where entities voluntarily partici-pate; an example is the sale of forest carbon credits in the voluntary carbon markets.

NOTE: The details of these trading schemes will be analysed exhaustively in Chapter 2.

1.8 Methods of assessment of ecosystem services

Different approaches have been developed for the evaluation of ecosystem services. These methods integrate the following points:

- identification of ecosystem services;
- characterization of ecosystem services; and
- the quantification of ecosystem services.

1.9 Classes of payment for ecosystem services operational in Africa

There are three groups of PES commonly implemented across Africa:

- biodiversity conservation;
- watershed services; and,
- carbon sequestration and storage

These groups also represent common types of environmental markets related to ecosystem services (Vonada et al., 2011).

1.9.1 Biodiversity conservation PES

These are schemes that compensate landholders for the additional costs of conserving biodiversity. They mainly focus on habitat enhancement or species protection; though specific projects may have additional outcomes. The following activities are included in providing biodiversity/water/carbon ecosystem services:

- creation of biological corridors;
- creation (or strengthening) of protected areas;
- replanting degraded areas with native species;
- removal of invasive alien species;
- conservation of areas outside protected areas; and,
- protection of agricultural biodiversity.

Protection of biodiversity from threats such as loss of habitat, invasion of alien species, overexploitation of resources, climate change and pollution require huge investments. Biodiversity PES complements existing efforts by providing direct and conditional incentives to landholders to adopt practices that conserve biodiversity. A major hindrance to develop-ment of biodiversity PES in Africa is the social value of biodiversity that is difficult to estimate. This undermines the appreciation of the potential impact of loss of biodiversity on social well-being.

1.9.2 Watershed PES

These are schemes that allow end-users of watershed services to pay or reward individuals or communities whose practices affect watershed functions. Watershed PES may take the form of payments for watershed services (quality and quantity) or nutrient trading (nitrogen, phosphorus,

sediments). The most common water PES in Africa involves payments for management of catchment areas for water supply. The following activities are included in watershed PES:

- maintaining forest cover, for example through reforestation;
- creation, restoration, or enhancement of wetlands; and,
- adoption of best land use management practices.

Among the end-users of watershed PES are downstream dwellers who use clean water for domestic purposes or daily operations or hydroelectric power plants. They pay upstream dwellers for implementing activities that assist with purification processes that maintain clean water, promote groundwater recharge, regulate river flows, and mitigate floods.

There are fewer payments for watershed services schemes in Africa compared to other regions (Namirembe et al., 2014). This means that Africa remains marginalised from the mainstream markets for ecosystem services. Common hindrances to the development of watershed PES in Africa include, *inter alia*, lack of technical and market information, limited institutional experience, inadequate legal framework and limited successful business models (Ferraro, 2009).

1.9.3 Carbon sequestration and storage PES

C sequestration and storage PES are incentives made to land owners to encourage adoption of practices that remove CO_2 from the atmosphere or limit emission of GHGs from the soil and vegetation. The incentives enable land owners to plant and maintain trees as means of absorbing CO_2 into biomass, and to allow forests to remain standing as a means of reducing emissions from deforestation and forest degradation.

Scientific evidence shows that rising anthropogenic CO_2 emissions is a leading cause of global warming (IPCC, 2007). C PES can stabilize atmospheric CO_2 concentrations by increasing the amount of C stored in vegetation and soils ensuring that C and other GHGs such as methane are not released back to the atmosphere. The following activities are included in C sequestration and storage PES:

- afforestation – establishing forests in areas where there was no forest;
- agroforestry – integrating trees in agriculture;
- reforestation – replanting trees in forests and woodlands that have been depleted;
- preventing deforestation and forest degradation; and,
- reducing emissions in areas surrounding forests.

C sequestration and storage PES is the leading group of PES in Africa after biodiversity and water PES (Vonada et al., 2011; Ferraro, 2009; Cisneros, 2012). However, Africa's partici-pation in the C markets (linked to C PES) stands at 2% of the regulatory market and about 1% of the voluntary market (see Chapter 2). This proportion is low considering the potential benefits of PES for sustainable development on the continent. Insecure land and resource tenure of many poor people, complex methodologies, bureaucratic project procedures and high project transaction costs are the main obstacles to participating in and benefiting from C PES schemes.

Other PES programs include scenic beauty (ecotourism), bundled services (land trusts, conservation easements). In ecotourism for example, an operator pays local communities not to hunt in a forest where tourists go to view wildlife.

1.10 Potentials and risks associated with payment for ecosystem services

This section describes potentials and risks associated with PES in Africa. Learners will also discuss circumstances where PES works and those where PES may not be appropriate (See Activity 1.11.1). PES has the following potentials:

- opportunity to earn income;
- opportunities to improve livelihoods through access to new markets;
- potential to raise awareness of the value of ecosystem services;
- promotes voluntary adoption of sustainable land management practices;
- improves targeting of financing to address an environmental service's challenge;
- promotes voluntary financing of ecosystem service management by private sector; and,
- improves resilience of ecosystems in the long-term.

PES schemes are associated with the following risks:

- can increase responsibility and costs by land owners;
- can reduce autonomy in making land use and local development decisions;
- potential property rights challenges such as loss of rights to land (or certain products or services) or increased competition for land;
- weak legislation can lead to corrupt appropriation of land in cases where agreements are made for long periods;
- possible loss of employment;
- incompatibility of PES with cultural values; and,
- possibility to create perverse incentives.

Activity 1.11.1: Group discussion (20 minutes)

Discuss the different circumstances under which PES may or may not work in Africa.

Summary

In this session, we have learnt that PES remunerates or rewards landholders for positive actions aimed at realizing some kind of ecosystem service, allowing the benefit to occur where it would not have happened. We have described the thinking that brought about PES and the global initiatives and studies that spearheaded the development of PES. The session has also described different stakeholders in PES, three types of PES schemes, the common group of ecosystem services implemented in Africa and PES potentials and pitfalls. In the next session, we shall examine the various principles and concepts in C market and trading.

Chapter 2. Technical Preparation of Carbon Projects

2.0 Chapter overview

This chapter introduces technical preparation of C projects. It presents the Project development guide with focus on Project Idea Note (PIN) with technical specifications with an indicative list of areas of activity (sector scopes) where it is possible to generate projects eligible for the CDM. It also describes the preparation of Project Design Document (PDD), the whole submission procedure (National Approval, Executive Board Approval, Public Hearing, Validation, and Funding) and approved methodology. This session also develops the concepts related to Additionality; Emissions and Leakages; Baseline Scenario; Measurement, Reporting and Verification (MRV); Environmental Safeguards.

Objective

At the end of the session, learners should be able to prepare carbon projects.

Activity 2.1. Brainstorming (10 minutes)

- What are ecosystem services of forests and related economic opportunities?
- What do you know about C projects?
- What are the different stages of their conception?

2.1 Concepts in carbon project

A C project is any industrial or forestry project that reduces the emission of one of the six gases of the Kyoto Protocol (KP) and/or increases biosphere sequestration capacities in the atmosphere. It is launched under the KP, to be financed by Joint Implementation or Clean Development Mechanism. The development of C finance allows the emergence of a market mechanism to enact emissions trading (C credits) among the countries participating in the KP. Emission reduction projects in the newly industrialized countries can allow companies in developed countries meet their national standards through investment abroad. This form of investment is known as the Clean Development Mechanism (CDM).

CDM aims to help developing countries achieve sustainable development while contributing to the UNFCCC's ultimate objective of stabilizing GHG concentrations in the atmosphere at a level which prevents any dangerous anthropogenic interference with the climate system. CDM also aims to help industrialized countries (Annex 1 Parties to the UNFCCC) meet their KP emission reduction obligations. This mechanism limits atmospheric emissions and/or enhances the capacity of the biosphere to sequester six GHGs, the two most important being CO_2 and methane (CH_4).

For its implementation, the Executive Board of the CDM has produced an indicative list of 15 areas of activity (sector scopes) where it is possible to generate projects eligible for the CDM. This can range from the modernization or extension of existing structures to the creation of new structures such as:

- energy industries;
- distribution of energy;
- energy demand;
- manufacturing industry;
- chemical industry;
- construction;
- transportation;
- mining and mineral production;
- production of metals;
- fugitive emissions/fuel;
- fugitive emissions/HFC, SF_6;
- use of solvents;
- waste;
- afforestation/reforestation; and,
- agriculture.

However, some types of activities are excluded from CDM projects even if they reduce GHG emissions. This is the case for nuclear energy projects and those that reduce deforestation. It should be noted that in the area of forestry (C sink projects), only afforesta-tion and reforestation projects are currently eligible for the CDM.

Regarding project size, the Marrakesh Accords have different modalities and procedures (M & P) depending on the size of the projects. Thus, simplified M&P for small-scale projects have been adopted and are regularly modified and updated by the CDM Executive Board.

Small-scale CDM projects are defined as three types of project activity that include (as defined in the most recent definition, December 2006):

- type I: renewable energy projects of equivalent electrical power of 15 MW or less;
- type II: projects to improve energy efficiency, generating annual energy savings of 60 GWh/year or less on the supply and/or demand side; and,
- type III: other types of projects with emission reductions less than or equal to 60 kt CO_2 - e/year.

2.2. Project development guide

2.2.1 Project Information Note

The Project Information Note (PIN) is an optional document that can be developed by the project proponent for initial approval of its CDM project idea prior to initiating costly cycle procedures of a CDM project (DPP and next steps).

Activity 2.2. Group work (15 minutes)

Identify 3 project ideas eligible for the CDM and describe how you will develop project plans.

2.2.2 Technical specifications

The Project Information Note includes the following headings and information:

- project participants: summary information on the promoters and sponsors of the project;
- description of the project: title, geographical location, type of activities and a brief description of the technical consistency of the basic project incorporating the implementation schedule;
- project financial aspects: project cost (core and CDM components) and expected sources of funding;
- GHG emissions avoided: GHGs affected by emission reductions, baseline scenario description, CDM accounting period, calculations of expected CDM reductions and financial revenues; and,
- contribution of the project to sustainable development; and other relevant information.

2.2.3 Project Design Document

The Project Design Document (PDD) is the project document on the basis of which the project is registered by the Executive Council. The developer of a project (State, private company or NGO) must fill in a standard form ("Project Design Document") and submit it to the Executive Council for approval. This form should contain the following key information:

- the emissions reference scenario (business as usual scenario): it is the scenario of the host country's future emissions within the project's sphere of activity, which is most likely in the absence of any CDM project; It is established on the basis of methodologies approved by the Executive Board;
- a plan for monitoring emissions (i.e. reductions) of the project based on methodologies to be approved by the Executive Board;
- environmental impact assessment of the project; and,
- comments received during consultation with local stakeholders organized by the project developer.

2.2.4 Approved methodology

The variability of GHG emission reduction potential across all sectors of economic activity is reflected in the diversity of methodologies already approved by the CDM Executive Board. For each of the 15 sectors of activity distinguished by the Executive Board, there are names and references of approved methodologies for conventional projects and small projects (Example: Approved and formalized methodologies referenced AM0004, AM0005, AM00007, AM0010, AM0014, AM0015 and NM0010rev relate to the "Energy-production (renewable/non-renewable source)" sector on a large scale, whereas for small projects in the same sector (Energy-production (renewable/non-renewable)), methodologies referen-ces are AMS-IA, AMS-IB, AMS-IC, AMS-ID, AMS-II.B respectively). The list of methodolo-gies, frequently updated, as well as all documents related to each methodology, are available at: http://cdm.unfcc.int/methodologies.

In addition to the methodologies approved and formalized by sector of activity by the CDM Executive Council, there are also methodologies consolidated by sector (Example: "Consolidated methodology for grid-connected electricity generation from renewable sources (ACM0002)" to designate Consolidated methodology for landfill gas project activities, (ACM0001) "to designate the consolidated methodology of the "waste" sector).

C offset mechanisms such as CDM can only be effective climate mitigation policy tools if their resulting C offset credits represent actual emissions reductions achieved by a project. This is usually referred to as the 'environmental integrity' of an offset mechanism or its offsets. Environmental integrity depends on two main factors: "Additionality" and "Baseline".

2.2.5 Additionality

Additionality is an essential core concept in the CDM philosophy. The CDM requires each approved project to be 'additional'. To avoid giving credits for emission reductions that would have occurred even without the CDM Project, the CDM Executive Board specifies rules to ensure that the Project reduces emissions more than what would occur in the absence of it. If the emissions from the Project are lower than the Baseline, it looks at what would have happened without the Project, which is the 'Project Additionality'. This means that the project only went forward because of the extra financial support provided by the sale of C credits.

It is noted that only "emission reductions in addition to those that would occur in the absence of the certified activity would be accepted in the CDM". To be eligible, therefore, a CDM forestry project must demonstrate that its net effective GHG removals would not have occurred in the absence of a project. Without this additional condition, a project cannot prove that it contributes to reducing GHG concentrations in the atmosphere. It will be argued that an additional CDM project is required if it meets the following two conditions:

- The GHG emissions from the project are lower than those that would have occurred without the project. Emissions reductions must be real, measurable and additional to those that would occur in the absence of the project activity; and,
- The project could not be carried out without the contribution of the CDM (i.e. financial, technological, regulatory, current barriers).

By way of illustration, in order to demonstrate the first additional condition, it is necessary to:

- determine the most likely reference scenario for the evolution of emissions, i.e. the baseline;
- estimate the emissions that the project itself should generate; and,
- calculate the difference between baseline emissions and project emissions.

2.2.6 Baseline scenario

Every project needs to determine what its emissions would have been if the project was not implemented. These are called the baseline emissions. Baseline for a CDM Project activity is the volume of emissions that would occur in the absence of the proposed Project. For this purpose, a project must establish a reference level ("baseline") that describes what would happen without a CDM. In assessing a project's contribution to emissions reduction, a comparative element is needed. The baseline is this comparator. The baseline can be defined as the future trajectory of GHG emissions that would normally and probably have been observed in the absence of the CDM project. GHG removals by baseline activities should be assessed and compared with actual project removals. In other words, the baseline is the most probable scenario of a firm, sector, or country's emissions evolution that would occur in the future if the project was not realized. The baseline is critical to any CDM project because it is used as a basis for calculating the emission reductions that would be achieved. Hence the crucial importance of the care to be taken in its determination in a transparent and prudent way. The characteristics of the baseline are as follows:

- the baseline is the future path of GHG emissions that would normally and probably have been observed in the absence of the CDM project; the baseline should be expressed in measurable terms;
- the emission rate generated by the project is estimated before the start of the project and will be monitored throughout the life of the project; and,
- the emission reduction rate attributable to the project is the difference between the baseline and the project emission rate; obtaining such a difference constitutes part of the demonstration of the additional condition of the project.

2.2.7 Emissions and leakages

Forestry projects can emit GHGs, for example when oil is consumed by machinery, the use of fertilizers or the clearing of plots during the installation of the plantation. Activities considered in the baseline may also emit GHGs. However, it was decided that only emissions from the project would be counted and not baseline emissions, as defined in the definitions of "net baseline GHG removal by sinks" and "net effective GHG removals by sinks"(Decision 10/CP9). If a plantation project replaces a GHG-emitting agricultural activity (use of fertilizers that emit N_2O, use of CO_2-emitting oil, flood or ruminant land that emits CH_4), it directly contributes to reducing concentrations of gas in the atmosphere. Never-theless, it was decided not to count these emission reductions in the project balance sheet and in the sale of Certified Emission Reduction Units. On the other hand, leaks (emissions caused by the project outside its limits) must be accounted for. Leakage is defined as the net change in anthropogenic emissions from GHG sources that occurs outside the project boundary, which is measurable and attributable to the project activity.

2.2.8 Measurement, Reporting and Verification

The concept of Measurement, Reporting and Verification (MRV) emerged in 2007 at the Conference of the Parties (COP) in Bali. The Conference noted that for non-Annex 1 countries, all mitigation commitments must be measurable, reportable and verifiable. As a result, countries undertaking C projects are required to monitor emissions trends in order to demonstrate the impact of their projects in terms of reducing or increasing GHGs compared to a pre-identified scenario (baseline scenario). This requires knowing the initial value of C stocks at a given point in time and then monitoring them through an effective monitoring system based in particular on measurable, reportable and verifiable GHG emissions and removals (MRV).

The measurement (MRV MR) refers to the collection of data and information for C estima-tion. The IPCC identified two main sources of data:

- activity data such as forest area; and,
- emission factors such as C changes in the IPCC reservoirs (Aerial Biomass, Under-ground Biomass, litter, Deadwood, Soil Organic C).

