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MINISTRY OF ENVIRONMENT,
PROTECTION OF NATURE AND
SUSTAINABLE DEVELOPMENT

FOREST LANDSCAPE RESTORATION OPPORTUNITIES ASSESSMENT

For Sub-National Landscapes of Cameroon:
Waza, Mbalmayo and Douala-Edea



October, 2021

Forest Landscape Restoration Opportunity Assessment

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Foreword, Ministry of Environment, Protection of Nature and Sustainable Development

The Restoration Initiative (TRI), is a Global Environment Facility (GEF) funded programme that brings together three agencies – Food and Agriculture Organization of the United Nations (FAO), the International Union for Conservation of Nature (IUCN), and UN Environment Programme (UNEP) to support the Bonn Challenge and regional initiatives in ten different countries from Asia and Africa by investing in the restoration of degraded land. Cameroon was privileged to harbor one of the eleven Child Projects of the TRI global programme. This project is part of Cameroon contribution to the African Forest Restoration Initiative (AFR100) and the Bonn challenge to which Cameroon pledge the restoration of 12,062,768 hectares of forests and degraded lands by 2030.

The project has been striving to support activities geared towards the improvement of Forest Landscape Restoration (FLR) policies, restoration of degraded lands, capacity building and communication on FLR processes using bamboo and Non Timber Forest Products (NTFPs). This outfits the vision outlined in the National Action Plan for the Fight against Desertification (PAN-LCD), National Strategic Framework for Forest and Landscape Restoration (NSFFLR), National Plantation Forest Development Programme (NPFDP) and the National Development Strategy (NDS 2020-2030) elaborated and implemented by the Government of Cameroon. More importantly, it contributes to the national efforts towards the attainment of the restoration pledge of Cameroon and livelihoods improvement of the population through poverty reduction, food security, job creation and economic growth which are crucial to attain the 2035 emerging vision of the Head of the State.

In Cameroon, the pressure on land and natural resources is increasing, due to continuous destruction of ecosystems for subsistence needs; fuel wood, grazing, logging and expansion of development projects. In order to reinforce ongoing restoration effort, Cameroon has opted to experiment the Restoration Opportunities Assessment Methodology (ROAM) as a tool for FLR planning in the Waza, Mbalmayo and Douala - Edea landscapes As a tool to better implement the restoration activities. The current ROAM assessment Report defines ways by which participatory restoration could be encouraged in order to improve the health of ecosystems while improving the livelihoods of the local communities in the three degraded landscapes.

I wish to take this opportunity therefore to affirm the Government of Cameroon's commitment to support the implementation of the findings and recommendations outlined in this ROAM report. We are deeply grateful to the GEF, IUCN and INBAR for the financial, material, technical and human resources mobilized for the elaboration of this report.

We look forward to continue partnerships towards the realization of a national level ROAM assessment that could efficiently support the attainment of Cameroon's restoration commitment.

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List of Acronyms/ Abbreviations

ANAFOR	Agence National d'Appui au Développement Forestier
CADEPI	Cellule d'Appui au Développement local Participatif Intégré
CCNUCC	Convention-cadre des Nations Unies sur les changements climatiques
CDN	Contributions déterminées au niveau national
CTD	Collectivités territoriales décentralisées
FAO	Food and Agriculture Organization of the United Nations
FEM	Fonds pour l'Environnement Mondial
FLEGT	L'accord de partenariat volontaire
FLR	Forest landscape restoration
FODER	Forêts et Développement Rurale
INBAR	International Bamboo and Rattan Organisation
IRAD	Institut de Recherche Agricole pour le Développement
kha	Thousands hectares
Mha	Million hectares
MINADER	Ministère de l'Agriculture et du Développement Rural
MINDCAF	Ministère des Domaines, du Cadastre et des Affaires Foncières
MINDDEVEL	Ministère de la Décentralisation et du Développement Local
MINEPAT	Ministère de l'Économie, de la Planification et de l'Aménagement du Territoire
MINEPDED	Ministère de l'Environnement, de la Protection de la Nature et du Développement Durable
MINEPIA	Ministère de l'Élevage, des Pêches et des Industries Animales
MINFOF	Ministère Des Forêts et de la Faune
MINIMIDT	Ministère des mines, de l'Industrie et du Développement Technologique
MINRESI	Ministère de la Recherche Scientifique et de l'Innovation
NEPAD	Nouveau Partenariat pour le Développement de l'Afrique
NTFP	Non-Timber Forest Product
PFNL	Produit Forestier Non Ligneux
PNDP	Programme National de Développement Participatif
PNIA	Programme National d'Investissements Agricoles
PLADDT	Plans Locaux d'Aménagement et de Développement Durable de Territoire
REDD+	Réduire les émissions de GES dues à la déforestation et à la dégradation des forêts
RPF	Restauration des paysages forestiers
SNADDT	Schéma national d'Aménagement et développement Durable du territoire
SND30	Stratégie Nationale de Développement pour la période 2020-2030
SNDSR	Stratégie nationale de développement du secteur rural
SODECOTON	Société de Développement du Coton
SRADDT	Schéma régional d'aménagement et de Développement durable du Territoire
TRI	The Restoration Initiative
UICN / PACO	Union Internationale pour la Conservation de la Nature / Programme Afrique Centrale et Occidentale
UNFCCC	United Nations Framework Convention on Climate Change
UNCCD	United Nations Convention on Combating Desertification
WRI	World Resource Institute
ZNAT	Plan de Zonage National

Executive summary

Cameroon's forests are important locally, regionally and globally by virtue of diverse environmental services they provide. However, these forests are exposed to several threats accelerating its degradation. The degradation of forests is a threat to both the functioning of ecosystems and the well-being of local communities. Cameroon has lost 708kha of its humid primary forest from 2001 to 2020, making up 48% of its total tree cover loss in the same time period. In Waza landscape in particular, Agriculture is the main factor of deforestation accounting for about 88%, followed by the cattle and sheep livestock (11%) then the wood energy and charcoal production accounts for only 1%. In the Mbalmayo and Douala-Edea landscapes, the deforestation increased by 50% between 2005 -2015. Total deforestation between 2001 and 2015 reached 208,800 hectares, about 3% of forest cover in 2000. Nearly two-thirds of the deforestation is in four departments: Sanaga-Maritime, Ocean, Moungo and Nyong and Kellé.

To reverse the aforementioned drivers of degradation in the three landscapes and accrue the multiple benefits that come with a functional landscape, Cameroon made a commitment to restore about 12 million hectares of deforested and degraded land, a pledge towards the Bonn Challenge which is a global effort intended to restore 150 million hectares of the World's deforested and degraded land by 2020 and 350 million hectares by 2030. In line with this commitment, Cameroon through the Ministry of Environment, Protection of Nature and Sustainable Development (MINEPDED) has received one of the twelve Child Projects of The Restoration Initiative (TRI) funded by the Global Environment Facility (GEF) and is being implemented by International Union for Conservation of Nature (IUCN), the International Bamboo and Rattan Organisation (INBAR), the Food and Agriculture Organization of the United Nations (FAO) and the UN Environment Programme (UNEP). The project also contributes to other efforts including the New York Declaration on Forests, and other local restoration priorities. TRI project is being implemented in the three sub-national landscapes of Cameroon named Waza, Mbalmayo, and Douala-Edea.

In order to identify deforested and degraded lands, the project used the Restoration Opportunities Assessment Methodology (ROAM). ROAM uses geospatial techniques to quantify the restoration opportunity areas, and rapid restoration diagnostic approach to identify restoration options that offer multiple benefits. The entry point consists of understanding the landscape challenges, degradation drivers, and define the restoration objectives. The restoration interventions are selected based on economic and financial analysis and the best restoration options are those with a positive Net Present Value (NPV) and competitive return on investment at a pre-defined discount rate and a time period of production. Rapid restoration diagnostic appraisal is also used to assess the success factors of restoration implementation as well as determine enabling institutional and policy conditions for the sustainability of restoration investments. Key findings are summarized as follow:

Landscape challenges

Waza landscape being located in the degraded Sudano-Sahelian savannah zone is threatened by deforestation, bush fires, biodiversity loss, human-wildlife conflict, lack of community integration in the conservation of Waza National Park, population growth, lack of infrastructure development, ineffective land-use planning, insufficient implementation of management policies and coordination mechanisms. Poverty, and lack of alternative livelihoods are the major drivers of degradation in Waza landscape.

Mbalmayo landscape is rather challenged by the rapid growth of urbanization, rural migration, shifting cultivation, deforestation and biodiversity loss, Land and water scarcity and soil fertility depletion causing low agricultural productivity. Underlying degradation forces are fundamental social processes, such as human population dynamics, agricultural practices, limited availability of jobs, and lack of alternative livelihoods. Linking Communities, conservation, and livelihoods is key to sustainable forest management and restoration of degraded forest reserves in Mbalmayo landscape.

The population pressure in Douala-Edea landscape has consequently led to uncontrolled exploitation of resources and encroachment into the conservation areas – which is amplified by insufficient law enforcement by the local administration. However, the issue of the encroachment in Lake Ossa wildlife reserve by Agro-industrial expansion is more complex and falls within the spheres of the central state. Land is very scarce and communities tend to extend their activities inside conservation areas, which to date do not have a development plan.

Current state on land use and forest landscape degradation

Out of 671,087 hectares of Waza landscape, tree savannah is dominant (37.96%), followed by grass and shrub savannah/agricultural plantation (31.09%) and wet savannah (14.86%). The domain of shrubs occupies about 4.26%, wooded savannah (7.81%), degraded savannah (2.32%), and Water (mostly temporal streams) covers about 1.70% of the total landscape area. The dynamics of the Waza landscape have considerably contributed to the extensive degradation of its woody cover. Shrubland tremendously decreased of about 18.6% from 153,374 hectares to 28,605 hectares i.e., almost a reduction of 2% every year. The environment being that of savannah, its degradation is currently 0.78% per year between 2010 and 2020. This rate is 3.80% for wooded savannah, 1.49% humid savannah and 0.43% for shrub savanna. This changes for the benefit of degraded savannah and agricultural fields is about 3.11% per year.

The landscape of Mbalmayo with 361,924 hectares, still holds 52.7% of its forest area of which 18.4% of secondary forest. It is also highly anthropogenic with 25.4% agricultural space and 2.1% urbanized space. Mbalmayo landscape also holds the domain of humid forests (0.98%) and large rivers (0.36%). Its peculiarity is that it is close to the urban center of Yaoundé and constitutes a production center for its food which justifies nearly 43.85% of degraded forest. Land use of Mbalmayo landscape is marked by the presence of the Parc de la Mefou (1,101ha) of the forest reserves of Mbalmayo (8,162ha) and Zamakoé (4,220ha) as well as 5 community forests (29,101ha) which barely occupy 11.62 % of the

landscape. The community forests are in full threat with the expansion of agricultural activities and urbanization. The deforestation rate between 2010 and 2020 is 5.27% per year with an increase of 2.54% in the rate of extension of agricultural fields per year. Degraded forests bill of lading a rate of change of 1.84% per year.

The dense forest in Mbalmayo decreased of about 7.6% over ten years from 218,949 hectares to 190,774 hectares i.e., almost a reduction of 0.8% every year. Similarly, Secondary forest has also been reduced from 24,725 ha to 16,493 ha, about a reduction of 2.2% over a decade (2010-2020).

The landscape of Douala-Edea has an area of 371,612 hectares of which about 24,498 hectares are dense mangroves, and 8,950 hectares are degraded mangrove areas. The dense forest occupies about 142,758 hectares while degraded forest is amounting to 54,280 hectares. The human activities are: agro-industrial plantations which occupy about 35,407 hectares (9.57%), farmland extends to 58,162 hectares (15.7%) and urban centres/villages cover about 20,910 with (5.6%). About the changes in Douala-Edea landscape, between 2010 and 2020, there was a loss of 13.7% of dense forests and a loss of 10% of mangrove areas while farmland has increased by about 11.4%. Agro-industry plantations have also increased up to 8.8% of their original land in 2010. The degradation of forests continues to increase up to 6.4%. An annual reduction is estimated to be 2% for the natural forests and and mangrove combined.

Restoration interventions and opportunity areas

Six broad restoration interventions have been identified by stakeholders and communities; that could be used to improve the ecological and economic productivity of degraded land uses in the three landscapes:

1. Agroforestry on flat or gently sloping land, including those areas principally managed as pasture and rangelands
2. Agroforestry on steep sloping land in conjunction with other soil conservation measures such as contour bank terraces or benches
3. Improved management and rehabilitation of existing, community forests and council forests
4. Protection and restoration of existing areas of forest reserves, and restoration of degraded protected areas in or around national parks
5. Establishment or improvement of protective forests on important and sensitive sites such as very steep sloping land (>55%), riparian zones and wetland buffer zones and margins, creation of roadside forests, urban trees in concentrated camps. The opportunity areas for protective forests are estimated to 203,768 hectares in Waza,
6. Restoration of degraded mangrove forests (particularly to Douala-Edea landscape)

The geospatial analysis showed that in Waza landscape, agroforestry represents 231,747.5 hectares, creation of protective forests on steeply sloping and rocky areas represents 1,770 hectares, riparian buffers 142,262 hectares, the roadside forests, public spaces, and schools represent 9,591 hectares, and finally urban areas or village centers

59,232.36 ha.

For Mbalmayo, opportunity areas for agroforestry were estimated to 48,903 hectares, opportunity areas for improved management of community forests and forest reserve covers about 47,792 hectares. Protective forests areas are estimated to 101,502 hectares of which about buffer of water bodies alone covers about 72,871 ha. Trees planting on populated areas of 7,619 hectares.

In Douala-Edea, the restoration opportunity areas for agroforestry is estimated to 101,160 hectares while the restoration of degraded mangrove areas is estimated to 8,950 hectares. Protected forest areas are part of the restoration potential in the landscape. They are more concerned with assisted natural regeneration (47,988 hectares) and restoration council forests by planting forest species preferably indigenous species in the degraded zones covering about 54,193 hectares. Protective forests areas in Douala-Edea landscape are estimated to 56,909 hectares of which buffer of water bodies alone covers about 37,893 hectares, riparian buffers covers 3,114 hectares and trees planting on roads and in populated areas represents about 15,902 hectares.

Selection of restoration models -Cost-Benefits analysis

The restoration assessment covers also the economic and financial analysis in order to estimate the costs and benefits of restoring degraded land. A model of each land use and restoration intervention is created by combining the results from the ecological modeling with market prices and an enterprise budget that accounted for the direct and indirect financial costs of restoring the land. The time horizon for analysis is 25 years, the analysis is done per hectare for the different models and the discount rate is 10% for the calculation of net present value (NPV).

1. Neem in Waza landscape is very profitable from the point of view of all profitability indicators (NPV=8,252\$ per hectare; IRR=21.4%). It explains the perseverance of neem plantations in the Waza landscape despite its negative impact on soil fertility.
2. By continuing to carry out selective removing of trees in replacement with the cocoa plantation in Mbalmayo landscape, the farmers obtain substantial income (NPV=3,699\$ per hectare; IRR=36.4%). However, this planting model cannot continue as it put pressure on other trees in the forest. However, the community showed a strong interest in growing cocoa without clearing existing trees.
3. With the presence of two large agro-industrialists (SAFACAM and SOCAPALM) in Douala-Edea landscape, the communities have embarked on the cultivation of oil palm with certain outlets. However, large-scale plantations are increasingly criticized by populations who are waiting for alternatives to meet their needs in terms of wood products (firewood) and food. At current state, large scale oil palm are profitable (NPV=2,416\$ per hectare; IRR=22.81 %)
4. Agroforestry plantation (maize - peanuts - prosopis) in Waza landscape is slightly profitable (NPV=305\$ per hectare; IRR=13,74%). Maize and peanuts are planted and

harvested in years 1 and 2, thereafter the plantation is dedicated to prosopis only which will produce firewood and fodder for the livestock. In Mbalmayo, Agroforestry systems based on Cocoa -Ndo'o association is more profitable (NPV=3,181US\$, IRR=30.23%) while in Douala-Edea, agroforestry based on macabo - pistachio - ndo'o has a NPV of 1,136 US\$ and IRR close to 40%.

5. Although the establishment of a plantation on degraded mountains (millet - acacia) is not much profitable (NPV=192\$ per hectare; IRR=11.5%), there are non-monetary values associated with this restoration intervention.
6. Restoration of degraded community forests takes into account both the productive and conservation forests. Forests are restored by multiple-use species such as acacia, balanitis and prosopis and this restoration option is highly profitable (NPV=3,708.25 \$ per hectare; IRR=18.98 %).
7. The restoration of national parks and reserves appears to be the least profitable plantation model (NPV=-531\$ per hectare; IRR=8.12% for Waza National Park, and IRR = 19.42% and NPV = 352,055 FCFA for Douala-Edea Park and the Mbalmayo reserve). This is because the restoration here is primarily done for conservation purposes. Moreover, for the community of Waza landscape, they will be able to benefit from the services offered by these species, such as gum arabic and fodder.
8. The protection of the water bodies with creation buffer forests beyond the ecological interest, they also present as a very profitable plantation model. (NPV= 2,553 \$ per hectare and IRR=24.2% in Waza and NPV=4908.21 \$ and IRR=24.2% for Mbalmayo and Douala-Edea landscapes).
9. It is worth highlighting the results of Carbon sequestered in the different forest landscapes according to the selected restoration options. Restoring community forests using Acacia trees would store an additional 113.5 million tons of CO₂e. The restoration of Waza National Park and its peripheral area could help sequester around 110.7 million tons of CO₂e. Reforestation of degraded mountains with acacia would store an additional 1.7 million tons of CO₂e. Converting traditional agriculture to agroforestry systems (maize-prosopis for example) would store additional 42 million tons CO₂e. For Mbalmayo, restoring degraded forests and agricultural land with Irvingia could store around 85 million tons of CO₂e. Restoring community forests using Irvingia and Cocoa would store an additional 3 million tons of CO₂e. While the restoration of the peripheries of watercourses could help sequester around 130 million tons of carbon. For Douala-Edea landscape, Restoring degraded mangroves would store around 32 million tonnes of CO₂e. The restoration of degraded forests with the Irvingia species would store around 2.78 million tonnes of carbon. Restoring Irvingia and Cocoa forest landscapes would store around 19.66 million tonnes of CO₂e. Restoration river buffers with bamboo in the vicinity of the ponds would store 40.45 million tonnes of CO₂e. The monetary opportunities associated with the restoration of the various zones are 11.5 billion for the restoration of degraded forests reserves, 81.05 billion for the restoration of large-scale agro-industrial areas, 166 billion for the

restoration of the peripheries of rivers and rivers and 133.19 billion for the restoration of mangroves.

Enabling Environment for FLR implementation

The recommendations have been formulated for better coordinated FLR actions:

1. Social and gender aspects are key in FLR assessment and implementation of results. There are successful stories in Waza landscape where Women are taking the lead in restoration and value chain management of FLR products. The main products concerned in waza landscape are: neem oil, baobab juice and powder, balanites oil, acacia gum tamarind juice and syrup and moringa powder. Men and women each have a role to play in the restoration of the landscape of Mbalmayo, while in Douala-Edea landscape, in the fishing camps, the mangrove tree (matanda) is used by women to smoke fish and men working on the woods used in making canoes.
2. Land tenure system were also analysed and some land related factors were highlighted in order to facilitate FLR investments: Accelerating and finalizing the national and regional land-use planning process, securing the rights of actors on land both on customary rights on the national domain as well as in classified forests; enhancing participatory land management structures at the landscape and village level; awareness and education of traditional authorities and populations is essential to encourage men to grant substantial land rights to women.
3. Cameroon has several sectoral policies and laws relevant to forest landscape restoration (FLR) whose harmonization and alignment with the requirements of the FLR process will ensure its success.
4. Because of the cross-cutting, multidisciplinary and inclusive nature of the FLR initiative, and the "landscape" approach it advocates for several sectors whose fields of action lie in the areas concerned by the forest and the open land will contribute significantly to the success of the FLR.
5. The role of Communities in the implementation of FLR activities should be strengthened. If support mechanisms throughout the process are to be put in place, communities must play their part. They can easily contribute to the production of a local seed and plant production chain, as well as to watering. Funds from the sale of these plants could be capitalized, among other things, for the maintenance of the plots.

Résumé

Les forêts du Cameroun sont importantes aux niveaux local, régional et mondial en raison des divers services environnementaux qu'elles fournissent. Cependant, ces forêts sont exposées à plusieurs menaces accélérant sa dégradation. La dégradation des forêts est une menace à la fois pour le fonctionnement des écosystèmes et le bien-être des communautés locales. Le Cameroun a perdu environ 708 milles hectares de sa forêt primaire humide de 2001 à 2020, ce qui représente 48% de la perte totale de sa couverture arborée au cours de la même période. Dans le paysage de Waza en particulier, l'agriculture est le principal facteur de déforestation représentant environ 88%, suivie par l'élevage bovin et ovin (11%) puis la production de bois énergie et charbon de bois ne représente que 1%. Dans les paysages de Mbalmayo et Douala-Edea, la déforestation a augmenté de 50 % entre 2005-2010 et 2010-2015. La déforestation totale entre 2001 et 2015 a atteint 208 800 hectares, soit environ 3% du couvert forestier en 2000. Près des deux tiers de la déforestation se situent dans quatre départements : Sanaga-Maritime, Océan, Moungo et Nyong et Kellé.

Pour inverser les facteurs de dégradation susmentionnés dans les trois paysages et accumuler les multiples avantages qui accompagnent un paysage fonctionnel, l'évaluation de la restauration des paysages forestiers (RPF) fournit un outil pour quantifier les zones d'opportunité de restauration, les options de restauration adaptées à de multiples avantages. La RPF constitue un processus à long terme de récupération de la fonctionnalité écologique et d'amélioration du bien-être humain dans les paysages déboisés ou dégradés. Il est réalisé pour construire un paysage forestier qui peut améliorer la conservation de la biodiversité, le fonctionnement écologique et les moyens de subsistance.

Le Cameroun s'est engagé à restaurer environ 2 millions d'hectares de terres déboisées et dégradées, comme un engagement envers le Défi de Bonn - un effort mondial visant à restaurer 150 millions d'hectares de terres déboisées et dégradées dans le monde d'ici 2020 et 350 millions d'hectares d'ici 2030. Conformément à cet engagement, le Cameroun à travers le Ministère de l'Environnement, de la Protection de la Nature et du Développement Durable (MINEPDED) a reçu l'un des douze Projets Enfant de "The Restoration Initiative" (TRI) financés par le Fonds pour l'Environnement Mondial (FEM) et est mis en œuvre par Union Internationale pour la Conservation de la Nature (UICN), l'Organisation internationale du Bambou et du Rotin (INBAR), l'Organisation des Nations Unies pour l'Alimentation et l'Agriculture (FAO) et le Programme des Nations Unies pour l'Environnement (PNUE). Le projet contribue également à d'autres efforts, notamment la Déclaration de New York sur les forêts et d'autres priorités locales de restauration de paysages dégradés. Le projet est mis en œuvre dans les trois paysages sous-nationaux du Cameroun nommés Waza, Mbalmayo et Douala-Edea.

Afin d'identifier les terres déboisées et dégradées et les parties prenantes à restaurer, le projet a utilisé la méthodologie d'évaluation des opportunités de restauration (MEOR). Le point d'entrée est de comprendre le système de paysage à traiter – les principaux défis,

les facteurs de dégradation, de définir les objectifs et les résultats de la restauration. Deuxièmement, identifiez les zones d'opportunité de restauration. Les outils SIG sont utilisés pour extraire les zones dégradées dans les paysages, en utilisant les parties prenantes et les consultations communautaires, l'intervention de restauration est sélectionnée dont l'analyse économique et financière est appliquée afin de sélectionner la meilleure intervention de restauration avec une valeur actuelle nette (VAN) positive et retour sur investissement compétitif à un taux d'actualisation prédéfini et une période de temps de production. Enfin, l'évaluation diagnostic rapide de la restauration est également utilisée pour évaluer les facteurs de réussite de la mise en œuvre de la restauration ainsi que pour déterminer les conditions institutionnelles et politiques. L'évaluation des paysages a abouti aux résultats et conclusions résumées comme suit :

Défis dans les paysages cible

Situé dans la région de l'extrême nord du Cameroun et dans la zone de savane soudano-sahélienne dégradée, le paysage de Waza est menacé par la faible pluviométrie, la déforestation, les feux de brousse, la perte de biodiversité, les conflits homme-faune à cause de l'insuffisance du pâturage, le manque d'intégration communautaire dans la conservation du parc national de Waza, la croissance démographique, le développement des infrastructures faible, une planification inefficace de l'utilisation des terres, une mise en œuvre insuffisante des politiques de gestion et des mécanismes de coordination des activités de restauration, le manque de moyens de subsistance alternatifs sont les principaux moteurs de la dégradation du paysage de Waza.

Le paysage de Mbalmayo est plutôt mis à l'épreuve par la croissance rapide de l'urbanisation et le développement des infrastructures, la culture itinérante, la déforestation et la perte de biodiversité, la pauvreté et l'exode rural, la rareté des terres et de l'eau ainsi qu'une faible productivité agricole. Les forces motrices sous-jacentes sont des processus sociaux fondamentaux, tels que la dynamique de la population humaine, les pratiques agricoles, la disponibilité limitée d'emplois et les alternatives. Les communautés, la conservation et les moyens de subsistance est la clé de la gestion durable des forêts et de la restauration des forêts dégradées dans le paysage de Mbalmayo.

La pression démographique dans le paysage Douala-Edea a par conséquent conduit à une exploitation incontrôlée des ressources et à un empiètement sur les zones de conservation - qui est amplifié par une application insuffisante de la loi par l'administration locale. Cependant, la question de l'empiètement dans la réserve de faune du lac Ossa par l'expansion agro-industrielle est plus complexe et relève des sphères de l'État central. Très peu de terres sont disponibles et les communautés ont tendance à étendre leurs activités à l'intérieur des zones de conservation, qui à ce jour n'ont pas de plan de développement favorables à la durabilité des investissements de restauration.

Etat des lieux sur les utilisations des terres et la dégradation de paysages forestiers de Waza, Mbalmayo et Douala-Edea

Le paysage de Waza a une superficie de 671 087 ha. L'analyse de couverture des sols en 2020 montre qu'il est le domaine de la savane arbustive (4.26%), de la savane arborée (37.96%), de la savane boisée (7.81%) la savane dégradée (2.32%), la savane herbeuse/plantation agricoles (31.09% et la savane humide (14.86%). L'eau, bien qu'en majorité non permanente y représente 1.70%. La dynamique du paysage de Waza y a considérablement contribué à la dégradation poussée de sa couverture ligneuse. Le milieu étant celui de savane, sa dégradation est actuellement de 0.78% par an entre 2010 et 2020. Ce taux est de 3.80% pour la savane boisée, 1.49% savane humide et 0.43% pour la savane arbustive. Toutes ces dynamiques au profit de la savane dégradée/champs est de 3.11% par an

Le paysage de Mbalmayo, 361 924 ha, détient encore 52.71% de sa superficie forestière avec 18.41% de forêt secondaire. Il est aussi fortement anthropique avec 25.44% d'espace agricole et 2.10% d'espace urbanisé. C'est aussi le domaine des forêts marécageuses (0.98%) et des grands cours d'eau (0.36%). Sa particularité est qu'il est proche du centre urbain de Yaoundé et constitue un centre de production en matière de bois de chauffe, de bois d'œuvre et d'alimentation ce qui justifie près de 43.85% de forêt dégradées.

L'occupation des terres sur le paysage est marquée par la présence du Parc de la Mefou (1101ha) des réserves forestières de Mbalmayo (8162ha) et de Zamakoé (4220ha) ainsi que de 5 forêts communautaires (29 101ha) qui occupent à peine 11.62% du paysage. Ces derniers sont menacés par l'extension des activités agricoles et la forte urbanisation. Le taux de déforestation entre 2010 et 2020 est de 5.27% par an avec une augmentation de 2.54% sur le taux d'extension des champs agricoles par an. Les forêts dégradées connaissent un taux d'évolution de 1.84% par an.

Le paysage de Douala-Edea a une superficie de 371 612 hectares dont environ 24 498 hectares de mangroves denses et 8 950 hectares de zones de mangroves dégradées. La forêt dense occupe environ 142 758 hectares tandis que la forêt dégradée s'élève à 54 280 hectares. Les activités humaines sont : les plantations agro-industrielles qui occupent environ 35 407 hectares (9,57 %), les terres agricoles s'étendent sur 58 162 hectares (15,7 %) et les centres urbains/villages couvrent environ 20 910 hectares (5,6 %). Concernant les changements dans le paysage de Douala-Edea, entre 2010 et 2020, il y a eu une perte de 13,7% des forêts denses et une perte de 10% des zones de mangrove tandis que les terres agricoles ont augmenté d'environ 11,4%. Les plantations agro-industrielles ont également augmenté jusqu'à 8,8% de leurs terres d'origine en 2010. La dégradation des forêts continue d'augmenter jusqu'à 6,4%. Une réduction annuelle est estimée à 2% pour les forêts naturelles et la mangrove combinées.

Types d'interventions et zones d'opportunité de restauration

Six grandes interventions de restauration ont été identifiées par les parties prenantes et les communautés ; qui pourraient être utilisées pour améliorer la productivité écologique et économique des utilisations des terres dégradées dans les trois paysages :

1. Agroforesterie sur des terres plates ou en pente douce, y compris les zones gérées

principalement comme pâturages et parcours

2. Agroforesterie sur des terres à forte pente en conjonction avec d'autres mesures de conservation des sols telles que des terrasses ou des bancs de courbe de niveau ;
3. Amélioration de la gestion et de la réhabilitation des forêts communautaires existantes et des forêts communales
4. Protection et restauration des zones existantes des réserves forestières, et restauration des zones protégées dégradées dans ou autour des parcs nationaux
5. Etablissement ou amélioration de forêts de protection sur des sites importants et sensibles tels que terrains en pente très raide (>55%), zones riveraines et zones tampons et marges humides, création de forêts en bordure de route, arbres urbains en agglomérations.
6. Restauration des forêts de mangrove dégradées (en particulier dans le paysage Douala-Edea)

Il ressort de l'analyse géospatiale que dans le paysage de Waza, l'agroforesterie représente 231 747,5 hectares, la création de forêts de protection sur les zones à forte pente et rocheuses couvre une superficie d'environ 1 770 hectares, les zones tampons riveraines de 142 262 hectares, les forêts en bordure de route, les espaces publics et les écoles représentant 9 591 hectares, et enfin les zones urbaines ou centres villageois 59 232,36 ha.

Pour Mbalmayo, les zones d'opportunité pour l'agroforesterie ont été estimées à 48 903 hectares, les zones d'opportunité pour une meilleure gestion des forêts communautaires et la réserve forestière couvrent environ 47 792 hectares. Les zones de forêts de protection sont estimées à 101 502 hectares dont environ la zone tampon des cours et de plan d'eau couvre à elle seule environ 72 871 ha. Plantation d'arbres sur des zones habitées s'étend sur 7 619 hectares.

A Douala-Edea, les zones d'opportunité de restauration pour l'agroforesterie sont estimées à 101 160 hectares tandis que la restauration des zones de mangroves dégradées est estimée à 8 950 hectares. Les zones forestières protégées font partie du potentiel de restauration du paysage. Ils sont plus concernés par la régénération naturelle assistée (47 988 hectares) et la restauration des forêts communales en plantant des espèces forestières de préférence indigènes dans les zones dégradées couvrant environ 54 192,59 hectares. Les zones de forêts de protection dans le paysage de Douala-Edea sont estimées à 56 909 hectares dont la zone tampon des plans d'eau couvre à elle seule environ 37 893 hectares, les zones tampons riveraines couvrent 3 114 hectares et les plantations d'arbres sur les routes et dans les zones peuplées représentent environ 15 902 hectares.

Sélection de modèles de restauration - Analyse coûts-bénéfices

L'évaluation de la restauration couvre également l'analyse économique et financière afin d'estimer les coûts et les avantages de la restauration des terres dégradées. Un modèle de chaque intervention d'utilisation et de restauration des terres est créé en combinant les résultats de la modélisation écologique avec les prix du marché et un budget d'entreprise qui prend en compte les coûts financiers directs et indirects de la restauration des terres. La période de l'analyse est de 25 ans, l'analyse se fait par hectare pour les différents modèles et le taux d'actualisation est de 10 % pour le calcul de la valeur actuelle nette (VAN) et Taux de rentabilité interne (TRI). L'analyse tient compte tout d'abord de la situation sans restauration scénario « business as usual » pour calculer la valeur marginale de chacune des interventions. Sans restauration à Waza, les paysans continueront à reboiser avec le Nimier. A Mbalmayo, les paysans se concentreront sur la cacaoculture alors qu'à Douala-Edéa il s'agira de la culture du palmier à huile. Dans le cadre de restauration les bénéfices ont été estimés comme suit :

1. Le Nimier dans le paysage de Waza est très rentable du point de vue de tous les indicateurs de rentabilité (VAN=8 252\$ par hectare ; TRI=21,4%). Elle explique la persévérance des plantations de Nimier dans le paysage de Waza malgré son impact négatif sur la fertilité des sols.
2. En continuant à procéder à l'abattage sélectif des arbres en vue de la mise en place des plantations de cacao dans le paysage de Mbalmayo, les agriculteurs obtiennent des revenus substantiels (VAN=3699\$ par hectare ; TRI=36,4%). Cependant, ce modèle de plantation ne peut pas continuer car il met la pression sur les autres arbres de la forêt. Cependant, la communauté a montré un vif intérêt pour la culture du cacao sans défricher les arbres existants.
3. Avec la présence de deux grands agro-industriels (SAFACAM et SOCAPALM) dans le paysage Douala-Edea, les communautés se sont lancées dans la culture du palmier à huile avec certains débouchés. Cependant, les plantations à grande échelle sont de plus en plus critiquées par les populations qui attendent des alternatives pour répondre à leurs besoins en matière de produits ligneux (bois de feu) et d'alimentation. A l'état actuel, les palmiers à huile à grande échelle sont rentables (VAN=2,416\$ par hectare ; TRI=22,81 %)
4. La plantation agroforestière (maïs - arachide - prosopis) dans le paysage de Waza est peu rentable (VAN=305\$ par hectare ; TRI=13,74%). Le maïs et les arachides sont plantés et récoltés dans les années 1 et 2, par la suite la plantation est dédiée uniquement aux prosopis qui produiront du bois de chauffage et du fourrage pour le bétail. A Mbalmayo, les systèmes agroforestiers basés sur l'association Cacao -Ndo'o sont plus rentables (VAN=3.181US\$, TRI=30,23%) tandis qu'à Douala-Edea, l'agroforesterie basée sur l'association macabo - pistache -ndo'o a une VAN de 1.136 US \$ et TRI proche de 40 %.
5. Bien que l'établissement d'une plantation sur des montagnes dégradées (mil - acacia) ne soit pas très rentable (VAN = 192\$ par hectare ; TRI = 11,5 %), il existe des valeurs non monétaires associées à cette intervention de restauration.