The reporting (MRV R) also involves the compilation and dissemination of national data and statistics at the UNFCCC level. Reporting requirements to UNFCCC (national communica-tions) should cover the purposes rather than the simple measures. The main elements of national communications are information on GHG emissions and reductions, and details of activities undertaken by a country to fulfil its obligations to the UNFCCC.

As regards verification (MRV V), it is necessary to refer to the process of an independent evaluation which involves:

- the accuracy and reliability of the information provided; or,
- the procedures used to generate the information.

Verification is carried out by a totally independent external structure. It concerns all the variables collected in connection with the project.

2.2.9 Environmental safeguards

Protecting and improving the environment for a better quality of life for human beings are key operational objectives to be expected in any C project. Environmental issues are considered at all stages of the project cycle. UNFCCC also calls for partners in developing countries to address the drivers of deforestation and forest degradation, land tenure issues, forest governance issues and gender considerations in the development and implementation of their national strategies or action plans. The generally accepted environ-mental safeguard measures are as follows:

- **the precautionary principle**, on the concept of preventive rather than curative action, on the principle of the correction at source of environmental damage and on the polluter pays principle;
- all projects are subject to an **environmental assessment** in accordance with the environmental requirements;
- all projects are assessed in terms of their potential impact on **protected natural sites**; if the impact is expected to be significant, a specific biodiversity analysis will be carried out based

on the principles and practices of the directive and the partners' safe-guarding policies on natural habitats;

- projects are subject to an assessment to measure their impact on **GHG emissions**; the possibilities for improving their **energy efficiency** and the measures required to **adapt to climate change** are also studied;
- the principles, the recommended practices and the standards of the Water Framework and **Wastewater** Framework Directives are applied for projects in these sectors;
- projects must comply with the standards set out in the directives and the safeguard policies of the partners for the sector to which they relate, e.g. large combustion plants for the **electricity generation** sector and the directive and related safeguard policies related to integrated pollution prevention and control for the industrial sector; and,
- all projects must comply with the criteria of the host country's **multilateral environ-mental agreements**.

2.2.10 Preparation of the Project Design Document

The Project Design Document (PDD) is the project document based on which the project is registered by the Executive Council. The developer of a CDM project (State, NGO or private company) must fill in a standard form (the"PDD") and submit it to the Executive Council for approval. This form should contain the following key information:

- the emissions reference scenario (business as usual scenario) is the scenario of the host country's future emissions within the project's sphere of activity, which is most likely in the absence of any CDM project; it is established on the basis of methodologies approved by the Executive Board;
- a plan for monitoring emissions (i.e. reductions) of the project based on methodologies to be approved by the Executive Board;
- environmental impact assessment of the project; and,
- comments received in consultation with stakeholders organized by project developer.

2.2.11 Submission of Project Design Document

Validation: After approval of the PDD by the DNA, all projects must be validated by a Designated Operating Entity (DOE). Project participants must select and establish a contract with a DOE for the validation of their project, previously approved by the DNA. The DOE will review the PDD and post it on its website to make it available to the public for a period of 30 calendar days. The public, including local project stakeholders and NGOs, can comment on the project. These comments are recorded by the DOE and sent to Project Participants (PP) to respond. During this public consultation period, the DOE examines the PDD and gives the PP the opportunity to make the necessary changes to the PDD in order to bring it into line with the requirements of the CDM "Modalities and Procedures". The DOE must follow a procedure established by the EC to conclude the validation of the project.

Registration: The registration corresponds to the formal acceptance by the EC of the project validated as a CDM project activity. This is a prerequisite for verification and subsequent certification of CERs. With the validation report, the DOE transmits to the EC an application for registration of the project. Registration fees and administrative fees must then be paid by the PPs. The CER

Registration and Issue Team (RIT) assists the EC in the process of evaluating projects submitted for registration and possible revision. The official response of the EC on the registration of the project is transmitted to the DOE who informs the project holder. If positive, the project is officially recognized as a CDM project and can then be implemented. Otherwise, the PPs have to respond to EC requests for clarification.

Financing and implementation of the project: The project financing must be defined within the framework of the feasibility studies of the project upstream of the PDD. The financial package may include public, national or foreign funds, private funds and own funds of the Participants in the project. They can use a portion of the revenue from the sale of CERs that would be prepaid (if there is an advance) to complete project financing. This stage of the CDM project cycle is the same as in any other non-CDM project.

2.2.12 Implementation project

At the earliest date, the DOE conducts verification of emission reductions on the basis of the monitoring report provided by the PPs.

Verification: Upon receipt of the monitoring report prepared by the PPs, the DOE shall review and determine the emission reductions that result from the implementation of the project during the period covered by the report. During this process, the DOE must perform a few tasks, including a control on the project site. The DOE may propose changes to the monitoring methodology and comment on the implementation of the registered project. The DOE provides a verification report to the PPs, the Parties involved and the EC.

Certification: after verification, the DOE must certify in writing that the project activity has achieved the verified emission reductions. It must inform the PPs, the Parties involved and the EC in writing of its decision on certification immediately after the certification process. The certification report is usually transmitted with a letter from the PP to the EC specifying the distribution of CERs between the PPs.

Registration of CERs: The certification report submitted to the EC by the DOE constitutes a request for the issuance of verified CERs. However, the issuance of CERs is effective only 15 days after receipt of the request. This period allows Parties involved in the project or at least three EC members to request a review of the number of CERs proposed for issuance. After this 15-day period, if there is no request for revision, the EC instructs the Registry Administrator to enter the specified amount of CERs on the EC “Transition Account” and then Transfer to PP accounts according to their “distribution declaration”, after deduction of 2% of the CERs issued which will feed into the Adaptation Fund account.

Group exercise (15 minutes)

Explain the different steps involved in developing a carbon project?

Summary

This session addressed the different steps involving the development of a bankable C project. To be eligible, C projects must methodically follow these steps.

Chapter 3. Concepts and Principles in Carbon Markets and Trade

"A carbon credit is the currency for carbon trade"

3.0 Chapter overview

This training session introduces the concepts and principles which govern C markets and trade. The session will provide learners with a thorough review of the subject within the context of climate change mitigation. Key types of C markets will be discussed including the main features of the compliance and the voluntary markets. Practical insights will be provided into C trading; the activities of cap-and-trade and C offsetting will be outlined. The session will also discuss common mechanisms for mobilizing resources that are required to develop and implement C projects.

Objectives

By the end of this session, the learner should be able to:

- Outline the C trading processes
- Describe the different C standards
- Describe the different C financing schemes, and,
- Evaluate C market risks and opportunities.

3.1 Terminologies in carbon trading

- **Carbon:** Carbon is a chemical element of symbol C. It is one of the main elements of organic matter constituting living beings. It is the plants that fix it from CO_2 when they grow.
- **Carbon cycle:** is the displacement of C between the earth's surface, its interior and the atmosphere. The main mechanisms of C exchange are photosynthesis, respiration and oxidation (Figure 2).
- **Carbon sequestration:** is the net process of storing C in a C sink. Sinks can include terrestrial (soil, trees), oceanic, atmospheric, and geologic. For example, terrestrial sequestration could result when C is fixed in trees through afforestation, or in soil and root masses through practices that result in photosynthesis exceeding CO_2 release through plant respiration
- **Carbon source:** A C source is an element that releases CO_2 into the atmosphere.
- **Geologic sequestration** is achieved by fixation of CO_2 in subterranean permanent reservoirs such as basalt formations and deep wells. Geologic sequestration is a more permanent form of GHG offset and has significant potential for longer term sequestration, but it is very costly to implement compared to terrestrial sequestration alternatives.
- **Greenhouse effect** refers to the temperature regulation effect that some atmospheric gases exert to the earth. Temperature-regulating gases, called "greenhouse gases" or GHGs, form a blanket around the earth that traps heat from the earth within the earth's atmosphere,

keeping the planet warm and habitable. "Global warming," or climate change, can occur when the blanket of GHGs gets thicker. Climate models from IPCC, as well as models from other scientific bodies, indicate that global concentrations of GHGs have been rising steadily over the past 100 years. As atmospheric concentrations of GHGs increase, the greenhouse blanket gets thicker.

- **Emission of carbon** is a discharge of CO_2, whatever the means. There are several types of emissions: emissions from human activities (heaters, vehicles, incineration or combustion units), natural emissions (volcanoes, forest fires, animal and plant respiration) and transport-related emissions.
- **Carbon tanks** refers to locations of the environment where C is present; there are four reservoirs: atmosphere, terrestrial biosphere, oceans and sediments.
- **Carbon stock** is the amount of C in a "basin", i.e. a reservoir or system that can accumulate or release C.
- **Carbon sink** is a natural or artificial reservoir that absorbs C from the atmosphere. Forests and oceans absorb about half of C emissions.
- **Credit** is what is given to project holders who have demonstrated that they have reduced emissions from the baseline situation.
- **Carbon credit** represents the right to emit one ton of CO_2. Credits can be exchanged between the project holder and a company or individual that requires these credits to issue or can be bought or sold on the international market at the current price.
- **Carbon trading** is the sale and purchase of GHGs (or C) from a licensing and credit transaction account. C trading is also a process of buying and selling quotas that entitle the holder to issue the equivalent in tons of CO_2.
- **Carbon emission unit** is an instrument that allows C to be released to a given location and counterpart reduces it to another location. They are measured in credits for each ton of CO_2 or equivalent gas reduced. GHGs come from several components, but only some are accepted by voluntary markets.
- **Certified Emission Reduction (CERs)** is a GHG emission reduction unit under the KP's CDM and is measured in tons of equivalent CO_2. A CER represents a reduction in GHG emissions of one ton of CO_2.
- **Carbon markets** are markets for the trading and exchange of GHG emission allowances (not just CO_2).
- **Activity Based Carbon Contracts** are based on predictive models or methods of measurement that simulate C offsets accomplished through specific management practices that reduce emissions or sequester C.
- **Cap-and-trade** is the term for legislation that deals with capping allowed emissions and allowing a trading scheme to meet emission caps. Under a "capped-uncapped" system (like that currently in place among EU nations) GHG emissions from the major energy sectors are limited or capped, while those in other sectors, most notably land use sectors including agriculture and forestry, are not capped. In such a market, the energy (emitter) sector becomes the principal buyer, or demander, of C credits. Uncapped sectors (including agriculture and

others who can generate emissions offset projects) become a supplier of GHG offsets, or C credits, for purchase by entities seeking to meet or comply with their caps. Until there is a cap on emissions, emitters only reason to purchase C credits is to appear environmentally responsible on a voluntary basis.

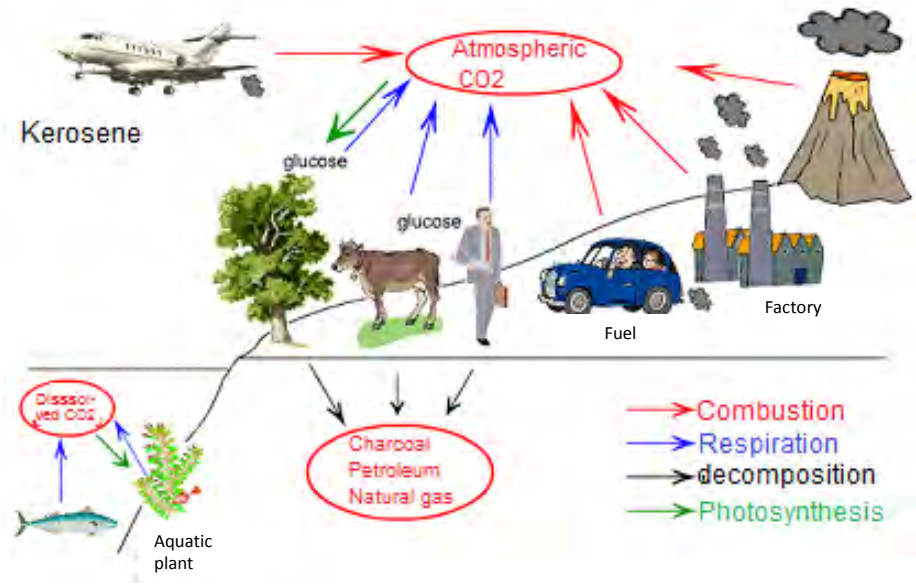


Figure 2. Carbon cycle.

- **Carbon Offset** is a term associated with avoiding a C emission in one location by imple-menting an emissions reduction project (or practice) in another location. A C offset is the net reduction in C emissions resulting from the avoidance of a ton of CO_2 (CDM Gold Standard). A C offset could also arise from practices that sequester C.

3.2 Carbon markets

C markets refer to markets formed for buying and selling of C emission permits that are allocated by a regulatory body or that are generated by a GHG emission reduction project (Bayon et al., 2007). The primary aim of C markets is to encourage countries and companies to limit their GHG emissions, effectively and efficiently. It was set up in 2005 by the KP to encourage countries to reduce their CO_2 emissions and to invest in cleaner technologies to combat global warming. They involve allocating a price to GHG emission rights to encourage actors - states or companies - to reduce their own emissions by exchanging "rights to pollute" between themselves. A "quota" generally corresponds to the authorization to issue one ton of CO_2e and is a commonly accepted standard for trade. At the same time, the market regulator sets emission quotas defining the trading volume on the market. Clearly, a "polluting" actor who has reached its emission quotas becomes a purchaser of emission permits. Conversely, a "clean" actor who has made efforts in environmental terms will be a seller in the market. Meeting these two types of players creates a market where the law of supply and demand for emission sets the price of C.

3.2.1 Characteristics of carbon markets

The design of a C market involves firstly the delimiting of its scope in terms of GHGs and participants. Unlike other markets, there is no flexibility of supply. The different actors (companies or states involved in a GHG emission reduction process) must purchase additional allowances if they pollute more than their cap. C cap-and-trade schemes generally provide a free distribution of permits in the first instance. They can be allocated based on past GHG emission rates ("grandfathering"), benchmarks, or auctions. Two actors often carry out their transactions in three ways:

- negotiate directly between themselves (over-the-counter);
- through a financial intermediary (easier for small issuers who are unfamiliar with the market); and,
- via a stock exchange like BlueNext.

A regulator ensures compliance with the cap. Registers or transaction logs allow global monitoring. If the cap is not respected, sanctions vary: Countries committed to the KP can no longer sell licenses until the Compliance Committee restores their rights.

3.2.2 Types of carbon markets

There are currently two types of markets relevant to forest C projects in Africa: the compliance market, also known as regulated market, and the voluntary C market. The two markets have different rules that guide their operations, and vary in terms of volume transacted, financial value of transactions, prices, project sizes, location and types, and the standards used (Table 2).

Table 2. Comparison of the volume, value and average prices of forest C transacted in 2014 for the compliance market, the voluntary market, and for Africa

Market	Volume ($MtCO_2e$)	Value ($M)	Average price ($)
Compliance market	10.6	129	12.7
Voluntary market	23.7	128	5.4
Africa	3.8	27.9	7.3

Source: Goldstein, 2015.

Africa's participation in the compliance markets has been relatively less impressive. Of the total 8814 projects registered by CDM in 2016, only 261 were from Africa, a mere 3.0%, against a total population of over 900 million, a small fraction compared to Latin America and Asia pacific that hold 95% (Baimwera et al., 2017). African projects are expected to generate only 84 million CERs, against Latin America 400 million and Asia Pacific's 1.8 billion (UNEP, 2016). Moreover, to date no country in sub-Saharan Africa has put in place a price on C. Despite the abundance of natural resources and the potential for large emissions reduction, Africa has performed poorly in the compliance market. African countries struggle to secure conventional finance to initiate CDMs, and lack adequate capacity to deal with the numerous technical and procedural challenges (Redmond & Convery, 2015).

Africa's share of voluntary C markets is also still small and sits at a mere 1% compared to the rest of the world - a huge shortfall considering the potential benefits of C offset revenue for sustainable development on the continent. However, many African countries, including Kenya, Ghana, Mozambique, Uganda and DRC have seen an upsurge in international demand for offset for projects in the voluntary C markets such as delivering clean cook stoves and water purification devices, which are likely to increase participation in these markets (Bloomberg Energy, 2013).

While African C projects development has historically lagged behind its Asian and Latin American counterparts, total offsets transacted have steadily risen over the years. By 2015, buyers had contracted a total of 45.1 $MtCO_2e$ from the continent, of which 54% was transacted in the last three years alone. African offset sales remained stable last year at 6.7 $MtCO_2e$, just slightly less than 2014's volume. Most of the volume originated from forestry or cook stoves projects as buyers sought to support emissions reductions that contributed to low-deforestation and sustainable development on the continent (Ecosystems Marketplace, 2016).

Though average prices decreased 9% to $5.2/ton in the voluntary markets, buyers paid more for African offsets than those from any other region except Oceania, for a total value of $34.7 million. Buyers (whether end-users or retailers) often contracted directly with project developers: 54% of Africa's 2015 offset transactions represented primary market demand, while the remaining 46% were resold by secondary market actors. However, the momentum of the C markets was not matched by the growth in compliance markets (Ecosystems Marketplace, 2016; CPI, 2015).

Overall, the high level of expectations attached to C markets in Africa has not yet been matched with an equivalent level of achievement, particularly about delivery of CERs and their associated revenues (Gray, 2011; Carbon Africa, 2012). For instance, of the 13 recognized regional C trading schemes, none is in Africa. The recently launched Africa Carbon Credits Exchange in Lusaka, Zambia is not yet fully operational and lacks a clear system of trading C credits (The World Carbon Market Database, 2016).This is despite the continent's endowment with huge renewable energy prospects such as the tropical sunny climate, huge geothermal prospects, huge rivers and windy conditions among others, which are ideal for C credits generation (Yadoo and Heather, 2012; World Bank, 2010). It is therefore apparent that Africa makes very little use of the C finance mechanisms on offer for investment in its low C sector, such as the abundant renewables.

3.2.2.1 Compliance markets

These are markets created by the need to comply with a regulatory act. They are governed by international rules outlined in the 1997 KP of the UNFCCC. The main actors are countries and industries that are required by law to limit their emissions. Those that emit more than their limit are required to purchase permits from projects that use biological means to reduce GHG emissions (Peters-Stanley et al., 2012).

Compliance markets include:

- *Kyoto Protocol Markets*: EU ETS (European Union Emission Trading System), JVETS (Japan's Voluntary Emission Trading Scheme).
- *Market outside the Kyoto Protocol*: In the US and Australia, C markets have emerged even though these countries have decided not to ratify the KP. These include: the RGGI initiative (Regional GHG Initiative), WRCAI (Western Regional Climate Action Initiative).

C credits under the compliance market can be generated and dealt under cap-and-trade regime, such as EU ETS or they can be project-based credits, such as those under the CDM of the KP. The EU ETS is currently the world's leading regulatory scheme (Goldstein and Gonzalez, 2014); however, it excludes C credits from land-use, land use change and forestry. The CDM is the main project-based mechanism established under the compliance market, under afforestation and reforestation projects. The CDM was designed to help developed countries fulfil their commitments to reduce emissions, and to assist developing countries in achieving sustainable development (http://cdm.unfccc.int/about/index.html).

Most African governments have developed national climate change response policies, which ensure that adaptation and mitigation measures are integrated in governments' planning, budgeting and development objectives. The policies are guided by principles set out in countries' constitutions, Acts of parliament and also international agreements such as the KP. For instance, Kenya's national climate change response strategy proposes, inter alia, a manual to guide CDM implementation.

A designated national authority (DNA) is the organization granted responsibility by a Party to authorize and approve participation in CDM projects.

Compliance C markets derive their legitimacy from international treaties such as the KP. They include transactions generated by UNFCCC, including the EU C market (ETS), and a growing number of national or regional markets. They are based on systems of allocation and exchange of GHG equivalent CO_2 emission allowances. Under the KP, states and industry that are forced to reduce GHG emissions exchange Assigned Quantity Units (AAUs) at the government level and EU Allowances (for the EU ETS) at the industry level via a market.

These compliance markets are often referred to as "cap-and-trade" or "allocation and permit trading" mechanisms. Under certain treaties (KP, RGGI), participants in a compliance market could acquire C credits from projects in order to achieve their objectives by offsetting their emissions. International agreements or national policies compel countries or economic actors to reduce their GHG emissions and give them the opportunity to exchange emission rights.

Given the different sources of investment in these compliance markets, and in accordance with the primary mission of protecting the savings assigned to the regulator of the financial markets, it was considered crucial to apply to the CO_2 market rules similar to those of the financial markets and thus apply the good practices of regulation of the financial world: the fight against abuses, the regulation of intermediaries, etc.

Mechanisms and functioning of the compliance market

Compliance markets are governed by compulsory national or international climate-friendly provisions. They allocate or auction GHG emission targets (quotas or caps) to countries, sub-national entities or companies and allow them to purchase C credits to reach their caps or to

sell if their emissions are lower than these caps (there is therefore exchange, that is why it is also referred to as "cap and trade").

Limits of compliance markets

Several limits have been identified at the regulated markets. These include:

- the capping and the nature of the regulation: the cap-and-trade system is very cumber-some in its application: defining the companies subject to them, allocating quotas and managing registers and transactions make this system an *administered* program and, therefore, rigid;
- sectors that cannot be reached by the regulation: if the large emitters in the industrial and energy sectors are easily identifiable, this is not the case for small emitters and even medium emitters, especially when they do not belong to the industry; non-industry and energy emissions, particularly those related to buildings, account for 30% of total GHG emissions and consume 40% of all energy used; and,
- political uncertainties: both at the international and local levels, political uncertainties weigh on the development of the compliance market and even on its existence; the same is true at the national level where changes in the political majority call into question cap-and-trade legislation, as has been the case in Australia.

3.2.2.2 Voluntary markets

These are markets where entities participate because of their voluntary interest in tackling climate change. The voluntary markets are not governed by a regulatory act; they operate under guidelines created by C offset standards (Chapter 3) and are subject to national and international laws. Companies, individuals, or other entities interested in offsetting their emissions may buy C credits from projects that reduce the amount of C in the atmosphere. Voluntary markets provide an opportunity to reduce GHG emissions where there is no direct statutory regulation (Gledhill et al., 2011; Cisneros, 2012). Some of the voluntary exchange markets exist and the best known are: Montreal Climate Exchange, Chicago Climate Exchange, European Climate Exchange, Regional GHG Initiative, Mid-western GHG Reduction Accord.

The voluntary markets are used by entities which want to offset their emissions for reasons such as corporate social responsibility, demand from stakeholders or shareholders, pre-parations for future legislation (also known as early adoption or pre-compliance), public relations or marketing. Currently, the majority of forest C offsets in Africa are purchased by voluntary offset buyers (Goldstein, 2015). The prices of C credits on voluntary markets vary depending on project type, location, and seller; the average price in 2014 was US$5.24 per tCO_2e (Table 1). There have been discussions to include projects which aim at reducing emissions by avoiding deforestation, avoiding forest degradation, as well as conservation, SFM and enhancement of forest C stocks (REDD+) under UNFCCC as a new mechanism (Cisneros, 2012). This is important because land use projects are not eligible under the CDM or other flexibility mechanism under the KP. REDD+ and other integrated forest management projects were left out of the CDM because of technical concerns over measurement, monitoring, and demonstration of additional conditions.

The voluntary exchange market is a C credit exchange mechanism which is not linked to international regulation. The voluntary market allows entities (companies, municipalities, individuals or NGOs) to acquire C credits to offset their GHG emissions, outside the regulatory framework and any legal obligation.

Structure and organization of Voluntary Markets

Chicago Climate Exchange (CCX) is a major hub in the voluntary exchange market established in 2003. It includes some states, municipal governments and private companies which are voluntarily committed to reducing their GHG emissions of an average of 4% over the period 1998-2001 for the first phase (2006) and 6% for the second phase ending in 2010. In addition to exchanging credits, CCX also facilitated the creation of 3.6 Million tons of emission reductions at the end of 2006. In November 2010, CCX stated that it would cease trading C credits at the end of 2010, although C exchanges will still be facilitated. CCX has therefore ceased trading C credits at the end of 2010 due to inactivity in the U.S. C markets, although C exchanges were intended to still be facilitated.

The players in this market can buy either C credits from a regulated market or from the voluntary market (VERs) which are certified, mainly by NGOs. The VERs are therefore not issued by a state or administrative authority. As a result, their issuance is not subject to the bureaucratic cumbersome nature of the CER rules. The retail market is mainly for individuals or companies that seek to offset their emissions by funding emission reduction projects or C sequestration projects. Many intermediaries exist and seize market niches, such as the offset of air travel emissions.

Supervision of the voluntary market

This market is not regulated, but standards have been developed to ensure a credible (real and verifiable) GHG emission reduction. Indeed, national and international public bodies and NGOs have developed standards to be applied to this market. These include *Voluntary Gold Standard* and *Voluntary Carbon Standard*. In addition, the ISO 14064 standard also allows demonstrating a rigorous approach in designing an emission reduction project. The value of *Voluntary Emission Reduction* (VER) units will depend on the quality and integrity of the project.

Voluntary market mechanisms: concept of voluntary credit

In voluntary markets, organizations or individuals seek to purchase C credits to offset their emissions for ethical or public profile reasons. These markets are characterized by a wide group of actors, processes and types of C certificates. Voluntary markets can sometimes be linked to other markets. For example, some companies offering emissions offsets, purchase CDM project credits and cancel them to prevent them from issuing it elsewhere. Credits purchased by individuals will reduce the amount of total emissions permitted for businesses on the regulated market.

3.2.3 Carbon trade

We have defined markets and explained the commodity traded on C markets - C credits. Now we shall look at the different modalities of C trading.

C trading is a scheme whereby industries or countries buy and sell C credits or C offsets in order to reduce C emissions. C trading was launched through the KP in 1997 to control GHG emissions by providing economic incentives to reduce emission of CO_2 to the atmosphere. It allows countries that have higher emissions to purchase the right to release more emissions from countries that have lower emissions. C trading can take the form of cap-and-trade scheme or C offsetting.

Cap-and-trade

Cap-and-trade is a scheme where a limit (“cap”) is set on the total quantity of emissions allowed to be released over a given period of time. Countries and industries are also given a certain number

of licenses referred to as “C permits” or “emission allowances” that allows them to sell or buy depending on whether they have excess or a shortage in “C permits”. Those industries that emit less than their “C permits” can sell the surplus to those that have exceeded their “C permits”.

Cap-and-trade provides an incentive for industries to reduce emissions; they make money from selling excess of C permits, allowing emission reductions in a cost-effective manner. Governments can then progressively reduce C permits to encourage companies to adopt better technology which limits emissions (Bayon et al., 2007).

Carbon offsetting

C offsetting is the process through which individuals or businesses compensate their emissions by funding projects that either prevent the release of CO_2 to the atmosphere or allow uptake of CO_2 into living vegetation and into the soil. C offsetting provides an incentive for non-regulated entities to reduce or avoid C emissions or sequester C. The projects can deliver social, economic and environmental co-benefits to surrounding communities.

C offsetting is project-based; usually involves projects or activities that produce a measurable reduction, avoidance, or sequestration of CO_2 (Gorte and Ramseur, 2008). Table 2 describes two examples of project-based C offsetting mechanism, through bio-logical sequestration (afforestation/reforestation, and REDD+).

Market rules

C marketing is done between a seller and a buyer on a contract basis. The objective of the contract is to define the conditions for delivery and payment of CER between the two parties. Contracts are generally designed taking into account the specificities of the project and the parties involved (sellers and buyers). Depending on the contracts, the risks are distributed very differently between the buyer and the seller. Some buyers, such as the Japanese Carbon Fund, bear a large part of the non-validation risk by acquiring the emission credits as soon as they are validated by an operating entity before they are certified by the CDM Executive Board. However, most of other buyers require the delivery of certified credits. In case of default, penalties are often introduced into the contract, for example in the form of fines or obligations on the seller to acquire CERU on the secondary market.

The total value of ETSs and C taxes in 2017 was US$52 billion, an increase of 7% compared to the 2016 value of US$49 billion (Word Bank, 2017). This growth is primarily due to the launch of several C pricing initiatives at the end of 2016 and in 2017. Part of the increase is offset by lower C prices and declining caps in some ETSs.

It is worth noting that the price of C is very sensitive to the nature of the underlying asset. Brokers, organizations that typically sell at the lowest possible prices, transacted offsets at an average price of €0.8/t. Excluding brokers, that average rises to €3.9/t for retailers and €4.1/t for project developers (Word Bank, 2017). European-headquartered organizations reported transacting 39.2MtCO_2e of voluntary C offsets in 2015 at an average price of €3.2/tCO_2e (t). Thus, the average price could be considered as reflecting only a subset of overall market transactions.

But the observed C prices span a wide range, from less than US$1 to up to US$140/tCO2e. Price levels have increased in some newer initiatives such as in the France C tax, which has risen from €22/tCO2e (US$26/tCO2e) to €31/tCO2e (US$37/tCO2e) over 2016-2017, and in the Republic of Korea ETS, where allowance prices have increased from US$15/t$CO_2$e to US$18/tCO_2e over the same period (Word Bank, 2017).

The number of C pricing initiatives and their global coverage has grown significantly over the past few years, with increasing support from both the public and private sectors. However, the pace of these developments needs to accelerate. To help meet the temperature goal of the Paris Agreement, the High-Level Commission on Carbon Prices identified that prices will have to be in the range of US$40–80/$tCO_2e$ in 2020 and US$50–100/$tCO_2e$ by 2030 (Word Bank, 2016). In the same context, the High-Level Panel on Carbon Pricing set a global target to achieve 50 % coverage of emissions under C pricing initiatives within the next decade, which entails a much higher coverage than today's level.

Legal entity accreditation

Accreditation is the phase that precedes the generation of C credits. After verification, an independent auditor certifies that the project has been successful in avoiding GHG emissions. Under CDM, the Designated Operating Entity (DOE) certifies GHG reductions.

Purchase contracts

There are three main options for purchasing contracts:

- tolling agreement: this type of contract involves the sale with payment in advance, or advance sale and sale with payment on delivery;
- contract with purchase option: the buyer pays an option premium to the project developer; and,
- direct use of the C market: after the project developer receives the CERs, he can either call on a broker or find a buyer.

Sharing of benefits

In the framework of C trading, a benefit may be pecuniary or not, and be shared among individuals, groups, communities and organizations. These benefits can be shared with forest-dependent communities at the sub-national or local level, in a manner that is either the contribution of the beneficiaries or the incentive to stimulate a particular set of activities. In some cases, the benefits may take the form of compensation given to beneficiaries for not performing certain activities or to meet social obligations required by law.

Concepts and principles of green economy

Green economy is economic activity "that leads to improved human well-being and social equity while significantly reducing environmental risks and resource scarcity". This economic model follows the rules, principles and criteria that lead to or support sustainable development. First and foremost, green economy is environment-friendly and seeks to keep natural capital in balance (i.e. not to consume more resources than the ecosystems, the earth and the sun can provide, while maintaining ecosystem services equitably available to all and for future generations). In green economy, eco-activities, therefore, focus directly on the restoration or protection of the environment and the preservation of natural and human resources, especially when they are not little, hard, slow or costly to renew. They seek to reduce the ecological footprint of the products or services they offer. This may include, waste and water management, maintenance of air quality, energy efficiency, reduction of GHG emissions or renewable energy. Green economy focuses on six main sectors: 1) renewable energy; 2) green construction; (3) means of transport; 4) water

management; 5) waste management; and, (6) land-use planning.

In 2012, the Green Economy Coalition supported a broad-based online consultation with hundreds of policy analysts, community activists, academics, and thinkers on equality, sustainability, and economics. This consultation helped identify nine (9) principles of green economy (Table 3).

Table 3. Principles of Green Economy

Principles	Contents
The Sustainability Principle. A green, fair and inclusive economy is a means to deliver sustainability	- It is one of the means to deliver sustainable development – not a replacement for it. - It respects its dependency on a healthy environment, and it strives to create wellbeing for all. - It addresses all three dimensions of sustainability (environmental, social and economic) and develops policy mixes that integrate and seek the best results across all of them.
The Justice Principle. A green, fair and inclusive economy supports equity	- It supports equity between and within countries and between generations. - It respects human rights and cultural diversity, - It promotes gender equality and recognizes knowledge, skills, experience and contribution of each individual. - It respects indigenous peoples' rights to lands, territories and resources.
The Dignity Principle. A green, fair and inclusive economy creates genuine prosperity and wellbeing for all	- It alleviates poverty. - It delivers a high level of human development in all countries. - It provides food security and universal access to basic health, education, sanitation, water, energy and other essential services. - It transforms traditional jobs by building capacity and skill; respects the rights of workers and actively develops new, decent, green jobs and careers. - It achieves a just transition. - It acknowledges the contribution of unpaid work. - It promotes the self-empowerment and education of women. - It supports the right to development if delivered in a sustainable way.