6. La restauration des forêts communautaires dégradées prend en compte à la fois les forêts de production et de conservation. Les forêts sont restaurées par des essences à usages multiples telles que l'acacia, la balanite et le prosopis et cette option de restauration est très rentable (VAN = 3 708,25 \$ par hectare ; TRI = 18,98 %).
7. La restauration des parcs nationaux et réserves apparaît comme le modèle de plantation le moins rentable (VAN=-531\$ par hectare ; TRI=8,12 % pour le parc national de Waza, et TRI = 19,42 % et VAN = 352 055 FCFA pour le parc Douala-Edea et la réserve de Mbalmayo). En effet, la restauration ici est principalement effectuée à des fins de conservation. De plus, pour la communauté du paysage de Waza, ils pourront bénéficier des services offerts par ces espèces, tels que la gomme arabique et le fourrage.
8. La protection des plans d'eau avec la création de forêts tampons au-delà de l'intérêt écologique, elles se présentent aussi comme un modèle de plantation très rentable. (VAN= 2 553 \$ par hectare et TRI=24,2% à Waza et VAN=4908,21 \$ et TRI=24,2% pour les paysages de Mbalmayo et Douala-Edea).
9. Il convient de souligner les résultats du Carbone séquestré dans les différents paysages forestiers selon les options de restauration choisies. La restauration des forêts communautaires à l'aide d'acacias permettrait de stocker 113,5 millions de tonnes supplémentaires de CO₂e. La restauration du parc national de Waza et de sa zone périphérique pourrait aider à séquestrer environ 110,7 millions de tonnes de CO₂e. Le reboisement des montagnes dégradées avec de l'acacia stockerait 1,7 million de tonnes de CO₂e supplémentaires. La conversion de l'agriculture traditionnelle vers des systèmes agroforestiers (maïs-prosopis par exemple) stockerait 42 millions de tonnes de CO₂e supplémentaires. Pour Mbalmayo, la restauration des forêts dégradées et des terres agricoles avec *Irvingia* pourrait stocker environ 85 millions de tonnes de CO₂e. La restauration des forêts communautaires à l'aide d'*Irvingia* et de Cocoa permettrait de stocker 3 millions de tonnes supplémentaires de CO₂e. Alors que la restauration des périphéries des cours d'eau pourrait permettre de séquestrer environ 130 millions de tonnes de carbone. La restauration des forêts dégradées avec l'espèce *Irvingia* permettrait de stocker environ 2,78 millions de tonnes de Carbone. Dans le paysage de Douala-Edea, la restauration des paysages forestiers à base d'*Irvingia* et du Cacao permettrait de stocker environ 19,66 millions de tonnes de CO₂e. La restauration avec des périphéries des cours d'eau avec le bambou dans les alentours des marres permettraient de stocker 40,45 millions de tonnes de CO₂e. La restauration des mangroves dégradées permettrait de stocker environ 32 millions de tonnes de CO₂e. Les opportunités monétaires associés à la restauration des différentes zones est de 11,5 milliards pour la restauration des forêts dégradées, de 81,05 milliards pour la restauration des paysages agro-industrielles, de 166 milliards pour la restauration des périphéries des cours d'eaux et de 133,19 milliards pour la restauration des mangroves.

Environnement favorisant la mise en œuvre de Restauration des paysages forestiers (RPF)

1. Les aspects sociaux et de genre font partie de l'évaluation de la RPF. Il y a des leçons de réussite dans le paysage de Waza où les femmes prennent la tête de la restauration et de la gestion de la chaîne de valeur des produits RPF. Les principaux produits concernés dans le paysage waza sont : l'huile de Nimier, le jus et la poudre de baobab, l'huile de balanites, le jus et le sirop de gomme d'acacia et de tamarin et la poudre de moringa. Les hommes et les femmes ont chacun un rôle à jouer dans la restauration du paysage de Mbalmayo, tandis que dans le paysage de Douala-Edea, dans les camps de pêche, le palétuvier (matanda) est utilisé par les femmes pour fumer le poisson et les hommes travaillant sur les bois utilisés dans la fabrication de canots.
2. Le régime foncier a également été analysé et certains facteurs liés à la terre ont été mis en évidence afin de faciliter les investissements de la RPF : Accélérer et finaliser le processus national et régional de planification de l'utilisation des terres, sécuriser les droits des acteurs sur la terre tant sur les droits coutumiers que sur le domaine national ainsi que dans les forêts classées ; le renforcement des structures de gestion participative des terres au niveau du paysage et du village ; la sensibilisation et l'éducation des autorités et des populations traditionnelles sont essentielles pour inciter les hommes à octroyer des droits fonciers substantiels aux femmes.
3. Le Cameroun dispose de plusieurs politiques et lois sectorielles relatives à la restauration des paysages forestiers (RPF) dont l'harmonisation et l'alignement avec les exigences du processus de RPF assureront son succès.
4. Du fait du caractère transversal, pluridisciplinaire et inclusif de l'initiative RPF, et de l'approche « paysage » qu'elle prône pour plusieurs secteurs dont les champs d'action se situent dans les espaces concernés par la forêt et le grand espace contribueront de manière significative au succès de la RPF.
5. Le rôle des Communautés dans la mise en œuvre des activités de RPF devrait être renforcé. Si des mécanismes de soutien tout au long du processus doivent être mis en place, les communautés doivent jouer leur rôle. Ils peuvent facilement contribuer à la production d'une chaîne de production locale de semences et de plantes, ainsi qu'à l'arrosage. Les fonds issus de la vente de ces plantes pourraient être capitalisés, entre autres, pour l'entretien des parcelles.
6. En matière de financement, Le Cameroun est engagé au plan d'investissement forestier (PIF) et du processus CAFI dans lequel des activités de RPF pourront être financés

1. Introduction

1.1. Forest Landscape Restoration

Globally, around ten million hectares of forests are deforested every year. According to the UN Food and Agriculture Organization (FAO) Forest Resources Assessment, the annual rate of deforestation was estimated at 10 million ha per year over a five-year period between 2015 and 2020. Africa is an outlier as a result of how many people still rely on wood as their primary energy source. Noriko Hosonuma et al. (2010) looked at the primary drivers of deforestation and degradation across tropical and subtropical countries specifically¹. Across Africa, fuelwood and charcoal played a much larger role – it accounted for more than half (52%). Cameroon in particular has lost 708kha of its humid primary forest from 2001 to 2020, making up 48% of its total tree cover loss in the same time period.

According to the Global Forest Watch (2020), the total area of humid primary forest in Cameroon decreased by 3.7% from 2001 to 2020. In terms of tree cover, Cameroon lost 1.53Mha of tree cover in these two decades, equivalent to a 4.9% decrease in tree cover since 2000, and 603Mt of CO₂ emissions. Top 2 regions were responsible for 52% of all tree cover loss between 2001 and 2020. The Centre region had the most tree cover loss at 467kha followed by the East (323kha), South (295kha), and littoral (166kha) regions compared to an average loss which is at 153kha. Despite its vulnerability to desertification and its closeness to Sahel, the Far North registered a loss of 26 hectares. The dominant drivers of deforestation in Cameroon are wildfire, shifting Agriculture, forestry, and commodity-driven deforestation. In 2019 alone, shifting cultivation led to deforested of about 119kha while commodity-driven deforestation led to 1.23kha of forest loss².

The United Nations development agenda entitled “Transforming our world: the 2030 Agenda for Sustainable Development” known as Sustainable Development Goals (SDGs), in its goal 15 calls to “protect, restore, and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss”. The Bonn Challenge launched in 2011 is a key contributor in this regard, of which 150 million hectares was pledged to be restored worldwide by 2020 and 350 million hectares by 2030. Africa in particular has set out its challenge to restore 100 million hectares (AFR100) by 2030 and many African countries are in the course of contributing to this target. Cameroon in particular has pledged to restore about twelve million hectares of degraded forests and landscapes by 2030. In line with these commitments, Cameroon through the Ministry of Environment, Protection of Nature and Sustainable Development (MINEPDED) has received one of the twelve Child

¹ Hosonuma, N., Herold, M., De Sy, V., De Fries, R. S., Brockhaus, M., Verchot, L., ... & Romijn, E. (2012). An assessment of deforestation and forest degradation drivers in developing countries. *Environmental Research Letters*, 7(4), 044009.

² <https://www.globalforestwatch.org/>

Projects of The Restoration Initiative (TRI) funded by the Global Environment Facility (GEF) and is being implemented by the International Union for Conservation of Nature (IUCN), the International Bamboo and Rattan Organisation (INBAR), the Food and Agriculture Organization of the United Nations (FAO) and the UN Environment Programme (UNEP). The project also contributes to other efforts including the New York Declaration on Forests, and other local restoration priorities. The project is being implemented in the three sub-national landscapes of Cameroon named Waza, Mbalmayo, and Douala-Edea.

As an entry point to restoration and project baselining, TRI project has commissioned a Forest Landscape Restoration (FLR) Assessment in the three sub-national landscapes using the Restoration Opportunities Assessment Methodology (ROAM). ROAM was developed by IUCN and World Resource Institute (WRI) in 2014 to assess and optimize restoration in support for global initiatives such as the Bonn Challenge, AFR100 and climate change commitments such as the Nationally Determined Contributions (NDC) to the Paris Agreement, 2015³.

The Restoration Opportunities Assessment Methodology (ROAM) helps to identify degraded ecosystems, restoration opportunities, restoration enablers, restoration readiness, cost benefits as well as the economic benefits. Forest landscape restoration (FLR) is the long-term process of regaining ecological functionality and enhancing human well-being across deforested or degraded forest landscapes. It is about “*forests*” because it involves increasing the number and/ or health of trees in an area. It is about “*landscapes*” because it involves entire watersheds, jurisdictions, or even countries in which many lands use interact. It is about “*restoration*” because it involves bringing back the biological productivity of an area in order to achieve any number of benefits for people and the planet. It is long-term because it requires a multiyear vision of the ecological functions and benefits to human wellbeing that restoration will produce although tangible deliverables such as jobs, income, and carbon sequestration begin to flow right away⁴.

³ The Paris Agreement is a legally binding international treaty on climate change. It was adopted by 196 Parties at COP 21 in Paris, on 12 December 2015 and entered into force on 4 November 2016. Its goal is to limit global warming to well below 2, preferably to 1.5 degrees Celsius, compared to pre-industrial levels.

⁴ IUCN and WRI (2014). A guide to the Restoration Opportunities Assessment Methodology (ROAM): Assessing forest landscape restoration opportunities at the national or sub-national level. Working Paper (Road-test edition). Gland, Switzerland: IUCN. 125pp.

Forest Landscape Restoration has eight main guiding principles:

- 1) Restore entire landscapes rather than sites to balance a mosaic of interdependent land uses.
- 2) A forward-looking approach to restoring the functionality of the landscape.
- 3) Aim to generate a suite of ecosystem goods and services from a range of restoration activities.
- 4) Actively engage local stakeholders in decisions regarding restoration goals, implementation methods, and trade-offs
- 5) Consider a wide range of eligible technical strategies for restoring trees on the landscape
- 6) Adapt restoration strategies to fit local social, economic, and ecological contexts.
- 7) Adapt restoration strategies to changes in human knowledge and societal values.
- 8) Address ongoing loss and conversion of primary and secondary natural forests (if any).

1.2. Objectives of the assessment

The objective of the Cameroon TRI project is to support the implementation and scaling up of Forest Landscape Restoration (FLR) in Cameroon, notably by a) improving Cameroon Government policy commitment to FLR and Sustainable Land Management (SLM); b) piloting and assessing the effectiveness of restoration using *Bambusa spp* and other indigenous Non-Timber Forest Product (NTFP) like *Irvingia spp*, *Ricinodendron heudelotii*, etc, and ensuring the development of their value chains to support biodiversity conservation, sustainable livelihoods and GHG emissions reduction; c) enhancing institutional capacities and financing arrangements for large-scale FLR in Project sites in Cameroon; and d) improving knowledge of best practices in landscape restoration and Monitoring and Evaluation among Project stakeholders. Thus, the objective of the assessment is to provide the baseline for the TRI project activities by providing the pathways of change in policy and practices towards the restoration of degraded landscapes in Cameroon. The three landscapes constitute the prototype for Cameroon's major landscapes.

From North-East dryland to South-West humid ecosystem passing through the Centre plateau and hills, the following landscapes were assessed for restoration opportunities using ROAM methodology:

Landscape 1: The Degraded Sudano-Sahel savannah of the Waza landscape in the Extreme North Region of Cameroon;

Landscape 2: the degraded Forest Margins of the Mbalmayo cluster in the Centre Region of Cameroon;

Landscape 3: the degraded Mangroves of the Douala-Edea landscapes in the Littoral Region of Cameroon.

Beside supporting the restoration objective, FLR contributes to multiple sustainable development objectives. Such objectives include but not limited to, increased agricultural

productivity, food security, and rural incomes; increased resilience to climate change; improved water supplies; and reduced vulnerability to landslides, drought and other disasters.

The Methodology used to assess the Restoration Opportunities (ROAM) has six specific outputs:

- 1) A shortlist of the most relevant and feasible restoration intervention types across the assessment area
- 2) Identified priority areas for restoration
- 3) Quantified costs and benefits of each restoration intervention type
- 4) Estimated values of additional carbon sequestered by these intervention types
- 5) A diagnostic of the presence of key success factors and identification of strategies to address major policy, legal and institutional bottlenecks
- 6) Analysis of the finance and resourcing options for restoration in the assessment area

This report therefore presents the results of ROAM process for sub-national landscapes of Cameroon namely Waza, Mbalmayo and Douala-Edea. The results presented in this report are intended to guide the scaling up of TRI project outputs and can also be used to leverage international forest financing mechanisms for both forest restoration activities and avoided deforestation, through mechanisms such as the Forest Investment Program (FIP - Cameroon), Forest Carbon Partnership Facility (FCPF), and Reducing Emissions from Deforestation and forest Degradation (REDD+)⁵. The results may also be used to support national afforestation and reforestation projects.

1.3. Theory of Change

A Theory of Change (ToC) is a hypothesized series of changes that are expected to occur in a given context as the result of specific integrated actions. ToC development includes both a process and a product.

The process involves thinking about a problematic situation, recognizing the underlying causes of the situation, identifying the long-term change we want to see in order to improve the situation, and working through the steps to determine how we will achieve that change. The process includes regularly revisiting the ToC throughout the program cycle with continual reflection on what, how, and why change is occurring as we hypothesize.

The product is the diagram produced from this process, the set of indicators that tell us how to recognize success at each step in the ToC pathways, and the Complementary Documentation that communicates information not easily interpreted from the ToC diagram

⁵ Cameroon was selected as one of the six FIP pilot countries, in view of the country's REDD+ readiness progress. Cameroon has a National Readiness Preparation Proposal (R-PP), which was approved by the Forest Carbon Partnership Facility (FCPF).

1.3.1. *Brief description of Waza landscape*

Located in the far north region of Cameroon and within the degraded Sudano-Sahelian savannah zone (Figure 1), Waza landscape is located in three divisions of the Far North region namely: Diamaré (Pette subdivision), Mayo Sava (Mora subdivision) and Logone et Chari (Waza and Zina subdivisions). Waza landscape covers a total area of about 6,764 Km² and a home to Waza National Park, one of the oldest national parks on the African continent that was founded in 1934. The Waza-Logone floodplain contains a vast flood plain known as the *yaéré* which is an important wetland in this part of the country. Those wetlands like the one of canton de Mémé (lac de Gogo), Canton de Magdémé and the populated areas of Boundéri, Touski, Kossa, Homaka, Doublé, Tchakramari, Kangaléri, Wambaché, etc. These areas are usually flooded in the rainy season.

The annual average rainfall varies from 600 to 750 mm in the landscape. During last years it has been gradually reduced to about 500 to 600 mm. The rainy season has a duration of three to four months – from mid-June to mid-October – while little or no rainfall during the rest of the year. Temperatures vary from an average annual maximum of around 41°C to a minimum of 13°C⁶. Nowadays, the temperature is gradually increasing up to 43°C⁷. The climate is characterised by two extremes: extreme rainfall and extreme dry season with devastating flooding in the wet season and water scarcity for households in the dry season. The period from March to May is the hottest of the year with temperatures above 40°C. This extreme climatic variation is an unavoidable constraint that must be taken into account in the development of agricultural and reforestation activities. The scarcity of water resources remains a major challenge.

The landscape is drained by the tributaries of the main Logone River, receives the greatest part of its flow from a higher rainfall zone in Cameroon (Adamaoua Region), Chad and the Central African Republic. These tributaries are among others Ambarare, Ndekeya, Badi, Moussarvou, Lagon afua, Mayo ngoungoula and Mayo boula. During September and October, the peak flow reaches the lower flood plain, and except in very poor rainfall years, the river overtops its banks and floodwaters spill onto the floodplain. The rivers are irregular. They are generally called Mayo. They fill up after heavy rain and empty a bit later. In the dry season, only a sandbar remains, and water can be 6 to 7m deep in the ground. Because of the almost complete lack of relief, the flood spreads over a large area.

The landscape features the National Park (Waza) and four community forests (FC Pette, FC Fadare, GIC AGBER Fadare, and GIC AGBER Pette) all in the Pette Subdivision and a wetland recognised as a Ramsar site. The latter occupies almost half of the landscape between Zina and Pette where floods have a habit of burying many villages in the rainy season. This is notably the case of Pette Community Forest which remained 70% inaccessible throughout the month of October (2020). However, these sites have vegetation in full degradation because human activities are intense for the rest of the year.

⁶ <https://www.ramsar.org/sites/default/files/documents/pdf/lib/hbk4-07cs03.pdf>

⁷ Field work, January 2021

It is the harvest site for NTFPs (gum arabic, mahogany nuts, ...) and medicinal plants for the local population.

Often ravaged by bush fires, the vegetation comprises open *combretaceous* shrub savanna, *Borassus ethiopium* (rôniers), *Anogeissus leiocarpus* woodland on sandy soil, *Lannea humilis* open grass savanna and *Acacia seyal* tree savannah on degraded black clay soils which are saturated with water in the rainy season. We find herbaceous plant formations along the Mayo, the latter vegetation type is slowly spreading as the area gradually dries out. Low water table occasioned by deep sandy low lead to scarce vegetation in the landscape. These contribute to an increased threat for desertification while lack of tree species in the area is a major threat to the existence of the National Park. The increasing human population characterized by low income (whose livelihoods depend on natural resources and agricultural activities), an influx of migration due to insecurity in the Northern part of the landscape is a major cause of declining biodiversity in the area. These are due to the increase in farm and cattle size, the increase in fuelwood exploitation for sale and family consumption, competing farmland and grazing land, and population encroachment into the protected area. The constant reduction of farmland and the farming system (especially with cereals) occupied a large area of land without tree integration.

The scarcity of grassland and agricultural land is a source of enormous conflicts in the Waza landscape. The lack of a zoning plan and the non-control of the spatial extension of agricultural land, the grazing corridors, proximity to the National Park and the Community forests are the causes of vegetation decrease, soil erosion, and poverty. On one hand, the agricultural land is encroaching into the Park and the grazing land. On the other hand, due to the increase of cattle and high demand for grazing land also encroached into the agricultural land. These have caused overexploitation of resources and has also impacted the natural regeneration of plant and trees used both by animals and the population.

In the lowland (floodplains), there is competition in the use of water for cattle, agriculture, and fishing. More than 1000 dams have been constructed by the population along the Eastern part of the Park and some have contributed to reducing the quantity of water available for the fauna. This phenomenon is also observed in the community forest of Pette (bordering the Waza National park) where shepherds are struggling more and more to find ponds for watering cattle. These infrastructures are a threat to road circulation and water bodies. It has caused conflicts between the population, the fishermen, the farmers, and the cattle breeders.

In the urban and populated areas, the Neem tree (*Azadirachta indica*), is increasingly being embraced by farmers in the Waza landscape. Due to its high medicinal value, farmers have invested in planting huge quantities of the plants as agroforestry and shade trees for livestock. The farmers attest to the fact that the agroforestry tree species is healing their communities while also improving their livelihood income.

Two main types of soil can be distinguished: the soils located partly at the foot of the

shallow mountains, characterised by low fertility due to water erosion and its essentially stony structure. It favors less demanding crops such as red millet, yellow millet, and vegetables. The sandy/clay-loam soils occupy a large part of the landscape and are very fertile and deep, favorable for all crops (food crops, market gardening, grazing) in the rainy season and cotton⁸. Major crops in the area include millet, sorghum, fonio, maize, rice, watermelons, groundnuts, potatoes, niébé, soja and cotton. Due to poor soil fertility, the area is characterized by low crop productivity which could consequently lead to high dependency on national Park for forest goods. In fact, the harvest of products, in particular cereals (which constitute the staple food), does not generally exceed 2 tonnes per hectare. These low yields are also justified by the fact that crop rotation is little practiced and farmers do not always have the means to amend the soil properly. The Waza-Logone floodplain constitutes a highly productive breeding ground for fish, which are harvested intensively each year. The pastures are overstretched by large numbers of livestock during the dry season leading to further degradation.

The fauna in the park is very rich and diverse and includes animals such as elephant (*Loxodonta africana*), spotted hyena (*Crocuta crocuta*) and leopard (*Panthera pardus*), and more than 300 bird species, including the Nubian bustard (*Neotis nuba*), great white pelican (*Pelicanus onocrotalus*) and marabou (*Leptoptilos crumenifer*). Several threatened or endangered species are also to be found in the reserve, including the Korrigum (*Damaliscus korrigum korrigum*), pale fox (*Vulpes pallida*) and the last population of Kordofan giraffes (*Giraffa camelopardalis antiquorum*).⁹ Human-Wildlife Conflicts (HWC) is common in the area where for example, human-lion conflicts have regularly occurred provoking the killing of lions and consequently the decline of lion population in the park. Similarly, in forest areas, major conflicts occur between elephants and communities, but there is also evidence of HWC involving great apes and minor herbivores such as porcupines or hedgehogs. Crop damage is yet another most prevalent form of HWC. The primary causes are; the ineffective land-use planning policies -including protected area creation and management- coupled with the increase of inhabitants around these areas.¹⁰

Apart from being a driver of degradation in the area, infrastructure development, such as dam construction is another factor for human – wildlife conflicts. De Longh et al (2004) demonstrated how the construction of Maga dam in the area around Waza National Park (Far North region) and Lagdo dam (North region) in 1979 led to an increase of crop-raiding patterns by elephants in Kaele and the Lagdo/Rey Bouba districts. Elephants reallocated closer to agricultural land due to the combined factor of water scarcity and landscape disturbance.

The ethnic groups mostly found in the area are the Kototo and Arab choa (waza and zina), the Kanouri or Bornouan, the Mandara, Podoko and Mada (Mora), Pheul ou Fulani (Pette) and Mousgoum. The main economic activity among the Bornouan, Mandara and Mada is

⁸ CDP, Mora, 2013.

⁹ <http://www.unesco.org/new/en/natural-sciences/environment/ecological-sciences/biosphere-reserves/africa/cameroon/waza/>

¹⁰ <https://pubs.iied.org/pdfs/G03726.pdf>

agriculture, while the Kotoko and Mousgoum practise fishery and agriculture. For the Pheul and the Chadian Arabs, animal husbandry is the main economic activity.

Concerning the governance, the main actors intervening in the WAZA Landscape are made up of 'representatives of the sectoral ministries and administrative authorities, by the WAZA National Park Conservation Service, the elected councils, the traditional chiefdoms, the development partners such as international and local NGOs and the communities.

Traditional chiefdoms are fairly well structured and hold strong traditional power. They strongly influence the behavior of communities and actively participate in settling conflicts within the territory. The concerns of women are taken in the background by the male population while most of the agricultural and household activities fall to them. Access to education and the distribution of schools across the landscape is poor. However, when they do exist, the students often contribute to the establishment of school gardens, through the "Friends of my Nature Club". Overall, there is a strong negative trend in the landscape resources degradation for economic reasons. In addition, there are numerous restoration initiatives (individual and collective). The introduction of certain species (*Acacia albida*, *Azadirachta indica* ...) is effective because of the services provided by trees: shade, windbreaks, firewood, service wood, the fertility of the topsoil etc. Indeed, the level of poverty of the populations accentuates their dependence on natural resources. Also, their poor knowledge of techniques for the sustainable exploitation of resources coupled with the influx of refugees and internally displaced persons along with population growth exacerbates the level of pressure on the resources. The migrations are due to threats from terrorist groups from neighboring countries but also for the search for arable lands and water resources. Several international and local NGOs are based there and their actions are oriented both towards restoration and improving the conditions of local populations, including refugees and internally displaced persons.

Faced with this pressure, the conservation services of MINFOF and the other competent authorities do not have sufficient capacity to fight against the excessive cutting of wood (for agriculture, firewood and timber) in the countryside and mainly in the park.

Moreover, while the land is available in some localities, some communities, in this case, those on the mountains, do not have enough arable land. Moreover, no recognition of their customary rights is guaranteed by the law in force, the State being the sole legitimate landowner and the land title the only document of proof of land ownership. Women traditionally do not inherit except for Muslim women who have a low portion (25%). However, they can become an owner by purchase. The absence of a land-use plan exacerbates this precariousness of land tenure and is the underlying cause of agro-pastoral conflicts on the one hand and conflicts between local populations and the Conservation Services on the other hand. Also, the lack of participation of the communities around in the management of the Park gives room to these conflicts. Transhumance tracks, areas of cattle grazing, migration routes of the wildlife, and the limits of the Park are not materialized and thus poorly known.

The non-existence of a multi-stakeholder consultation framework constitutes one of the major challenges to be taken up in the WAZA landscape. This weak synergy and collaboration between actors whose complementarity is essential for the structuring relations and the harmonization of the interventions of the various actors at the landscape level. Organizing stakeholders to raise awareness and build their capacities is an urgent matter. The grouping of actors around the restoration goals must take into account the need to make the municipalities within the framework of the coordination of restoration actions at the local level but also that of a monitoring-evaluation system to ensure the sustainability of the plants planted beyond the duration of the project.

In summary, low rainfall, deforestation, bush fires, biodiversity loss, human-wildlife conflict, lack of community integration in the conservation, population growth, infrastructure development, ineffective land-use planning, insufficient implementation of management policies and coordination mechanisms, poverty, and lack of alternative livelihoods are the major drivers of degradation in Waza landscape.

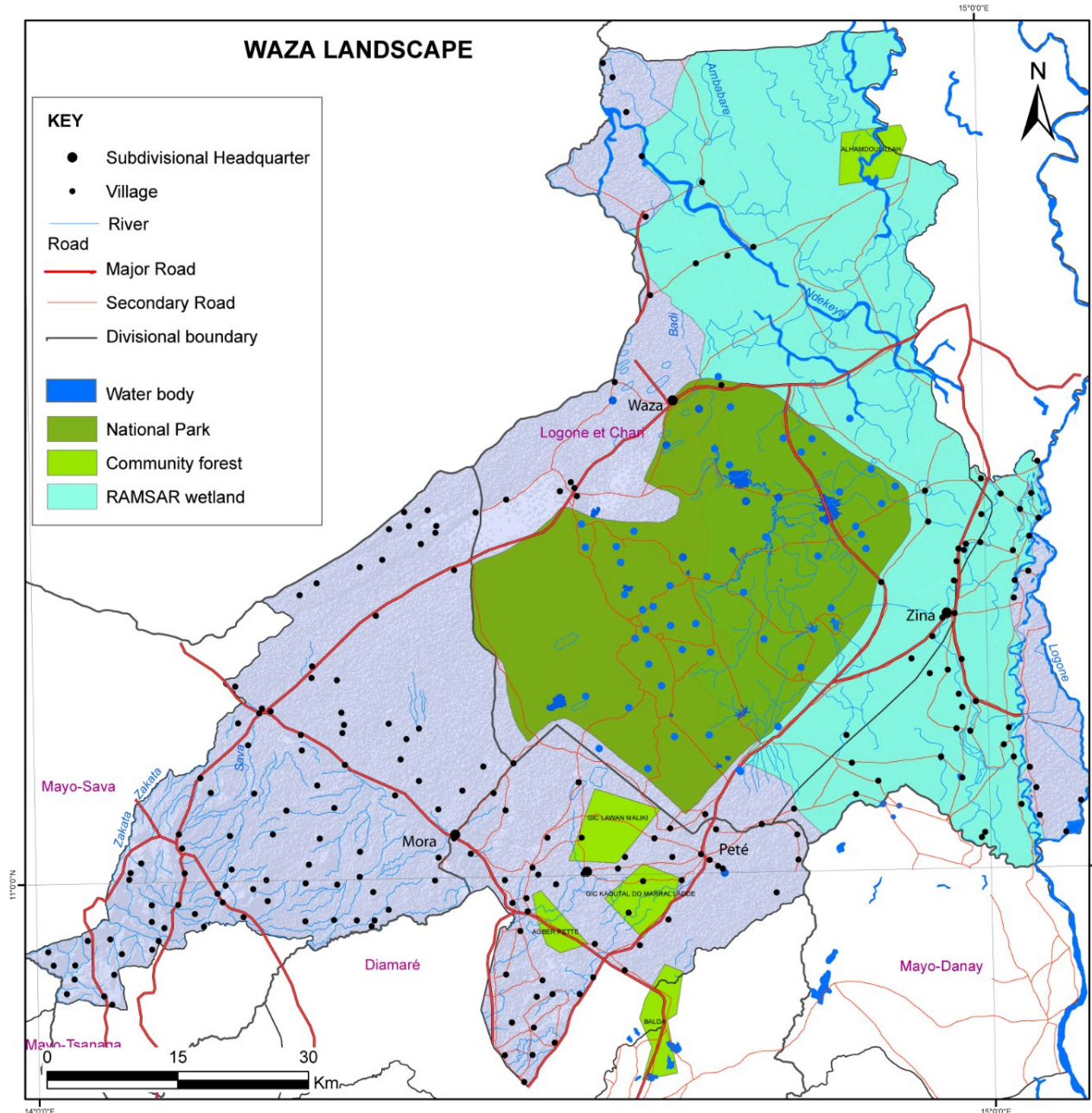


Figure 1. The map of Waza Landscape

1.3.2. Brief description of Mbalmayo Landscape

Located in the central region, Nyong and So'o divisions, Mbalmayo landscape comprises community forests (in Akoeman, Nkolmetet and Mbalmayo), and forest reserve (Ebogo, Zamakoe, Nkolmekoh and Mbalmayo forest reserve in Ngomedzap, Dzeng, Mengueme and Akoeman on an area of 3620 km² (Figure 2).

The landscape is situated in a classic Guinean equatorial-type climate which is characterised by four distinct seasons: a short rainy season, a short dry season and a long rainy season, and a long dry season. These four seasons tend to decrease to two due to seasonal disturbance and rainfall and rising temperatures. They remain relatively

warm with an annual average of around 25.7°C which sometimes reaches 30°C during January and April and 19°C between September and December. The average annual rainfall is around 1496 mm. The southern part of the landscape has high humidity and high precipitation, with rainfall up to 2,000 mm each year. Temperatures are steady, averaging 24°C.

Mbalmayo landscape is covered by the central plateau of Cameroon characterised by a hilly topography with medium altitudes. Its relief is made up of small hills of average altitude not exceeding 700m. These gently sloping hills are slightly inclined towards the southern part and each plateau is surrounded by valley bottoms, drained by rivers of varying importance, most of which originate in the Nyong. The flat, and gently sloping lands occupy about 65% of the surface area, those with steep slopes are of the order of 5%, and the rest is occupied by swamps, valley bottoms and rocks.

The Nyong (750 km length) is the main river watering the region and the surrounding areas with their tributaries Mfoumou, and So'o. They are mainly used for the domestic needs of the population, fishing, and sand production. Fishing and sand mining are income-generating activities mainly done by the youth. The Nyong has several assets: the development of mass fishing, the promotion of water sports, and the supply of drinking water with the CAMWATER factory installed in Akomnyada which supplies the capital (Yaounde). The main constraints observed on the rivers are the lack of regulated exploitation of the natural resources, cultivation along the river banks and the pollution of the rivers by fishermen. It is also regrettable that there is no drinking water in the riverside communities, as water is collected to supply the capital directly.

The vegetation is influenced by the slightly hilly relief and human activities. The locality is dominated by secondary forests of equatorial humid type that alternate in places with oil palm plantations, and areas left fallow or uncultivated. The grassy plant formations found on fallow and fallow land are dominated by *Chromoleana odorata*, *Imperata cylindrica*, *Ageratum conyzoides*, *Lantana camara*, *mimosaceae* and *marantaceae*. The wealth of the forests surrounding the Commune is quite important. The forest species are abundant. The forest is also the domain of non-timber forest products (NTFPs) such as Okok, Njansan, Essok, Rotin...Caterpillars (minkongs), chafer larvae (foss) and snails. The main ethnic groups found in the landscape are: The Ewondo (Ngomedjap), the Mbitambani (djeng) and the beneu in the greater Mbalmayo area (Mbalmayo, Mengueme, Akoeman and Nkolmetet). The forest plays a crucial role in the lives of these communities, which draw on it for many resources for their livelihood. It is the place where non-timber forest products (NTFPs) and firewood are collected. There is also the exploitation of wood to meet local needs for timber, which has increased in recent years. Together with agriculture (extension of fields), it is the cause of the strong degradation of the forests observed.

The landscape of Mbalmayo is characterised by the presence of two reserves, the Zamakoué reserve, and the Mbalmayo reserve. These forest reserves date back to colonial times and were created for research, reforestation and biodiversity conservation. In the 1990s the State decentralised the management of these reserves and entrusted

the National Agency for Support to Forest Development (ANAFOR), the International Institute of Tropical Agronomy (IITA), the National School of Water and Forests (ENEF) and the municipalities to take over the management of these two reserves. When these reserves were created, communities were granted enclaves to secure their customary lands and plantations. The Mbalmayo reserve has two community enclaves (Ebogo-1200 ha and Bilik-250 ha) and 11 individual enclaves of about 2 ha representing the cocoa trees identified at the time of its creation.

The soils are characterised by a predominance of ferralitic and hydro-morphic soil with the presence of the Nyong. Ferralitic soils are formed on denatured acidic rocks with good physical properties, deep soils with good permeability, stable micro-structure, which makes them less susceptible to erosion than other types of soil (IRAD, 2005). Often well-drained, they are subject to edaphic drought due to their low water retention capacity by the mineral fraction of the soil. All food crops can be grown there with good yields when soil organic matter levels are satisfactory. From the point of view of development, it has good mechanical characteristics for road and building construction. Hydro-morphic soils are found in swampy areas and on the banks of watercourses. They are exploited for off-season market gardening. The race for space for market gardening and agriculture to supply neighbouring towns is increasingly attracting migrants in search of arable land. There is over-exploitation of the soil with high use of chemical fertilisers for market gardening and the destruction of the woody cover. These actions have contributed to the destruction of soil and water quality in areas with hydromorphic soils, with extensive use of prolonged fallow.

The soils are clayish in consistency and reddish in color. Being close to the town of Mbalmayo, Mbalmayo forest reserve has been under extreme pressure due to urban area expansion as well as the increased human dependency on tree and non-tree products. Households occupy marginal unsuitable lands such as swamps and wetlands, hills and valleys exposing the area to environmental problems such as floods and landslides. Charcoal is the main source of cooking fuel for the poorest households. Increasing demand for charcoal aggravates forest degradation and deforestation near the town.

There is poor practice in agricultural activities marked by insufficient agricultural supervision, aging plantations, soil degradation, low yields, the search for fertile land and falling household incomes. Ignorance of modern agricultural techniques leads to anarchic exploitation of forest land, which in turn leads to soil degradation and the emergence of land conflicts.

Cassava, maize and groundnut are grown in almost all households in rural areas is the main staple food in the Mbalmayo landscape. Indeed, in the rural areas, the main activity is agriculture: men involve themselves in growing cocoa (Woody species are often found in these cocoa plantations). Farmers carry out selective felling, leaving the trees that will serve as shade for the cocoa trees. In addition, plantain banana is generally introduced during the first years of cocoa plantations and, at times in tapping palm wine. Women grow food crop and harvest non-timber forest products (NTFPs). The agriculture practiced is subsistence farming (food crop) and only the surplus production is marketed. NTFPs

are exploited in the forest reserve (people do not have extensive cultivation of tree plantations).

Illegal sawmill operators are particularly active in this area, despite repressive measures taken by the forest administration. This activity is partly due to the area's proximity to Yaoundé. The agricultural activities are characterised by Slash-and-burn practices, combined with logging, are the first known forest degradation drivers leading to a massive conversion of forest land into farmland. It is important to note that with the exception of cocoa, for other trees, systematic felling is carried out. It is important to note that only for cocoa, some trees are kept in the plantation (selective cutting).

Since pre-colonial times, land use in the area has been subject to the classification of conservation areas for sustainable resource management. With population growth and urbanisation, land issues are increasingly difficult to settle. Conflicts between neighboring populations are noted, encroaching on forest and land reserves, and the customary domain or the sale of land attracts many investors in the agricultural sector.

In the national domain, hectares of forest are being destroyed by farmers who are always looking for a better yield to improve their socio-economic condition. The vegetation cover is increasingly being degraded as a result of the reconversion of forests into agricultural land. This and other declines in dense forest cover derive from the high demand for agricultural land by the elites and population growth in the region. In rural areas, the degradation is much more independent of local uses, rather it is the result of illegal exploitation and large-scale land acquisition by the urban elite. Such a situation is inherent to the lack of tools for land use planning and management of forest reserves in the landscape, and numerous land conflicts.