Healthy Planet Principle. A green, fair and inclusive economy restores lost biodiversity, invests in natural systems and rehabilitates those that are degraded	- It recognizes its dependency on the productivity of ecosystems and biodiversity. - It does not violate, disrupt, or overstep ecological boundaries and commits to co-operate within them, including reducing pollution, safeguarding ecosystems, biodiversity integrity, other natural resources including air, water, soil, and bio-geochemical cycles. - It ensures that environmental integrity is maintained before allocating resources among competing uses. - It ensures an efficient and wise use of natural resources, including water, natural gas, oil and mineral resources, without compromising future generations' prospects. - It supports the respect of all forms of life - It applies the precautionary principle. - It assesses the potential impact of new technologies and innovations before they are released. - It assesses the environmental impacts of economic policies and seeks to find the least disruptive, most positive benefit for the environment and people. - It promotes the restoration of balance between ecological and social relations.
The Inclusion Principle. A green economy is fair, inclusive and participatory in decision-making	- It is based on transparency, sound science and the visible engage-ment of all relevant stakeholders. - It supports good governance at all levels from local to global. - It empowers citizens and promotes full and effective voluntary participation at all levels. - It respects cultural values, is tolerant to religious views and lifestyle choices, and sensitive to ethical considerations. - It builds societal awareness, developing education and skills. - It is transparent, inclusive and participatory, giving equal opportunities to, and advocating further for the rights of, young and old, women and men, poor and low skilled workers, indigenous peoples, ethnic minorities and local communities.
The Good Governance and Accountability Principle. A green, fair and inclusive economy is accountable	- It provides a framework to structure markets and production in consultation with all stakeholders. - It reports its sustainable progress on environmental, social and economic measures, in company, national and international accounts. - It achieves transparency. - It promotes international cooperation and defines international liability. - It promotes global policy coherence and fair international cooperation. - It promotes common but differentiated responsibilities. - It commits to international human rights standards and environmental agreements.

The Resilience Principle. A green, fair and inclusive economy contributes to economic, social and environmental resilience	- It supports the development of social and environmental protection systems, and preparedness against and adaptation for climate extreme events and disasters. - It creates a universal social protection floor. - It promotes a variety of green economy models relevant to different cultural, social and environmental contexts. - It considers indigenous local knowledge and promotes the sharing of diverse knowledge systems. - It builds on local skills and capacities and develops these further. - It supports sustainable, diverse economies and local livelihoods. - It promotes systems approaches, recognizing the interdependence and integrated nature of these systems, underpinned by culture and ethical values.
The Efficiency and Sufficiency Principle. A green, fair and inclusive economy delivers sustainable consumption and production	- It seeks to ensure that prices reflect true costs incorporating social and environmental externalities. - It implements the polluter pays principle. - It supports life-cycle management, and strives for zero emission, zero waste, resource efficiency and optimal water use. - It prioritizes renewable energy and renewable resources. - It seeks absolute decoupling of production and consumption from negative social and environmental impact. - It delivers sustainable lifestyles supporting a major cultural trans-formation. - It promotes social, economic and environmental innovation. - It gives fair rights to access intellectual property within a global legal framework.
The Generations Principle. A green, fair and inclusive economy invests for the present and the future	- It delivers inter-generational and intra-generational fairness. - It promotes conservation of resources and the quality of life over the long term. - It influences and regulates the finance sector so that it invests in the green, fair and inclusive economy and achieves a stable global monetary system. - It prioritizes long-term, scientifically-sound decision making above the short-term. - It promotes equitable education at all levels and sustainability education for children.

Exercise: Group discussion (30 minutes)

- What are the mechanisms of the Kyoto Protocol?
- Critically examine the rules guiding the different carbon markets?
- Describe the activities eligible under the CDM mechanism?

3.3. REDD+

3.3.1. Terminologies

- **REDD**: Reducing Emissions from Deforestation and Forest Degradation.
- **REDD+**: includes a) Reducing emissions from deforestation, b) Reducing emissions from forest degradation, c) Conservation of forest C stocks, d) Sustainable management of forests and e) Enhancement of forest C stocks.
- **Deforestation:** The conversion of forest to other land use or the permanent reduction of the tree canopy cover below the minimum 10 percent threshold.
- **Forest degradation:** The reduction of the capacity of a forest to provide goods and services.
- **Afforestation:** Establishment of forest through planting and/or deliberate seeding on land that, until then, was not classified as forest.

3.3.2 Background

Under UNFCCC, Parties agreed to collectively aim to slow, halt and reverse forest cover and C loss, in accordance with national circumstances and in a manner consistent with the ultimate objective of the Convention. In that regard, from 2007 to 2015, Parties to the Convention adopted several decisions on this matter aiming to set the foundations for a global initiative to reduce emissions from deforestation and forest degradation, considering the role of conservation, SFM and enhancement of forest C stocks (known as REDD+).

REDD+ investments may include public and/or private investments across many different sectors at multiple scales. Therefore, proposed investments in the forest and land use sector should consider the characteristics of different actors and their roles, activities, and financial instruments, which may vary according to the different land-use activities being proposed for reducing emissions and achieving sustainable development. Key actors may include governments (national, sub-national, local); local communities (indigenous communities, rural communities, forest-dependent groups, etc.); private sector (producers, providers, financial institutions, service providers, etc.); civil society organizations, and other relevant stakeholders.

3.3.3 Operationalization of REDD+

The decisions adopted regarding REDD+ require that these activities should be undertaken in phases, beginning with the development of national strategies or action plans, policies and measures, and capacity-building, allowed by the implementation of national policies and measures, and national strategies or action plans that could involve further capa-city-building, technology development and transfer and results-based demonstration active-ties, and evolving into results-based actions that should be fully measured, reported and verified (Figure 5). The implementation of the phases of REDD+ at the intended scale will require significant mobilization of multiple sources of funding (public and private, domestic and international, multilateral and bilateral) from all available sources. Thus, investments will need to look beyond the ongoing REDD+ initiatives, mainly funded by donor funds, toward innovative solutions to catalyze additional (public and private) funding. Despite the limited availability of funding, over 70 countries have engaged in implementation of early phases of REDD+ as conceived by the UNFCCC.

Financial compensation is provided by developed countries to developing countries that are able to reduce their emission sources at the national level. This is the payment mechanism that was found to keep rainforests intact. The mechanism consists of 3 phases (Figure 3):

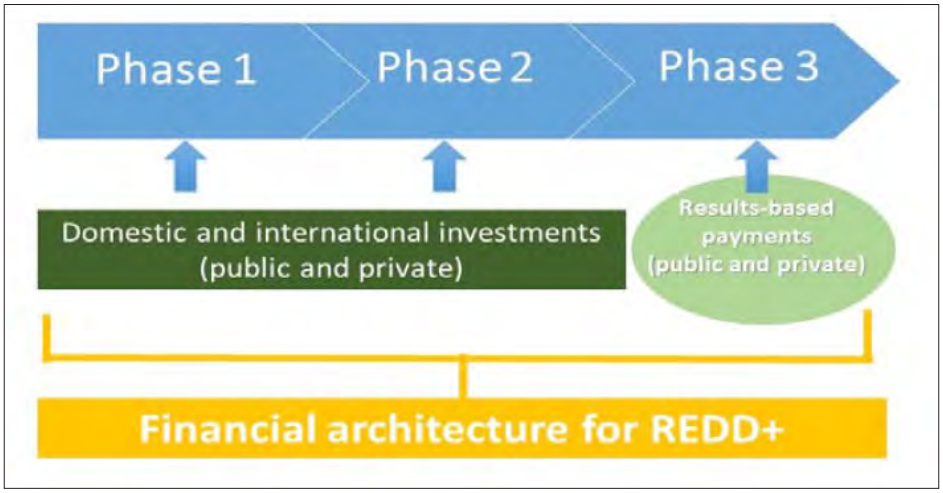


Figure 3: REDD+ phases and the financial architecture for REDD+. Source: GCF, 2017

- **phase 1:** Preparation: Developing favourable conditions; identification of the causes of Deforestation and degradation (DD) and definition of strategic options, development of national strategy, national emission reduction program, baseline scenario, Monitoring, Reporting and Verification (MRV); capacities building;
- **phase 2:** implementation of strategy and policies, investments / pilot projects;
- **phase 3**: measurement, notification, audit of results, payments.

3.3.4 Funding for REDD+

There are many financing initiatives for REDD + projects:

- **Forest Carbon Partnership Facility** (FCPF) is a global partnership administered by the World Bank that assists developing countries in reducing emissions from deforestation and forest degradation; forest C stock conservation; SFM; and enhancement of forest C stocks (REDD+). The facility demonstrates how REDD+ can be applied at the country level and thereby complements the UNFCCC negotiations on REDD+. The FCPF became operational in 2008.
- **Global Climate Change Alliance** is a multilateral initiative of the European Commission and EuropeAid, aimed at funding projects for climate change related opportunities in Least Developed Countries while at the same time promoting dialogue and South-South cooperation.
- **International Climate Initiative – Germany** is an initiative of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) which supports climate protection and biodiversity conservation projects.

- **Sustainable Forest Management (SFM)/REDD+ Programme** focuses on efforts to prevent, control and reverse desertification and land degradation. It is administered by the Global Environment Facility (GEF) which draws on guidance provided from three international conventions dealing with forests; CBD and UNFCCC.
- **UN-REDD Programme** is a multi-donor trust fund (MDTF) that allows donors to pool resources and provide funding to support the REDD+ mechanism which aims to reduce global emissions from deforestation and forest degradation in developing countries. The Programme is a collaborative initiative by the three UN agencies UNDP, FAO & UNEP.
- **Auction of quotas:** carried out by developed countries which have emission reduction quotas, and support for REDD+ activities.
- **The voluntary carbon market:** companies and other organizations that do not have emission reduction strategies voluntarily purchase C credits to offset the impact of their activities, activity-based or results-based payments.

3.3.5 Challenges of REDD+

REDD+ faces huge challenges: Powerful political and economic interests favour continued deforestation and degradation. Implementation must be coordinated across various govern-ment levels and agencies; benefits must be distributed and need to balance effectiveness and equity; tenure insecurity and safeguards must be genuinely addressed; and transparent institutions, reliable C monitoring and realistic reference levels are all required to support result-based systems.

REDD+ requires and can catalyse transformational change: New economic incentives, new information and discourses, new actors and new policy coalitions have the potential to move domestic policies away from the business as usual trajectory.

REDD+ projects are hybrids in high deforestation areas: Project proponents are pursuing strategies that mix the enforcement of regulations and support to alternative livelihoods (ICDP) with result-based incentives (PES). Projects tend to be located in high deforestation and high forest C areas, yielding high additional conditions if they succeed.

There are no regret policy options: Despite uncertainty about the future of REDD+, stake-holders need to build political support and coalitions for change; invest in adequate information systems and implement policies that can reduce deforestation and forest degradation, but are desirable regardless of climate objectives.

In addition, REDD+ initiatives are facing other huge challenges on the ground that threaten to undermine the potential of REDD+ to deliver the large contributions to GHG reductions that have been hoped for (Sunderlin et al., 2014; Sunderlin et al., 2015). The largest of these challenges concern the insecurity of tenure arrangements at all scales (national, sub-national, within site boundaries) and the currently unfavourable economics of REDD+, which favour business-as-usual interests. On one hand, this may be a legacy of familiarity with, and dependence on, other non-conditional interventions (e.g. in Integrated Conserva-tion and Development Projects or ICDPs), or it may merely reflect the fact that proponents have not had enough experience with conditional incentives to single them out as the most important intervention, as envisioned at the inception of REDD+. On the other hand, it may signal that the enabling conditions for REDD+ are not yet in place, and that proponents might not be able to wait much longer for those conditions to emerge. With the Paris Agreement (Signed in 2015), currently there are existing opportunities

for strong action on the national and sub-national policy front to assure that the years of hard work spent to lay the groundwork for forest-based climate change mitigation have not been in vain.

Exercise: Group discussion (25 minutes)

- Define the REDD+ mechanism clarifying why it was initiated?
- Identify and analyse the sources of funding for REDD+?
- Critically examine the challenges of REDD?

Note: The carbon market mechanism offers opportunities for the designing of sustainable development projects while reducing GHG emissions.

3.4 Carbon credits

The commodity which is traded in C markets is referred to as C credits or C offsets; it is a financial unit of measurement that represents one ton of CO_2 equivalent (tCO_2e) removed, avoided or sequestered. The credits are either emission allowances under the cap-and-trade scheme, or emission reductions from projects. The prices of C credit vary from time to time depending on market demand and supply.

There are two types of C credits depending on whether they are generated under the compliance or voluntary markets:

- certified emissions reductions (CERs) generated under the compliance markets; CERs can also be used on the voluntary markets, but not vice versa; and,
- voluntary emission reductions (VERs) generated under the voluntary market; the value of VERs is determined by the cost of implementing the project, and therefore varies, for example depending on the C offset standard used.C credits can only be traded if it is established that the emissions reductions have occurred or will occur, and that the reductions would not have occurred in the absence of the project (see Chapter 3). Examples of projects that sell CERs or VERs, including the seller, buyer, and verification status are described in Table 4 above. Government agencies are the indicated organizations which are granted responsibility to authorize and approve the participation in CDM projects (designated national authority).

C credits are traded as certificates. These can be ex-ante, ex-post and non-certified sequestration benefits (Moura-Costa et al., 2000).

- **Ex-ante credits** are traded on the assumption that the project will sequester a given amount of CO_2 within a specified period of time. They are mainly generated in the voluntary market. Ex-ante credits are issued just before or after the trees have been planted.
- **Ex-post credits** are traded only after emission reductions have been verified. They are generated mainly in the compliance market but also in voluntary market.
- **Non-certified sequestration benefits** are climate benefits that have not been certified by any recognized standard and no independent audits have been conducted.

Table 4. Examples of forest C projects that sell C credits on the compliance and voluntary markets

Project	Makira Forest Protected Area Project	Kachung Forest Project
Location	Maroantsetra, Madagascar	Dokolo district, Uganda
Start date	2005	2006
Land cover	Forest	Forest plantation
Project type	REDD+	Afforestation/Reforestation
Project developer	Wildlife Conservation Society	Green Resources AS
Target (and planted) area	372,470 hectares	2,099 (2,016) hectares
Total emission reduction (t CO_2e) *	38,016,930	548,530
Market	VCM	CDM
Buyer	Carbon Neutral	Swedish Energy Agency
Tenure and land-use rights on the project site	State (as owner of Makira Natural Park)	Corporate entity (as concession)
Crediting period (years)	30	20
Designated national authority	National Climate Change Coordination Office, Ministry of Environment, Ecology, the Sea and Forests	Climate Change Unit, Ministry of Water and Environment
Verification status, Auditors	Verified, by Rainforest Alliance	Verified, by TÜV SÜD South Asia Pvt. Ltd
Standard	VCS; CCBS	CDM; CCBS
Challenges experienced	Uncertainty about future carbon market	Conflicts over land rights

Estimated amount of net anthropogenic GHG removals by sinks over the chosen crediting period

Activity 3.1. Group discussion (30 minutes)

- Read the CDM Rule Book available at the internet site: (http://www.cdmrulebook.org/514.html)
- Discuss the basic requirements for C trading.

3.5 Financing mechanisms

Forestry C projects are faced with high costs, especially at the start of project operations. Financing for these projects can be grouped to cover the following cost categories (Covell, 2011):

- establishment of the project, such as development and installation of technologies; this may be provided by debts, equities, or grants depending on the project (discussed under approaches to funding);
- transaction costs, such as development of project design document and project registration fees; such projects are often covered by the project developer; and,
- C finance used to purchase C credits.

C finance is the general term for resources provided to projects that generate GHG emission reductions that can be transacted on the C market. The following are the key elements of C finance:

- available only for projects that reduce GHG emissions;
- must contribute to the sustainable development of the host country; and;
- emission reductions need to be measured and verified before they can be sold.

C finance provides an opportunity to meet some of the costs indicated above; but has limitations.

3.5.1 Advantages of carbon finance

- Possible to access future revenue streams from emission reductions before the start of project operations.
- It is a possible means of obtaining up-front (project) financing against C revenues.
- It can be used to re-finance projects, freeing up resources for development of new projects.

3.5.2 Limitations of carbon finance

- There is a small number of potential buyers of emission reductions because of limited demand.
- Risks exist associated with up-front financing when purchases are made ahead of project registration (under the CDM) or if C revenues are uncertain.
- The process of realizing C revenues is complex and costly.
- C finance only covers part of the cost.

3.5.3 Sources of finance

The main source of C finance is the primary buyer of C credits. The following is a list of the most active buyers of C credits in forest C projects in Africa:

- governments;
- C project developers;
- industrial firms;
- private C funds;
- financial institutions; and,
- traders.

Projects can be self-financed, donor supported, or may obtain forward financing from investors, buyers or commercial project developers (Covell, 2011; Olander and Ebeling, 2011). Self-financing mainly happens in projects developed by organizations that have capacity to invest their finances and human resources in the projects. In the rest of the session, we describe alternative financing such as donor support and forward finance from investors, buyers or commercial project developers.

C finance can come through domestic, foreign or philanthropic financing, or from NGOs (Peters-Stanley et al., 2012; Gondo, 2012; Olander and Ebeling, 2011).

- *Domestic financing* includes funds from the public sector, private sector, corporate investors, small to medium scale forest enterprises, or financial institution.
- *Foreign financing* includes bilateral (country to country) and multilateral (international monetary institutions to countries) funding given as official development assistance or as direct investment.
- *Philanthropic funding* includes funds given by individuals, foundations such as Ford Foundation or Melinda and Bill Gates Foundation, and religious groups. Philanthropic funding is driven by environmental and humanitarian concerns rather than commercial factors.
- *International* (such as WWF, IUCN, Conservation International, and World Vision) and local NGOs also implement projects directly or in partnership with governments, or community-based organizations.

C funds and facilities have been set up by multilateral, bilateral or regional institutions to raise capital from both private and public sector for use by project developers (Table 5).

Table 5. Examples of sources of carbon finance, their focus areas and selected participating countries.

No	Source of funding	Main focal area in forestry	Example of countries
1.	The World Bank		
a)	BioCarbon Fund	Afforestation/ reforestation Avoided deforestation	Uganda, Ethiopia, Madagascar
b)	BioCarbon Fund Initiative for Sustainable Forest Landscapes	REDD	Ethiopia, Zambia
c)	Forest Carbon Partnership Fund	REDD	Ethiopia, Zambia
d)	The Forest Investment Program*	REDD	Burkina Faso, DRC, Ghana
2.	African Development Bank (AfDB)**	Forestry for sustainable economic development Environmental conservation	
3.	Global Environment Facility	Biodiversity	Many

* The AfDB serves as an implementing agency of the climate investment funds. The forest investment program is funded by the strategic climate fund, one of the two climate investment funds.

** AfDB also houses the Africa Climate Change Fund

3.5.4 Approaches to funding

Capital required to develop and implement C projects is normally obtained in the form of grants, loans, equities, and upfront payment (Figure 4) (Labatt and White, 2011; Covell, 2011):

- Debts (concessional loans and bonds) refer to funds allotted to project owners through public or private mechanisms.
- Equities refer to funds given to the project by company shareholders. The return on equity is obtained either from dividends or from sale of shares.
- Grants refer to funds provided by governments and institutions to project developers who contribute to their objectives. Grants cover only part of the project cost and may not be recoverable.
- Upfront payment (forward crediting) refers to advance payment for C credits.

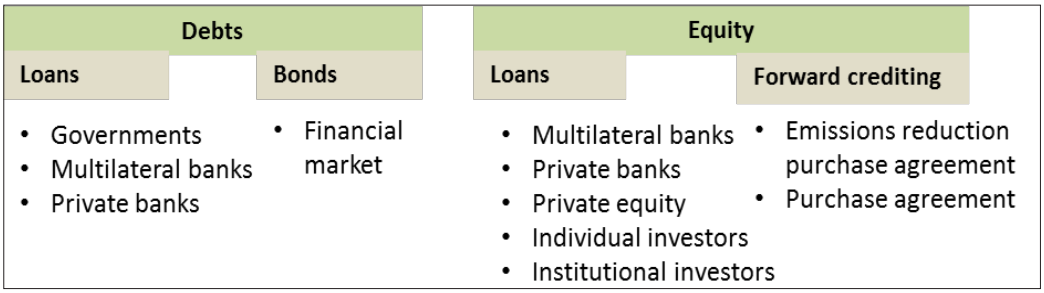


Figure 4. Approaches to funding.

3.5.5 Access to carbon finance

Access to finance is a major constraint to development of forest C projects. C credit buyers (mainly governments and private companies) are the primary source funding for projects. Funds from the sale of C credits can be accessed following any of the three models described below:

- unilateral model where the host country develops and invests in a project, and sells CERs; the project developer bears all risks and benefits related to the preparation and sale of CERs;
- bilateral model where the project developer partners with Annex 1 country that received the CERs generated from the project; and,
- multi-lateral model where CERs are sold to a fund (for example at the World Bank), which manages a collection of projects.

It is necessary for project developers to prepare a proposal for submission to interested buyers in order to access C finance. This is mainly in the form of a PIN, which can be sub-mitted to funding institution such as BioCarbon fund of the World Bank.

Improved awareness among financiers can increase access to financing options. This requires training financial institutions to enhance their understanding of the viability of investments in forest C projects. There is also a need to find ways to ease the conditions attached to C finance. Other options to improve access to financing are to introduce incentives designed to encourage investment in C projects.

3.5.6. Challenges facing Carbon markets

The C market challenge is primarily environmental. The KP aims to limit the average increase in global temperature and imposes quantified obligations on signatory countries to implement UNFCCC. The KP strengthened the States' obligation through quantified GHG emission reduction commitments (to reduce GHG emissions by at least 5% over the period 2008 to 2012) referred to1990 emissions. EU its members have therefore committed themselves to reducing their GHG emissions by 8% over the period 2008-2012 to 20% in the period 2013-2020, compared with the levels of the year 1990.

But critical views are increasingly being raised since its introduction, the CO_2 emissions in industrialized countries have continued to increase instead of falling significantly. In addition, since early 2012, the metric ton of C hardly exceeds 5 Euros, while its price should exceed 20 Euros for the system to be effective. As a result, the C market is increasingly criticized, particularly by NGOs, who accuse it of not encouraging companies to reduce their emissions. Other C markets are gradually being introduced in other parts of the world, such as New Zealand, Japan and some North American countries. In June 2013, China, the world's largest emitter of GHGs, also launched its C market.

3.5.7 Opportunities and risks associated with carbon markets and trade

C markets and trade result in a range of outcomes in addition to reducing emissions. These can be linked to development and implementation of projects that generate the C credits or to the marketing and trading process. Positive outcomes are regarded as co-benefits while adverse or uncertain outcomes are considered risks (Smith et al., 2014). The extent of co-benefit and adverse effects depend on the context and size of the project. The effects can be socio-economic or environmental. This section describes potential impacts of projects on land tenure and biodiversity and lists other opportunities and risks of C trade and markets.

Potential impacts on land tenure and land-use rights for several social groups including indigenous peoples, local communities and other groups, dependent on natural assets (Smith et al., 2014). Co-benefits include clarification of land tenure and property rights. Adverse effects include lack or recognition of customary rights, loss of tenure or possession rights, limited access to certain resources, relocation of local people, and leakage.

Potential impacts on biodiversity: projects such as afforestation and reforestation hold positive or negative impacts on biodiversity depending on the ecosystem where the project is located and the management options being implemented. Projects can promote conser-vation of biological diversity by reducing deforestation and using afforestation to restore degraded lands. However, clearing and replacing native forests with plantations of exotic species reduce biodiversity. C projects can also encourage establishment of fast growing exotic trees, which give quick returns compared to indigenous trees that grow much slower.

Potentials:

- C payments or compensation mechanisms may provide a new source of income. Income can also be generated from project activities and employment.
- Increase in food security can be realized where measures such as agroforestry, intensi-fication of agricultural production or integrated systems are implemented.
- Improvement of infrastructure. Projects support local development priorities, including

infrastructure such as roads, schools and health facilities. They also support education and healthcare in terms of materials and facilitation of staff.

- C markets mobilize capital required to scale up successful land-use practices.
- C markets and trade promote collaboration between private sector, public sector, and local community.

Risks:

- Large scale land acquisition is regarded as land grabbing.
- Non-delivery of credits.
- Non-payment by buyers.
- Price fluctuation in the market.
- Plantations can reduce food production locally (Foley et al., 2005)
- Projects can increase inequity and land conflicts or marginalize small-scale land owners depending on the distribution of benefits and responsibilities as well as technologies being used (Smith et al., 2014).

Summary

We have learned that C markets are markets created from the trading of C allowances in order to encourage or help countries and companies to limit their emissions; that the C credits are the currency in C markets; C offsetting is the most common and relevant form of C trading for forest C projects in Africa; and buyers of C credits are the key sources of C finance. In the next session we shall look at regulations governing C market and trading.

Chapter 4. Regulations on Carbon Market and Trading

4.0 Chapter overview

This training session introduces regulations that govern the C market and trading. It will provide learners with an overview of Kyoto agreement, emissions trading master agree-ments, and emission reduction purchase agreement. The session will also analyse C offset standards, including essential components of the standards, classification of the standards, and a review of the most appropriate standards used in forest C projects in Africa.

Objectives

By the end of this session, the learner should be able to:

- describe emission reduction purchase agreement;
- analyse C offset standards appropriate for Africa.

4.1 Agreements

A few initiatives have been set up to act on climate change. They range from regional level initiatives such as the African Ministerial Conference on Environment, the Framework of Southern and Northern Africa Climate Change Programmes, and the East African Community Climate Change Policy, the Committee of African Heads of States and Govern-ments on Climate Change, to global level initiatives such as UNFCCC and International Emissions Trading Association (IETA). These initiatives commit member countries to reduce emissions, participate in emission trading, and administer agreements for emission reduction programs.

The following part of the session describes different types of initiatives and agreements that support the C market, with emphasis on the KP that established C markets, and the emission reduction purchase agreements (ERPA) that provide a documented framework within which emission reductions are bought, sold, acquired and transferred.

The Intergovernmental Panel on Climate Change (IPCC) was established by UNEP and WMO in 1988. It assesses climate change to provide clear scientific view on the current state of knowledge in climate change and its potential environmental and socio-economic impacts (http://www.ipcc.ch/). See earlier comment on referencing style.

The UN Framework Convention on Climate Change (UNFCCC) is a treaty aimed at stabilizing GHG emissions. It was entered at the Earth Summit at Rio in June 1992. UNFCCC lists industrialized countries and countries with economies in transition that have commitments to reduce GHG emissions ("Annex I Countries"). Non-Annex I (mostly developing) countries have no GHG emission restrictions, although some developing countries such as China, India and Brazil are significant emitters.

The 1997 **Kyoto Protocol** (KP) of UNFCCC is an international agreement that sets binding targets for parties to reduce GHG emissions. Parties are required to meet their targets primarily through

domestic measures or alternatively through C trading. The KP established C trading under three market-based instruments (flexibility mechanisms) (Figure 5):

- **Emissions trading (ET)** allow countries with commitments under the Protocol to buy emission permits from other countries to help meet their domestic emission reduction targets. ET is an administrative-based mechanism.
- **Joint implementation (JI)** allows Annex I countries to invest in emission reduction projects in any other Annex I country as an alternative to reducing emissions domestic-cally. JI is limited to transactions between industrialized countries and countries with economies in transition.
- The **Clean Development Mechanism (CDM)** allows countries to meet their domestic emission reduction targets by buying C credits from projects in non-Annex I countries. CDM project activities must be hosted by a developing country.

The flexibility mechanisms of the KP were designed to:

- stimulate sustainable development through technology transfer and investment;
- help countries with commitments to the KP meet their targets by reducing emissions domestically or supporting projects that reduce emissions in other countries; and,
- encourage the private sector and developing countries to contribute to emission reduction efforts.

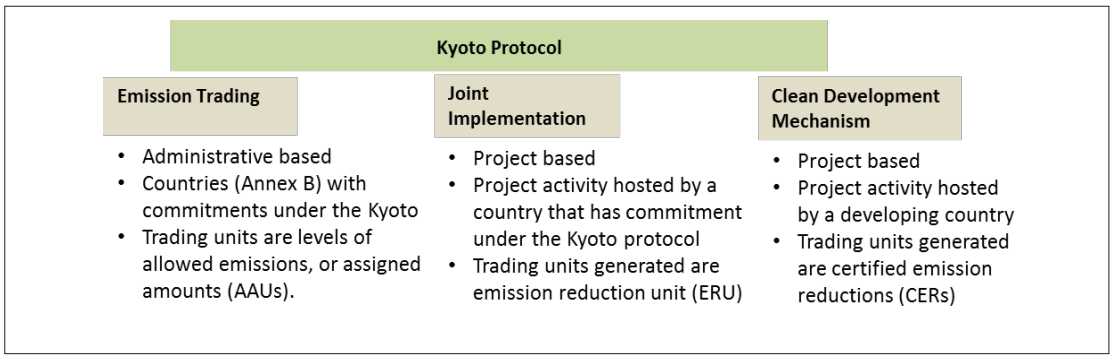


Figure 5. Characteristics of the "flexibility mechanisms" of the Kyoto protocol

The KP was designed to be implemented under two commitment periods, the first running from 1997 to 2012 and the second and final running from 2012 to 2020. UNFCCC is developing a protocol that will be implemented from 2020.

4.1.1 Emissions Trading Agreements

We have described the different initiatives behind C trading, including the main international frameworks regulating C markets and trading. Now we look at agreements within C trading.

Emissions trading at international level typically take place under one of the three agree-ments developed by IETA, the European Federation of Energy Traders (EFET), and the International Swaps and Derivatives Associations (ISDA). The documents form the three main standard contract forms for emissions trading. They have been harmonized to create an "umbrella" agreement that defines

the different aspects of emissions trading schemes. The IETA published the following master agreements:

- **Emissions Trading Agreement for the EU Scheme** - developed to facilitate trading under the EU emissions trading scheme;
- **California Emissions Trading Agreemen***t* - developed to facilitate trading under the California's cap-and-trade system;
- **International Emissions Trading Standard Agreement** – developed to facilitate trading under the KP, the EU ETS, and other national emissions trading systems that may be developed.

4.1.2 Emission Reduction Purchase Agreement

Emission Reduction Purchase Agreement, ERPA (also referred to as C purchase agree-ment), is an agreement between the buyer and seller of C credits. It provides a documented framework within which emission reductions are bought, sold, acquired and transferred. The standards for ERPAs are outlined by IETA. The purposes of ERPAs are to (Hawkins et al., 2010):

- record the agreement;
- identify responsibilities;
- establish the rights; and,
- manage risks.

ERPAs define the product being traded (VERs, CERs), define the commercial terms of the project including price, volume and schedule of delivery of emission reductions. They also spell out consequences of non-delivery and non-payment.

ERPAs are important because of the unique challenges linked to the forest C markets in Africa, for example:

- C trade is a voluntary transaction; the project must therefore satisfy the interest of both the buyer and the seller of emission reductions;
- the product does not exist physically;
- buyers and sellers differ in terms of their financial resources and commercial experience; sellers are often community members and landowners with little experience on markets; buyers are generally companies and C brokers; and,
- the rules are constantly changing, and in some cases not clearly defined.

There are typically three types of ERPA (spot contract, forward contract, and transactions option) based on the delivery of emission reductions and payment options (Table 6). Buyers and sellers can negotiate a range of terms and conditions; combination of these can also be used (Hawkins, 2011).

Table 6. Description of different types of emission reduction purchase agreements

Attribute	Spot agreement	Future delivery agreement	Option contract	
			a) Call option	b) Put Option
Status of emission reductions	Issued, ready for delivery	Not yet issued, to be delivered in the future	Not yet issued, to be delivered in the future	Not yet issued, to be delivered in the future
Payment	Immediate, on delivery	In the future (on delivery or advance)	On delivery	On delivery
Risk to buyer	Negligible	Depends on amount of upfront payment	Negligible	Price higher than the market
Risk to seller	Negligible	Depends on level of guarantee for delivery	No guarantee that the buyer will purchase	May be unable to pay for them
Price	Fixed	Various options	Fixed	Fixed

1) **Spot agreement** (spot contract): parties agree to the purchase and sale of C credits that have already been generated and issued. Spot agreement eliminates non-delivery or non-payment risks and allows the seller to ask for a higher price per emission reduction; however, it does not provide any upfront finance from the buyer, which is often needed to meet project costs.

2) **Future delivery agreement** (forward contract): parties agree to the purchase and sale of C credits that have not yet been issued. Future delivery agreement can be used to obtain project financing (debt and equity); buyers negotiate lower prices because of non-delivery risk.

3) **Options transactions.** Two different types of 'options' transactions can be defined in ERPAs (Table 6). The Call option gives the buyer the right (but no obligation) to buy C credits at a certain point in future for a fixed price. The Put option gives the seller the right (but no obligation) to sell at a certain point in time for a fixed price.