Communities have the particularity of not being well structured. Traditional authority does not exercise real authority over populations. They simply ensure the liaison between the populations and the administration. It constitutes the basic pillar of this administration. The patriarchy, which is the informal body for regulating and managing the community, is also quite weak. Women collaborate with men in the implementation of activities within the family and the community. These women have access to land on the same basis as men. In addition, the ethnic groups considered indigenous are the Beneu followed by the Ewondo. These groups live in perfect harmony with other ethnic groups from other parts of the country. The landscape is attracting more and more people from Akonolinga, the West, the North-West and the South-West of Cameroon. Unlike the natives, the migrants practice unsustainable semi-industrial fishing activities there and thus maintain conflicting relations with them. Indeed, their activities have negative impacts on the performance of local fishing activities, fluctuation in fish prices at the village level and are often the cause of bush fires, resulting from neglect of wildfires. The newcomers constitute cheaper labor for the communities (sand exploitation, agriculture, etc.). With insufficient land outside the reserve and generally in the town of Mbalmayo, and population pressure, more and more people are moving to the reserves and claiming customary rights.

Overlaps between different users of space and resources, and dysfunction in the rights

allocation and land title management system give rise to competition and conflict between resource users. This competition is exacerbated by the lack of horizontal collaboration between the various actors whose complementarity is essential for the harmonization of policies and interventions in the area of environmental management and the socio-economic development of populations. By way of illustration, no reserve management plan exists to date. The same is true of a local zoning plan covering the entire landscape. These absences constitute real obstacles to the effective engagement and participation of the various actors in the sustainable management of the territory. As a consequence, various human activities take place in the reserve. The office in charge of conservation plays a role of protecting and control for the application of laws and regulations, however, due to the limited resources, the monitoring remains challenging and consequently, the illegal activities persist. The deterioration of these reserves is greatly accentuated.

To summarize, the Mbalmayo landscape is challenged by the rapid growth of urbanization and infrastructure development, shifting cultivation, deforestation and biodiversity loss, poverty and rural migration, land and water scarcity as well as low agricultural productivity. Underlying driving forces are fundamental social processes, such as human population dynamics, agricultural practices, limited availability of jobs, and alternatives. Linking Communities, conservation, and livelihoods is key to sustainable forest management and restoration of degraded forests in Mbalmayo landscape.

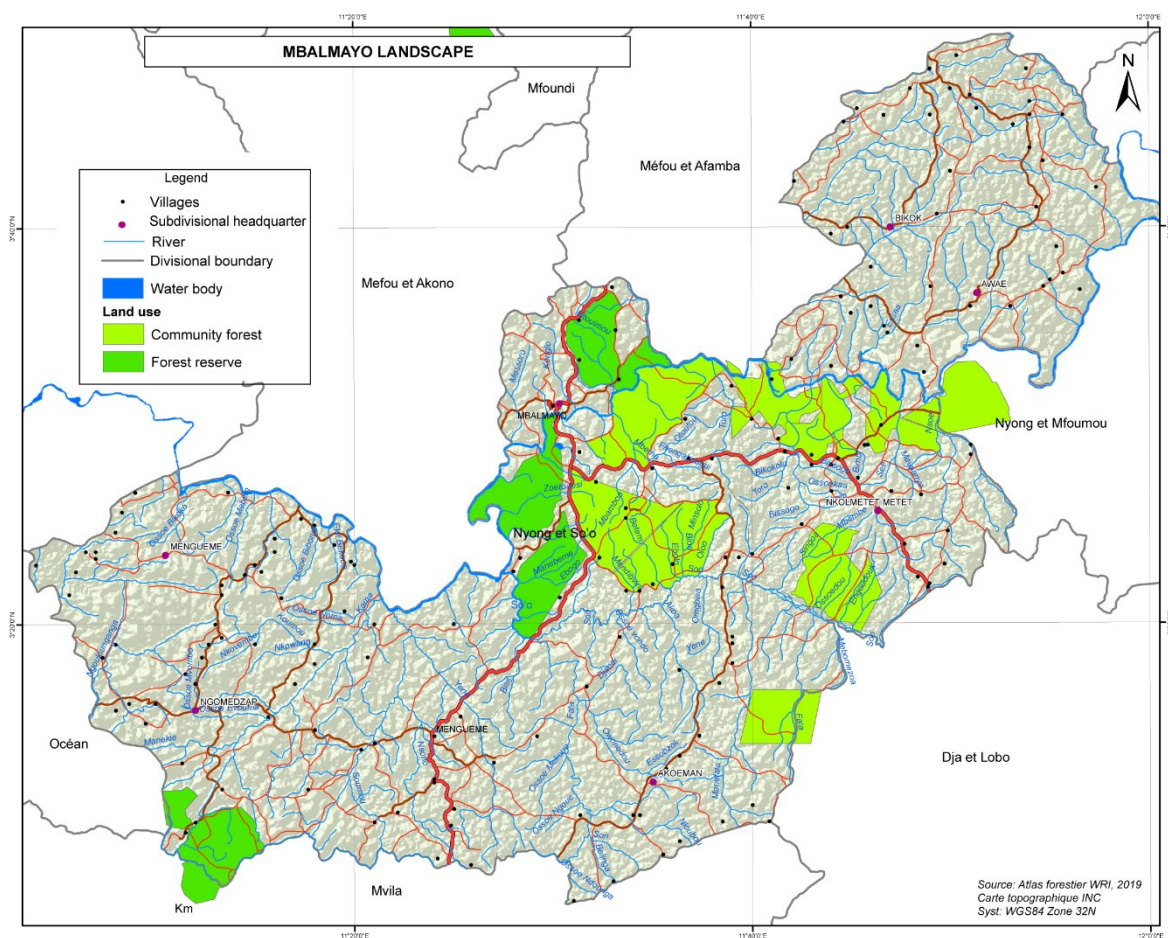


Figure 2. The map of Mbalmayo landscape

1.3.3. *Brief description of Douala-Edea landscape*

Located in the southwest part of the littoral region and touching the Atlantic coast of Cameroon Douala-Edéa landscape (Figure 5) has the largest and most intact estuarine, freshwater, and coastal forest complexes in Africa, and harbours a wealth of biodiversity, including several threatened species. Douala-Edéa National Park is Cameroon's first marine and terrestrial National Park, covering 2,629 km². Lake Ossa Wildlife Reserve lies adjacent to Douala-Edéa National Park and is a key hotspot for threatened biodiversity. Furthermore, this Lake provides vital ecosystem services, which local communities rely on; almost 25% of the total population living in this coastal ecosystem carry out subsistence and small-scale agriculture on the land surrounding the lake and over 15% of households are dependent on fisheries. Douala-Edea Wildlife Reserve, first created in 1932, to national park status, and approved for expansion of 3,500 km² that includes mangrove forests, rivers, wetlands, and marine habitats. Collectively, this expansion and conversion actively safeguard a total of 7,410 km², almost the size of Yosemite National Park.

Hydrography is marked by the presence of water bodies are numerous and constitute the most precious resource for local communities. The sanaga river (Kwakwa), the creeks, Lake Ossa (rich in lamentein), Lake Tisongo (which in addition to many fish species, has white sand prized by the populations), the sea.

Mouanko, with an estimated population of 13,815 inhabitants¹¹, is home to a cosmopolitan population. Three ethnic groups are considered indigenous: the malimba (people related to Douala, Batanga and Bakweri) the Yakalak (Bakoko), and the pongo songo. Alongside its native groups, there is a strong West African community (Nigerian, Beninese, Ghanaian,) and many other ethnic groups from four corners of the country (Bassa, Yambassa, Bamiléké, Bansa'o, Ewondo, etc.). The cohabitation between these different communities is relatively good. This is facilitated by the activities in which everyone is involved. Indeed, semi-industrial fishing is the prerogative of West Africans, agriculture is mainly practiced by non-natives while the natives are confined to subsistence fishing, agriculture, and the fish trade.

The vegetation of the landscape presents a diversification of species with a complete stratification of large trees up to the herbaceous stratum. The main existing exploitable species are the forest species (moabi, iroko, fraquet, bibolo, bubinga, beté) and NTFPs for consumption (mango, safou, bitter cola, hazelnut ...) or used in crafts (rattan, raffia and its derivatives, bamboo ...). About 80% of the NTFP species come from the forest because the populations do not have the culture of forest tree planting. The vegetation is also marked by vast plantations of palm trees and rubber trees (SAFACAM and SOCAPALM and small-scale producers) which occupy a preponderant place in the landscape of Douala-Edea (especially in Dizangué). Citrus fruits (mango, orange, guava, avocado and

¹¹ Update from the RGPH, 2005

coconut trees) can be observed in most of the areas around the residential areas.

The people living in this ecosystem face poverty, unpredictable incomes, and lack of food caused by seasonal changes as well as a decline in the fisheries they depend on. This decline is due to unregulated and unsustainable fishing practices, which leads to overexploitation of fish species. What exacerbates this issue is the demand for fuelwood, construction, and use in bivalve and smoked fish industries, and it results in the overharvesting of mangroves (Figure 3) and consequent loss of important nursery sites for fish. Threatened species such as turtles, forest elephants, manatees, and crocodiles, are not only experiencing this habitat loss and encroachment but also poaching (Figure 4).¹²



Figure 3. Photo of Mangrove wood stored for fish smoking (Source: TRI Fieldwork, February 2021)



Figure 4. Photo of the exploitation of clams at Nkaganzog (Source: TRI Fieldwork, February 2021)

The land issues are dominated by lack of cultivable land for poor households, land grabbing by agro-industries, the dependence of young people and women on the wages

¹² <https://www.zsl.org/conservation/regions/africa/improving-management-of-douala-edea-national-park-and-lake-ossa-wildlife>

of plantation workers, and fishing for men, all increasingly contribute to the degradation of the forest cover. On one hand, the lack of land use policy and the management plan for the national park and forest reserve has been reported as among the leading factors of deforestation and illegal logging in the reserve. Though prohibited in the protected forest areas, forest exploitation is denounced by the local authorities. The lack of monitoring and inspection mechanisms, on the other hand, has been reported as key to increased illegal wood exploitation in the protected areas. The lack of proper guidelines in forest monitoring and control of forestry activities is a major hindrance to community participation in the conservation process. Lack of community land tenure security alienates and limits the development of alternative activities in the face of the declining in fish stocks.

The local communities are 70% dependent on fishing resources. These resources are becoming increasingly scarce in the face of the rising industrial fishing where the populations are dispossessed of their fishing equipment installed on the areas authorized for industrial fishing. The heavy equipment used by Chinese giants have already reduced the daily income of local fishermen from 100 to 25%. The local communities are not empowered to compete with foreign investors in the fishing industry. They practice subsistence fishing in the middle of business-oriented foreign investors. This contributes to increasing poverty in the islands and villages of the landscape where nearly 90% of the population does not have alternative source of livelihood. Consequently, this has seen an increased shift to agriculture which demands extension services. Currently, the extension services are provided by agro-industry investors.

Both fishing and agricultural activities contribute to deforestation. In the fishing camps, hectares of mangrove (matanda) have cut down for wood meant for fish smoking (Figure 3). On the agricultural side, oil palm cultivation has led to the destruction of thousands of hectares of woody cover and other NTFPs trees. Bush fires are also known to destroy large areas of forest annually. The NTFPs species, although considered and economically profitable by the populations, there are increasingly disappearing due to unsustainable agricultural techniques and extension of agro-industry in the region.

The exploitation of clams resulting from bivalves fishing and as such, they occupy nearly 90% of the population. Formerly a women's activity, all the members of the family are now involved in clam's arts and trade and it has taken overfishing. A clam business has been created around this activity, forcing the authorities to regulate the fishing calendar (January 15 - June 30) to ensure the survival of the species (a picture of this activity at Nkaganzog is presented in Figure 4). The clams are sold locally to buyers from Bafoussam or in Douala in the feed mills. There is a lack of organization in the clam trade putting pressure on oyster extinction.

The change of weather has been characterized by the disruption of the rainy seasons from four seasons per year to two. There has been a resurgence of floods along river banks and in the islands and landslides on the hillsides. Increased floods in the islands, and along River Sanaga and its tributaries has led to distraction of homes and

displacement of communities. Siltation on the river beds has led to declining water levels and proliferation of water hyacinth leading a drastic reduction in fishing resources. The phenomenon of silting is a danger for survival clams. Indeed, the level of siltation tolerated by clams is about 10 to 30 cm. Presently it is more than 50 cm. The clam feeds on water filtration (on average, 100 l of water and filtered by one clam per day).

Douala-Edea landscape is characterized by the presence of different types of actors whose uncertainty in the interplay of interests is coupled with the inability to regulate and control the resources use. This feeds the complexity and the 'inadequacy of interventions in response to the degradation of natural resources. The landscape hosts two Conservation Areas, namely the Lake Ossa Wildlife Reserve and the Douala-Edea National Park. The later was designated as a National Park in 2018. Three agro-processing factories including the Swiss farm, SAFACAM, and SOCAPALM occupy a large tract of land with palm trees and rubber plantations where workers' camps constitute the population living in poor conditions. Several other family and/or individual plantations exist in the area.

Douala-Edea landscape is also characterized by high influx of foreign migrants from neighboring Nigeria, Ghana, Benin, and Niger who have settled around the forest reserve and constitute more than 70% of the coastal population. There are also populations from other regions of Cameroon. These migrants are attracted by the economic activities in the landscape. The population pressure has consequently led to uncontrolled exploitation of resources and encroachment into the conservation areas – which is amplified by insufficient law enforcement by the local administration. However, the issue of encroachment in Lake Ossa wildlife reserve by SAFACAM is more complex and falls within the spheres of the central state. Very little land is available and communities tend to extend their activities inside conservation areas, which to date do not have a development plan.

The process of reclassifying the reserve of Douala-Edea into a National Park allowed the work on the development of its management plan, allowing the configuration of the immediate landscape of the park as well as the interventions and above all to set up consultation frameworks for the management and participatory monitoring of the Park. However, the slow speed observed in the validation process of the management plan and the inability of the conservation service and MINFOF to ensure the control and application of the laws have demotivated the involved authorities and encouraged the communities to go into a spree of illegal activities. This highlighted the need to develop a land zoning plan and the establishment of land rights. It also points to the need to strengthen local governance of the protected areas.

These reflections can be considered in the context of the management plans taking into account the economic development targeting the main parties including local communities. They could also take into account the mechanisms to engage agro-industries in the restoration of the immediate landscape under the environmental and social corporate responsibility.

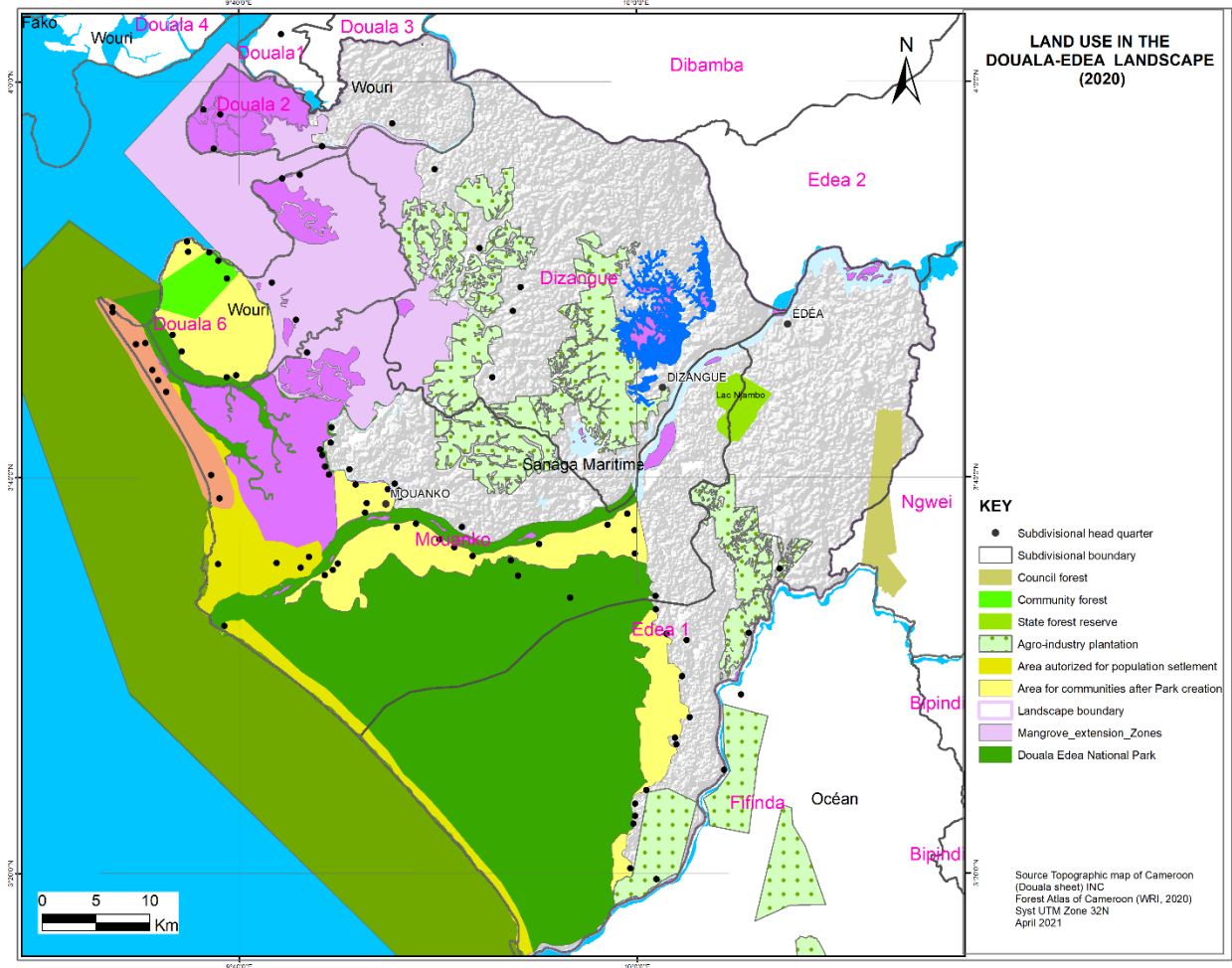


Figure 5. Map of Douala-Edea landscape

The following flow ToC diagram (Figure 6) summarizes the restoration pathways of change in the three subnational landscapes of Cameroon which represent the large mosaic of restoration in Cameroon.

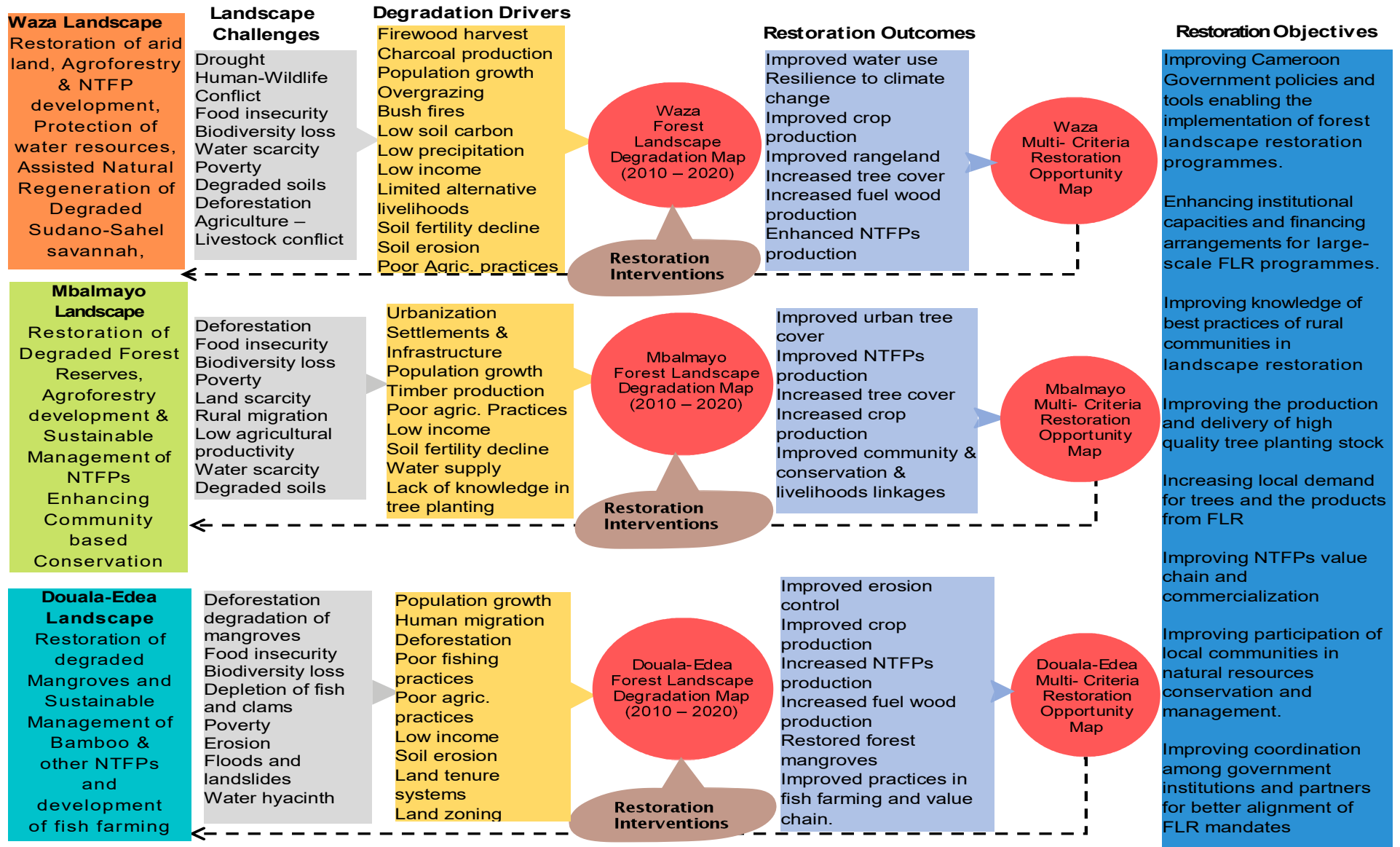


Figure 6. The Theory of Change diagram illustrating the restoration challenges, underlying causes of forest degradation, the selected interventions, and restoration opportunity objectives and outcomes in Waza, Mbalmayo, and Douala-Edea landscapes.

1.3.4. *The functional degradation and restoration opportunity*

To reverse the aforementioned drivers of degradation in the three landscapes and accrue the multiple benefits that come with a functional landscape, forest landscape restoration approach will be applied to:

- 1) reduce or stop forest degradation and deforestation,
- 2) reduce loss of biodiversity,
- 3) reduce GHG emissions,
- 4) improve soil water retention and increase water yield,
- 5) improve soil fertility and agricultural productivity,
- 6) control soil erosion
- 7) enhance fuelwood production,
- 8) enhance the production of non-timber forest products (NTFPs)
- 9) reduce food insecurity
- 10) improve livelihoods,
- 11) improve the community participation in the conservation and management of natural resources; and forest plantations
- 12) enhance the resilience to climate change

The GEF Cameroon Child projects project is piloting the restoration program with the aims of:

1. Improving Cameroon Government policy commitment to forest landscape restoration and sustainable land management.
2. Piloting and assess the effectiveness of restoration using *Bambusa spp* and other indigenous NTFP like *Irvingia spp*, *Ricinodendron heudelotii*, etc, and ensure the development of their value chains to support biodiversity conservation, sustainable livelihoods, and GHG emissions reduction.
3. Enhancing institutional capacities and financing arrangements for large-scale forest landscape restoration in Waza, Mbalmayo, and Douala Edea Landscapes of Cameroon.
4. Improving knowledge of best practices in landscape restoration, Monitoring, and Evaluation among Project stakeholders.

In essence, these are simply the restoration enabling conditions, which must be fulfilled to assure restoration success and provide the basis for scaling up.

The expected landscape transition requires a raft of nature-based measures (nature-based interventions) that address not only the actual degradation but also the cause. Intervention packages is being designed to respond to multiple restoration objectives creating mosaics and overlaps that encourage synergies among the actors and generate landscape multiple benefits.

1.4. Deforestation and degradation forest landscape in Cameroon

Cameroon's forests are important locally, regionally and globally by virtue of diverse environmental services they provide. However, these forests are exposed to several threats accelerating its degradation. The results of Global Land Analysis and Discovery (GLAD) alerts 2019 also visible on the Global Forest Watch (GFW), out of 127,804 GLAD alerts Nationwide, on (loss and/or gain) reported in 2019, among the forest cover loss alerts, 2,360 aggregates were digitised into polygons and 1,178 selected as landmark deforestation events (LDEs) were registered on the surface area of approximately 3,628.61 ha, of which 10.5% (381.03 ha) were found in the Permanent Forest Estate (PFE) and 89.5% (3,247.58 ha) in the Non-Permanent Forest Estate (NPFE). The East Region had the most LDEs with a proportion of approximately 54.77% of the depletion in national forest cover. The increase of agro-industrial plantation expansion areas in the Littoral Region is reducing forested areas. Here, over 20 ha of deforested areas were identified, thus 27.33% of the national deforestation rate. Varying forms of agriculture (59.99%) are the prime drivers of deforestation in Cameroon. Logging (34.45%), mining (5.11%) and infrastructure development projects (0.45%) are the other drivers of deforestation.



Source: Report on landmark deforestation events 2019

Despite a slight increase in deforestation between 1990 and 2000 (0.06%) and the period from 2000 to 2005 (0.07%), the rate of forest deterioration in Cameroon remains slightly upward (Nasi et al., 2009). The rate of deforestation was 0.08% in Cameroon in 2012 (Wasseige et al., 2012) and currently based on Landmark deforestation Events (LDE, 2019), the rate of deforestation is estimated to 0.02% in relation to the surface area of Cameroon a drop of 0.06% from 2012 to 2019. The Cameroon Ministry in charge of Forests and Wildlife is recommended to put suitable measures in place that limit the

creation of farms in production forests of the Permanent Forest Estate (PFE: Forest Management Units and Council Forests).

1.4.1. *Deforestation and degradation of the forest landscape in Waza landscape*

A study on deforestation factors was conducted in Cameroon based on agro-ecological zones (UNIQUE/IIASA/Rainbow, 2017) and revealed that agriculture is the main factor of deforestation in Waza landscape accounting for about 88%, followed by the cattle and sheep livestock (11%) then the wood energy and charcoal production accounts for only 1%. This finding confirmed the results of the study conducted by Bessat (1997) in wet savannah areas. Bessat (1997) identified agriculture expansion and migration due to insecurity in the Waza region, and overgrazing, as well as firewood and charcoal production, are key drivers of deforestation in Waza landscape. This study also will assess the level of forest landscape degradation by comparing the forest cover 2010 and 2020 (see section 3.1)

1.4.2. *Deforestation and degradation of forests in the Mbalmayo and Douala Edea landscape*

Estimating rates of deforestation and forest degradation in Cameroon is complex given the diversity of agro-ecological zones (RPP, 2012). Some regional sources such as the State of the Congo Forests (EdF, 2010) estimate deforestation and degradation rates at 0.08% and 0.06% between 1990 and 2000. Duvellier et al. (2008) put Cameroon's net deforestation rate at 0.14% and degradation at 0.01% (for a period from 1990 to 2000). In contrast, the FAO study (FRA, 2005 and FRA, 2010) estimates deforestation rates at around 1% annually (FAO and ITTO, 2011). This variation in numbers can be caused by several reasons for the sample scale, the area studied, the type of vegetation chosen, the method of calculation, etc. In addition, the majority of data on deforestation and degradation are derived from studies in the southern forest area and at the sub-regional level.

Between 2001 and 2015, two-thirds of deforestation occurred in the Mbalmayo and Douala-Edea Agro-ecological zones (ZAE 4, ZAE 5). The acceleration of deforestation in these two ZAEs is alarming: deforestation increased by 50% between 2005-2010 and 2010-2015 (UNIQUE/IIASA/Rainbow, 2017). Total deforestation between 2001-2015 reached 208,800 hectares or 3% of forest cover in 2000 (UNIQUE/IIASA/Rainbow, 2017). Nearly two-thirds of the deforestation of ZAE 4 is in four departments: Sanaga-Maritime, Ocean, Moungo and Nyong and Kellé.

In the Douala-Edéa area, in addition to agriculture and agribusiness, logging (mainly *Rhizophora*) is cut for drying and smoking fish. Cutting this wood is a serious threat for the mangroves because in addition to being used for drying fish, this wood is also used for the construction of houses.

2. Restoration Opportunities Assessment Methodology (ROAM)

The Restoration Opportunities Assessment Methodology (ROAM) - an approach that was developed by IUCN and the World Resources Institute (WRI) to guide the processes of developing forest restoration interventions at the landscape level was applied in the current study. It is a stepwise and iterative application of a series of analyses used to identify the best set of Forest landscape restoration (FLR) opportunities applicable to a specific site (IUCN & WRI 2014). The approach has been published in a handbook¹³

A ROAM application delivers six main products:

1. A shortlist of the most relevant and feasible restoration intervention types across the assessment area.
2. Identified priority areas for restoration.
3. Quantified costs and benefits of each intervention type.
4. Estimated values of additional carbon sequestered by these intervention types.
5. A diagnostic of the presence of key success factors and identification of strategies to address major policy, legal and institutional bottlenecks.
6. Analysis of the finance and resourcing options for restoration in the assessment area.

Implementation of ROAM requires a systematic and rigorous assessment and quantification of restoration opportunities available in the target landscapes. The first step is to identify the main environmental challenges in the assessment area, identify site-specific priorities, and landscape intervention options available in the landscape. ROAM uses geospatial, economic, and rapid restoration diagnostic analyses to map, quantify, and assess the institutional readiness of areas with opportunities for restoration. The implementation of ROAM requires a set of fields of knowledge and expertise ranging from GIS and multi-criteria analysis, Agricultural and environmental sciences, REDD+ and carbon market, ecosystem services modeling and valuation, economics, and policy analysis. The assessment team must comprise local experts as it requires good local knowledge in terms of biophysical, social, cultural, and economic dynamics of landscapes. In this case, INBAR recruited a local team composed of a GIS expert, socio-economist, Carbon modelling expert, Policy analyst, and International lead expert who has good knowledge and experience in the application of ROAM for leading the assessment and backstopping the local team. INBAR engaged key partners in each landscape as Landscape leads to lay the ground for workshops preparation, landscape stakeholder mapping and preparation for field data collection. The landscape leads play also a vital

¹³ IUCN and WRI (2014). A guide to the Restoration Opportunities Assessment Methodology (ROAM): Assessing forest landscape restoration opportunities at the national or sub-national level. Working Paper (Road-test edition). Gland, Switzerland: IUCN. 125pp

role in the validation of results and dissemination of findings within the landscapes.

The implementation of ROAM starts with planning. The planning started by drawing a feasible road map that contains detailed activities to be done in ROAM assessment and timelines. In addition, a series of technical meetings were held with the aim to understand the process and the role of every partner in the ROAM team-especially for the landscape leads who needed to understand requirement for stakeholder engagement both in the workshop and in the matters of field survey. The following are the key parameters considered in the planning.

- 1) Define the problem and objectives for FLR in the three landscapes (Waza, Mbalmayo and Douala-Edea).
- 2) Engage with key partners within the landscapes.
- 3) Identify capacity within the ROAM technical team and potential resource persons outside the core team.
- 4) Identify which stakeholders need to be involved, how, and when.
- 5) Define the specific outputs of the assessment.
- 6) Define the geographical scope of the assessment.
- 7) Stratify the assessment area for the field visits.
- 8) Data collection: Customize data collection templates, guiding questions
Categorization of stakeholders, Identification of sites and communities to be visited.

The primary data collection was carried out through field focus group discussions with the communities and key informants in the villages, and stakeholder workshops held in each landscape. Guiding questions were set to guide the discussion in the three thematic working groups (GIS and Monitoring Working Group, Social-economic Working Group, Policy and Governance Working Group). Three main stakeholder workshops held in each landscape were critical for ROAM. Detailed primary data continued thereafter at the field, visiting and meeting local communities in various villages within the landscape in order to collect the view of communities around restoration objectives. The primary data were supplemented by a desk review of baselines, reports, project documents, available policy documents.

ROAM uses restoration diagnostic tool¹⁴ to assess the institutional readiness of areas with opportunities for restoration. The flow diagram (Figure 7) summarizes the ROAM process.

¹⁴

https://www.researchgate.net/publication/289372752_The_Restoration_Diagnostic_A_Method_for_Developing_Forest_Landscape_Restoration_Strategies_by_Rapidly_Assessing_the_Status_of_Key_Success_Factors

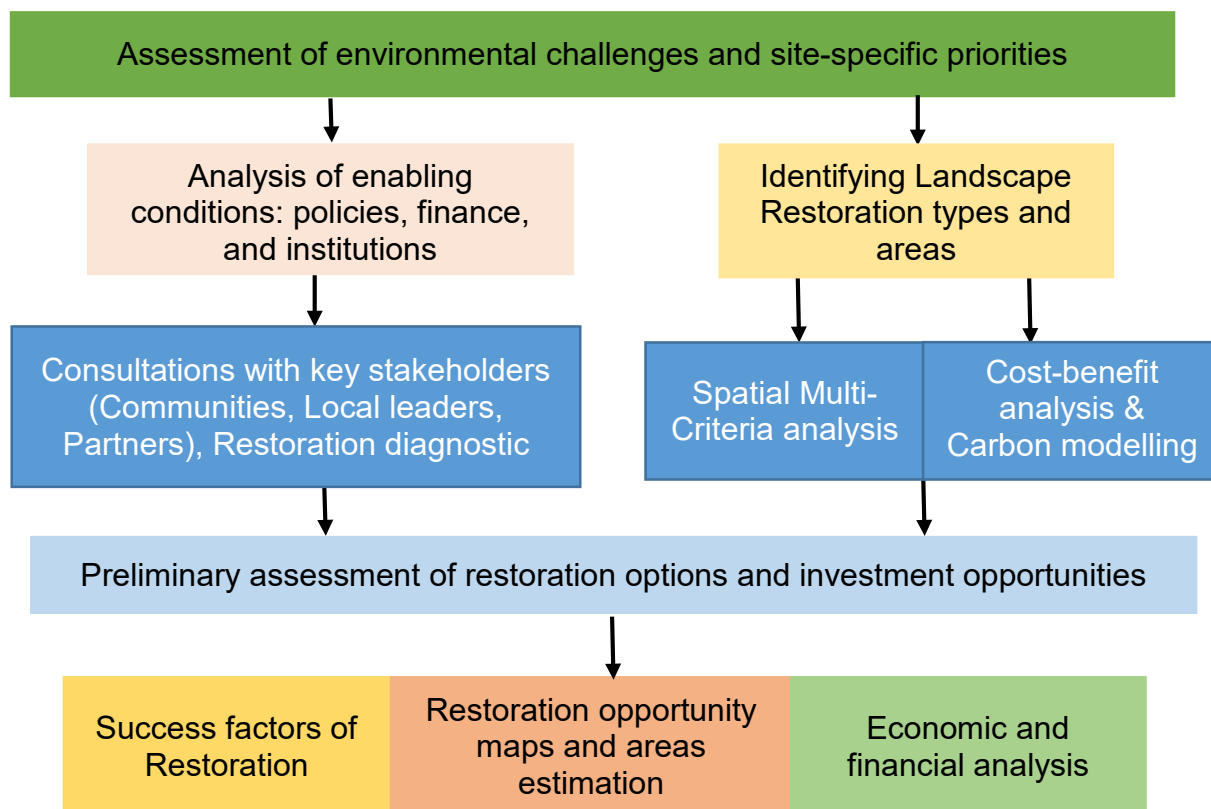


Figure 7. Diagram showing stepwise Restoration Opportunities Assessment process

2.1. The geographic scope of the assessment

As shown on the map (Figure 8), three sub-national landscapes (Waza, Mbalmayo and Douala-Edea) were assessed for restoration opportunities. Cameroon started with these three sub-national landscapes, thanks to the Project TRI which is one of the twelve Child Projects of The Restoration Initiative (TRI) supporting the piloting of Forest Landscape Restoration (FLR) in Cameroon, three sites were selected to represent the major landscapes as follow:

Site 1: The Degraded Sudano-Sahel savannah of the Waza landscape in the Extreme North Region of Cameroon;

Site 2: the degraded Forest Margins of the Mbalmayo cluster in the Centre Region of Cameroon;

Site 3: the degraded Mangroves of the Douala-Edea landscapes in the Littoral Region of Cameroon

The sub-national landscapes were stratified into sub-areas (or 'strata'), each relatively homogeneous in terms of its restoration-relevant characteristics. This process of stratification was important later on, as it enabled the Cost and Benefits Analysis (CBA) to use the same values (e.g., population growth rates, labour costs, and per hectare productivity) for each sub-area. As the process continues the restoration options and characteristics for each geographic sub-area were analysed, reviewed, and refined based on feedbacks from relevant stakeholders.