C projects are implemented in accordance with existing domestic laws of host country. This means that ERPAs are formulated considering certain domestic laws such as property laws, taxation laws, trade laws, financial services laws, and environmental and planning frame-works.

4.2 Mechanisms in the Kyoto protocol

The KP defines three flexible mechanisms:

- The Clean Development Mechanism (CDM);
- Joint Implementation (JI); and,
- Emission trading (trade in carbon credits).

4.2.1 Clean Development Mechanism

Under the CDM, an Annex I State or an enterprise invests in a project to reduce GHG emissions in a developing country. In exchange for the reductions noted, an equivalent volume of Certified Emission Reduction Units (UREC) is issued. This investor may sell these Units on the market or deduct them from its international reduction obligations.

4.2.2 Joint Implementation

JI is a form of international trading of pollution rights or emission permits defined by the KP. Companies (public or private) invest in "own projects" within industrialized countries or out-side the national territory, enabling them to obtain emission credits. These C credits are measured in Emission Reduction Units (ERUs). The JI operates like the CDM, except that these projects are carried out in industrialized countries and generate Kyoto units called ERUs.

4.2.3 Carbon Credit Trading

This is an emission permit market system. A country that fails to meet its target can purchase emission rights from another country that would have exceeded its own. In the other direction, a country that reduces its emissions more than is necessary to meet its commitment will be able to cede its "surplus" of emission rights to countries that find their objectives more difficult or more expensive to achieve. Several emissions permit markets have been established at the level of companies, groups of companies, or states.

4.3 Carbon offset standards

Activity 4.1. Brainstorming (10 minutes)

What do you understand by C offset?

C offset standards refer to a set of project design, monitoring, and reporting criteria to which C offsetting activities or the projects' co-benefits can be certified or verified (Goldstein and Gonzalez, 2014). They set out all of the procedures that need to be followed to implement and consistently quantify emission reductions and/or co-benefits of a C offset project. The standards are established by entities such as NGOs, foundations or private companies.

There are three essential components of C standards: the accounting standards, the monitoring verification and certification standards, and the registration and enforcement standards (Kollmuss et al., 2008; Gledhill et al., 2011).

Accounting standards ensure offsets are real, additional and permanent. They provide definitions and rules for elements that are essential during design and early implementation phases of the project, such as the additional condition and the baseline methodologies, the project types, the project location, the project start date, the crediting period, and the co-benefits etc.

Monitoring, verification and certification standards that ensure projects perform as designed. Procedures for monitoring, verification and certification are outlined early during project design, although the actual activities happen later in the project.

Registration and enforcement systems that elaborate ownership, facilitate trading of C credits, and track retirement of C credits. Projects that are approved get registered on online registries of the standards or other registries to avoid double counting.

4.3.1 Types of carbon offset standards

C offset standards fall into three broad categories, KP compliant standards, voluntary standards, and premium (also referred to as secondary) standards (Olander and Ebeling, 2011; Kollmuss et al., 2008; Gledhill et al., 2011). Figure 6 lists C offset standards that have been documented to be relevant and commonly used for forest C projects in Africa.

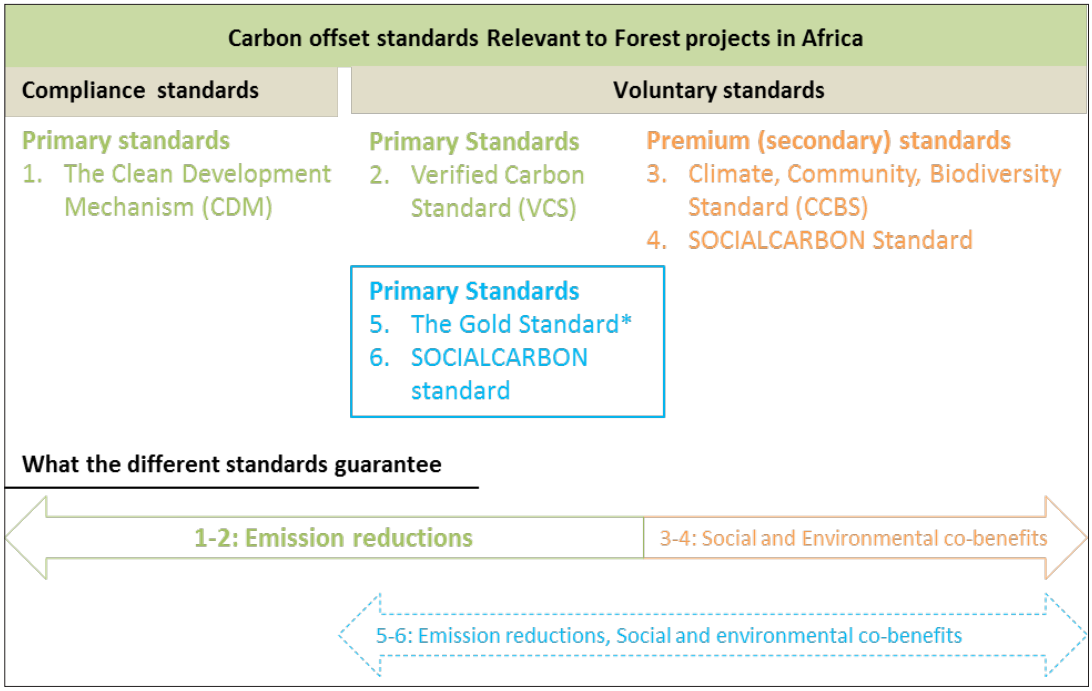


Figure 6. Carbon offset standards relevant to forest carbon projects in Africa

C offset standards can be broadly classified as primary or secondary standards depending on whether they certify emission reductions. Primary standards refer to those that guarantee that the emission reduction is real and permanent, for example the VCS. They use methodologies and market approaches that resemble the CDM in many ways. Primary standards issue C credit certificates.

Secondary standards (also referred to as premium standards) refer to those that are used to certify projects that generate additional social and environmental co-benefits, for example CCBS. They do not issue C credit certificates. Projects under secondary standards are generally first certified either under the voluntary C standards or compliance standards.

4.3.2 Carbon offset standards relevant to Africa

Clean Development Mechanism

The CDM itself is a C 'standard' because it sets out its own guidelines for assuring the quality of projects. The CDM is administered by UNFCCC, which has methodologies for CDM projects, and bodies that approve, certify and register projects under the CDM. Projects that intend to be registered under the CDM use methodologies approved by the CDM Executive Board or propose a new methodology to the EB for consideration.

Table 7. Summary of the features of C offset standards commonly used in Africa.
Source: Kollmuss et al. (2008); Olander and Ebeling (2011); Merger (2008).

Standard	Admin-istrative body	Type of credits	Crediting period (years)	Perma-nence (risk buffer)	Socio-economic benefits	Environ-mental benefits	Price of a tCO_2e (US$)**
CDM	CDM Executive Board		20 or 30*				
VCS	VCS Association	Ex-post	20-100	10-50%	+	+	4.7
Gold Standard	Gold Standard Foundation	Ex-ante	30-50	30%	++	++	4.2
Plan Vivo	Plan Vivo Foundation	Ex-ante and Ex-post			++	++	6-15
CCB	CCB Alliance	N/A	N/A	N/A	+++	+++	N/A
Social carbon	Ecologia Institute	N/A	N/A	N/A	+++		

*The crediting period is 20 years renewable twice, or a single 30-year crediting period.

**Average prices based on the state of the voluntary carbon markets 2010.

The CDM is offered for afforestation and reforestation project types. Project location is limited to developing countries (Non-Annex I). The KP requires that CDM projects contribute to sustainable development in the host country. The CDM does not recognize any other standards; however, standards such as the VCS recognize and accept CERs under their schemes (Kollmuss et al., 2008). Other features of the CDM are summarized in Table 7 above. Project activities located in least developed countries do not have to pay registration fee to UNFCCC through or a share of the proceeds.

The section that follows describes voluntary C offset standards commonly used in Africa. They guarantee the quality of C credits outside the KP scheme. Because there is no universal set of standards in the voluntary C markets, institutions such as the Verified Carbon Standard, Climate, Community and Biodiversity Alliance, The Gold Standard Foundation, Plan Vivo Foundation guarantee the quality of C credits developed under their Standards (Cisneros, 2012). In each case, the requirements are approved by an indepen-dent auditor, such as DVN Climate change services SA, Environmental services, Rainforest Alliance, Scientific certification systems, SCS global services, TÜV SÜD South Asia Pvt. Ltd., etc.

Verified Carbon Standard (VCS)

The VCS was developed in 2005 as a global standard for voluntary C offset projects (www.v-c-s.org/). The VCS focus is mainly on emission reduction and does not require projects to have additional environmental or social benefits. However, projects must demonstrate compliance with existing local and national environmental laws. VCS approved C offsets are registered and traded as VERs.

The VCS integrated guidelines for projects in agriculture, forestry and other land uses (AFOLU) projects. VCS AFOLU projects include REDD+ (VCS, 2013). Projects must provide evidence that the proposed project area was not cleared in order to generate C credits and forested at least for 10 years prior to project start.

Climate, Community and Biodiversity Standard

The Climate, Community and Biodiversity Standard (CCBS) was developed in 2005 by the Climate, Community and Biodiversity Alliance (CCBA) to help design and evaluate land management projects that mitigate climate change and support sustainable development and biodiversity conservation (www.climate-standards.org/).

CCBS is applicable to land-based climate change mitigation projects such as afforestation, reforestation, re-vegetation, forest restoration, agroforestry, sustainable agriculture and avoided deforestation and forest degradation. It does not issue C credits, and thus it does not set own project specifications. Planting can be conducted anywhere as long as there are positive net benefits on climate, community and biodiversity.

Social Carbon Standard

The Social Carbon Standard was published in 2008 by the Ecologica Institute in Brazil to provide criteria for monitoring the social gains of projects (www.socialcarbon.org/). Projects are assessed against six aspects of sustainable development: social, human, financial, natural, biodiversity, and C. Social C Standard indicators have been developed for affore-station and reforestation project types.

Gold Standard

The Gold Standard was established in 2003 by WWF and other international NGOs for CDM projects and later for use in the voluntary C market in 2006 (www.goldstandard.org/). The Gold Standard aims to ensure that emission reduction projects are real and provide social, economic and environmental benefits. Version 0.9 of the Gold Standard includes guidelines of the CarbonFix Standard. The Gold Standard is applicable (since 2013) to land use and forest projects such as afforestation and agroforestry, forest management and climate smart agriculture.

Plan Vivo-Standard

The Plan Vivo Standard was developed in 2008 by the Edinburgh Centre for Carbon Management in collaboration with El Colegio de la Frontera Sur and the University of Edinburgh (www.planvivo.org/). It is a standard specifically focusing on rural smallholder and community based land use projects in developing countries.

Plan Vivo Standard is applicable to afforestation, reforestation, integrated forest manage-ment, avoided deforestation, forest restoration or rehabilitation, agroforestry and improved agricultural systems. There are no restrictions to projects' start date or eligible planting area. Projects that are already implemented can be registered; however, retroactive crediting for implemented project activities is not allowed. Only native or naturalized species are allowed to be planted.

4.4 REDD+ Social and Environmental Standards (REDD+ SES)

The REDD+ SES is a standard closely associated with CCBS (www.redd-standards.org/). It was developed by CCBA and CARE International through an initiative that began in 2009. REDD+ SES is designed to be used for developing REDD+ programs at national or sub-national levels rather than site-based projects. It provides criteria to support the develop-ment and implementation of safeguards for a government-led REDD+ programs.

Summary

In this session, we have discussed initiatives leading to development of C markets, the frameworks for regulating C trading and the standards that guarantee the quality of C credits. We have described the standard contract forms for emission trading, and the role of emission reduction purchase agreements. The session explained CDM as the only market-based mechanism of the KP that is relevant to Africa but limited to afforestation and reforestation activities. Finally, the CDM, VCS, CCBS, Social Carbon Standard, Gold Standard and Plan Vivo-Standard were discussed as the most appropriate primary and premium standards to Africa. In the next session, we shall look at sharing benefits arising from C trade.

Chapter 5. Carbon Benefit Sharing

5.0 Chapter overview

This session introduces C benefit sharing. It explains what benefit sharing is and why it is important. The session also describes the types of benefits, the costs of generating the benefits, the distribution of the benefits to the beneficiaries, and the responsibilities of different stakeholders. The session also explains land tenure and property rights, and discusses governance issues such as equity, transparency and accountability. The session finally identifies potential negative and positive effects of benefit-sharing.

Objectives

By the end of this session, the learner should be able to:

- define the term C benefit sharing;
- describe C offset standards appropriate for Africa.

5.1 Concept and principles of carbon benefit sharing

C benefit sharing refers to the distribution of gains generated from the development and implementation of C projects among stakeholders. Benefit sharing ensures that project developers support measures that advance the welfare of people who bear most of the negative impacts of the project, especially those living in the project area.

Benefit sharing serves two main purposes:

- **creates incentives**: benefit sharing aims at rewarding those who implement activities that reduce emissions; the benefits given should be up and above the cost of imple-menting the activities or the opportunity cost associated with change of activity; and,
- **creates legitimacy**: benefit sharing aims to build support and general acceptability for the projects; projects succeed if those directly affected and the general public feel treated fairly and equitably (Lindhjem et al., 2010; Peskett, 2011).

5.2 Types of benefits

C projects generate a variety of monetary benefits in terms of revenues from sale of C credits, timber or NTFPs, and non-monetary benefits. There are also additional (co-benefits) benefits beyond GHG emission reductions from climate change mitigation measures. They maximize the impacts of projects and sustainably contribute to development goals among local communities. Benefit sharing follows an agreement between different stakeholders about the distribution of gains from the project.

Examples of socio-economic co-benefits associated with C projects

- Increased income opportunities (e.g. from employment, sustainable forest enterprises);
- Increased production of timber and non-timber forest products;
- Enhanced (diversified) livelihoods;
- Enhanced capacity (institutional capacity, human resources);
- Improved physical infrastructure (e.g. roads, schools, health facilities); and,
- Improved governance (e.g. improved tenure security, strengthening of local institutions).

Examples of environmental co-benefits

- Conservation of biodiversity;
- Improved forest ecosystem and ecosystem service provision;
- Soil conservation; and,
- Improved watershed functions.

5.3 Benefit sharing mechanisms

Activity 1. Brainstorming (15 minutes)

What are the key elements of carbon benefit sharing scheme?

Benefit sharing mechanisms refers to a range of the institutional means, governance structures, and instruments that are used to distribute project gains to stakeholders (Luttrell et al., 2013). The mechanisms are determined by the nature of funding, the type of activity, and stakeholders involved. The mechanisms can be determined by legal rights, emission reductions, stewardship, compensation of costs incurred, reward for facilitation, and pro-poor considerations (Luttrell et al., 2013; Lindhjem et al., 2010).

There are four categories of benefit sharing mechanisms depending on the scale of benefit sharing i.e. national, sub-national, or project level) or the condition that needs to be met for disbursement of benefits, i.e. input based or performance (Chandrasekharan et al., 2012; Pham et al., 2013):

- national input-based arrangements;
- sub-national input-based arrangements;

- national performance-based arrangements; and
- sub-national performance-based arrangements.

The elements of these categories are briefly described below:

- national level mechanisms distribute benefits from a national to sub-national or local level, for example from state to local community;
- sub-national mechanisms distribute benefits from a sub-national to local level, e.g. from a sub-national government institution to local community;
- performance-based mechanisms distribute benefits to participants who directly imple-ment activities that reduce emissions or that increase C stocks, e.g. disbursement of benefits to community groups who have restored or protected a defined number of hectares; and,
- input-based mechanisms distribute benefits to participants who agree to undertake or refrain from certain activities in return for monetary or non-monetary compensation, e.g. in a community based natural resource management program (Chandrasekharan et al., 2012; Lindhjem et al., 2010; Pham et al., 2013).

5.4 Principles of benefit sharing

Benefit sharing mechanisms outline guidelines for the distribution of benefit among stake-holders. The guidelines cover principles of effectiveness, efficiency and equity (Lindhjem et al., 2010; Luttrell et al., 2013; Peskett, 2011).