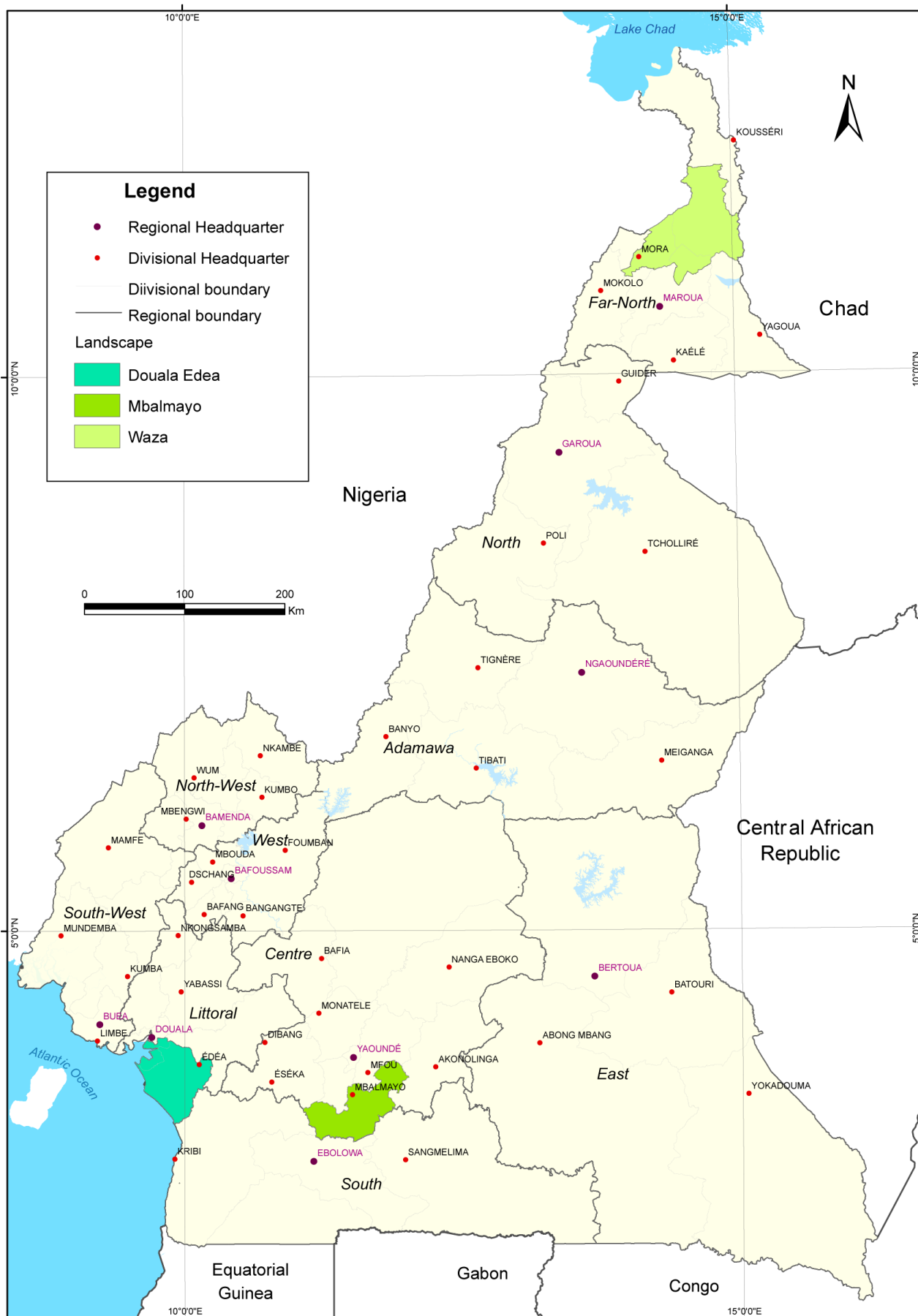


Figure 8. Spatial location of the assessed landscapes

The three landscapes constitute about 14,101 Km² situated in the Northern, Central to Southern and the Littoral of Cameroon. The ROAM assessment covers the entire area. Although seems to be small as compared to the country territory, however, the restoration findings are likely to be found in the three regions (Far-North, Centre – South and Littoral), subject to verification.

Table 1. Area coverage of Waza landscape

Administrative units			Area (km ²)	Hotspots	Community/village consultations
Regions	Divisions	Sub-divisions			
Far-North	Diamaré	Petté	826	Community forest	Abouli (Community forest management, Peul community in the Bogo village)
	Logone & Chari	Waza	3,682	National park, Community Forest	Waza Canton (Agriculture Karal) Canuri community
		Zina	703	Waza Logone Floodplain Zigagué, Ziguina	Agriculture, livestock Human – Wildlife conflicts (HWC), Agriculture – livestock conflicts (ALC)
	Mayo Sava	Mora	1,553	Degraded mountains (arid areas)	Podoko community in the Oujila village, Mada community in the Aissa Hardé village
	Total		6,764		

Table 2. Spatial coverage of Mbalmayo landscape

Administrative units			Area (km ²)	Hotspots	Community/village consultations
Regions	Divisions	Sub-divisions			
Centre-South	Nyong et So'o	Mbalmayo	581	Community forests, Natural reserve, Humid zone of Ebogo	Zouatoupsi Akomyada II
		Ngomedzap	652	Natural reserve (Nkolmekoh)	Nkolnguet
		Dzeng	757	UFA 1481-1, 2, 3, 4, 5 and 6	
		Mengueme	491	Traditional agriculture,	Ebogo
		Nkolmetet	469	Community forests	
		Akoeman	670	Community forests	
Total		3,620			

Table 3. Spatial coverage of Douala-Edea landscape

Administrative units Regions	Divisions	Sub-divisions	Area (km ²)	Hotspots	Community /village consultations
Littoral	Wouri	Douala 6 (Ile de Manoka)	285	Protected area (mangrove forest)	
		Douala 2	190	Protected area (mangrove forest)	
	Sanaga Maritime	Edea 1 (Yassoukou)	1,172	Protected area (Agro-industry, community forests)	
		Mouanko	1,182	Protected area (mangrove forest)	Bedalé, Bakaka, Yoyo 2, Youme 2, Balondo communities
		Dizangue	888	Lake Ossa, Protected area, Agro-industry	Mevia community
	Total		3,717		

2.2. Land Use and forest landscape degradation mapping

The land cover mapping for Waza, Mbalmayo and Douala-Edea landscapes was done using digital supervised image classification with maximum likelihood classifier (MLC). This classification uses the training data using estimating means and variances of the classes, which are used to estimate probabilities and also consider the variability of brightness values in each class. The MLC is based on Bayesian probability theory. It is the most powerful classification method when accurate training data is provided and one of the most widely used algorithm. Based on the 2010 and 2020 Landsat TM and ETM satellite images (Table 4) obtained from the Earth Explorer (<https://dds.cr.usgs.gov/>) land cover for Waza, Mbalmayo and Douala-Edea were produced. Field observation work collected in January and February 2021 enabled the ground-truthing and the accuracy estimation and validation of the classified land cover maps. The land cover maps of 2010 and 2020 were used, through change detection techniques, to assess the trend of land degradation and deforestation over a decade, and predict the future trend if no action is taken.

Table 4. Image Characteristics

Landscape	Images Coordinates (p: path r: raw)	Sensor	Number of band	Period and bandwidth	Color composition index	Unit
Waza	p184r53 p185r53	Landsat TM and ETM	Band 3 - Green, Band 4 - Red, Band 5 - Near Infrared,	2010 2020 175km	RGB Vegetation index	Z33N UTM
Mbalmayo	p185r57 p185r58		Band 6 - Medium Infrared 1			UTM Z32N 30m
Douala Edea	p186r57 p186r58					

2.3. Geospatial Analysis

To quantify degraded land use (equivalent to opportunity areas for forest and landscape restoration), a geospatial analysis was performed incorporating sub-national datasets representing the geographic and topographic features of Cameroon. Datasets including elevation, slope, land cover, forest cover, water bodies, parks and reserves, and administrative areas, were consolidated into a geographic information system (GIS), where criteria associated with each type of potential restoration intervention were applied to identify the area's best suited for implementing the intervention. The spatial multi-criteria techniques were used to combine multiple layers representing criteria to consider in order to identify opportunity areas for restoration. The spatial data are overlaid and combined with each other, and areas where they intersected were identified as opportunity areas. This process was replicated for each of the restoration interventions to create maps of opportunity areas. Areas were summarized at various administrative levels (e.g., Region and Subdivision) to convey the level of opportunity within an applicable context.

2.3.1. Mapping opportunity for agroforestry

To identify areas for agroforestry on flat or gently sloping land, including lands principally managed as pasture or rangelands, we used the same three datasets identified above, with a few differences in methodology. We isolated areas of both cropland and grassland/shrubland from the land cover data; non-forested areas from the forest cover data; and land with a slope less than 3 degrees (5%). The intersection of these datasets is the opportunity area for agroforestry on flat or gently sloping land.

To identify opportunity areas for agroforestry on steep sloping land, the geospatial analysis involves isolating areas of cropland from the land cover data; non-forested areas from the forest cover data; and land with slope greater than 3 degrees (5% incline) from the slope data. The intersection of these datasets, is the opportunity area for agroforestry on steep sloping land.

2.3.2. *Mapping opportunity for forest plantations (woodlots)*

To identify opportunity areas for creation of forest plantations and woodlots on steep sloped land, the geospatial analysis involves isolating areas of bare soils / degraded forest land/or savannah & shrubs (non-protected areas) from the land cover data; non-forested areas from the forest cover data; and land with a slope greater than 3 degrees (5% incline) from the slope data. The intersection of these datasets is the opportunity area for forest plantations on steep sloping land.

2.3.3. *Assisted natural regeneration of the protected degraded wooded savannah and shrubs, parks, reserves, and community forests*

The interventions associated with natural forest regeneration include restoring degraded natural forest inside parks and community forests. For the ‘degraded savannah’ intervention, we extract areas from the forest cover dataset defined as “degraded savannah” and overlay these areas with the boundaries of reserves and national parks. Any areas of degraded forest that overlap with these boundaries are quantified as opportunity areas for assisted regeneration intervention.

2.3.4. *Restoration and improved management of community forests, forest council, and forest reserve*

For the analysis to identify areas for restoration and improved management of community forests, forest council, and Natural reserve, we use the data on community forests, forest council and forest reserve boundary, and a non-forested area within the boundary of these two. To identify areas of restoration, we extracted areas of non-forested areas within the boundary of forest reserve, forest council, and of community forests.

2.3.5. *Mapping opportunity for protective forests*

The protective forest interventions mapped in this analysis include establishing a protective forest on steep degraded land; within 50-m buffers of riparian areas; and within 50-m buffers of wetlands and within 30-m of water bodies. Protective trees are also established within the populated areas and along with the roads.

The topographic highs are extracted as “steep” and “very steep” categories from the slope dataset. The criteria for a steep slope is defined as a slope between 12 and 30 degrees (20-55% incline) and the criteria for a very steep slope is defined as greater than 30 degrees (>55% incline). To quantify only those steep sloped land that is currently non-forested, we used the forest cover dataset to extract only non-forested areas.

The ‘riparian buffer’ interventions include establishing 30-m buffers along rivers that are

non-forested that should be forested with native species. The national datasets of forest cover and rivers are used in this analysis. We use the forest cover dataset to extract areas of non-forest. Using ArcGIS tools, we then buffer rivers by 30m and overlay the buffered area with the area of non-forest. Areas, where these datasets overlap, are defined as opportunity areas for the riparian buffer interventions. We use a similar approach for the 'wetland buffer' intervention, where we use an existing dataset of wetlands and ArcGIS tools to buffer the dataset of wetlands by 50 meters. We then overlay this buffer with the forest cover dataset that has non-forest areas extracted, thus defining the opportunity area as areas within 50m of non-forested wetlands.

For the 'buffer of water bodies' intervention, we use the water bodies dataset. Using ArcGIS tools, we then buffer this area of water bodies by 30m and, using the forest cover dataset /waza national boundary again, we eliminate (using erase tool) any areas from the buffer that were already forested. Thus, the opportunity area for this intervention is defined as all non-forested areas within 30-m of existing water bodies.

The 'roads protection' interventions include establishing 20-m buffers along roads that are non-forested that should be forested with wood species. The datasets of forest cover and road network are used in this analysis. We use the forest cover dataset to extract areas of non-forest. Using ArcGIS tools, we then buffer roads by 20m and overlay the buffered area with the area of non-forest. Areas, where these datasets overlap, are defined as opportunity areas for road protection interventions.

For the populated areas (settlement), we use the land cover dataset to extract areas with settlements (schools, villages, administrative offices etc.), Using ArcGIS tools, we digitized the settlement area and overlay it with the area of non-forest. Areas, where these datasets overlap, are defined as opportunity areas for the 'urban forests' interventions.

2.3.6. *Mapping areas for restoration of mangrove forests*

To identify opportunity areas for restoration of mangrove forests, the geospatial analysis involves isolating areas of mangrove forests from the land use or land cover data; non-forested areas of mangrove (deforested mangrove areas) from the forest cover data and land with swamp or within the boundary of mangrove occupation map. The intersection of these datasets, is the opportunity area for mangrove plantations. The opportunity areas correspond to the non-forested area within the mangrove boundary limit. The expansion of mangroves trees can also be identified in swamp along the natural reserve/park. Existing mangroves forest areas correspond to the part of mangrove forest which has not been deforested.

2.4. Suggested species for FLR

During Field visits and in the workshops with major stakeholders, species were suggested for restoration of landscapes based their multiple use. Once the options were known, the costs (price) of the products (as part of agroforestry) and ecosystem services of the selected species (energy wood, service wood, soil fertility, fodder, feeding, carbon

sequestration etc.) were sought. For example, Table 5, Table 6, and Table 7 show the different woody species identified during consultations and community visits that need to be considered in the restoration of target landscapes (Waza, Mbalmayo and Douala-Edea).

Table 5. Major Species for the restoration of the Waza landscape

Nb	Common name	Scientific name	Vernacular name	Main uses
1	Egyptian Mimosa	<i>Acacia nilotica</i>	Gabdé	Firewood, timber, soil fertilization, fodder, hedgerows
2	Senegal's gum tree	<i>Acacia senegal</i>	Pattugelhi	Firewood, soil fertilization, fodder, shading
3	Whitebark Acacia	<i>Acacia seyal</i>	Mboulbi	Firewood, fodder
4	Siberianna	<i>Acacia sieberiana</i>	Alloukidanéhi or dandaneh	Firewood, soil fertilization, fodder
5	Acacia with round apple	<i>Faidherbia albida</i>	Tchaski	Firewood, soil fertilization, fodder, shading
6	Dattier desert	<i>Balanites aegyptiaca</i>	tanned	Food, firewood, lumber, medicinal, fodder, charcoal, timber
7	Bayahonde	<i>Prosopis juliflora</i>	-	Firewood, timber, soil fertilization, fodder
8	Bamboo	<i>Oxytenanthera abyssinica</i>	Kewé	Non-Timber products

Table 6. Major Species for the restoration of the Mbalmayo landscape

Nb	Common name	Scientific name	Vernacular name	Main uses
1	Mango/ mangué sauvage	<i>Irvingia gabonensis</i>	Ndo'o	Food, seed used for medicine, Firewood, power supply, shading
2	Bitter Kola	<i>Garcinia cola</i>	Onié	Firewood, food, medicinal plant, shading
3	Safou	<i>Dacryodes edulis</i>	Nsé	Firewood, power supply, shading
4	Ndjansang	<i>Ricinodendron heudelotii</i>	Ndjansang	NTFP fruits, kitchen oil, medicinal plant, wood for arts
5	Bamboo	<i>Oxytenanthera abyssinica</i>	Esong tanhain	Non-Timber products

Table 7. Major Species for the restoration of the Douala-Edea landscape

Nb	Common name	Scientific name	Vernacular name	Main uses
1	Mangrove	<i>Rhizophora R. racemose</i> (<i>R. mangle</i> , and <i>R. harrisonii</i>)	Matanda	Firewood, lumber, coastal protection
2	Mango	<i>Irvingia gabonensis</i>	Ndora	Firewood, power supply, shading, food
3	Bitter Kola	<i>Garcinia cola</i>	Nyalla	Firewood, food, medicinal, umbrag
4	Safou	<i>Dacryodes edulis</i>	Sàa	Firewood, power supply, shading, food
5	Ndjansang	<i>Ricinodendron heudelotii</i>	Ndjansang	NTFP fruits, kitchen oil, medicinal plant, wood for arts, food
6	Bamboo	<i>Oxytenanthera abyssinica</i>		Non-Timber products

It is important to note that the selected species are all for multiple use as can be seen in above tables. Indeed, the success of a landscape restoration program must take into account species that provide many goods and services at the local level (fertility improvement, diet, energy wood, cultural values, medicine etc.). In addition, some species are planted in association with crops (agroforestry system). We should also note that the bamboo is much expected in the three landscapes to restore the water bodies but also to play a role of service wood.

2.5. Economic analysis, carbon modelling and financial analysis

2.5.1. Cost and benefit analysis

The economic analysis modeled the costs and benefits of degraded and restored land uses and estimated Net Present Value (NPV), a return-on-investment (ROI)¹⁵ and sensitivity analysis. The analysis identified restoration intervention for each degraded land use and calculated the expected rate of return for each transition from the perspective of private landowners. The analysis modelled crop and timber yields, erosion, and carbon sequestration for each degraded land use and restoration intervention at one-hectare resolution using sub-nationally representative data collected during the field visits in each landscape. In order to estimate the costs and benefits of restoring degraded land, a model of each land use and restoration intervention was created by combining the results from the ecological modeling with market prices and an enterprise budget that accounted for

¹⁵ Goldstein et al. (2008) 'Using return-on-investment to guide restoration: a case study from Hawaii' Conservation letters.

the direct and indirect financial costs of restoring the land¹⁶. The benefits of the restoration types were defined as private or public goods depending on whether private landowners or the public at large received them. The financial and non-financial value of each restoration transition was calculated by modeling the ecosystem services associated with each degraded land use and restoration intervention using simulated mean-annual-increments, carbon sequestration, precipitation values, and crop yields¹⁷.

The time horizon for analysis is 25 years, the analysis is done per hectare for the different models and the discount rate is 10% for the calculation of net present value (NPV). For sensitivity analysis, the discount rate was varied from 10% to 40%.

A positive NPV indicates that the projected earnings generated by a restoration intervention—in present dollars—exceeds the anticipated costs of restoration, also in present dollars. It is assumed that a restoration option with a positive NPV will be profitable. A restoration option with a negative NPV will result in a net loss. This concept is the basis for the Net Present Value Rule, which dictates that only restoration with positive NPV values should be considered. The NPV is calculated as follow:

$$NPV = \sum_{t=1}^n \frac{R_t}{(1+i)^t}$$

Where, **R_t** is Net cash inflow - outflows during a single period, **i** is the Discount rate or return that could be earned in alternative restoration option at **t** the time horizon

2.5.2. Carbon modelling

Carbon sequestration values were calculated for each intervention previously identified during fieldwork, mapped and validated in the FLR strategy using the methods recommended by the IPCC's Best Practice Recommendations (IPCC, 2003; IPCC 2006). The IPCC proposes three types of methods for calculating carbon sequestration. The basic method (known as the "Level 1" method) tracks the evolution of carbon stored in biomass, based on default values. This method is simple and requires relatively little information. The more advanced methods (Level 2 and Level 3) are more complex, but produce more accurate results. They are appropriate when the scale of analysis is lower or when more accurate numbers are needed.

Given the lack of nationally available data, Level 1 was selected for this work. So, the data used come primarily from the basic data of the IPCC (2003; 2006), but this data were

¹⁶ An enterprise budget is a written objective statement for a crop or livestock production activity that lists the production goals, management activities, resource requirements, and economic returns of a farm enterprise.

¹⁷ Financial values reflect the revenue earned through the sale of primary production, such as crops, fuel wood, or timber. Non-financial values reflect ecosystem benefits received such as Rainfall, Biodiversity, carbon sequestration, cultural, medicine etc.

supplemented by the existing data. In mangrove areas, for example, we used baseline data from Ajonina et al., (2014) and Zapfack (2005).

Data on the storage and sequestration potential of the species used for restoration was also be obtained from the IPCC literature and baseline data review (2003; 2006).

Estimates of biomass, especially in forests, are often reported in terms of standing volume (cubic meters), but since carbon is reported as a weight (tons) the standing volume estimates have to be converted. First, standing timber volume (cubic meters) is converted to weight (Kg) using a biomass conversion expansion factor (BCEF) appropriate for the climate zone and forest type (Equation 1):

The carbon from the above ground biomass were calculated using the formula

$$\text{Above ground biomass}_i(\text{AGB}) = M^3 * BCEF_s^i \quad [1]$$

Where **M** is standing volume (cubic meters), *i* indexes the growing stock level and **BCEF** is the Biomass Expansion and Conversion Factor.

Belowground biomass, or Root Biomass Dry Matter (RBDM) is calculated using an equation 2 that converts above ground biomass into RBDM:

$$\text{RBDM} = e^{(-1,805+0,9256*\ln(\text{AGB}_i))} \quad [2]$$

Where **AGB** is Above ground biomass for the growing stock level *i*.

Once the standing volume has been converted, the weight of carbon is estimated assuming that biomass represents 49% of carbon in dry weight. The total amount of carbon sequestered per hectare is obtained using the following formula 3:

$$C (\text{tonnes}) = (\text{AGB} + \text{RBDM}) * 0,49 \quad [3]$$

Where 0.49 is the factor in converting tons of dry matter into carbon (IPCC, 2003).

The estimate can be converted into units of CO₂ equivalent by multiplying it by 3.67, which is the ratio between the atomic mass of CO₂e (equivalent) and C, respectively.

The estimate of monetary values of carbon benefits is be based on carbon price data. Ghana's assessment, for example, estimated that the price of carbon was 13.63 Ghanaian cents (GHS) (about 7.5 USD), which was the average price of a tons of carbon on the voluntary carbon exchange market in 2012 (Peters-Stanley et al.,2013). This price is therefore adjusted to the current market value.

2.6. Rapid restoration diagnostic

There are a number of factors that—when present— increase the likelihood that forest landscape restoration will successfully occur. In order to assess the state of these “key success factors” a “Rapid Restoration Diagnostic” developed by WRI and IUCN was used

to identify which success factors already exist and which are currently missing (or partially missing) within Waza, Mbalmayo and Douala-Edea landscapes (Figure 9). The assessment team conducted desk review, key informant interviews and workshop sessions to better understand the situation related to the key success factors for forest landscape restoration in Cameroon. First, Landscape leads made an inventory of key stakeholders governmental and non-governmental institutional stakeholders that are currently involved in restoration activities. Stakeholders were consulted in inception workshops to produce preliminary results of the assessment of key success factors for forest landscape restoration in Cameroon.



Figure 9. Stakeholder participation in the rapid restoration diagnostic plenary session in the Waza (left), Mbalmayo (middle) and Douala Edea (Right) landscapes.

3. Land use dynamics, forest degradation and restoration options

3.1. Forest types in Waza, Mbalmayo and Douala-Edea landscapes

The landscapes Waza, Mbalmayo and Douala-Edea selected for sub-national restoration opportunity assessment are distributed in three large ecological complexes of Cameroon. The current land occupation here is based on forest stratification from four classifications: YANGAMBI (1956), FAO (1967), UNESCO (1973) and SPIAF (1980), applied by ONADEF (National Forest Development Office) in 1996. These ensembles also guide the forms of land use that exist in landscapes.

Forest stands are forest formations: dense forests, forest galleries and wet forests (mangrove, swamp). Forest stands are secondary forests (young and adult), shrub savannas and tree savannah (steppe) and non-wooded stands are grassy savannahs, agricultural environments (unique), and urbanized environments. All these land-occupied entities have evolved in the different landscapes as a result of human actions (in the face of its ever-increasing needs) and also natural effects (floods, landslides, riverbanks, silos of rivers) with a rate of 2.7% degradation per year (GFW, 2020). Forest stands are lands that support closed forest formations as used by the Yangambi classification (1956). They can be found in the landscapes of Douala-Edea and Mbalmayo. They are formed of forest galleries encountered in savannah areas, areas with more or less drained cash. It has a closed vegetation of medium stature and follows the normal evolution of a forest.

Secondary forests are formations that follow a total disturbance and which constitute the transitional phase to the establishment of the primary forest. The secondary forests composition is different from the forest stands in part because of the heliophile nature of fast-growing species. The development of secondary forests is related to the various disturbances and the newly created light conditions. The *young secondary forest*, also known as forested land, precedes the adult secondary forest; it is a more advanced stage of regeneration. Physically, it has an irregularly dense tree floor in the vertical plane with a very dense undergrowth. The species of young secondary forests are either species of origin or fast-growing heliophile colonizers. The young secondary forest is likely to occur on stations previously occupied by evergreen forests and can also colonize savannahs exempted from annual fires that can settle very quickly at the end of the crop cycle.

There are also *hydromorphic forests* such as *mangroves* that dominate the landscape of Douala Edea with its sea front. These are the evergreen forests associated with the current marine alluvial. These naturally flat, muddy and impenetrable soils are periodically flooded by seawater, rains and rivers. Mangroves are located on the Bakassi Peninsula, at the mouths of the Akwa Yafé, Ndian, Lokélé and Meme rivers, and around Wouri bay, where the Mounjo, Wouri and Dibamba flow; also reaching the Sanaga estuary and the mouth

of Nyong in the Mouanko area. They are also located in a much less extensive way, south of the town of Campo on the banks of the Ntem. The mangroves consist of trees or shrubs with heights ranging from a few meters to 20 m heights and diameters sometimes up to 20cm. The density of the canopy, although higher on the banks of streams, is often low. The mangrove forest is distinguishable from swamp forests.

Swamp forest is a periodically flooded forest that is located in the valleys of medium and large streams on soils full of spongy water, whose height and duration of the submersion vary with the distance of the rivers. The flood can last several weeks but there is a fairly long drying period. It occurs in the towns of Pété, Zina and part of Mora and Waza in the Waza landscape. In the landscape of Douala Edea, there is a vast area of swamp forest and in Mbalmayo it is found not far from the banks of Nyong and So'o. The characteristic species of the flooded forest are the stands of *Guibourtia demeusei* (Bubinga); while the upper Nyong Valley is represented by *Sterculia subviolacea* (Efof ayous osoé), (Rikio) is found in the lower Nyong Valley and its tributaries, going southwest. *Raphia monbuttom* (Raphiale) is often present in these stands.

The *savannah stands* "trees and shrubs" are scattered among the graminial carpet" (Yangambi 1956). Tree strata range in density from 2% to 20%. The height of the trees does not exceed 10 meters. This is the specificity of the Waza landscape with the tree and shrub steppe which are formations composed mainly of thorns and rare non-thorny relic trees, dotted with a few grasses, termite mounds and trees or shrubs (Letouzey) it is the vegetation of the Hardé (the grasses are perennial and usually do not exceed 80 cm in height at the end of the vegetation season); it is the vegetation of the Mandara Mountains and south of the meadows periodically flooded from the low plains located in the extension of Logone. The savannah admits some trees that rarely exceed 10 m in height, while their density is exceptionally 20%.

The *grassy savannah* is a graminial carpet where trees and shrubs are absent. The height of the herbaceous canopy can vary from a few decimeters to two meters. The main recognized associations are dominated by *Pennisetum purpureum* and *Imperata cylindrica*. Large termite mounds are common in the latter association. Unlike the dry semi-naked which is edaphic and therefore, at very wide distribution, the savannah corresponds to a particular climate.

Shrub savannah: gramine carpet topped with shrubs. The shrub floor is barely more than 20% while the height does not exceed 5 meters. Two associations are particularly important: those in *Annona senqualellsis* and *Bridelia ferruginea* and that in *Terminalia glaucescens*.

Non-forested land consists of agricultural land and urbanized areas. For agricultural land, it is a mosaic of restricted areas either newly burned, fallow, wasteland or cultivated areas (village culture). There is also industrial cultivation that generally extends over large areas and has important means with perennial crops identifying non-forest plantations such as cereal, rubber, banana, coffee, sugar cane, oil palm, pineapple and cocoa.

Urbanized lands represent environments where human action has been so intense that it is difficult to foresee a return to the previous natural state by the forces of nature alone. In the landscapes, these are the industrial complexes, the localities (small town, village), urban centers combining services of various kinds. Non-forested land are also bodies of water (river, sea, ocean) that are used by people for various activities (fishing, displacement, etc.). In the Douala-Edea landscape, bodies of water are part of people's daily lives and are real economic resources, while in Waza it is a source of conflict of access and use that affects both the availability of the resource and the wildlife. In the landscape of Mbalmayo, they also serve as an alternative activity for young people (sands, fishing) and also the water supply of the city of Yaoundé.

Figure 10 shows the land cover map of **Waza landscape** dominated with wood savannah and humid savannah, grassland, and shrubs.

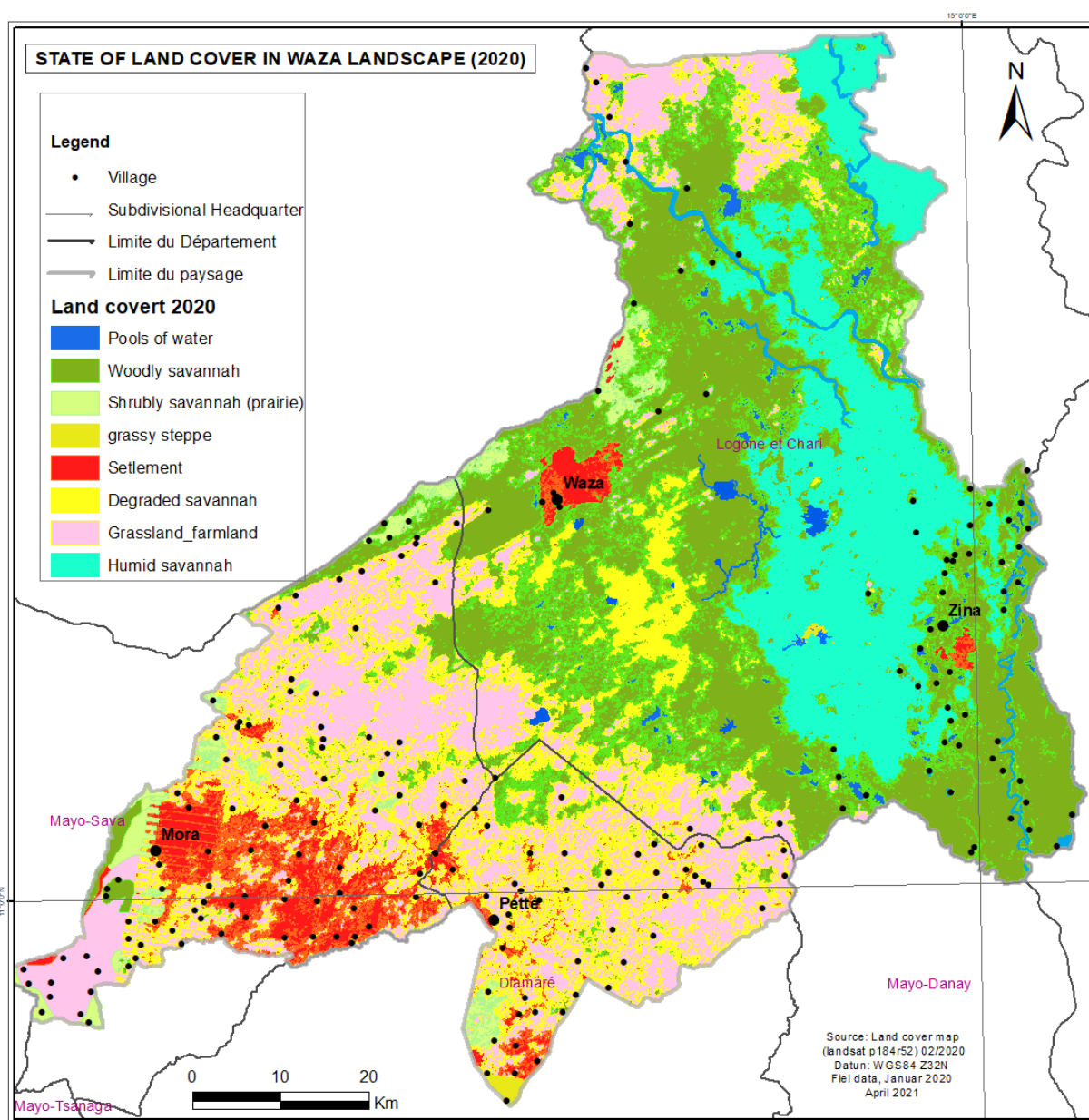


Figure 10. Land cover map of Waza landscape in 2020

Of 671,087.21 hectares of Waza landscape, tree savannah is dominant (37.96%), followed by grass and shrub savannah/agricultural plantation (31.09%) and wet savannah (14.86%). The domain of shrubs occupies about 4.26%, wooded savannah (7.81%), degraded savannah (2.32%), and Water (mostly temporal streams) covers about 1.70% of the total landscape area (Figure 11).

Waza landscape is largely occupied by the Waza National Park, the Pété Community Forests, and the RAMSAR-listed wetland, all of which occupy more than 60% of the landscape. The other areas consist of agricultural plantations (cotton, cereals), and pastures. There is a growing overlap between agricultural and pasture areas and the creation of canals for fishing areas around the park.

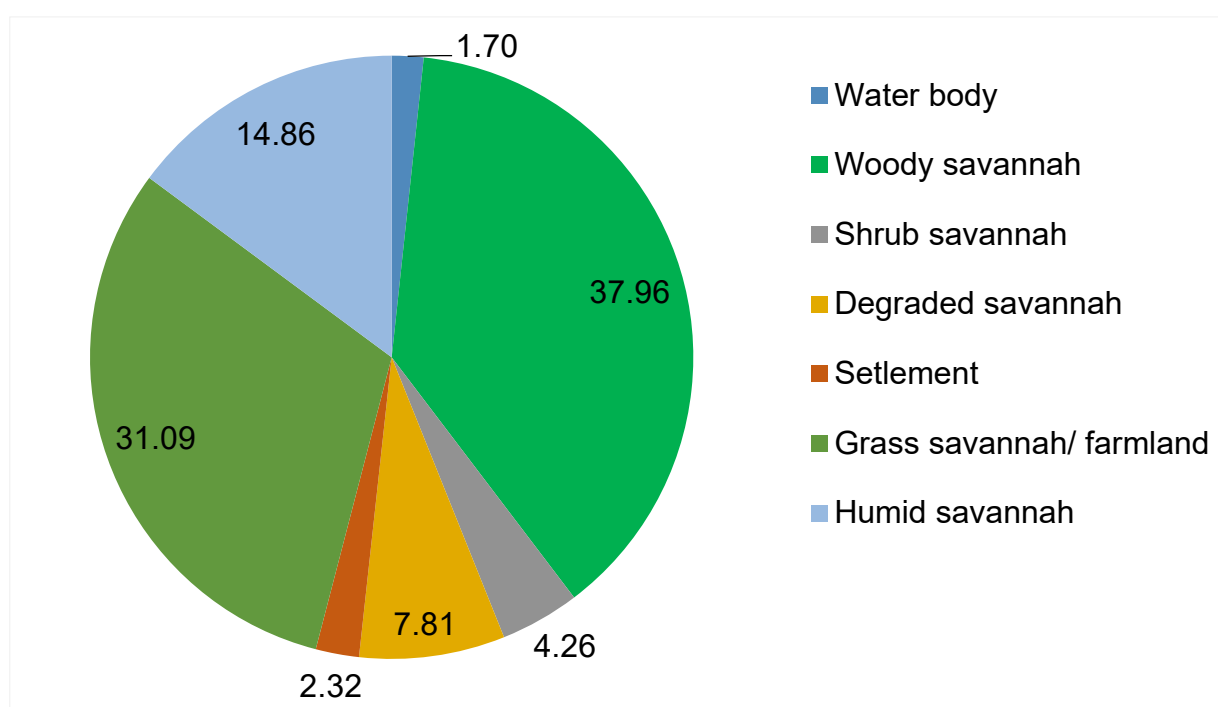


Figure 11. Land cover type proportions (%) in Waza Landscape

The dynamics of Waza landscape have significantly contributed to the extensive degradation of its woody cover. The environment being that of dry savannah, the degraded savannah has increased of 2% a decade between 2010 (Figure 12) and 2020 (Figure 10) meaning an increase of 0.2% every year. Shrubland also tremendously decreased of about 18.6% from 153,374 hectares to 28,605 hectares i.e., almost a reduction of 2% every year. The RAMSAR protected humid savannah also reduced of about 1.2% of its extent over this decade (2010-2020). All these dynamics are in favor of Agriculture and livestock which increased of about 13% meaning approximately an increase of 1.3% every year. Figure 13 and Figure 14 shows the land use dynamics and related degradation occurred over ten years from 2010. Refer also to appendix

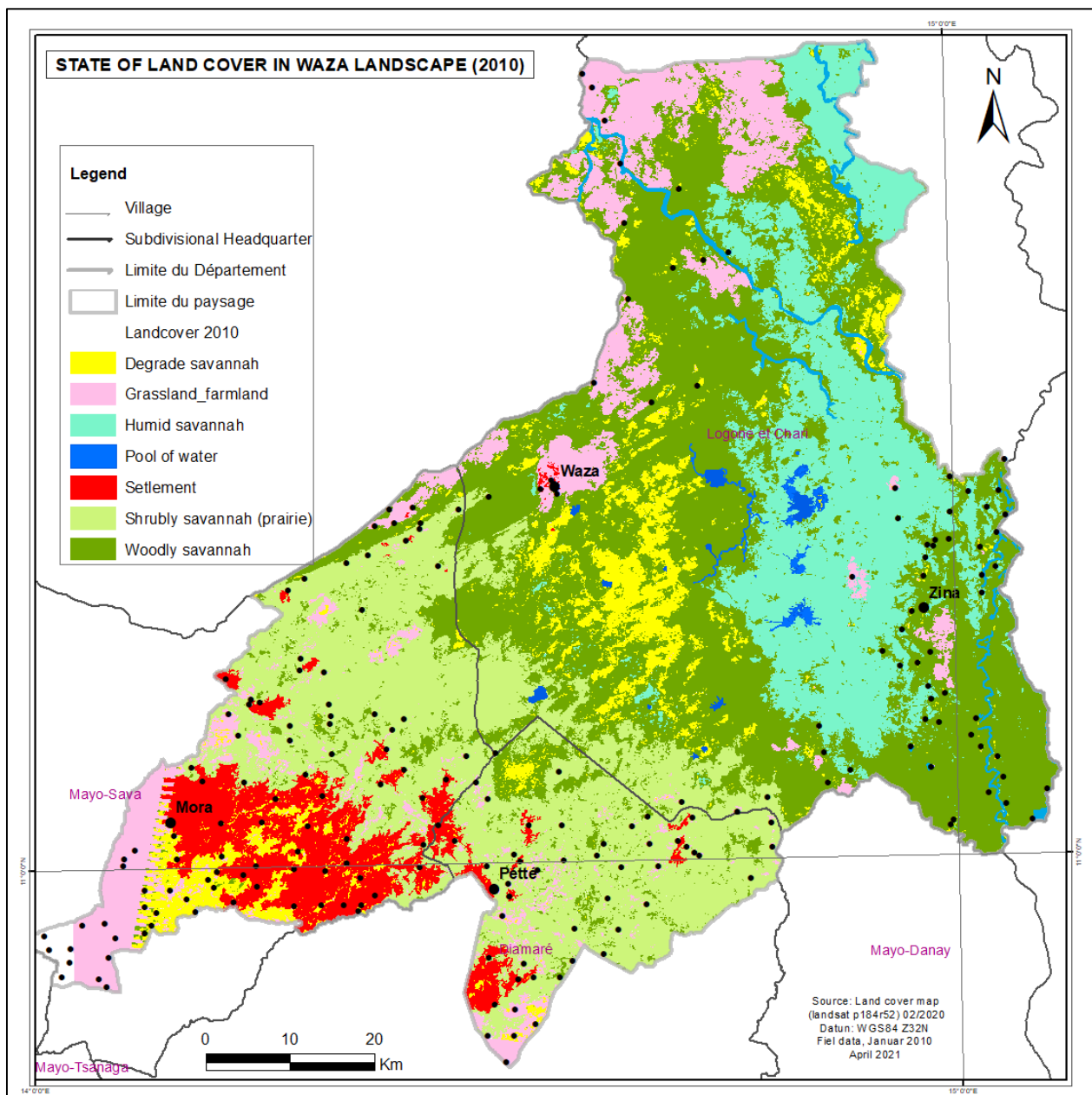


Figure 12. Land cover map of Waza landscape in 2010

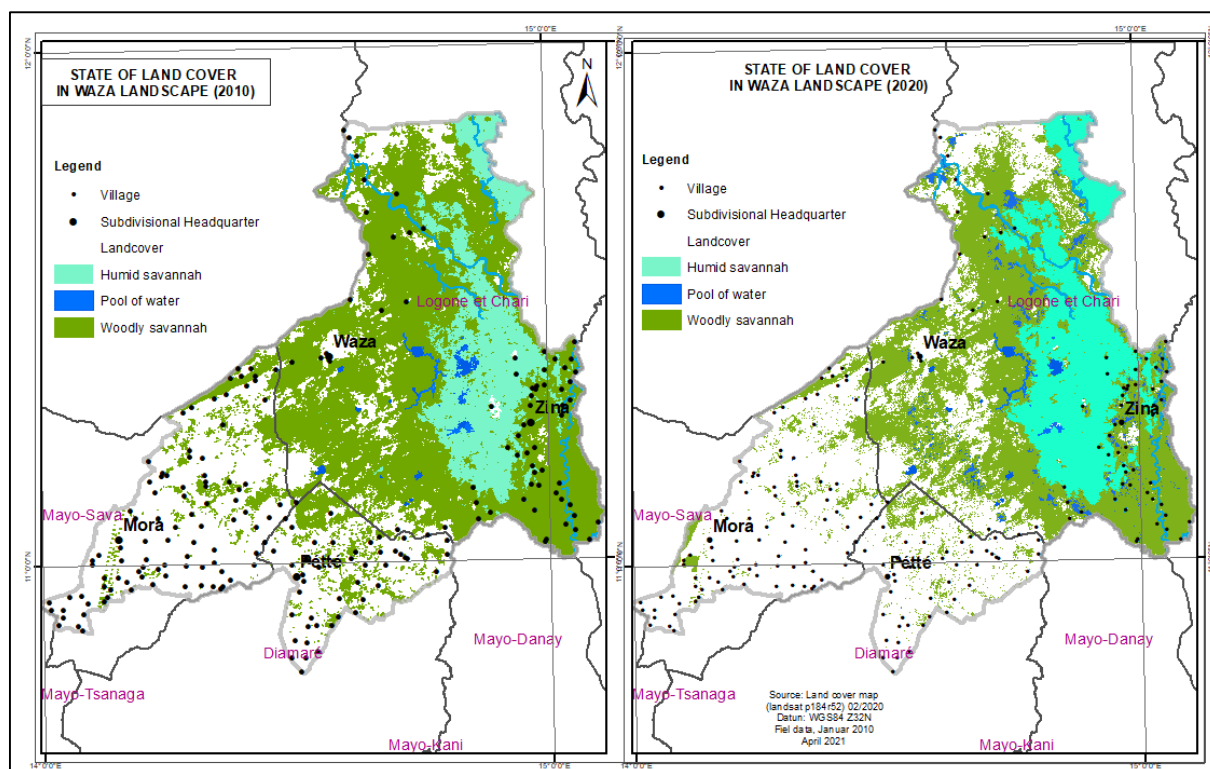


Figure 13. Forest cover change in Waza over ten years (2010 - 2020)

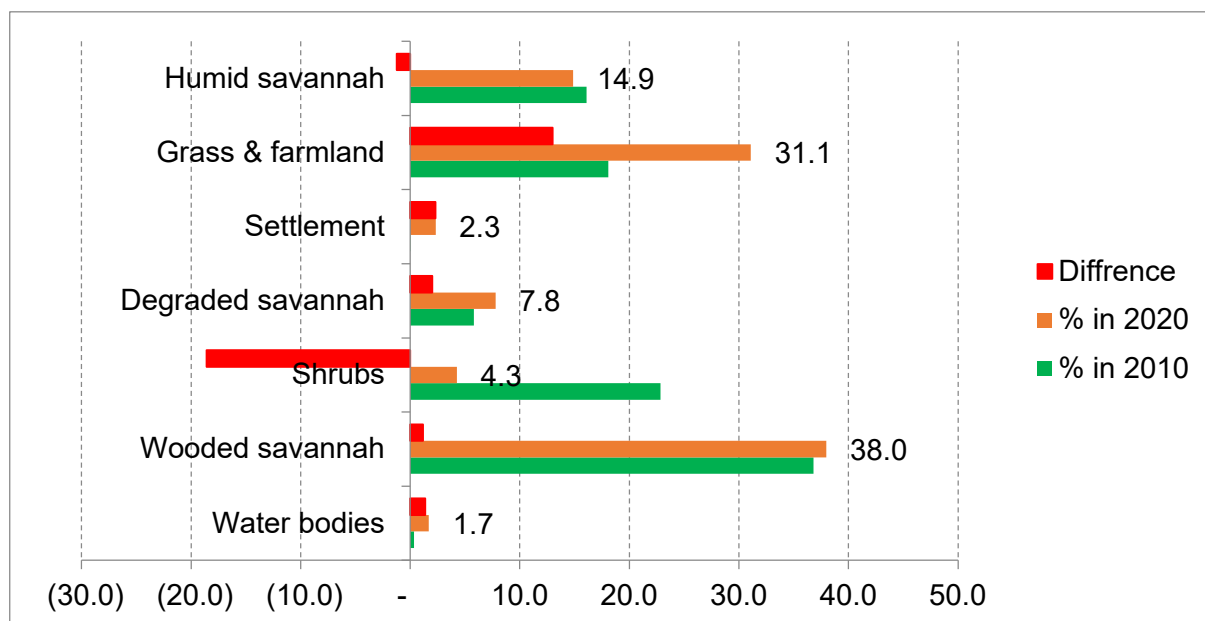


Figure 14. Land cover change in Waza landscape (2010-2020)

The **landscape of Mbalmayo** with 361,924 hectares, still holds 52.7% of its forest area of which 18.4% of secondary forest. It is also highly anthropogenic with 25.4% agricultural space and 2.1% urbanized space. Mbalmayo landscape also holds the domain of humid forests (0.98%) and large rivers (0.36%). Its peculiarity is that it is close to the urban center of Yaoundé and constitutes a production center for its food which justifies nearly 43.85% of degraded forest (Figure 16).

The landscape contains the forest reserves of Mbalmayo and Zamakoé as well as five community forests that occupy hardly 20% of the landscape. Mbalmayo landscape is at full threat with agricultural activities and urban expansion.

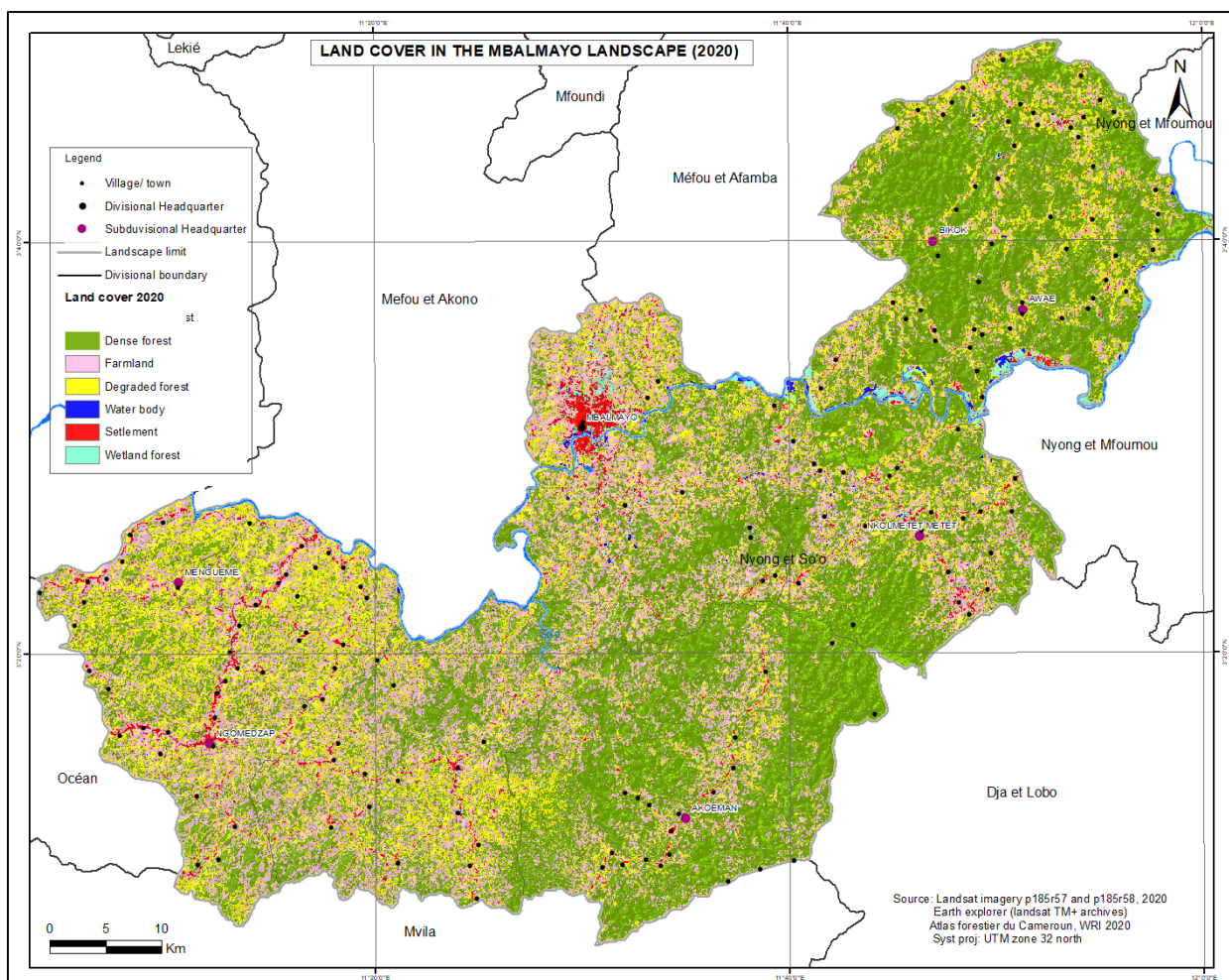


Figure 15. Land cover map of Mbalmayo landscape in 2020

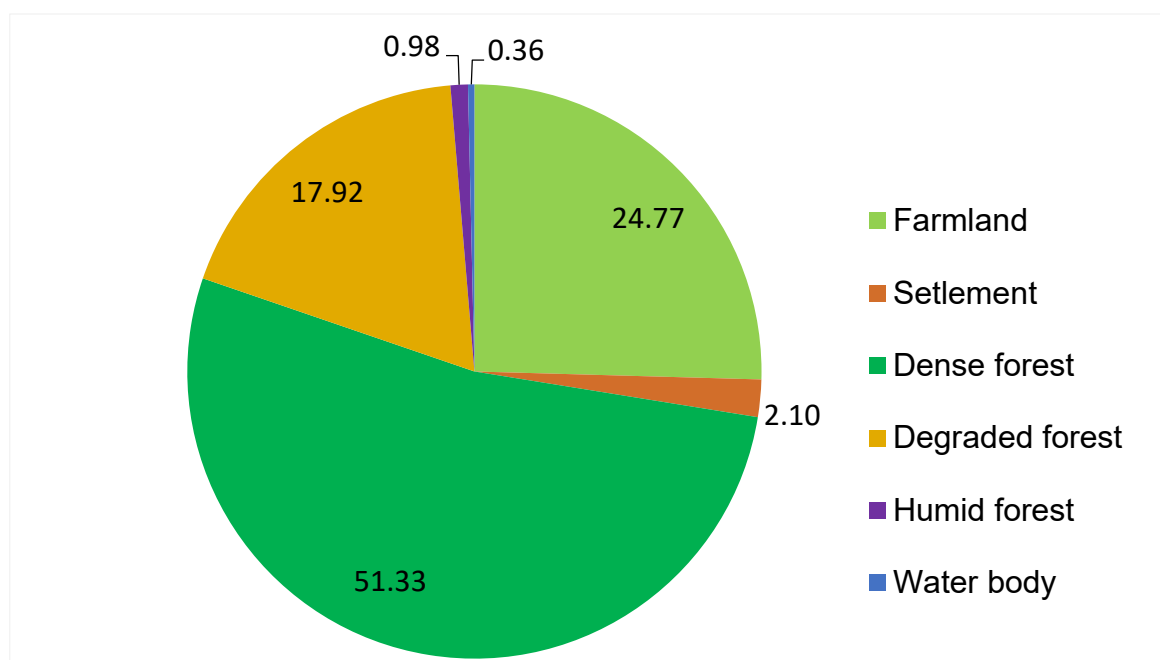


Figure 16. Land cover type proportions in Mbalmayo Landscape

The challenge in Mbalmayo landscape remains the expansion of agricultural activities and urbanization that have contributed to the acceleration of the degradation of the forest cover of the landscape. Figure 17, Figure 18 and Figure 19 shows the characteristics of land use dynamics between 2010 and 2020. The dense forest decreased by about 7.6% over ten years from 218,949 hectares to 190,774 hectares i.e., almost a reduction of 0.8% every year. Similarly, Secondary forest has also been reduced from 24,725 ha to 16,493 ha, about a reduction of 2.2% over a decade (2010-2020).

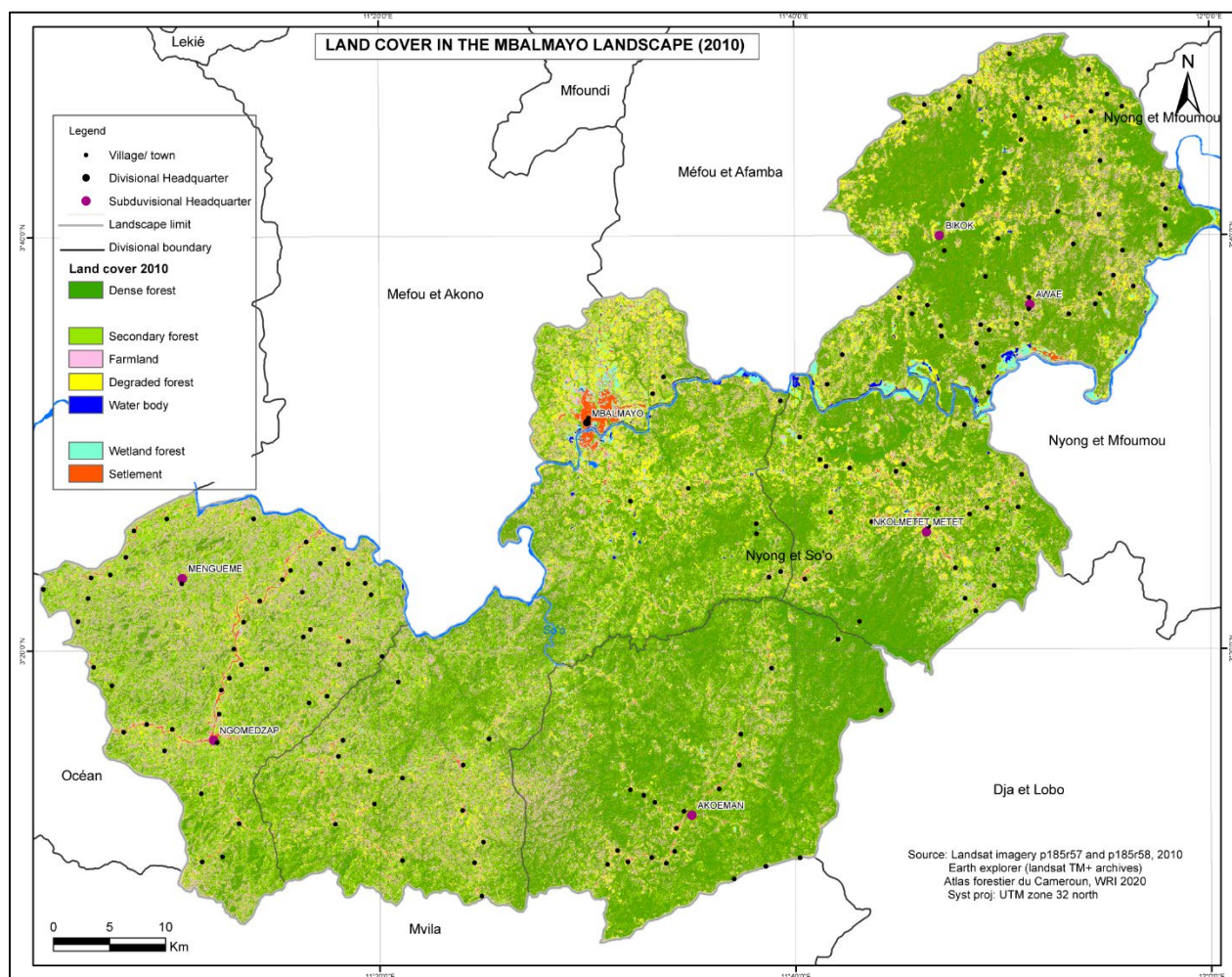


Figure 17. Land cover map of Mbalmayo landscape in 2010

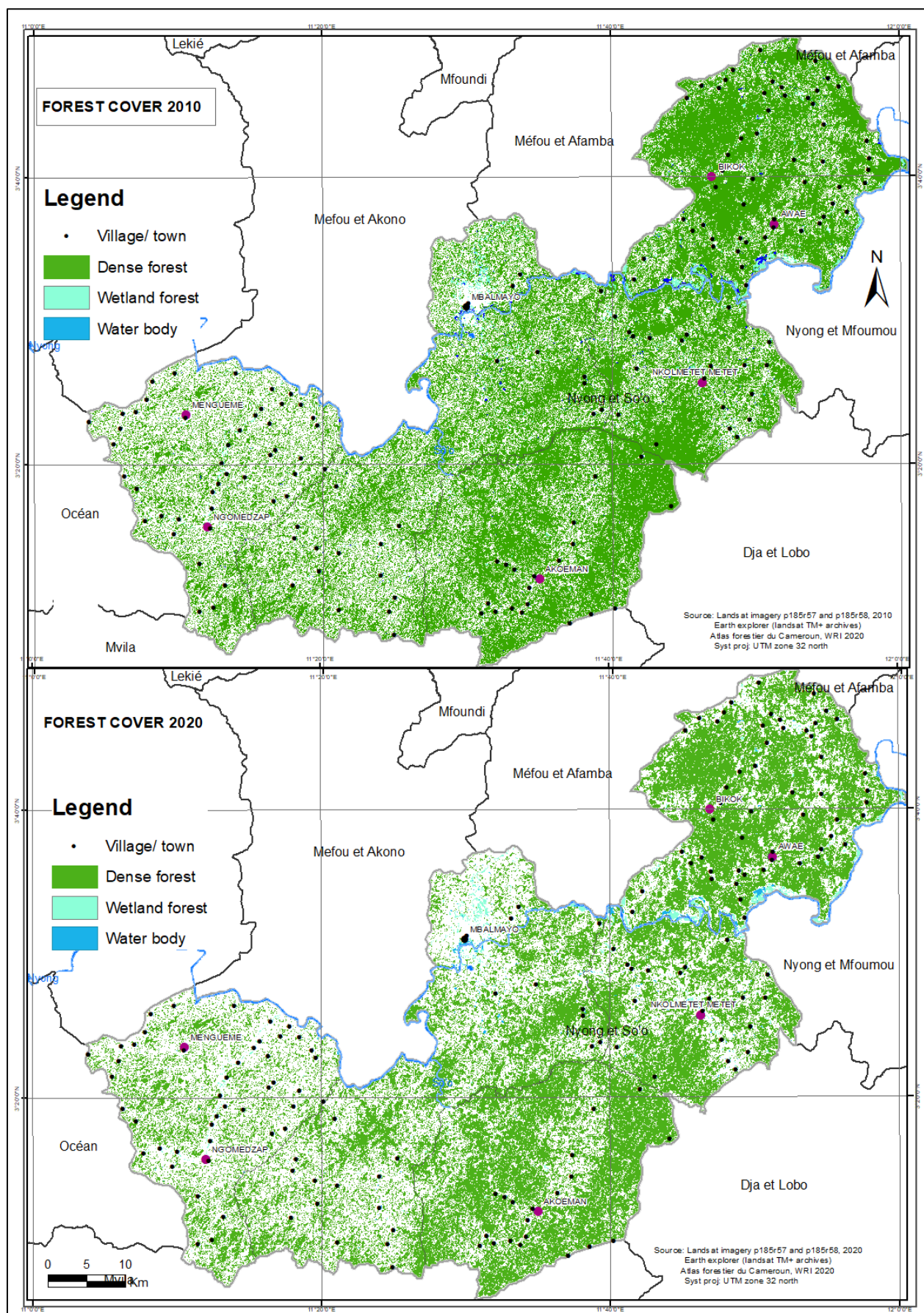


Figure 18. Forest cover change in Mbalmayo over ten years (2010 - 2020)

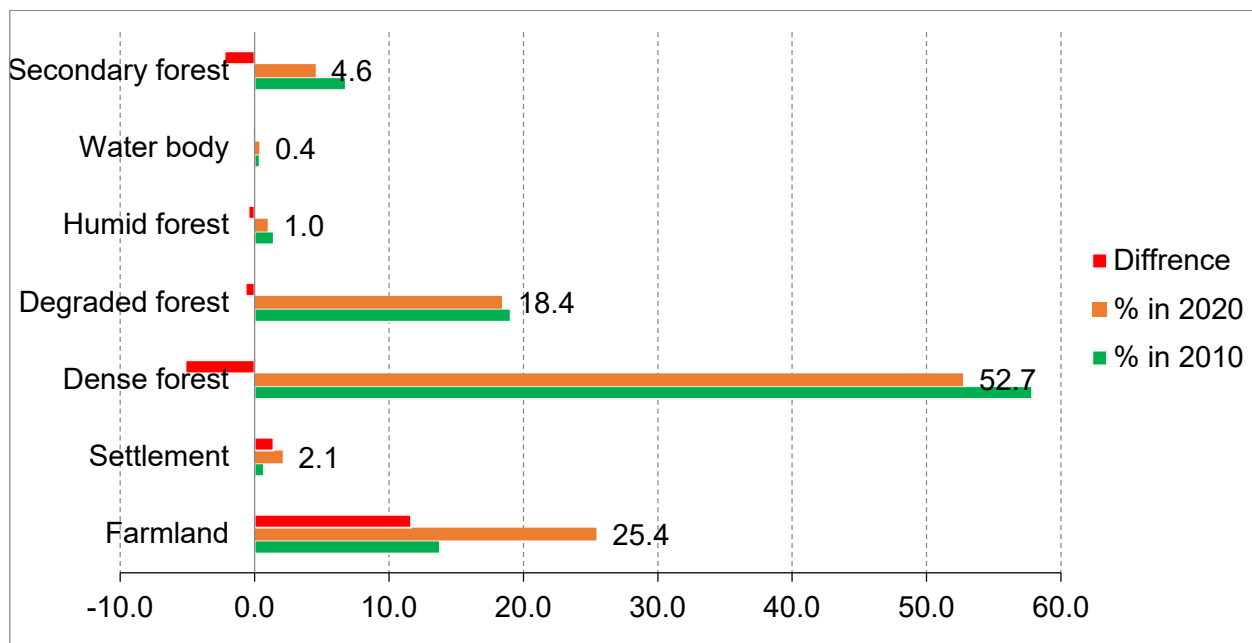


Figure 19. Land cover dynamics in Mbalmayo landscape (2010-2020)

The **landscape of Douala-Edea** has an area of 371,612 hectares (Figure 20 & Figure 21) of which about 24,498 hectares are dense mangroves, and 8,950 hectares are degraded mangroves. The dense forest occupies about 142,758 hectares while 54,280 hectares is degraded forest. The human activities are: agro-industrial plantations which occupy about 35,407 hectares (9.57%), farmland occupies extends to 58,162 hectares (15.72%) and urban centres/villages cover about 20,910 with (5.6%).

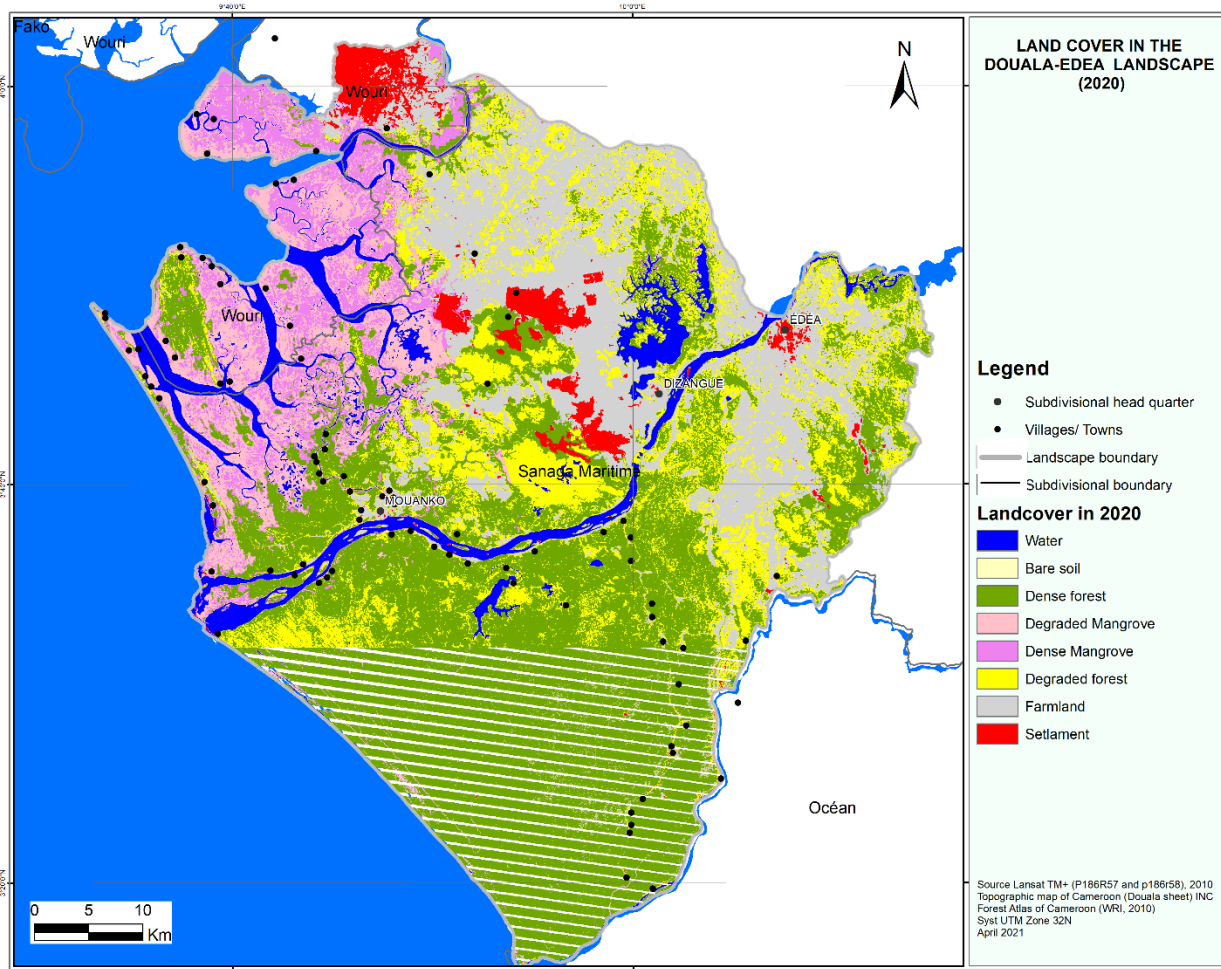


Figure 20. Land cover map of Douala - Edea landscape in 2020

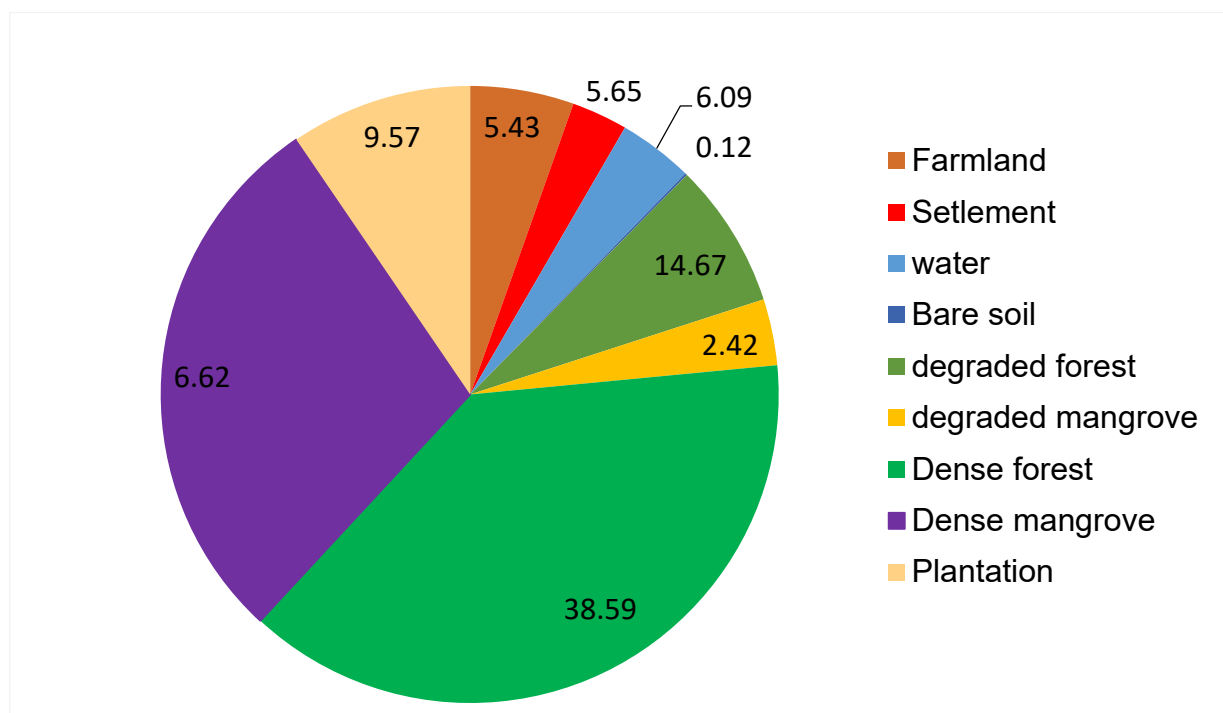


Figure 21. Land cover in Douala - Edea Landscape

About the changes in Douala-Edea landscape, between 2010 (Figure 22) and 2020 (Figure 20), there was a loss of 13.7% of dense forests and a loss of 10% of mangrove areas while farmland has increased by about 11.4% (Figure 24). Agro-industry plantations have also increased up to 8.8% of their original land in 2010. The degradation of natural forests continues to increase up to 6.4% for forests. An annual reduction is estimated to be 2% for the dense forests mangrove combined. Figure 22, Figure 23, and Figure 24 show the land-use dynamics in Douala-Edea landscape using land cover maps of 2010 and 2020.