- Effectiveness means that benefits should contribute to emission reductions and enhancement of C stocks.
- Efficiency means that emission reduction should be achieved at minimum cost.
- Equity means that there should be fair distribution of benefits. There are several con-cepts of equity that are applicable to C benefit sharing.
    - Benefits go to those who merit or earn the benefits, e.g. in performance-based or output-based mechanisms. Benefits are given to individuals within communities who reduce emissions or enhance C stocks. This concept covers benefits to those incur-ring costs, effective facilitators of implementations, and low emitting forest stewards.
    - Benefits go to those who have rights to them, for example in input-based mechanism. The benefits are given to those who have legal rights over the resources (land, forests) used to reduce emissions.
    - Benefits go to responding to social needs. This concept covers benefits that go to participants under pro-poor or needs-based arrangement. The benefits are distributed in a way that they satisfy everyone's basic needs.

Benefit-sharing mechanisms are normally designed in a balanced manner that considers effectiveness, efficiency, and equity, and their trade-offs.

5.5 Stakeholders and benefit sharing

5.5.1 Responsibilities

Benefit sharing arrangements involve a range of stakeholders with different responsibilities (Table 8). The preferences of the stakeholders to benefits also vary and are mostly influenced by their economic and social circumstances. The minimum number involves one local partner and one external partner.

Table 8. The selected roles of different stakeholders.

Stakeholders	Responsible
Central government	• Define policies. • Ensure coherence between national and international policies. • Uphold the integrity of indigenous peoples and local communities.
Regional governments	• Administration and control of forests. • Create enabling conditions such as capacity building. • Decision making surrounding land use in the region.
Local governments	• Support or implement research within their jurisdiction.
Indigenous people	• Participate in project activities taking place in their territories. • Organized groups are involved in policy discussions and present the interests of indigenous people's various fora.
Local communities	• Manage and conserve forests. • Define and distribute benefits on their projects on a communal level.
International stakeholders	• Support capacity building initiatives. • Provide technical assistance and financial support. • Define standards and develop guidelines.
Non-governmental organizations	• Provide technical assistance and financial support. • Support capacity building among different levels of stakeholders. • Play a role in the policy development.
Private sector	• Identify and channel funding for project development. • They are buyers, brokers, and verifiers of emission reductions

There are also actors that are central to the functioning of a benefit sharing mechanism:

- funders, e.g. the African Development Bank;
- administrators, e.g. local NGOs, farmer cooperatives;
- implementing agencies, e.g. project developers such as Wildlife Conservation Society;
- independent verifiers, e.g. Rainforest Alliance; and,
- beneficiaries, including stakeholders listed in Table 8.

Costs

Emission reduction programs are associated with costs (opportunity, implementation and transaction) that need to be factored in benefit sharing.

- Opportunity cost refers to the value of benefits forgone in favour of alternative land use to project activities.
- Implementation costs refer to the funds used to implement activities that store C, e.g. planting trees in order to relieve pressure on natural forests.
- Transaction costs refer to the costs of doing business on C markets, and covers:
    - search costs for identifying and finding interested partners to the transaction;
    - negotiation costs for drawing up contracts and agreements between parties;
    - approval costs for submission and processing of project design documents;
    - monitoring costs for technical expertise, training, collection and analysis of data, and reporting;
    - enforcement costs for ensuring that parties comply with the terms of agreements; and,
    - insurance cost for reducing or compensating for the risk of project failure (Milne 2002).

5.5.2 Benefit sharing under CDM and Voluntary Carbon Markets

Benefits shared under CDM are mainly generated from afforestation and reforestation project activities. CDM projects are supposed to contribute to sustainable development of the host country. Applicants for CDM projects are required to analyse socio-economic and environmental effects of the proposed project. CDM projects recognize the right of land owners and investors who plant trees to benefit from timber and C sinks, and the rights of local communities. However, CDM does not provide guidelines that regulate the sharing of benefits from the projects.

Complex rules and high transaction costs affect benefit sharing in CDM projects. Firstly, lack of capital and inadequate technical skills hinder local land owners from participating and benefiting from CDM projects. Secondly, international consultants who support local communities to validate and verify C sequestration are paid from the C revenue, leaving a small fraction for local land owners who are responsible for planting and protecting trees.

Voluntary C markets allow benefits generation in projects that are not eligible under CDM, such as forest conservation or SFM practices. Voluntary C offset standards provide guide-lines for ensuring and measuring benefits from the projects. Standards such as The Gold Standard, CCBS and Plan Vivo have strict requirements for documentation of co-benefits and therefore exclude projects with high chances of adverse impacts on biodiversity. Plan Vivo for example requires that a minimum of 60% of the C revenue is shared with local stakeholders. Reference level and leakage effects impact on the total available payments to be shared in both CDM and Voluntary Carbon Markets.

5.5.3 Property rights

Tenure and property rights generally refer to the rights that individuals or groups such as communities, families or firms hold on land or land resources. This meaning is maintained and expounded on respective description of property rights and tenure. Emphasis is placed on tenure and property rights in the context of forest resources.

Property rights and tenure

Property rights refer to a collection of rights on the use, control, and transfer of assets, e.g. land. Property rights govern the ability of people to acquire, manage, use, and dispose of their land and its products and services. Property rights are determined by governments, considering the interests of communities and land owners.

Three kinds of rights within forest C projects are described as follows:

- **use rights**: the rights to enjoy the benefits of an asset, for example, includes the right to access, the right to exploit and use;
    - **access rights** refer to the rights to gain access to the land and/or trees; systems that give access right include unwritten customary rights, private ownership, renting, leasing, concession, and squatting; and,
    - the **right to exploit** refers to the rights for individuals or organizations to use land rights for a fixed period; rights to exploit can be prescribed by the state, or framed through mutual agreement among resource users or simply based on local practice;
- **control rights**: the right to determine use rights, includes, for example, those with the right to rent out or sell a piece of land; and,
- **authoritative rights**: the right to define control rights or to assign them, for example the owner is entitled to use, control, and dispose of or transfer assets (Pham et al., 2013).

A simplified definition by USDA (2007) describes land tenure as the way in which people have access to and use land and natural resources, including trees. Land tenure is one of the main factors that determine the flow of and access to benefits by different stakeholders. Other factors include interpretation of rights to C, revenue sharing mechanisms, socio-economic criteria, and emissions reductions/removals requirements.

Forest tenure is a collection of rights over a piece of forest, a group of trees or a tree held by individuals, groups, firms, or political entities. The rights vary among people groups, time and place. Tenure rights are given by law or can be based on customs. Political entities that legitimize the rights, e.g. governments, communities or clans, may retain some of the right to the resource and designate other rights to resource users/holders.

The USDA (2007) defines security of tenure as the perception by people that rights to land will be recognized by others and protected in the event of specific challenges. A secure tenure system reduces uncertainties associated with long term investment in forest projects. A secure tenure can be established by a title deed, a system securing use and manage-ment rights to local land users or an agreement in case the land is rented.

In text questions (10minutes)

Analyse the land tenure issues that arise from unclear and insecure land tenure rights?

Tenure regimes

Tenure regimes refer to socially defined rules for access to and use of land resources, including trees. This can be statutory, customary, religious or non-formal. Categories of statutory tenure include private, communal, open access, and state ownership.

- **Private ownership**: the assignment of rights to a private party.
- **Public ownership**: the assignment of rights to some authority within the public sector.
- **Communal ownership**: the assignment of rights to members of a community to use independently for its prosperity; non-members of the community are excluded.
- **Open access**: no assignment of specific rights to anyone; no-one can be excluded.

Table 9. Common tenure regimes in Africa

Tenure regime	Characteristics	Strengths	Limitations
Customary regime	Ownership is vested in an ethnic group, clan or community. The resource is allocated by customary authorities such as chiefs.	Widely accepted, simple to administer and maintains social cohesion.	Does not have legal status in urban areas. Poor customary leadership may weaken its legitimacy.
Statutory private tenure regimes	Can be freehold (perpetual) or leasehold (specified) ownership. Covers rental on privately owned land.	Provides a high degree of security, freedom to dispose, or use as colla-teral. Increases comer-cial value of land	Costs of access can be high (excludes the poor). Requires legal framework and effi-cient management.
Statutory public tenure regimes	Rental occupation of publicly owned land.	Provides a high degree of security. Can reserve land for conservation.	Limited supply may restrict access. It is open to bureaucratic inactivity/corruption.
Religious tenure regimes	Common within Islamic societies.	Can provide family or group tenures.	Inheritance disputes can cause land conflicts.
Non-formal tenure regimes	Include categories such as squatting, unofficial rental arrangements.	Are socially determined to provide for the needs of the poor	Increasing demand has constraint access

Different land tenure systems have advantages and disadvantages (Peskett, 2011) (Table 9 above). Public and private ownership are the dominant forms of tenure arrangements for land and forests in Africa. Some countries such as Ghana and Malawi have customary rights vested in traditional authorities.

Forest carbon rights

C rights refer to the right to own or use C resource. C resource can be the C held within vegetation or soils, the trees and forest that retain C (sinks), or the potential of trees or forests to take up and preserve C. Forest C rights determine who has the authority to trade and transfer the C resource. Ownership of C rights also determine how C and non-C benefits are managed and shared between shareholders.

C rights can be linked to ownership of trees, forest or the land resources - where the right to C lies with the government, land owners, forest users. The right to C can also exist as a separate property - where a C right is distinct from trees, forest or land (rights) upon which it is found (Rosenbaum et al., 2004). In this case the owner of trees and forests may be different from the owner of the C, a situation that is only appropriate where forest C rights legislations have been developed (Chandrasekharan, 2012). However, there is a general lack of laws that explicitly enact the ownership over or right to forest C in Africa. The right to C resource can also be linked to participation in project implementation.

The rights to forest C can be determined by legislation, which is lacking in most African countries, or it can be determined on a case by case basis depending on existing custom. Projects often determine ownership or substantive use rights of forests in order to identify entities that are most likely to own C rights.

Vulnerable groups like women, the landless and indigenous groups can be affected when C rights are not clear (Peskett, 2011). In most African countries, women often have weaker rights, while landless may be unable to participate directly in the sale of C; indigenous peoples may in some cases have stronger claims because the law protects the integrity of indigenous lands, recognizing that indigenous peoples are the owners of their lands.

Activity 1. Group discussion (10 minutes)

Explain how accountability and transparency are enhanced and achieved in benefit sharing.

Summary

In this session, we have defined benefit sharing and its importance, and types of benefit sharing mechanisms. The session has explained the principles that guide the distribution of benefit among stakeholders, the different responsibilities and the opportunity, implementation and transaction costs that need to be factored in benefit sharing. The session has also explained tenure and property rights in the context of forest C.

References

Baimwera B., D. Wang'ombe and E. Kitindi, 2017. Carbon Markets: Have They Worked for Africa? Review of Integrative Business and Economics Research 6(2):90-104.

Bayon R, A. Hawn and K. Hamilton, 2007. Voluntary carbon markets: an international business guide to what they are and how they work. Routledge,

Bloomberg New Energy Finance, 2013. Renewable energy now cheaper than new fossil fuels in Africa. Accessed at: www.bloombergenergy.org

Carbon Africa, 2012. Analysis of the Carbon Market Landscape in Kenya. Nairobi. Available at: https://www.carbonafrica.co.ke

Chandrasekharan B.D., C.E. Mairena, G. Kajembe, G. Mbeyale, S. Nsita and K.L. Rosen-baum, 2012. Benefit sharing in practice: insights for REDD+ initiatives. Program on Forests (PROFOR), Washington, DC.

Cisneros F. and A. Jessica, 2012. Forest Carbon Projects in Africa: A Mapping Study. STEPS centre. pp 86.

Climate Policy Initiative, 2015. Global Landscape of Climate Finance. Available at: www.climatepolicyinitiative.org.

Covell P., 2011. Business guidance: Forest carbon marketing and finance. In: Olander J. and J. Ebeling (eds): Building Forest Carbon Projects. Forest Trends, Washington, DC, USA.

Demeyer, R. and F. Turkelboom, 2014. The ecosystem services stakeholder matrix. In: Lovens A. et al. (eds): Openness manual: Stakeholder analysis for environmental decision-making at local level. EC FP7 Grant Agreement no. 308428. INBO, Brussels

Ecosystems marketplace, 2016. State of the Voluntary Carbon Markets in 2015. Accessed at: www.ecosystemmarketplace.com

Engel S., S. Pagiola and S. Wunder, 2008. Designing payments for environmental services in theory and practice: An overview of the issues. Ecological Economics 65(4):663-674.

FAO, 2015. Forest Resources Assessment (FRA): Terms and Definitions. Working Paper 180. 36 p.

Ferraro P., 2009. Regional Review of Payments for Watershed Services: Sub-Saharan Africa. Journal of Sustainable Forestry 28:525-550.

Foley J.A. *et al.,* 2005. Global consequences of land use. Science 309(5734):570-574.

Gledhill R., C. Herweijer, D. Hamza-Goodacre, J. Grant, C. Webb and J. Steege, 2011. Agricultural carbon markets: Opportunities and challenges for Sub-Saharan Africa. PricewaterhouseCoopers (PwC).

Goldstein A., 2015. Converging at the Crossroads: State of Forest Carbon Finance 2015. Ecosystem Marketplace, Washington, DC.

Goldstein A. and G. Gonzalez, 2014. Turning over a New Leaf: State of the Forest Carbon Markets 2014. Ecosystem Marketplace, Washington, DC.

Gondo P., 2012. A review of forest financing in Africa. Southern Alliance for Indigenous Resources (SAFIRE), Zimbabwe.

Gorte R.W. and J.L. Ramseur, 2008. Forest carbon markets: potential and drawbacks. In Congressional Research Service, Library of Congress.

Gray, M., 2011. Carbon markets from 2005 to 2010: minor malfunction or fundamental failure? Recommendations for institutional and agenda reform. Journal of Carbon Management 2(2):135-144.

Green Climate Fund, 2017. Support for the early phases of REDD-plus; GCF/B.17/16; 18p.

Greiber T., 2009. Payments for Ecosystem Services. Legal and Institutional Frameworks. IUCN, Gland, Switzerland.

Greiber T., 2011. Enabling conditions and complementary legislative tools for PES. In: Payment for ecosystem services and food security. FAO, Rome, Italy. pp 205-225.

Hauck, J., H. Saarikoski, F. Turkelboom and H. Keune, 2016. Stakeholder Analysis in ecosystem service decision-making and research. In: Potschin, M. and K. Jax (eds): Openness Ecosystem services Reference Book. EC FP7 Grant Agreement no. 308428. Available at: www.openness-project.eu/library/reference-book.

Hawkins S., 2011. Legal Guidance: Legal and Contractual Aspects of Forest Carbon Pro-jects. Forest Trends, Washington, DC.

Hawkins S., M. Nowlin, D. Ribeiro, R. Stoa, R. Longest and J. Salzman, 2010. Contracting for forest carbon: elements of a model forest carbon purchase agreement.

IPCC, 2007. The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the IPCC. Agenda. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Kollmuss A., H. Zink and C. Polycarp, 2008. Making sense of the volunatry carbon market: A comparison of carbon offset standards. WWF Germany.

Labatt S. and R.R. White, 2011. Carbon finance: the financial implications of climate change. Vol. 362. John Wiley & Sons.

Lindhjem H., I. Aronsen, K.G. Bråten and A. Gleinsvik, 2010. Experiences with benefit sharing: issues and options for REDD-plus. Pöyry Management Consulting (Norway) AS, Norway.

Luttrell C., L. Loft, M.F. Gebara, D. Kweka, M. Brockhaus, A. Angelsen and W.D. Sunderlin, 2013. Who should benefit from REDD+? Rationales and realities. Ecology and Society 18(4):52.

MA, 2005. Ecosystems and Human Well-being: Synthesis. Island Press, Washington, DC.

Merger E., 2008. Forestry Carbon Standards 2008: A Comparison of the leading Standards in the Voluntary Carbon Market and the State of Climate Forest Projects. Carbon Positive.

Milne M., 2002. Transaction costs of forest carbon projects. CIFOR, Bogor, Indonesia.

Namirembe S. and R. Jindal, 2012. International market for forest carbon offsets: how these offsets are created and traded. ASB Lecture Note 14. ASB Partnership for the Tropical Forest Margins, Nairobi, Kenya.

Namirembe S., B. Leimona, M. van Noordwijk, F. Bernard and K.E. Bacwayo, 2014. Co-investment paradigms as alternatives to payments for tree-based ecosystem services in Africa. Current Opinion in Environmental Sustainability 6:89-97.

Olander J. and J. Ebeling, 2011. Building forest carbon projects. A step-by-step overview and guide. In: Olander J. and J. Ebeling (eds): Building Forest Carbon Projects. Forest Trends, Washington, DC.