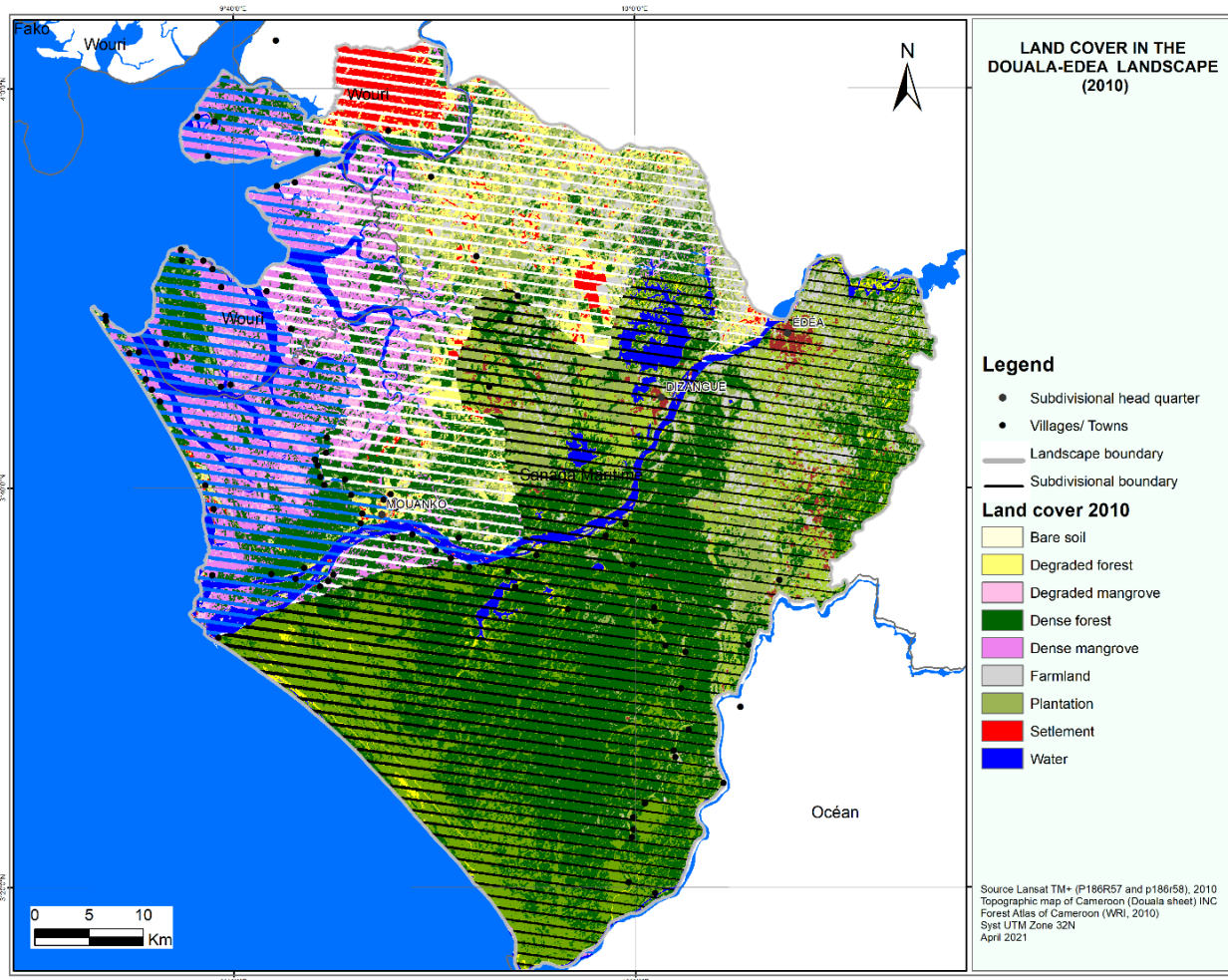


Figure 22. Land cover map of Douala - Edea landscape in 2010

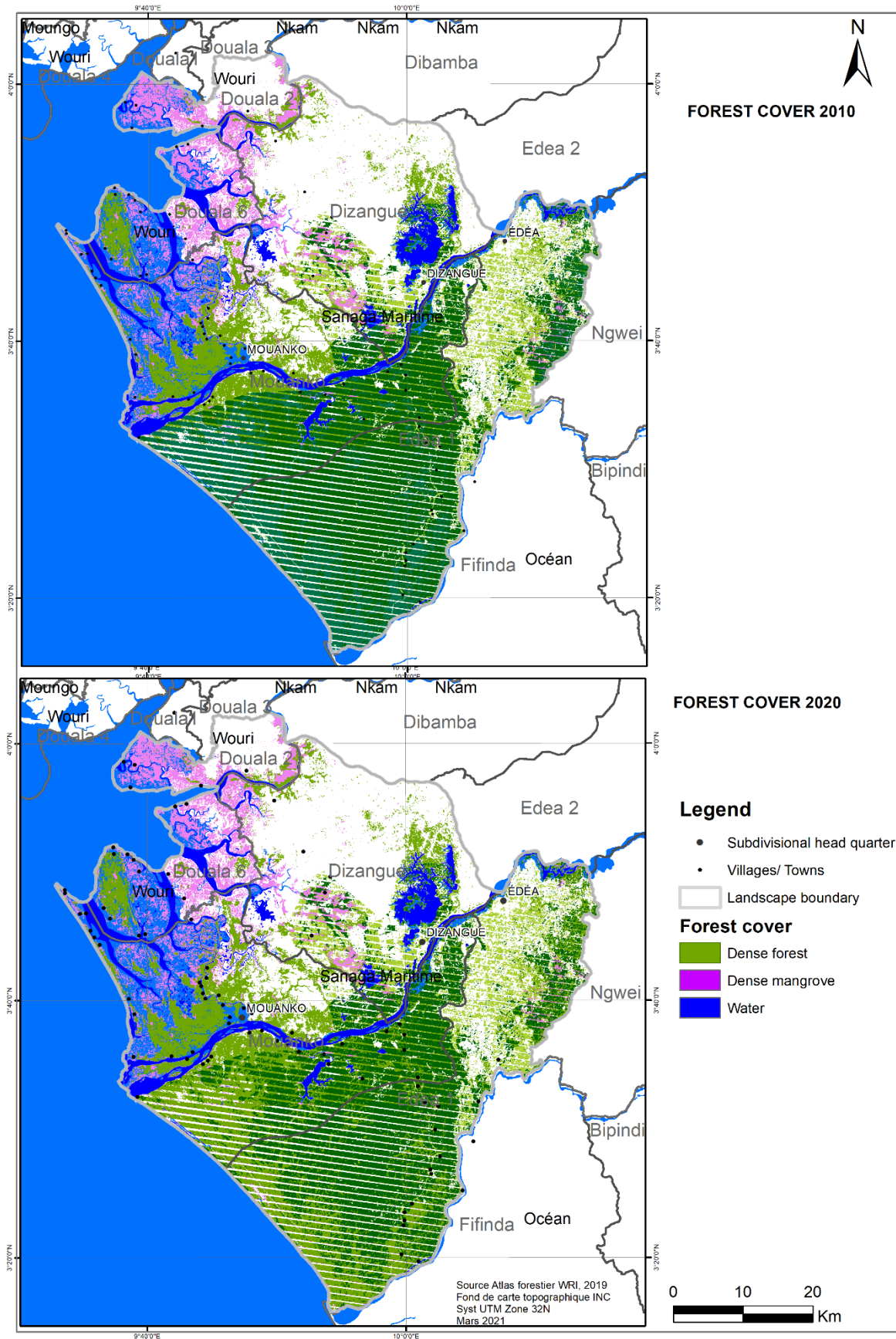


Figure 23. Forest cover change in Douala - Edea over ten years (2010 - 2020)

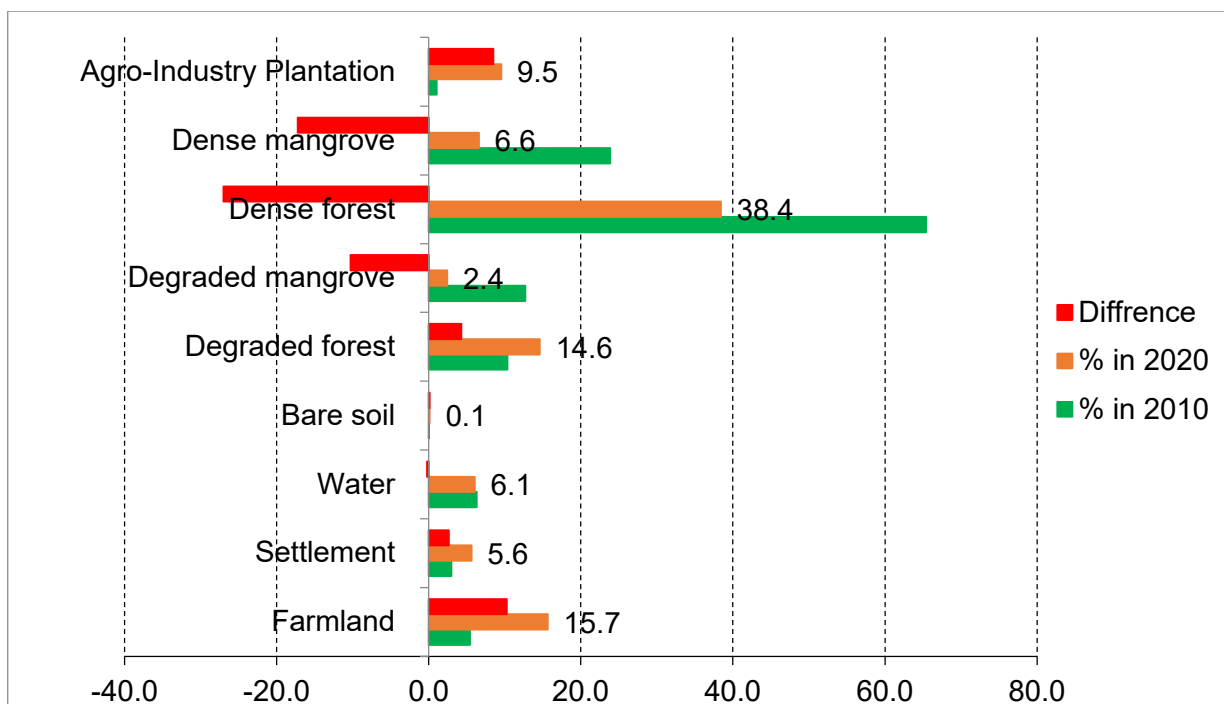


Figure 24. Land cover dynamics in Doula-Edea landscape (2010-2020)

3.2. Restoration interventions

Six broad restoration interventions that could be used to improve the ecological and economic productivity of degraded land uses are:

- Agroforestry on flat or gently sloping land, including those areas principally managed as pasture lands
- Agroforestry on steep sloping land in conjunction with other soil conservation measures such as contour bank terraces or benches;
- Improved management and rehabilitation of existing, community forests and council forests
- Protection and restoration of existing areas of forest reserves, and restoration of degraded protected areas in or around national parks
- Establishment or improvement of protective forests on important and sensitive sites such as very steep sloping land (>55%), riparian zones and wetland buffer zones and margins, creation of roadside forests, urban trees in concentrated camps.
- Restoration of degraded mangrove forests

Cross-cutting co-intervention strategies:

- Improved seed system and value chain of non-timber forest products (NTFP).
- Improved community participation in the production of seeds and seedlings and in co-management of natural reserves and council forests.
- Creation of alternative livelihoods to reduce high dependency on the forests by the population living in or around the forest reserves
- Improving access to water for tree watering (Waza specific co-intervention)

3.2.1. Restoration opportunities for Waza landscape

The assessment team identified three degraded land uses that could benefit from restoration through the strategic introduction of trees and management practices. Relevant governmental and non-governmental institutional stakeholders that are currently involved in restoration activities in Waza landscape were consulted in producing the preliminary list of degraded land uses. Through the consultative workshops, the following land uses were identified as benefiting most from restoration:

1. Extensive agriculture and livestock in floodplains,
2. Degraded community forests, and
3. Degraded steep sloping land.
4. Degraded national park zones
5. Unprotected rivers, wetlands and water bodies

Five broad restoration interventions have been also identified by stakeholders and communities; that could be used to improve the ecological and economic productivity of degraded land uses:

- 1) Agroforestry on flat or gently sloping land
- 2) Agroforestry on steep sloping land
- 3) Creation of forest plantations and woodlots on steep-sloped land
- 4) Assisted natural regeneration forests.
- 5) Protective forests around rivers, canals, wetlands and water bodies

Table 8. Table summarizing Land uses benefiting from the landscape restoration, interventions and options specific to each land uses in Waza landscape

Land uses benefiting from the restoration of landscape	Broad restoration interventions defined by landscape stakeholders	Restoration options, adapted species and economic options
1. Extensive agriculture and livestock in floodplains,	Agroforestry on flat or gently sloping land and silviculture	maize - peanuts - prosopis
2. Degraded steep sloping agricultural land.	Agroforestry on steep sloping land	millet - acacia
3. Degraded chain of mountains.	Forest plantations and woodlots on mountains	Acacia Senegal
4. Degraded community forests	Assisted natural regeneration forests.	acacia, balanitis and prosopis
5. Degraded national park zones	Assisted natural regeneration forest park.	Acacia sp. (albida, nilotica, siberiana)
6. Unprotected rivers, wetlands and water bodies	Protective forests around rivers, canals, wetlands and water bodies	Bamboo vulgaris
7. Unprotected roadsides and populated areas, public spaces (schools,	Protective roadside forests and urban forests, greening schools, public	Shade tree species (Neem) which plays the role of ornamental trees

Land uses benefiting from the restoration of landscape	Broad restoration interventions defined by landscape stakeholders	Restoration options, adapted species and economic options
administration, health centers etc.)	spaces etc.	and NTFP

1) Agroforestry for Agriculture and livestock (for degraded floodplains and rangelands)

The agroforestry interventions focus on incorporating trees into agricultural landscapes, including lands being used for cultivating crops and pastures for raising livestock. Two types of agroforestry interventions were assessed as part of the geospatial analysis and included identifying areas for new agroforestry on: 1) steeply sloping land; and 2) flat or gently sloping land, including those principally managed as pasture (silvo-pastoralism). The agroforestry intervention is divided into two categories because the objectives and implementation are different for each type of agricultural landscape. Agroforestry on steeply sloping land aims at reducing erosion on lands that are highly susceptible to soil loss, and is implemented mainly by establishing contour banks terraces on hillsides to reduce overland flow.

On flat or gently sloping cultivated land, the goal of agroforestry is mainly to integrate trees with crops to improve soil fertility and water quality. In the case of pasture and rangeland, agroforestry is aimed at providing shade for livestock and increasing the availability of trees for fuelwood and other household uses. It is most readily achieved through the assisted farmer-managed restoration of savannah forests and shrubland. Figure 25 illustrates opportunity areas for agroforestry on flat and gently sloping land and Figure 26 illustrates the opportunity areas for agroforestry on steeply sloping land.

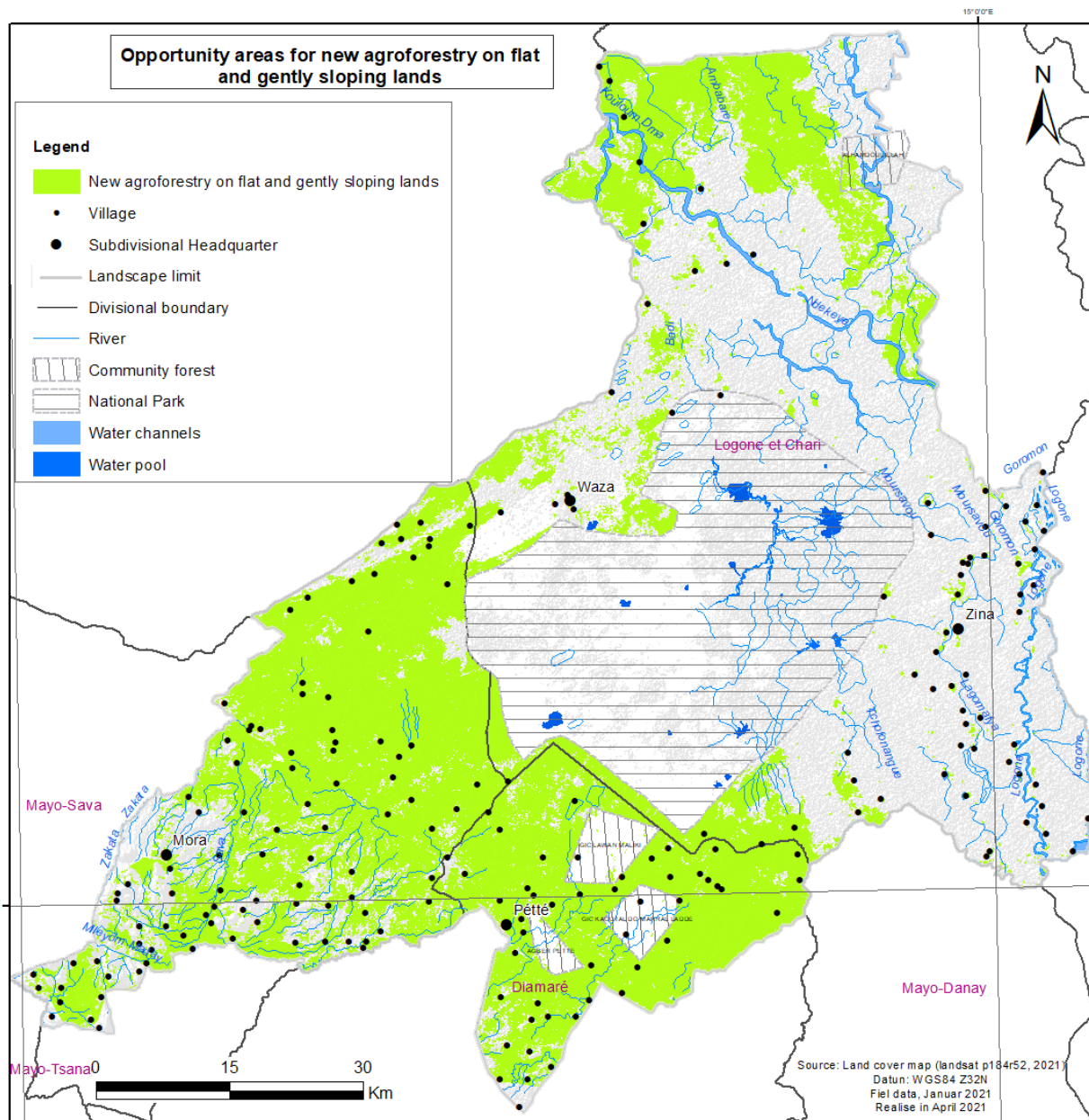


Figure 25. Opportunity areas for new agroforestry on flat and gently sloping lands (less than 5% incline).

Table 9. Opportunity areas for agroforestry interventions by Division.

Intervention	Subdivision (Area Ha)				Landscape Total (ha)
	Petté	Waza	Zina	Mora	
New agroforestry on flat and gently sloping lands	60,285.4	78,706.9	2,027.1	87,784.6	228,804.0
New agroforestry on steeply sloping lands	0	1.04	0	2,942.5	2,943.5

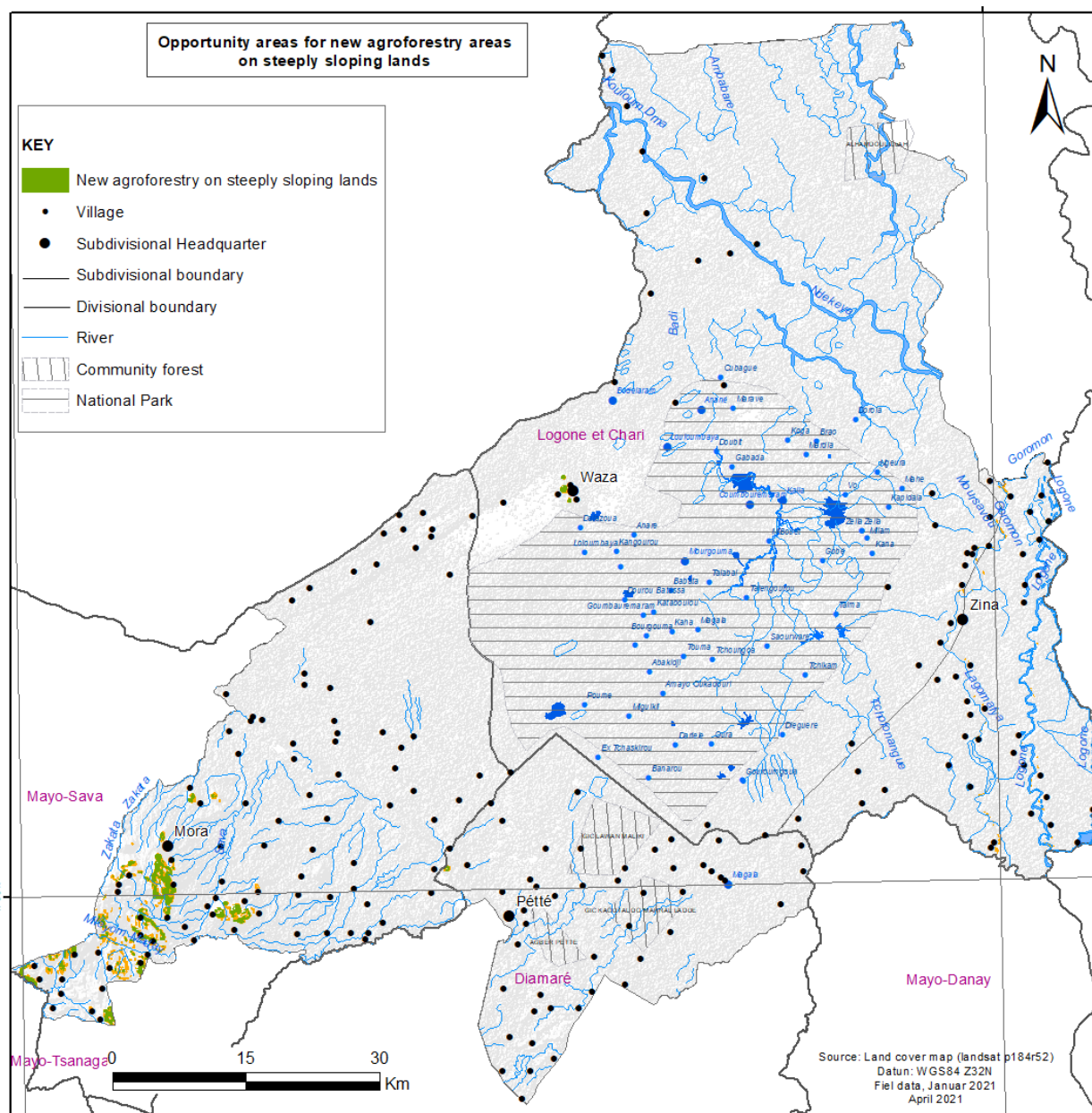


Figure 26. Opportunity areas for new agroforestry areas on steeply sloping lands (greater than 5% incline).

2) Forest Plantations (woodland)

To identify opportunity areas for creation of forest plantations and woodlots on steep sloped land, the geospatial analysis involves isolating areas of bare soils / degraded forest land/or savannah & shrubs (non-protected areas) from the land cover data; non-forested areas from the forest cover data; and land with slope greater than 3 degrees (5% incline) from the slope data. The intersection of these datasets, is the opportunity area for forest plantations on steep sloping land.

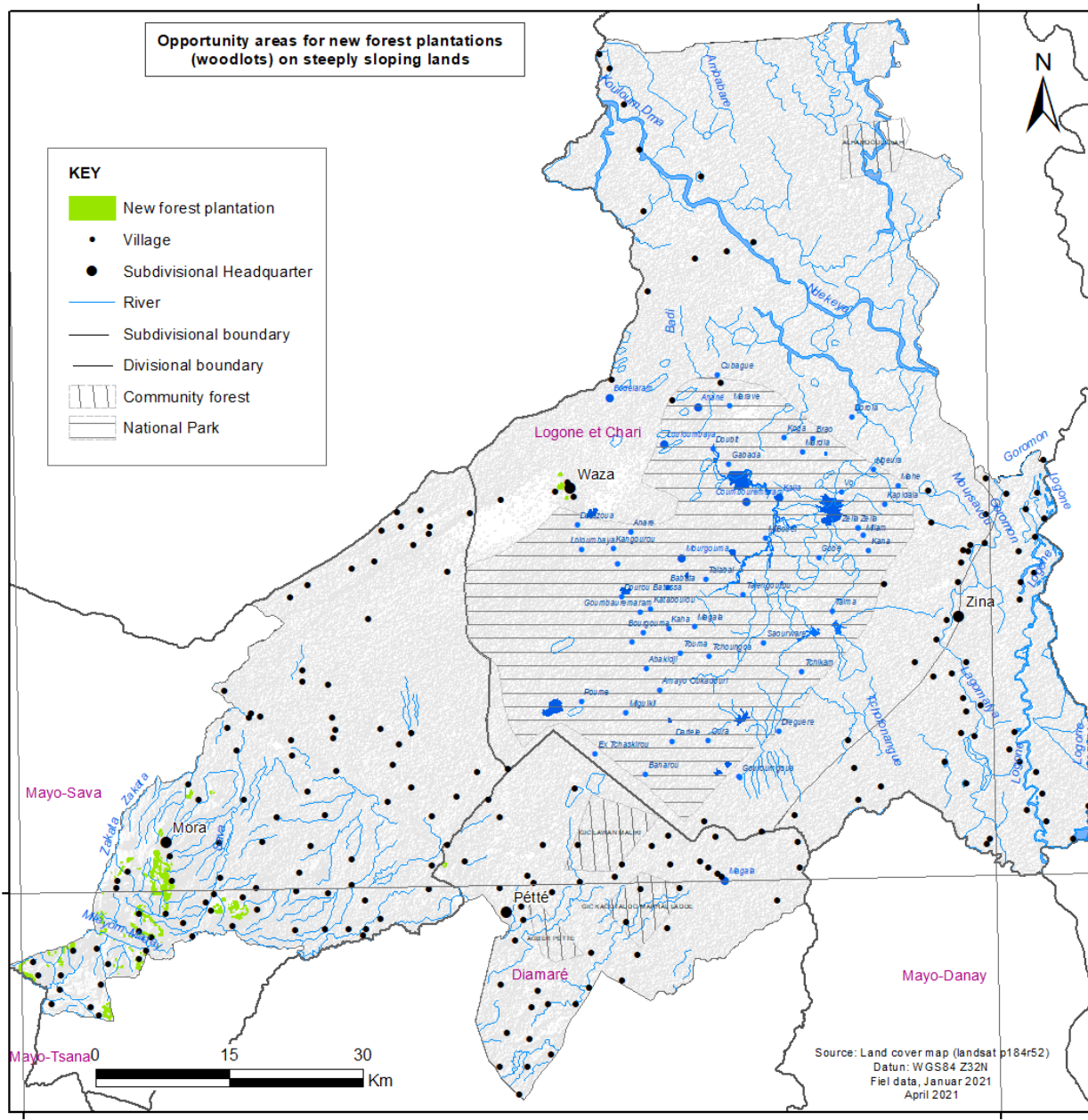


Figure 27. Opportunity areas for new forest plantations (woodlots) on steeply sloping lands (greater than 5% incline)

3) Assisted regeneration of Waza national park, forest reserves, and community forests

The interventions associated with natural forest regeneration include restoring degraded natural forest inside Waza park and community forests. For the ‘degraded savannah’ intervention, we extract areas from the forest cover dataset defined as “degraded savannah” and overlay these areas with the boundaries of reserves and national parks. Any forest areas degraded that overlap with these boundaries are quantified as opportunity areas for assisted natural regeneration.

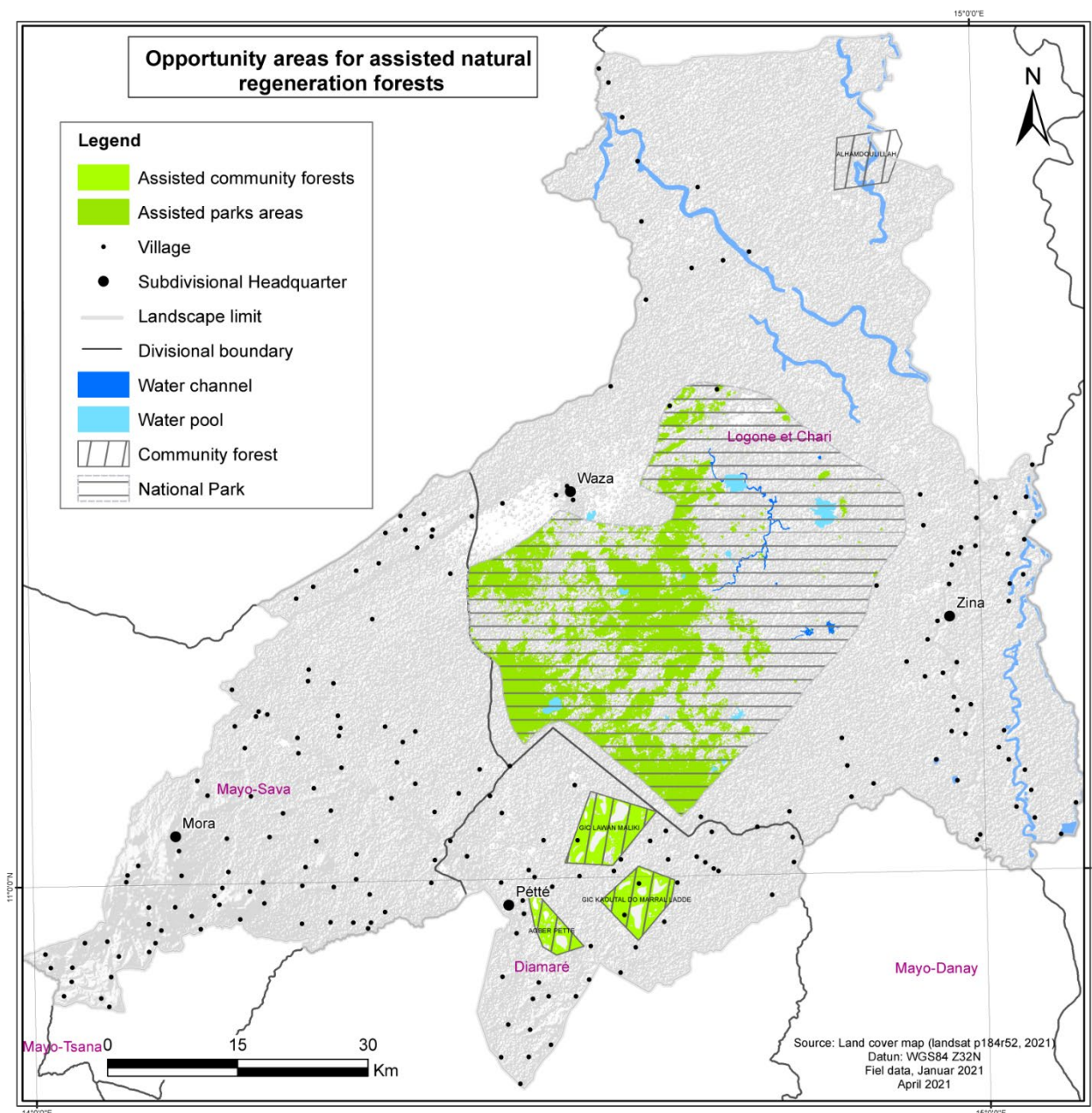


Figure 28. Opportunity areas for assisted natural regeneration forests.

The opportunities for the protection and assisted regeneration of classified forest areas occupy about 166,206.8 hectares for Waza National Park, 144.5 hectares for community forests and 37,416.9 hectares for wet savannah, an important water basin outlet for Waza Landscape ecosystem (Table 10).

Table 10. Opportunity areas for assisted Natural regeneration by Division in Waza

Intervention	Subdivision (Area Ha)				Landscape Total (ha)
	Petté	Waza	Zina	Mora	
Assisted parks areas		166,206.8			
Assisted RAMSAR Wetland	1,476.6	28,123.1	6,473.2	1,344.0	37,416.9
Assisted community forests			144.5		144.5

4) Protective Forests

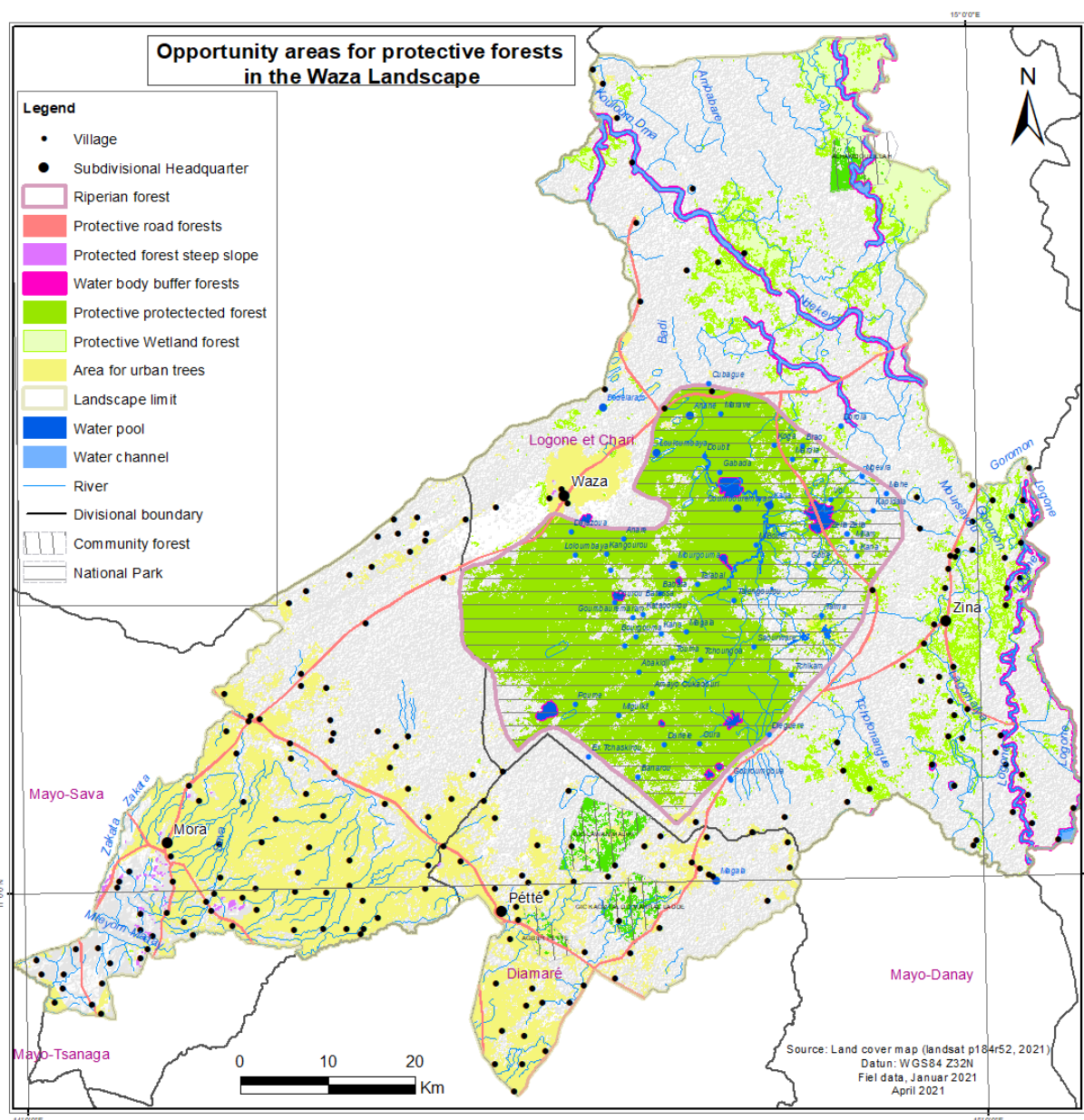


Figure 29. Opportunity areas for protective forests

The protection of fragile natural spaces also presents restoration opportunities in the Waza landscape. Thus, we have the steeply sloping and rocky areas which represent 1,770.45 hectares. They are also the riparian forests with buffer zones of 142,262 hectares' potential for trees / bamboos to be planted, the buffer zones of large rivers and ponds of about 5,584 hectares, the roadside forests, public spaces, and schools which represent 9,591 hectares, and finally urban areas or village centers 59,232.36 ha. Urban forests are very important restoration opportunities because these forests keep cooling the city, making citizens healthy and active.

Table 11. Opportunity areas for protective forests by Division in Waza.

Intervention	Subdivision (Area Ha)				Landscape Total (ha)
	Petté	Waza	Zina	Mora	
Protective forest on very steep degraded land				1770.45	1,770.45
Protective forest on riparian buffers		142,261.62			142,261.62
Protective forest on buffer of water bodies	248.1	2,965.65	575.33	124.22	5,584.34
Protective forest on roads	1,466	3,456	146	4,523	9,591
Protective forest on settlements	12,296.10	6,618.89	64.59	40,252.76	59,232.36

3.2.2. Restoration opportunities for Mbalmayo landscape

The assessment team identified three degraded land uses that could benefit from restoration through the strategic introduction of trees and management practices. Relevant governmental and non-governmental institutional stakeholders that are currently involved in restoration activities in Mbalmayo landscape were consulted in producing the preliminary list of degraded land uses. Through the consultative workshops, the following land uses were identified as benefiting most from restoration:

1. Traditional agriculture,
2. Very degraded community forests, and
3. Degraded Natural reserve.
4. Unprotected rivers, and water bodies

Table 12. Table showing Land uses benefiting from the landscape restoration, interventions and options specific to each land uses in Mbalmayo landscape

Land uses benefiting from the restoration of landscape	Broad restoration interventions defined by landscape stakeholders	Restoration options, adapted species and economic options
1. Traditional agriculture	Agroforestry on cropland	cacao, Mango, Ndo'o, and Safou trees: cocoa and banana plantain in year 1 followed by Irvingia gabonensis cocoa -Ndo'o association in year 2 Bamboo as fence around the farm area
2. Degraded community and council (public) forests	Restoration and Improved management of community and Council forests	Bamboo, Mango – Safou –Bitter Cola, and other NTFPs Ndo'o and safou for the purpose of exploitation and conservation

Land uses benefiting from the restoration of landscape	Broad restoration interventions defined by landscape stakeholders	Restoration options, adapted species and economic options
3. Degraded Natural reserve.	Restored and improved management of forest reserve	Bamboos in the buffer and Ndo'o - safou and bitter cola inside the reserves
4. Unprotected rivers, wetlands and water bodies	Protective forests around rivers, canals, wetlands and water bodies	Bamboo (<i>Bambusa vulgaris</i>)

3.2.2.1. Agroforestry on cropland

To identify opportunity areas for agroforestry on gently sloped land, the geospatial analysis involves isolating areas of cropland from the land cover data; non-forested areas from the forest cover data; and land with slope less than 3 degrees (5% incline) from the slope data. The intersection of these datasets, is the opportunity area for agroforestry on gently sloped land. Communities proposed cacao, Mango, Ndo'o, and Safou trees as their preference in the agroforestry systems and the use of Bamboo as fence around the farm area. Figure 30 shows the opportunity areas for agroforestry on gentle slopes in Mbalmayo landscape.

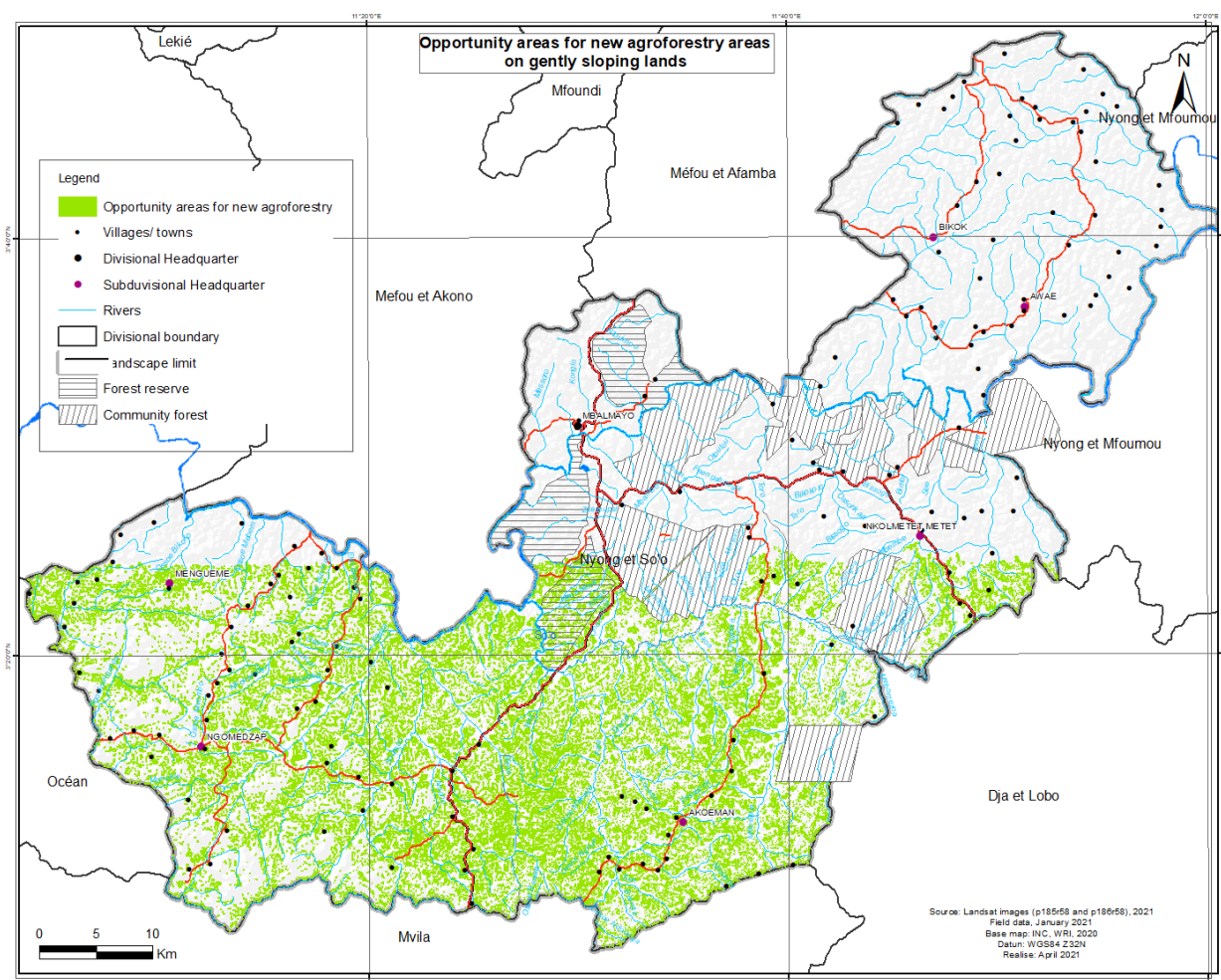


Figure 30. Opportunity areas for new agroforestry areas on gently sloping lands (less than 5% incline).

The landscape of Mbalmayo mainly rests on a plateau relief with plains on the edge of the Nyong River, the middle slopes and hills. The potential for restoration through agroforestry in cocoa plantations and degraded forests through the use of improved NTFP plants covers about 42,963 hectares with low and medium slopes and 5,940.24 hectares on steep sloping land as shown by the Table 13.

Table 13. Opportunity areas for agroforestry interventions in Mbalmayo.

Intervention	Subdivision (Area Ha)						Landscape Total (ha)
	Mbalmayo	Ngomedzap	Dzeng	Mengoume	Nkolmetet	Akoema	
New agroforestry on flat and gently sloping lands	5,183.1	18,144.8	3,542	9,918.2	1,874.9	4,299.9	42,963.3
New agroforestry on steeply sloping lands	544.32	2,857.12	485.11	1,263.3	144.22	646.14	5,940.24

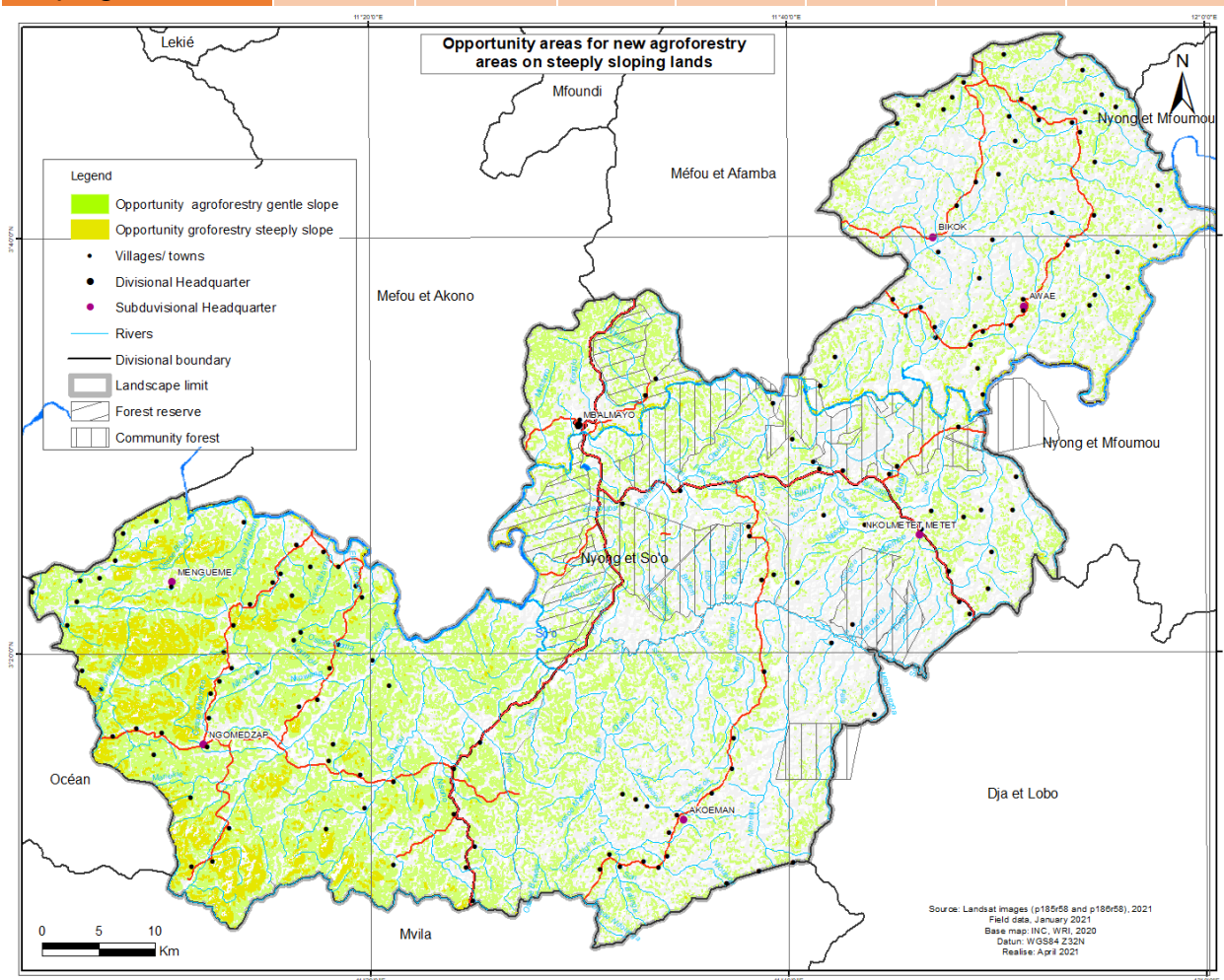


Figure 31. Opportunity areas for new agroforestry areas on steeply sloping lands (greater than 5% incline).

3.2.2.2. Restoration and improved management of community forests and forest reserve

For the analysis to identify areas for restoration and improved management of community forests and Natural reserve, data on community forests and forest reserve boundary and the non-forested area within the boundary of these two were used. To identify areas of restoration, areas of non-forested areas within the boundary of forest reserve and of community forests were extracted.

For the buffer of natural reserve; a buffer of natural reserve is established. This is established inside the reserve boundary (in contrast with other buffers which are outside the feature to protect). It consists of establishing 100-m buffer (inside the reserve boundary); then using forest dataset, areas from the buffer that are already forested is eliminated. The selected tree species for the buffer of forest reserve are Bamboo, Mango – Safou – Bitter Cola, and other NTFPs

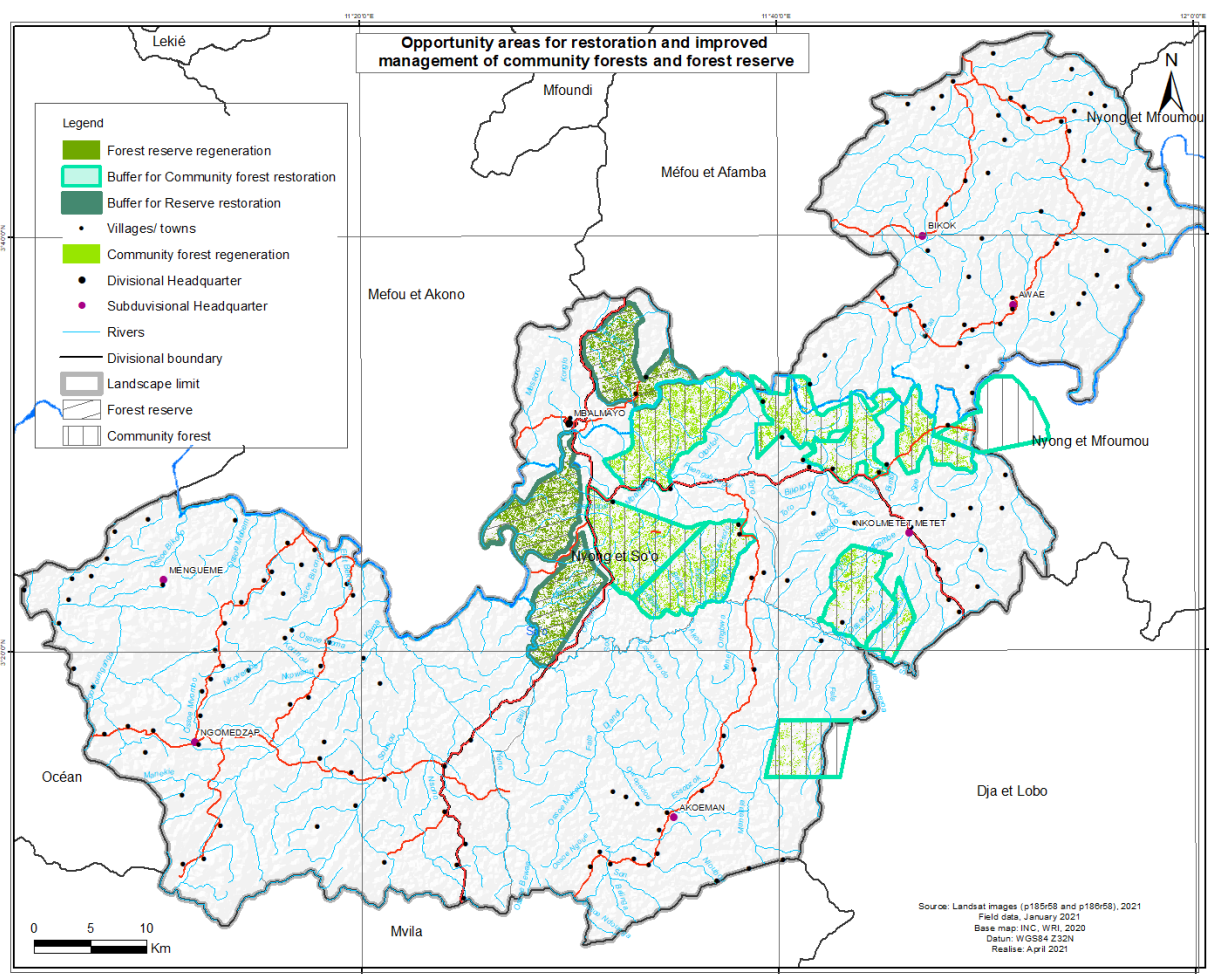


Figure 32. Opportunity areas for restoration and improved management of community forests and forest reserve

Assisting the regeneration of community forests and protected areas consists of planting indigenous species in the protected forests and reforestation for community forests to improve their productivities. About 11,946 hectares of community forests and 5,030

hectares of forest reserve are subject to rehabilitation while about 23,943 hectares of community forests and 6,871.5 hectares of forest reserve are required to be established around the two types of forests as buffers (Table 14).

Table 14. Opportunity areas for restoration and improved management of community forests and forest reserve

Restoration intervention	Subdivision (Area Ha)			Landscape Total (ha)
	Mbalmayo	Nkolmetet	Akoeman	
Restoration of community forests	3,734.22	5,800.21	2,412.11	11,946.54
Community forest buffers	12,000.10	9,897.41	2,046.12	23,943.63
Restoration of forest reserve	5,030.40			5,030.40
Forest reserve buffers	6,871.46			6,871.46

3.2.2.3. Protective Forests

Figure 33 presents the opportunities areas for protective forests.

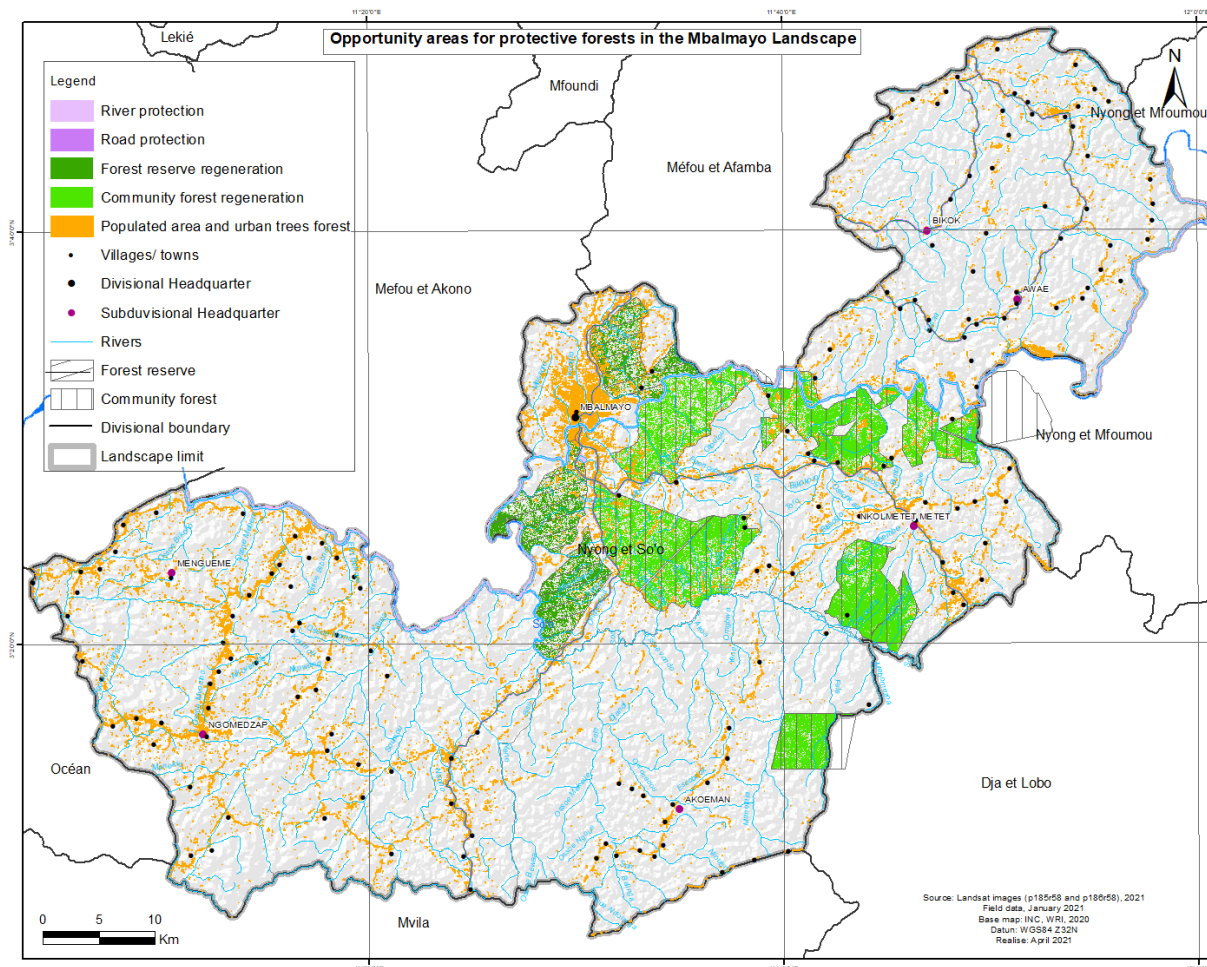


Figure 33. Opportunity areas for protective forests

Fragile natural spaces are concerned by protection with tree plantations and agro-forests.

There is a potential of 7,619 hectares for urban centers, public spaces and around villages. 1,680 hectares for the protection of buffer zones around protection forests, 72,871 hectares for the protection of the edges of rivers and 19,330 hectares for the protection of the edges of urban roads (Table 15).

Table 15: Opportunity areas for protective forests

Intervention	Subdivision (Area Ha)						Landscape Total (ha)
	Mbalma yo	Ngome dzap	Dzeng	Mengue me	Nkolme tet	Akoe man	
Populated area/town trees	2,712.4	2,042.5	794.4	739.2	935.8	394.8	7,619.1
Protective forest on riparian buffers	533.74				935.80	211.28	1,680.81
Protective forest on buffer of water bodies	59,295.3	9,234.2	1,850.5	197,169	1697.1	597.11	72,871.48
Protective forest on roads	497.64	122.04	784.22	3076.12	449,788	14.401	19,330.81

3.2.3. *Restoration opportunities for Douala-Edea landscape*

The assessment team identified three degraded land uses that could benefit from restoration through the strategic introduction of trees and management practices. Relevant governmental and non-governmental institutional stakeholders that are currently involved in restoration activities in Douala-Edea landscape were consulted in producing the preliminary list of degraded land uses. Through the consultative workshops, the following land uses were identified as benefiting most from restoration:

1. Traditional Agriculture and fishing,
2. Degraded community forests
3. Degraded mangrove.
4. Deforested national park zones
5. Unprotected rivers, and water bodies

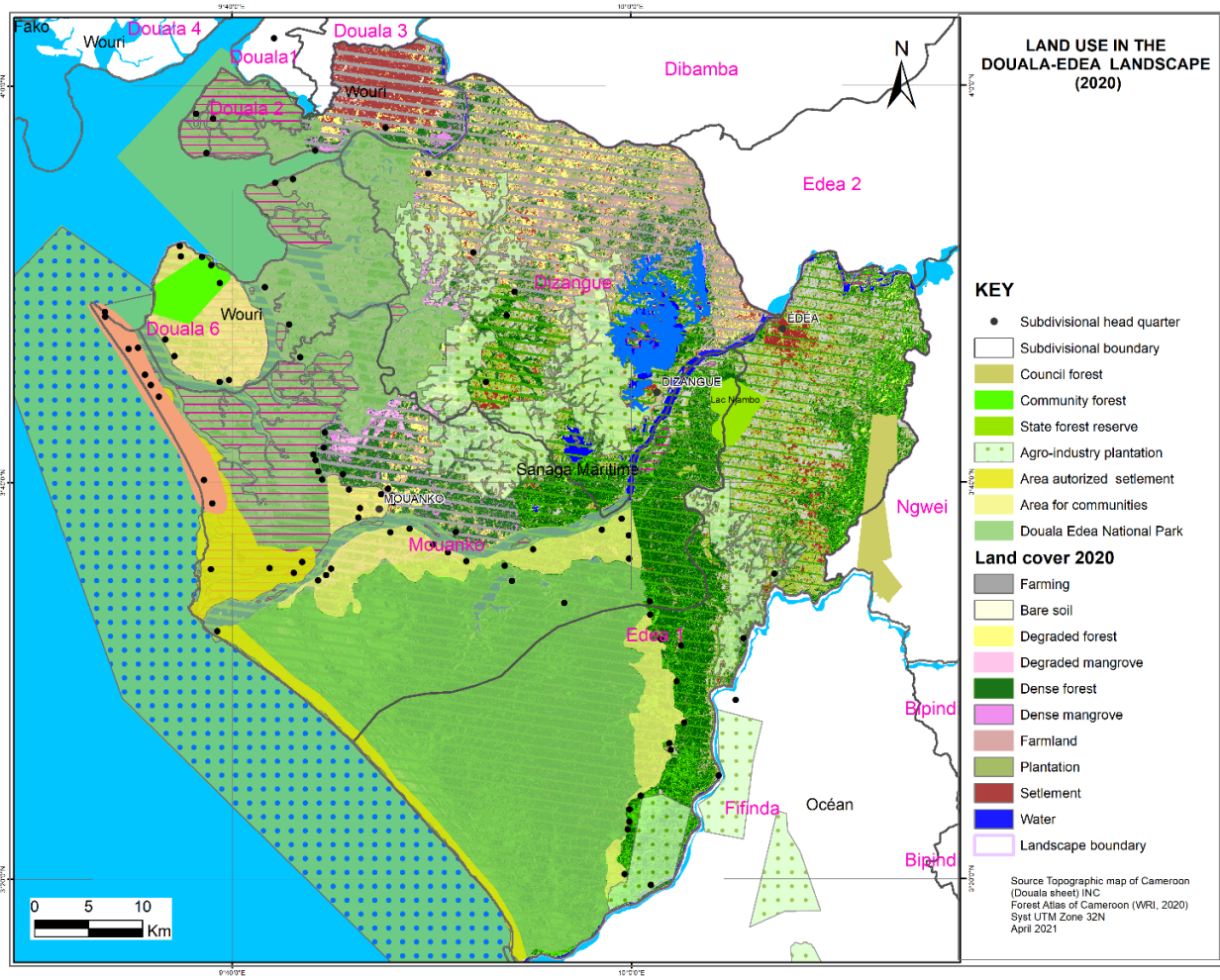


Figure 34. Land use map of Douala-Edea landscape 2020

Based on the degradation types identified, the participants in the workshop also identified the restoration interventions best suited to restoring these degraded lands such as:

1. Agroforestry on cropland
2. Protection of the national park and reserve by bamboo
3. Assisted natural regeneration of the community forests and reserves
4. Restoration of mangroves.
5. Protective forests around rivers, canals, wetlands, and water bodies

Table 16. Table showing Land uses benefiting from the landscape restoration, interventions and options specific to each land uses in Douala-Edea landscape

Land uses benefiting from the restoration of landscape	Broad restoration interventions defined by landscape stakeholders	Restoration options and adapted species and economic options
1. Traditional agriculture and fishing	Agroforestry on cropland	Macabo & Pistachio & ndo'o (Mango – Safou –Bitter cola)
2. Degraded community forests	Assisted natural regeneration of the community forests and	Ndo'o and safou for the purpose of exploitation and

Land uses benefiting from the restoration of landscape	Broad restoration interventions defined by landscape stakeholders	Restoration options and adapted species and economic options
	reserves	conservation
3. Degraded mangrove.	Restoration of mangroves	Mangrove species - (Rhizophora racemose)
4. Deforested national park zones	Protection of the national park and reserve by bamboo	Indigenous species of the degraded zones (collected locally)
5. Unprotected rivers, and water bodies	Protective forests around rivers, canals, wetlands, and water bodies	Bamboo, Mango – Safou – bitter cola, and other NTFPs

3.2.3.1. Agroforestry on cropland

To identify opportunity areas for agroforestry on flat and gently sloped land, the geospatial analysis involves isolating areas of cropland from the land cover data; non-forested areas from the forest cover data; and land with a slope less than 3 degrees (5% incline) from the slope data. The intersection of these datasets is the opportunity area for agroforestry on gently sloped land. Selection of the right species resulted from the cost-benefits analysis.

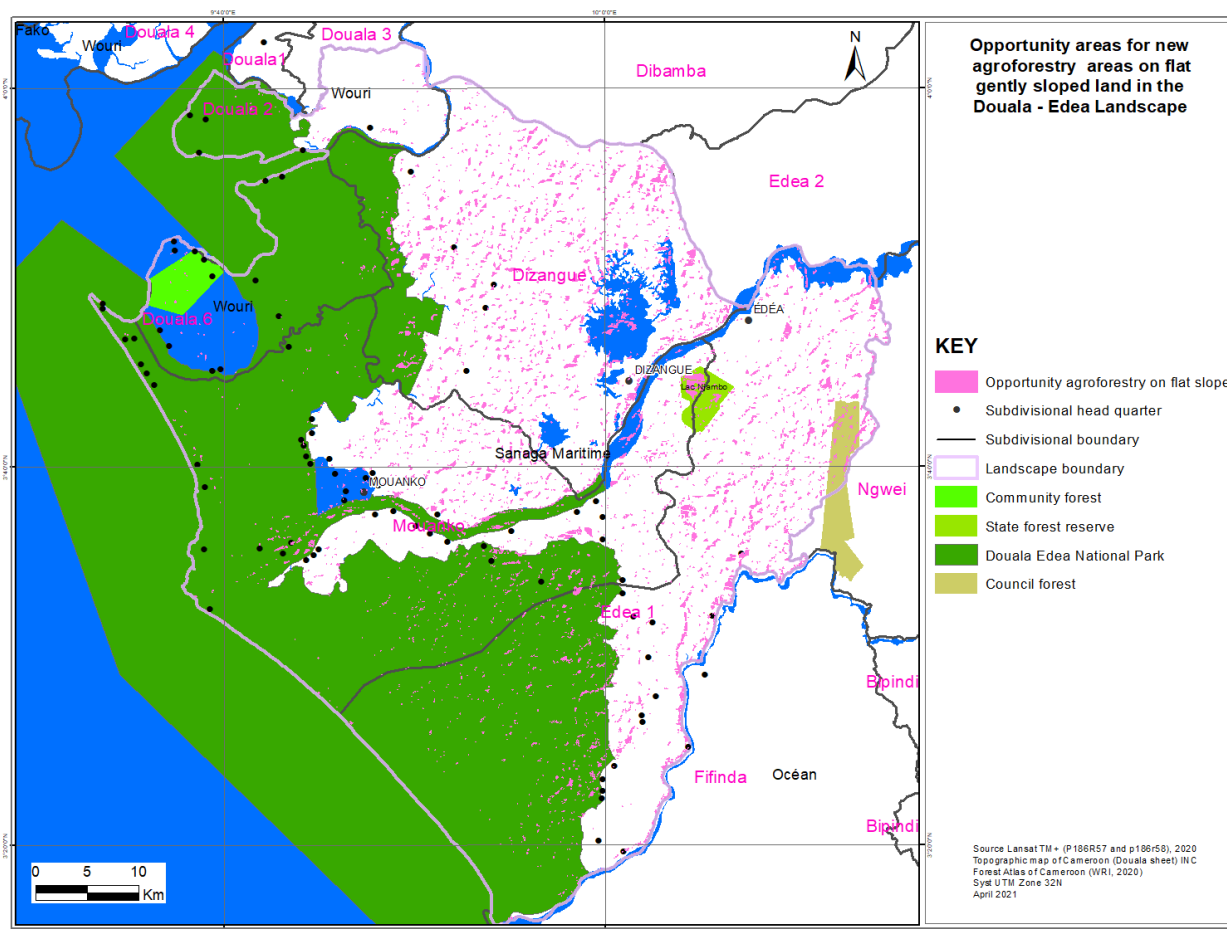


Figure 35. Opportunity map for new agroforestry areas on flat and gently sloped land (less than 3 degrees or less than 5% incline).

The option of agroforestry consists of mixing annual agricultural plants, perennial woody horticultural plants, agroforestry shrubs for the soil fertility restoration and forest trees for the plots boundaries' demarcation and the fuelwood. The areas were listed and assessed as presented in Table 14. There is an opportunity for about 5,196 hectares of restoration on low and medium slopes and 95,963 hectares for steep slopes using agroforestry systems.

Table 17: Opportunity areas for new agroforestry areas on flat and gently sloped land (less than 3 degrees or less than 5% incline)

Intervention	Unit	Subdivision (Area Ha)					Landscape Total (ha)
		Douala 6 (Ile de Manoka)	Douala 2	Edea 1 Yassoukou)	Mouanko	Dizangue	
New agroforestry on flat and gently sloping lands	Area (ha)	13.09	29	1,714.5	1,120.51	2,319.82	5,196.92
New agroforestry on steeply sloping lands	Area (ha)	3,211.06	5,285.09	29,924.61	15,417.72	42,124.76	95,963.25

3.2.3.2. Restoration of Mangrove forests

To identify opportunity areas for creation of mangrove forests, the geospatial analysis involves isolating areas of mangrove from the land use or land cover data; non-forested areas of mangrove from the forest cover data and land with swamp or within the boundary of mangrove occupation map. The intersection of these datasets, is the opportunity area for mangrove plantations. The opportunity areas correspond to the non-forested area within the mangrove boundary limit. The expansion of mangroves trees can also be identified in swamp along the natural reserve/park. Existing mangroves forest areas correspond to the part of mangrove forest which has not been deforested.

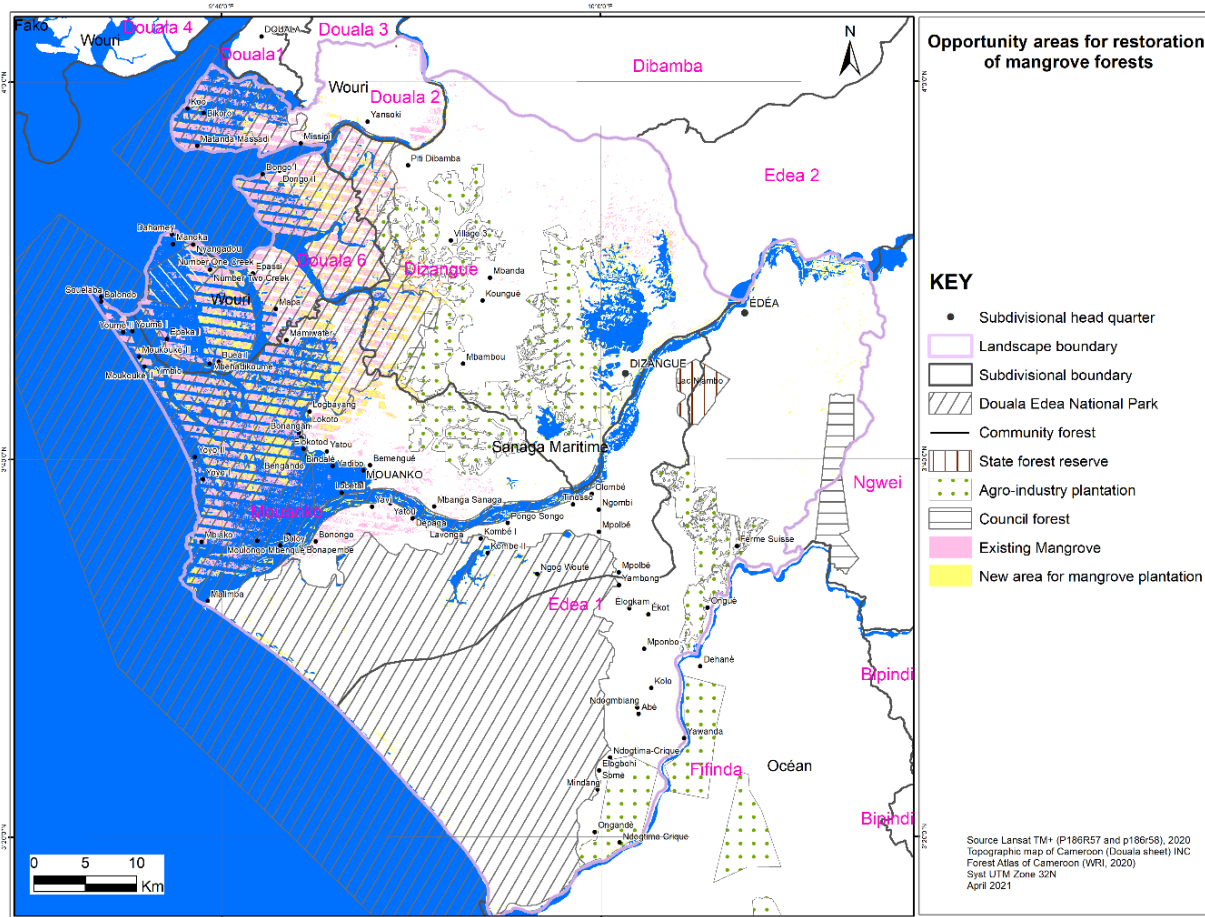


Figure 36. Opportunity map for restoration of mangrove forests.