Peskett L., 2011. Benefit sharing in REDD+: exploring the implications for poor and vulner-able people. World Bank and REDD-net.

Peters-Stanley M., K. Hamilton and D. Yin, 2012. Leveraging the landscape: State of forest carbon market 2012. Ecosystem Marketplace.

Pham T.T., M. Brockhaus, G. Wong, L. Dung, J.S. Tjajadi, L. Loft, C. Luttrell and S. Assem-be Mvondo, 2013. Approaches to benefit sharing: A preliminary comparative analysis of 13 REDD+ countries. CIFOR, Bogor, Indonesia.

Redmond L. and F. Convery, 2015. The global carbon market mechanism landscape: pre and post 2020 perspectives. Climate Policy 15(5)647-669.

Rosenbaum K., D. Schoene and A. Mekouar, 2004. Climate Change and the Forest Sector: Possible National and Subnational Legislation. FAO Forestry Paper 144.

Smith P., M. Bustamante, H. Ahammad, H. Clark, H. Dong, E.A. Elsiddig and S. Bolwig, 2014. Agriculture, Forestry and Other Land Use (AFOLU). In Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the 5th Assessment Report of IPCC (pp. 811-922). Cambridge University Press.

UNEP, 2016. Emissions Gap Report. Available at: www.unep.org/publications/ebooks/emissionsgapreport/

Vonada R., T. Herbert and S. Waage, 2011. Introduction to payment for ecosystem ser-vices: a reference book for Uganda.

World Bank, 2016. Leaders Set Landmark Global Goals for Pricing Carbon Pollution. At: http://www.worldbank.org/en/news/pressrelease/2016/04/21/leaders-set-landmark-global-goals-for-pricing-carbon-pollution

World Bank, 2017. State and Trends of Carbon Pricing 2017. Report, Washington DC, 104p.

World Bank, 2016. State and Trends of the Carbon Market 2016. Available at: https://openknowledge.worldbank.org/handle/10986/25160.

Wunder S., 2005. Payments for environmental services. Some nuts and bolts. CIFOR, Bogor, Indonesia.

Yadoo A. and C. Heather, 2012. The role for low carbon electrification technologies in poverty reduction and climate strategies: A focus on renewable energy mini-grids with case studies in Nepal, Peru and Kenya. Energy Policy 42:591–602. Cambridge, UK.

Lead authors

Prof. Kokou Kouami
Director of the Master of Climate and Human Security, West African Science Service Centre on Climate Change and Adapted Land Use (WASCAL), University of Lome, Faculté des Sciences; BP 1515, Lomé, Domicile BP 80825 Lomé, Togo;
Tel (00) 228 90 02 04 11/ Dom. (00) 228 22 71 33 44 ; Email: kokoukouami@hotmail.com

Dr. Shem Kuyah
Lecturer, Botany Department; Jomo Kenyatta University of Agriculture and Technology, P.O. Box 62000-00200 Nairobi, Kenya;
Mob. +254-721-590-198; Email: kshem@jkuat.ac.ke, kuyashem@gmail.com

List of other contributors

Name and Institution of affiliation

Dr. Abasse Tougiani
Senior Research Scientist; National Institute for Agricultural Research of Niger (INRAN)
BP 429, Niamey, Niger;
Tel: +227 96970886;
Email: abasse.tougiani@gmail.com

Dr. Bayen Philippe
Lecturer; University of Dédougou;
Private Bag Burkina Faso;
Cel: 226-705-73-601; Email: phbayen@yahoo.fr

Prof. Busuyi Olasina Agbeja
University of Ibadan, Nigeria; Department of Social and Environmental Forestry
Faculty of Renewable Natural Resources;
13, Ijoma Street, University of Ibadan, Nigeria;
Email: olasinagbeja@yahoo.com; bo.agbeja@mail.ui.edu.ng

Prof. Alfred Opere
Chairman of Department of Meteorology, University of Nairobi, College of Biological and Physical Sciences, Department of Meteorology;
P.O. Box 30197-00100, GPO, Nairobi, Kenya;
Email: aopere@uonbi.ac.ke

Prof. Adjima Thiombiano
Université de Ouagadougou, Laboratoire de Biologie et Ecologie Végétales ;
03 BP 7021 Ouagadougou 03, Burkina Faso
Tel. +226 70 238261;
Email: adjima_thiombiano@yahoo.fr

Dr. Bamba Syalla
Head of Research Cluster: Climate Change and Climate Variability, West African Science Service Center on Climate Change and Adapted Landuse (WASCAL);
WASCAL Competence Center, Ouagadougou, Burkina Faso;
Tel: Office: (+226) 25 37 54 23/29/39; Cell: (+226) 76 76 53 85 (+226) 76 89 66 70,
E-mail: sylla.b@wascal.org; syllabamba@yahoo.fr

Mrs. Beatrice Kolie
Assistant Lecturer ; Centre d'Etudes et de Recherche en Environnement; Université de Conakry ;
Private Bag; Conakry, République de Guinée

Dr. Daud Kachamba;
Lecturer; Lilongwe University of Agriculture and Natural Resources (LUANAR);
Private Bag, Lilongwe;
Tel: +265 993 605154;
Email: dkachamba@gmail.com

Dr. Dan Guimbo Iro
Senior Lecturer; Faculté d'Agronomie, Université Abdou Moumouni (Niger);
Tel: (+227)96461038/90525602 ;
Email: danguimbo@yahoo.fr

Prof. Dan Lansana Kouruma
Centre d'Ètudes et de Recherche en Environnement; Université de Conakry République de Guinée
Email : dan_lansana@yahoo.fr

Dr. Darlington Chima Uzoma
Senior Lecturer; University of Port Harcourt; Department of Forestry and Wildlife;
Choba, P. M. B 5323; Nigeria;
Email: uzoma.chima@uniport.edu.ng

Dr. Dickson Makanji
Lecturer, Egerton University, Njoro Campus, Department of Natural Resources;
P.O Box 536 Egerton 20115, Kenya;
Mobile: +254. 0702115860;
Email: lmakanji@hotmail.com , lmakanji@yahoo.co.uk

Dr. Doris Mutta
Senior Programme Officer; African Forest Forum (AFF);
C/o World Agroforestry Center (ICRAF), United Nations Avenue; P.O. Box 30677-00100, Nairobi, Kenya;
Tel: +254 020 7224485; Fax: +254 020 7224001;
Email: D.mutta@cgiar.org

Dr. Godfrey Hampwaye
Senior Lecturer, The University of Zambia, Dept of Geography and Environmental Studies;
Great East road, P.O Box 32379, Lusaka, Zambia;
Tel: +260 211 290 603, Mobile:. +260-977 806 063;
Email. ghampwaye@unza.zm; hampwaye@yahoo.co.uk

Prof. Godwin Kowero
Executive Secretary; African Forest Forum (AFF);
C/o World Agroforestry Center (ICRAF), United Nations Avenue;
P. O. Box 30677 – 00100, Nairobi, Kenya;
Phone: +254207224203;
Email: G.kowero@cgiar.org

Prof. Eliakimu Zahabu
Department of Mensuration and Management ;
Sokoine University and Agriculture, Faculty of Forestry and Nature Conservation;
P.O. Box 3013 Chuo, Kikuu, Morogoro, Tanzania;
Email: zahabue@yahoo.com; zahabue@suanet.ac.tz

Mr. Emmanuel Seck
Programme Manager; ENDA - Energy Environment Development ;
Complexe SICAP Point E Bâtiment B; 1er étage Avenue Cheikh Anta Diop X Canal IV; Dakar, Senegal;
Tél : (221) 33 869 99 48/49;
Fax : (221) 33 860 51 33;
Email : se@endatiersmonde.org ; ssombel@yahoo.fr

Dr. Emmannuel Acheampong
Senior Lecturer,; Department of Silviculture and Forest Management; Faculty of Renewable Natural Resources; Kwame Nkrumah University of Science and Technology (KNUST)
Private Mail Bag, KNUST, Kumasi, Ghana
Tel: 0243412179;
Email: eacheampong.irnr@knust.edu.gh

Mr. Eric Christophe Bayala
Chef de service Ecovillages ; Direction Generale de l'economie; Vorte et du changement climatique
BP 7044, Ouagadougou, Burkina Faso;
Tel: 78914757 / 70650252;
Email: bayalaeric2@gmail.com

Dr. Eyob Tesfamariam
Lecturer; University of Pretoria; RM 5-15, Plant Sciences Complex;
Corner of Lynwood Rd & Roper St.; Hatfield 0028; South Africa;
Mobile:. +27-724597140;
Email: eyob.tesfamariam@up.ac.za

Dr. Franklin Joseph Opijah
Senior Lecturer; University of Nairobi; Chiromo Campus; Department of Meteorology;
P.O Box 30197-00100 ; Nairobi, Kenya;
Email: fopija@uonbi.ac.ke; fopijah@gmail.com; fopijah@yahoo.com

Prof. Jacob Mwitwa
University of Copper belt, School of Natural Resources, Zambia;
Cell: +260 977 848 462; Email: Jacob.mwitwa@gmail.com

Prof. John Nzioka Muthama
Deputy Director; Wangari Maathai Institute for Peace and Environmental Studies; University of Nairobi, College of Biological and Physical Sciences; Head of Climate Change; Department of Meteorology;
P.O. Box 15160-00100, GPO, Nairobi Kenya;
Email: jmuthama@uonbi.ac.ke; jnmuthama@gmail.com

Dr. Joshua Ngaina
Chairman, Meteorology Department, South Eastern Kenya University (SEKU);
P.O. Box 170-90200 , Kitui, Kenya;
Email: jngaina@gmail.com

Dr. Joyce Lepetu
Senior Lecture (Forest Sciences); Director, Centre of In Service and Continuing Education (CICE), Botswana University of Agriculture and Natural Resources (BUAN);
PB 0027; Gaborone, Botswana;
Tel: +267 3650396; +267 3650100; Cell: (00267) 75168163 ;
Email: jlepetu@bca.bw; jlepetu@yahoo.com

Dr. Jules Bayala
Principal Scientist - Sahel Ecosystems; World Agroforestry Centre (ICRAF) ; West and Central Africa Regional Office - Sahel Node;
BP E5118, Bamako, Mali;
Tel: +223 20 70 92 20; Mobile: +223 77 71 41 90;
Email: J.Bayala@cgiar.org

Prof. Kokutse Adzo Dzifa, Epse Kokou
University of Lomé; Department of Botany;
BP 80825; Lomé Togo;
Tel: 0022890865207;
Email: mimidam@hotmail.com

Dr. Kossi Adjonou
Université de Ouagadougou, Laboratoire de Biologie et Ecologie Végétales ;
03 BP 7021, Ouagadougou 03, Burkina Faso;
Tél: +226 70 23 82 61;
Email: adjima_thiombiano@yahoo.fr

Prof. Larwanou Mahamane
Senior Programme Officer and Head of Programmes Management Unit; African Forest Forum (AFF);
C/o World Agroforestry Center (ICRAF); United Nations Avenue; P.O. Box 30677–00100, Nairobi, Kenya;
Phone: +254207224624;
Email: M.larwanou@cgiar.org

Dr. Lizzie Mujuru
Senior Lecturer; Department of Environmental Science, Bindura University;
Private Bag 1020, Bindura, Zimbabwe;
Tel/Fax: +263 271-6505, cell:+263 712 220 651/263 730 352279/+263 735302279
Email: mujuru2004@yahoo.co.uk

Dr. Louis Sawadogo
Directeur de Recherche en Biologie et Ecologie Vegetales; CNRST/INERA;
03 BP 7047, Ouagadougou 03, Burkina Faso;
Tel: 70255877;
Email: sawadogo_ls@hotmail.com

Prof. Louis Zapfack
University of Yaounde 1, Faculty of Science, Department of Plant Biology;
P.O. Box 812, Yaounde, Cameroon;
Tel: +237-99-3396;
Email: lzapfack@yahoo.fr

Mr. Macarthy Afolabi Oyebo
Chair, Governing Council, African Forest Forum;
No. 3 Daniel Arap Moi Close; Off Maitama Sule Street, Asokoro; Abuja, Nigeria;
Email: fola31@gmail.com

Dr. Massaoudou Moussa
Research Scientist, National Institute for Agricultural Research of Niger;
BP 240, Maradi, Niger;
Email : massaoudmoussa@yahoo.fr

Prof. Nacro H. Bismark
University Nazi Boni of Bobo Dioulasso;
Tel: 70247825; Email: nacrohb@yahoo.fr

Prof. Paxie Chirwa
University of Pretoria; SAFCOL Forest Chair & Director, Postgraduate Forest Programme; RM 5-15, Plant Sciences Complex; Corner of Lynwood Rd & Roper St; Hatfield 0028; South Africa;
Tel +27(0)12 420 3213/3177; Cell +27(0)82 852 3386; Email: paxie.chirwa@up.ac.za
Alt Email: forestscience@up.ac.za;
Extraordinary Prof of Forest Science, Stellenbosch University

Dr. Paul Donfack
Programme Officer; African Forest Forum (AFF); C/o World Agroforestry Center (ICRAF), United Nations Avenue;
P.O. Box 30677-00100, Nairobi, Kenya;
Tel: +254 020 7224485;
Email: p.donfack@cgiar.org

Dr. Ouédraogo Issaka
Lecturer; Université de Ouagadougou; Laboratoire de Biologie et Ecologie Végétales;
03 BP 7021, Ouagadougou 03, Burkina;
Email: sonrenoma@yahoo.fr

Dr. Ouédraogo Amadé
Lecturer, Université de Ouagadougou; Laboratoire de Biologie et Ecologie Végétales;
03 BP 7021, Ouagadougou 03, Burkina Faso;
Email: o_amade@yahoo.fr

Prof. Rajoelison Lalanirina Gabrielle
Head Department of Water and Forestry; School of Agronomy; University of Antananarivo;
BP 175, Antananarivo, Madagascar;
Tel. +261 32 46 060 16; Email: g.rajoelison@yahoo.fr

Mr. Richard Banda
Principal, Zambia Forestry College; Ministry of Lands, Natural Resources and Environmental Protection
Private Bag 1, Mwekera; Kitwe, Zambia;
Tel. +260-212-252459; +260-212-251 460;
Mobile: +260-966 845 945;
Email: rbinda4@yahoo.com

Dr. Rodrigue Castro Gredomon
Head of Unit; Forest and People Livelihood Research Unit; Laboratoire de Bio-mathématiques et d'Estimations Forestières; University of Abomey-Calavi; Faculty of Agronomic Sciences;
04 P O. Box 1525, Cotonou, Benin;
Email: castro.gbedomon@fsa.uac.bj; gbedomon@gmail.com

Dr. Salamatou I. Abdourahamane
Senior Lecturer; University of Diffa;
BP 78 Diffa, Niger;
Tel: (00227) 90316959/ 96978635; Email: assalamat2@yahoo.com

Dr. Tajudeen Okekunle Amusa
Lecturer; University of Ilorin; Fac,. of Agriculture; Dept.of Forest Resources Management;
P.M.B 1515, Ilorin; Kwara State, Nigeria;
Tel: 08051750289; 07033831616;
Email: amusa.to@unilorin.edu.ng; teejayui@gmail.com

Dr. Vincent Onguso Oeba
Programme Officer; African Forest Forum (AFF) ; C/o World Agroforestry Center (ICRAF), United Nations Avenue; P.O. Box 30677–00100; Nairobi, Kenya;
Phone: +254207224000 Ext 4048;
Email: v.oeba@cgiar.org and vongusoeba@gmail.com

Dr. Wilson Kasolo
Executive Secretary; ANAFE; c/o World Agroforestry Centre (ICRAF); P.O. Box 30677-00100, Nairobi, Kenya;
Email: W.KASOLO@cgiar.org

Prof. Winston J. Akala
Dean School of Education, College of Education and External Studies, University of Nairobi;
P.O Box 30197-00100, Nairobi, Kenya,
Tel: 066-32117/32020/29, Cell: +254723432546,
Email: akala@uonbi.ac.ke; akalajumba@yahoo.com

Prof. Zac Tchoundjeu
Higher Institute of Environmental Sciences;
P.O Box 35460; Yaounde, Cameroon;
Phone: +237-677 707582;
Email: z.tchoundjeu@cgiar.org

Notes

African Forest Forum

A platform for stakeholders in African forestry

African Forest Forum
United Nations Avenue, Gigiri
P.O. Box 30677-00100
Nairobi, Kenya
Tel: +254 20 722 4203
Fax: +254 20 722 4001
Email: exec.sec@afforum.org

ISBN 978-9966-7465-6-6