The mangrove occupies an important place in the landscape of Douala-Edea. Currently the area occupied by Mangrove forest is amounting to 33,448 hectares of which 8,950 hectares are currently degraded and 24,498 hectares are dense mangrove forests. The 8,950 hectares are opportunity for mangrove restoration.

Table 18: Opportunity areas for restoration of mangrove forests

Intervention	Unit	Subdivision (Area Ha)					Landscape Total (ha)
		Douala 6 (Ile de Manoka)	Douala 2	Edea 1 (Yassoukou)	Mouanko	Dizangue	
Degraded mangrove forest areas		3,064.04	535.53	0.00	5,350.45	0.00	8,950.01
Dense Mangrove forest areas		3,585.00	1,414.75	0.00	19,498.34	0,00	24,498.09

3.2.3.3. Protective Forests

The protective forest interventions to be mapped in this analysis includes establishing

protective forest around the park and the forest reserve; within 30-m buffers of riparian areas; and within 50-m buffers of wetlands and within 30-m of water bodies. Urban forests are also established within the populated areas and along the roads.

The 'riparian buffer' interventions include establishing 30-m buffers along rivers that are non-forested that should be forested with native species. The national datasets of forest cover and rivers are used in this analysis. Forest cover dataset to extract areas of non-forest is used. Using ArcGIS buffer tools, rivers are buffered by 30m and the buffered area is overlaid with the area of non-forest. Areas, where these datasets overlap, are defined as opportunity areas for the riparian buffer interventions. We use a similar approach for the 'wetland buffer' intervention, an existing dataset of wetlands and ArcGIS tools is used to buffer the dataset of wetlands by 50 meters. Then buffer is overlaid with the forest cover dataset that has non-forest areas and extracted, thus defining the opportunity area as areas within 50-m of non-forested wetlands.

For the 'buffer of water bodies' intervention, the water body is used. Using ArcGIS tools, the area of water bodies is buffered by 30m and, using the forest cover dataset, any areas from the buffer that are already forested is eliminated. Thus, the opportunity area for this intervention is defined as all non-forested areas within 30-m of existing water bodies.

For the buffer of national park, or natural reserve; this is established inside the reserve boundary (in contrast with other buffers which are outside the feature to protect). It consists of establishing 50-m buffer (inside the reserve boundary); then using forest dataset, the areas from the buffer that are already forested is eliminated. The selected tree species for the buffer of forest reserve are Bamboo, Mango – Safou –bitter cola, and other NTFPs

The 'roads protection' interventions include establishing 20-m buffers along roads that are non-forested that should be forested with wood species. The datasets of forest cover and road network are used in this analysis. We use the forest cover dataset to extract areas of non-forest. Using ArcGIS tools, we then buffer roads by 20m and overlay the buffered area with the area of non-forest. Areas, where these datasets overlap, are defined as opportunity areas for road protection interventions.

For the populated areas (settlement), we use the land cover dataset to extract areas with settlements (schools, villages, administrative offices etc.), Using ArcGIS tools, we digitize the settlement area and overlay it with the area of non-forest. Areas, where these datasets overlap, are defined as opportunity areas for the 'urban forests' interventions.

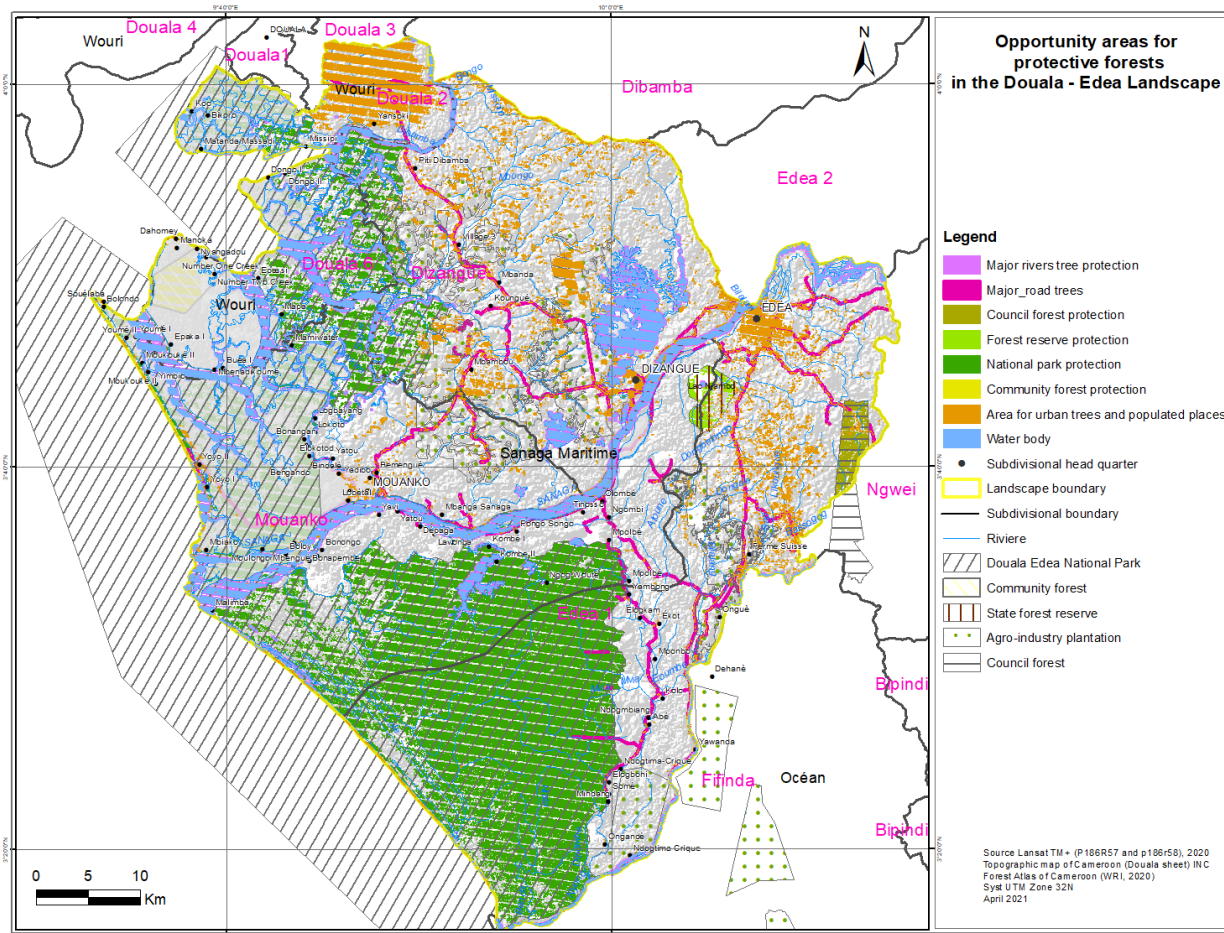


Figure 37. Opportunity map for protective forests.

The landscape offers several opportunities for the restoration of degraded areas as protective forests. These are tree plantations for the protection of sensitive sites such as forest belts (3,114 ha), the protection of the edges of roadways and public infrastructure (5,000 ha), the protection of the edges of waterways and ponds (37,893 ha) and the planting of trees within the villages and on the peripheries urban centers (10,902.14 ha) to create an active and cool environment for dwellers.

Table 19: Opportunity areas for protective forests

Intervention	Subdivision (Area Ha)					Landscape Total (ha)
	Douala 6 (Ile de Manoka)	Douala 2	Edea 1 (Yassoukou)	Mouanko	Dizangue	
Protective forest on riparian buffers	253.1	156.50	263.45	542.12	1,899.22	3,114.39
Protective forest on buffer of water bodies	6,750.11	3,457.22	5,000.33	15,233.45	7,452.26	37,893.37
Protective forest on roads	11.56	551	2,850	156.22	1431	4,999.78

Intervention	Subdivision (Area Ha)					Landscape Total (ha)
	Douala 6 (Ile de Manoka)	Douala 2	Edea 1 (Yassoukou)	Mouanko	Dizangue	
Protective trees in populated areas	11.99	4,198.69	2,635.78	562.24	3,493.44	10,902.14

3.2.3.4. Opportunity for regeneration of protected forests

Protected forest areas are part of the restoration potential in the landscape. They are more concerned with assisted natural regeneration (47,988 hectares) and restoration by planting forest species preferably indigenous species of the degraded zones of restoration of about 54,192.59 hectares. Table 17 shows the potential for restoration in forest protected areas of Douala –Edea landscape.

Table 20: Opportunity areas for restoration of protected areas in Douala – Edea landscape

Land use	Restoration protected areas by planting (ha)	Assisted natural regeneration (ha)
Forest reserve	1,167.86	455.46
National Park	12,026.36	45,965.73
Community forest	297.75	830.36
Council forest	37,912.90	736.83
Lake buffer	2,787.72	0.00
Total	54,192.59	47,988

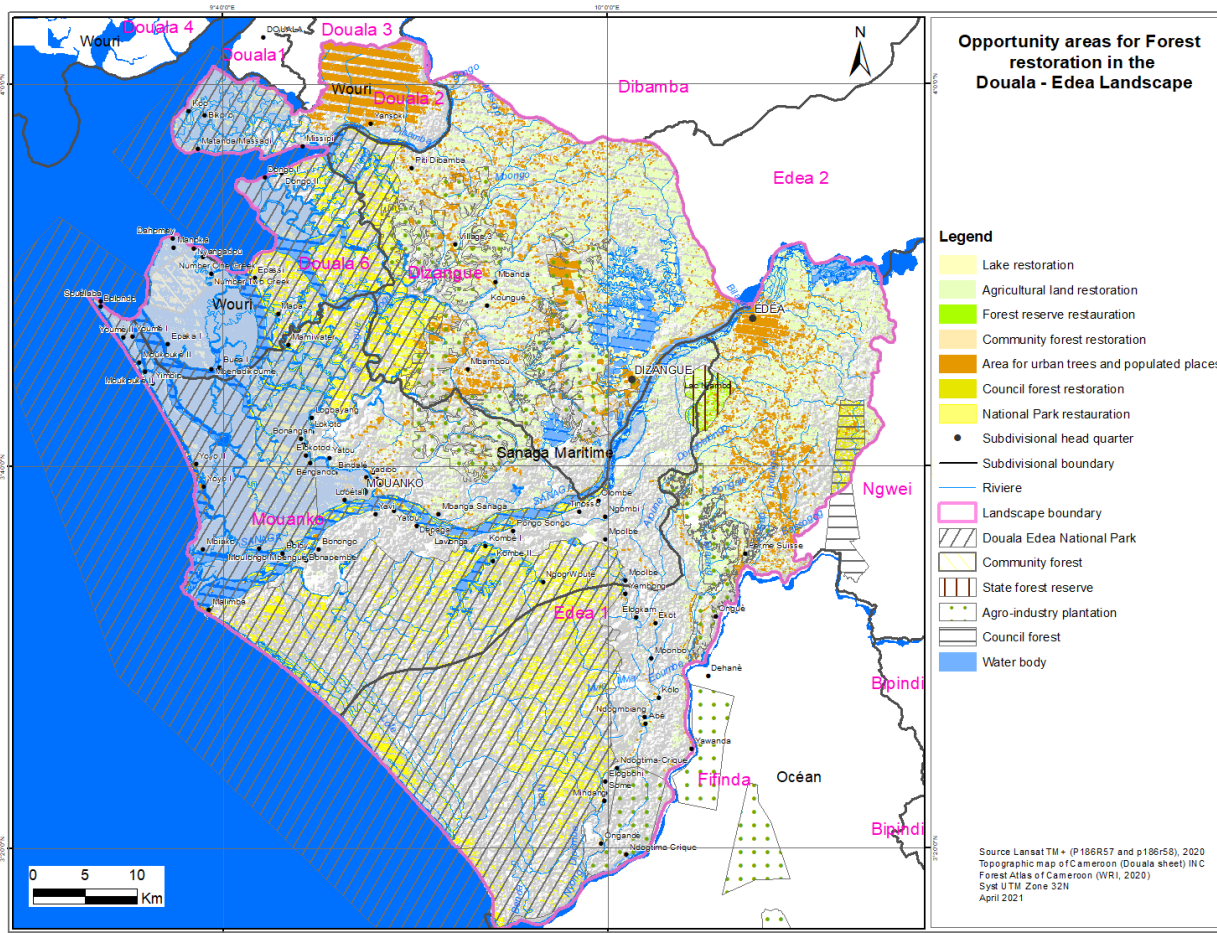


Figure 38. Opportunity map for restoration of deforested protected forest areas.

3.3. Economic and financial analysis

3.3.1. Cost-benefit analysis

The analysis took into account first of all the situation assuming without restoration (business as usual scenario). Without restoration in Waza, the community will continue to reforest with the neem tree. In Mbalmayo, farmers will focus on cocoa farming, while in Douala-Edea there will be the cultivation of oil palm. Indeed, the economic evaluation of the *business as usual* scenario is necessary to calculate the marginal value of each intervention.

It is important to note that the data were obtained during the focus group discussions carried out in the three landscapes consultation workshops and then refined by the secondary data obtained from the desk review done by the assessment team. The cost of the land was not taken into account in the analysis as farmers who invest in the restoration program do not own land, they have the right to use only.

It is also important to note that profits have been reduced to take into account the variability of the market and climate. Annex 3, Annex 4, and Annex 5 provide an overview of the

costs and benefits of community forest restoration in the Waza, Mbalmayo and Douala-Edea landscapes.

3.3.1.1. Description of the business as usual scenario

3.3.1.1.1. Business as usual scenario (BAU) for Waza landscape

In Waza the neem tree (*Azadirachta indica*) is planted in monoculture with 625 plants per hectare. The main activities concern: weeding, picketing, hole-in and planting. To these activities, we must add watering which constitutes a major constraint especially during the first 2 years (in the dry season that lasts 8 to 9 months) as well as, the firewall strip which constitutes an important part of the maintenance. The seeds are obtained from the 5th year however; the peak of production is reached after the 10th year. The pruning of the neem tree is carried out every 2 years and this from the 8th year. This not only provides firewood or poles, but also promotes better production in the interim year. A cup more or less equal to 1kg of shelled seed is sold to 500 FCFA on the local market; three cups of large grains produced 1L of oil and four cups of small grains produced 1L of oil for an estimated value of 5000 FCFA/L.

While it is true that the neem provides people with an oil of countless qualities, it is clear that it contributes to the depletion of soils, hence the decline of interest in populations. They have shown a strong interest in species that can improve soil fertility while producing wood and even other products. These include acacias, balanites and propopis.

Table 21. Costs and benefits modeled for the restoration of one hectare with Neem tree

Estimation of costs and benefits		Reforestation (Scenario business as usual in Waza)
1.	Cost discounted at 10%	4161.56 \$
2.	Income discounted at 10%	12413.53 \$
3.	NPV, Net Present Value at 10%	8251.97 \$
4.	CBR, Cost Benefit Ratio at 10%	2.98
5.	ROI, Return on Investment (rate of return)	9.41
6.	IRR, Internal rate of return	21.4 %

It is clearly observed from the Table 21 that the activity is very profitable from the point of view of all profitability indicators. This clearly explains the persistence of neem plantations in the Waza landscape despite its negative impact on soil fertility. Thus, taking into account this last factor (loss of fertility), the present result deserves to be mitigated.

3.3.1.1.2. Business as Usual Scenario (BAU) for Mbalmayo landscape

The cocoa plantation is generally established following a selective felling of trees in a forest area. The number of plants introduced per hectare is about 1111 plants and the activities necessary for the establishment of a cocoa plantation are: clearing, selective felling, staking, hole making and planting, maintenance, application of phytosanitary products and fertilizers. The harvest starts from the 4th year however, the peak is reached around the 13th year. The modeled costs and benefits for one hectare of plantation for the business as usual scenario in Mbalmayo are presented in the Table 22

In addition, it was observed during field visits that many cocoa plantations are degraded. Restoration of these degraded plantations is therefore necessary.

Table 22. Costs and benefits modeled for the restoration of one hectare with Cocoa in Mbalmayo Landscape

Estimation of costs and benefits		Reforestation (Scenario business as usual in Mbalmayo)
1.	Cost discounted at 10%	5097.37 \$
2.	Income discounted at 10%	8796.70 \$
3.	NPV, Net Present Value at 10%	3699.33 \$
4.	CBR, Cost Benefit Ratio at 10%	1.72
5.	ROI, Return on Investment (rate of return)	0.98
6.	IRR, Internal rate of return	36.4 %

Without the project, by continuing to carry out selective culling for the cocoa plantation, the farmers obtain substantial income. However, this planting model cannot continue. It is starting to show the breathlessness with the strong pressure on land in the management of agrarian activities in the landscape of Mbalmayo. Moreover, during the field visits, the community showed a strong interest in growing cocoa without clearing existing trees.

3.3.1.1.3. Business as usual Scenario (BAU) for Douala-Edea landscape

In the landscape of Douala-Edea, the cultivation of oil palm is a colonial heritage. With the presence of two large agro-industrialists (SAFACAM and SOCAPALM), the communities have embarked on the cultivation of oil palm with certain outlets. The number of seedlings introduced per hectare is about 143 and the activities necessary for the establishment of a palm grove are: clearing, felling, swathing, staking, holing and planting, maintenance (mainly felling and pruning), and fertilization (growth urea, then production fertilizer). The harvest starts from the 5th year but the peak of production is reached in the 10th year. The modeled costs and benefits for a hectare of plantation for the business as usual scenario

in Douala-Edea are presented in the Table 23

During field survey, it was observed that these large-scale plantations are increasingly criticized by populations who are waiting for alternatives to meet their needs in terms of wood products (firewood) and food.

Table 23. Costs and benefits modeled for the restoration of one hectare with Cocoa in Douala-Edea landscape

Estimation of costs and benefits		Reforestation (Scenario business as usual in Douala-Edéa)
1.	Cost discounted at 10%	3,389.47 \$
2.	Income discounted at 10%	5,805.21 \$
3.	NPV, Net Present Value at 10%	2,415.74 \$
4.	CBR, Cost Benefit Ratio at 10%	1.71%
5.	ROI, Return on Investment (rate of return)	1.4
6.	IRR, Internal rate of return	22.81 %

It appears that oil palm plantations generate substantial income in the Douala-Edea landscape. However, this result deserves to be mitigated by taking into account the ecological footprint (soil impoverishment) and social (large size plantations owned by a small number of actors, hence a weak redistribution of income).

3.3.1.2. Cost-benefit analysis of restoration in the Waza landscape

3.3.1.2.1. Restoration of degraded agricultural land in agroforestry plantation

The establishment of an agroforestry plantation (maize - peanuts - prosopis) takes into account the following activities: weeding, plowing, staking, hole making and planting, maintenance, fertilizers. To these activities, we must add the watering which constitutes a major constraint especially during the first 2 years and the firewall band which constitutes an important part of the maintenance. Maize and peanuts are planted and harvested in years 1 & 2, thereafter the plantation is dedicated to prosopis only which will produce firewood and fodder for the livestock. It is important to note that the carbon benefit was also taken into account in the analysis. The modeled costs and benefits for one hectare of agroforestry plantation in Waza are presented in Table 24.

Table 24. Costs and benefits modeled for the establishment of an agroforestry plantation in Waza landscape

Estimation of costs and benefits		Agroforestry on flat and gentle sloping land
1.	Cost discounted at 10%	3,687.57 \$
2.	Income discounted at 10%	3,992.88 \$
3.	NPV, Net Present Value at 10%	305.31\$
4.	CBR, Cost Benefit Ratio at 10%	1.08
5.	ROI, Return on Investment (rate of return)	0.95
6.	IRR, Internal rate of return	13.74

3.3.1.2.2. Restoration of degraded mountains of Waza landscape

The establishment of a plantation on degraded mountains (millet - acacia) takes into account the following activities: weeding, plowing, staking, hole-making and planting, maintenance. To these activities, we must add the watering which constitutes a major constraint especially during the first 2 years and the firewall band which constitutes an important part of the maintenance. Millet is planted and harvested in years 1 & 2, then the plantation is dedicated to acacias. The expected products in this plantation model are firewood, gum arabic and fodder for livestock. It is important to note that the carbon benefit was also taken into account in the analysis. The modeled costs and benefits for one hectare of plantation on degraded mountains in Waza are presented in Table 25.

Table 25. Estimated costs and benefits for the restoration of degraded Waza mountains

Estimation of costs and benefits		Reforestation (very steep degraded mountains)
1.	Cost discounted at 10%	3,560.23 \$
2.	Income discounted at 10%	3,752.36 \$
3.	NPV, Net Present Value at 10%	192.13 \$
4.	CBR, Cost Benefit Ratio at 10%	1.05
5.	ROI, Return on Investment (rate of return)	1.44
6.	IRR, Internal rate of return	11.48

3.3.1.2.3. Restoration of degraded community forests

The proposed model takes into account both the productive production of these forests but also conservation. The expected products in this plantation model are firewood (on a 5-year rotation), gum arabic, oil and fodder for livestock. The carbon benefit has also been taken into account. The cost of establishing a plantation to assist in the restoration of community forests (forest for production purposes) takes into account the following

activities: weeding, staking, hole making and planting, maintenance. These forests are restored by multiple-use species such as acacia, balanitis and prosopis. The modeled costs and benefits for one hectare of plantation on degraded mountains in Waza are presented in Table 26.

Table 26. Estimated costs and benefits for the restoration of degraded community forests in Waza

Estimation of costs and benefits		Reforestation (assisted community forest restoration)
1.	Cost discounted at 10%	3,247.19 \$
2.	Income discounted at 10%	6,955.44 \$
3.	NPV, Net Present Value at 10%	3,708.25 \$
4.	CBR, Cost Benefit Ratio at 10%	2,14
5.	ROI, Return on Investment (rate of return)	6.08
6.	IRR, Internal rate of return	18.98 %

3.3.1.2.4. Restoration of the degraded park

The cost of establishing one hectare of plantation to assist in the restoration of the degraded park takes into account the following activities: weeding, staking, hole-making and planting, maintenance. The restoration of the park is done for conservation purposes by the acacias. However, people will be able to benefit from the services offered by these species, such as gum arabic and fodder. The carbon benefit was also taken into account in the analysis. The estimated costs and benefits for one hectare of plantation on degraded mountains in Waza are presented in the following table (Table 27).

Table 27 : Estimated costs and benefits for the restoration of degraded park areas

Estimation of costs and benefits		Reforestation (assisted regeneration of degraded park areas)
1.	Cost discounted at 10%	3246.18 \$
2.	Income discounted at 10%	2715.17 \$
3.	NPV, Net Present Value at 10%	-531.01 \$
4.	CBR, Cost Benefit Ratio at 10%	0.84
5.	ROI, Return on Investment (rate of return)	1.02
6.	IRR, Internal rate of return	8.12 %

3.3.1.2.5. Creation of buffer zones around water bodies and riparian forests

The analysis model proposes bamboo to restore the park's buffer zones and water bodies (in this case the ponds). It takes into account the functions of production (timber and timber) and conservation. The activities to be carried out during the implementation of a bamboo plantation are as follows: weeding, staking, holing and planting, maintenance. This last activity is very important and must be perpetuated throughout the production cycle. Indeed, bamboo rejects many stumps and the risk of plantation overcrowding is perceptible. Bamboo can be exploited from the third year (Djé et al, 2017) and sold at 500 FCFA per unit according to field investigations. Thus, in the analysis we took into account a double rotation every 3 and 5 years and the situation with and without carbon benefit. The modeled costs and benefits for one hectare of plantation for the restoration of buffer zones and water bodies are presented in Table 28.

Table 28: Modeled costs and benefits for the restoration of buffer zones and water bodies

Estimation of costs and benefits		Reforestation (buffer and water bodies)
1.	Cost discounted at 10%	3183.15 \$
2.	Income discounted at 10%	5735.83 \$
3.	NPV, Net Present Value at 10%	2552.69 \$
4.	CBR, Cost Benefit Ratio at 10%	1.8
5.	ROI, Return on Investment (rate of return)	2.84
6.	IRR, Internal rate of return	24.2 %

It emerges from the Table 28 that taking into account the carbon benefit in the analysis, creation of water buffers with bamboo is a very profitable activity. Moreover, up to the discount rate of 20%, we obtain a positive NPV of approximately 2,553 US\$ and the internal rate of return is 24.2%. For every 1US\$ invested in protecting water bodies with bamboos, there is a creation of almost 3US\$ worth of ecosystem goods and services (ROI=2.84). This result is very understandable because, due to its rapid growth, bamboo has a high potential for carbon sequestration and would serve for various usage. For Odiwé et al (2012), bamboo is an environmentally very interesting plant from an environmental point of view because it can replace wood from natural forests through its capacity to sequester carbon and provide ecosystem services.

By not excluding the carbon benefit, it is contested that the activity is not at all profitable from the point of view of all profitability indicators. This situation can be explained by the fact that on the one hand, the products and services offered by bamboo are still little valued. On the other hand, it should be observed that the establishment of a forest plantation in the Waza landscape (Sahelian zone with fragile ecology) has significant fixed

costs during the first two years, particularly in terms of interview. Indeed, for Tchigankong et al (2018), rain is a limiting factor in reforestation programs in areas with fragile ecology. Moreover, the initial investment cost (first year) is about 1,822 US\$. It should be noted that one of the most awaited subsidies by the communities in the Waza landscape for the success of the restoration program is the construction of agro-pastoral boreholes.

3.3.1.2.6. Conclusions of the economic findings for restoration opportunities of Waza

Overall, we observe that all the restoration options are profitable from the point of view of performance indicators except for the restoration of the Waza Park which has an internal rate of return (IRR) of less than 10% and a net present value (NPV) negative. It also appears that the restoration of degraded mountains is the least profitable model. However, special attention deserves to be paid to these two areas. In fact, the park is primarily restored for conservation purposes. The benefits are more ecological. The same is true for degraded mountains, the restoration of which could constitute an important grazing area for livestock.

Agroforestry is the activity that requires the most investment (which is quite understandable given the high number of inputs). The Cameroon result is also similar to that obtained in Rwanda. The restoration of the community forests is presented as the most profitable activity from the point of view of the NPV (3,708 US\$). It is important to remember that the restoration of these forests is done for the purposes of production and conservation and this by multipurpose species able to provide both timber and other services. The protection of the water bodies with creation buffer forests beyond the ecological interest, they also present as a very profitable plantation model. Indeed, the bamboo put forward in this restoration option has the advantage of having very rapid growth (usable from the third year). A better adoption of its products and services by the local populations is still expected to make bamboo a real alternative to many species.

3.3.1.3. Cost-benefit analysis of restoration in the Mbalmayo and Douala-Edea

3.3.1.3.1. Traditional agriculture to agroforestry systems in Mbalmayo

The analysis proposes the transformation of traditional agriculture in agroforestry systems based on cocoa. It aims to reverse the trend in cocoa dominant farming. In fact, cocoa plantations are traditionally established following selective felling of a forest area. In this plantation model, cocoa and plantain are introduced in year 1, followed by ndo'o (*Irvingia gabonensis*) in the same year. The banana is harvested in years 1 & 2 then the plantation becomes a cocoa -Ndo'o association. Cocoa production begins in year 3 and Ndo'o in year 4. The wood is cut on a 5-year rotation. The activities necessary for the establishment

of an agroforestry plantation based on cocoa are as follows: weeding, plowing, staking, hole-drilling and planting, maintenance, fertilization and application of phytosanitary products. The modeled costs and benefits for one hectare of plantation for the restoration of degraded agricultural land in an agroforestry system in Mbalmayo are presented in Table 29. The carbon benefit was also taken into account in the analysis.

Table 29. Modeled costs and benefits for the establishment of agroforestry systems in Mbalmayo

Estimation of costs and benefits		Agroforestry systems (cocoa & banana plantain & Ndo'o)
1.	Cost discounted at 10%	5027.32 \$
2.	Income discounted at 10%	8208.59 \$
3.	NPV, Net Present Value at 10%	3181.28 \$
4.	CBR, Cost Benefit Ratio at 10%	1.63
5.	ROI, Return on Investment (rate of return)	0.998
6.	IRR, Internal rate of return (%)	30.23

3.3.1.3.2. Traditional agriculture to agroforestry systems in Douala-Edea

The analysis proposes the restoration transitions from traditional agriculture to agroforestry systems (macabo & pistachio & ndo'o). In this planting model, macabo and squash seeds are introduced and harvested in years 1 & 2. From year 3 the plantation is dedicated to ndo'o (*Irvingia gabonensis*) only. Production of ndo'o begins in year 4 and the wood is cut on a 5-year rotation. The activities necessary for the establishment of an agroforestry plantation in Douala-Edea are as follows: weeding, plowing, staking, hole-making and planting, maintenance. The modeled costs and benefits for one hectare of plantation for the conversion of agricultural land into agroforestry system in Douala-Edea are presented in Table 30. The carbon benefit was also taken into account in the analysis.

Table 30. Modeled costs and benefits for the establishment of agroforestry systems in Douala-Edea

Estimation of costs and benefits		Agroforestry systems (macabo & pistachio & ndo'o)
1.	Cost discounted at 10%	1419.23 \$
2.	Income discounted at 10%	2555.36 \$
3.	NPV, Net Present Value at 10%	1136.13 \$
4.	CBR, Cost Benefit Ratio at 10%	1.8
5.	ROI, Return on Investment (rate of return)	1.81

Estimation of costs and benefits		Agroforestry systems (macabo & pistachio & ndo'o)
6.	IRR, Internal rate of return	39.53%

3.3.1.3.3. Restoration of degraded community and council forests in Mbalmayo and Douala-Edea

The restoration of community and public forests is carried out by multiple-use species such as Ndo'o and safou for the purposes of exploitation and conservation. The activities necessary for the establishment of the plantation are: weeding, staking, holing, planting, and maintenance. The ndo'o is sold on average at 2.2 US\$ per kg and the safou at 1.8US\$ per kg. The carbon benefit is taken into account in the analysis. The modeled costs and benefits for one hectare of plantation for the restoration of community forests in Mbalmayo and Douala-Edea are presented in the Table 31.

Table 31. Modeled costs and benefits for the reforestation of community and council forests in Mbalmayo and Douala-Edea

Estimation of costs and benefits		Reforestation of community and council forests
1.	Cost discounted at 10%	1038.068 \$
2.	Income discounted at 10%	1996.67 \$
3.	NPV, Net Present Value at 10%	958.61 \$
4.	CBR, Cost Benefit Ratio at 10%	1.92
5.	ROI, Return on Investment (rate of return)	2.36
6.	IRR, Internal rate of return (%)	21.22

3.3.1.3.4. Restoration of degraded forest reserve and park areas in Mbalmayo and Douala-Edea

The establishment of a plantation based on non-wood forest products (Ndo'o - safou and bitter cola) for the restoration of degraded reserves includes the following activities: weeding, staking, hole-making and planting, maintenance. This plantation is established for conservation purposes. For this purpose, only the fruits are consumed during the production which begins in the fourth year. The carbon benefit is taken into account in the analysis. The modeled costs and benefits for one hectare of plantation for the restoration of degraded reserves in Mbalmayo and Douala-Edéa are presented in Table 32.

Table 32. Modeled costs and benefits for restoration of degraded forest reserves and parks in Mbalmayo and Douala-Edea landscapes

Estimation of costs and benefits		Reforestation of the natural reserve and parks
1.	Cost discounted at 10%	948 \$
2.	Income discounted at 10%	1593.97 \$
3.	NPV, Net Present Value at 10%	645.97 \$
4.	CBR, Cost Benefit Ratio at 10%	1.68
5.	ROI, Return on Investment (rate of return)	2
6.	IRR, Internal rate of return (%)	19.42

3.3.1.3.5. Restoration of mangroves in Douala-Edea

The restoration of mangroves is carried out for conservation purposes but also for exploitation (lawful cutting of timber). Per hectare, 5,000 matanda plants are planted. The first cut takes place at 10 years (50% of the stand and reforestation is carried out) then every 5 years. Indeed, the mangrove being a breeding ground for fish species, must have a semi-permeable cover for optimal production (Jones et al, 2014). When setting up the plantation, the creation of the nursery is a major and expensive activity (high number of plants per hectare). Subsequently, guarding (by village committees) is an activity to be perpetuated because matanda is very popular with fishermen who use it to smoke fish but also as timber (making canoes). The latter often do not respect the rotation periods. The model takes into account the situation with and without carbon benefit. The modeled costs and benefits for one hectare of restored mangrove plantation in Douala-Edea are presented in Table 33.

Table 33: Modeled costs and benefits for the restoration of degraded mangroves areas

Estimation of costs and benefits		Reforestation of deforested mangrove areas	
		With carbon benefit	Without carbon benefit
1.	Cost discounted at 10%	6605.86 \$	6605.86 \$
2.	Income discounted at 10%	19348.52 \$	6614.68 \$
3.	NPV, Net Present Value at 10%	12742.66 \$	8.82 \$
4.	CBR, Cost Benefit Ratio at 10%	2.93	1
5.	ROI, Return on Investment (rate of return)	4.17	1.14
6.	IRR, Internal rate of return (%)	47.43	10.03

3.3.1.3.6. Establishment of riparian forests and buffer zones of water bodies in Mbalmayo and Douala Edea

The analytical model proposes bamboo to establish buffer zones for the reserves,

protection of water bodies and creation of riparian forest along with rivers. It takes into account the production purpose (timber and timber) as well as the conservation purpose. The activities to be carried out during the implementation of bamboo plantation are as follows: weeding, staking, hole making and planting, maintenance. This last activity is very important and must be repeated throughout the production cycle. Indeed, bamboo rejects many stumps and the risk of plantation overcrowding is perceptible. Peaches (sold at almost a dollar (1US\$ per stem) are obtained for stems of 3 years and above. The carbon benefit was also taken into account in the analysis. The modeled costs and benefits for one hectare of bamboo plantation for the establishment of buffer zones and protection of water bodies are presented in Table 34.

Table 34. Modeled costs and benefits for the establishment of riparian forests and buffer zones of water bodies in Mbalmayo and Douala-Edea landscapes

Estimation of costs and benefits		Establishment of buffer zones and riparian forests
1.	Cost discounted at 10%	629.54 \$
2.	Income discounted at 10%	5537.75 \$
3.	NPV, Net Present Value at 10%	4908.21 \$
4.	CBR, Cost Benefit Ratio at 10%	8.8
5.	ROI, Return on Investment (rate of return)	11.4
6.	IRR, Internal rate of return (%)	40.0

3.3.1.3.7. Conclusions of the economic findings for restoration opportunities of Mbalmayo and Douala-Edea landscapes

The summary of performance indicators for restoration options for Mbalmayo landscape is presented in annex 2. The various restore options are cost effective from a performance indicator perspective. Taking into account the areas, the challenge in the landscape of Mbalmayo lies in the restoration of buffer zones / water bodies followed by agroforestry. This observation is quite understandable because for many years, the riparian communities have encroached on the reserves. There is therefore an urgent need to restore the limits of the reserves. In addition, we note the presence of many rivers like the Nyong, Mefou and So'o which are experiencing eutrophication. The proposed new agroforestry will allow farmers to continue to derive substantial income from cocoa cultivation while reducing pressure on natural forests.

It is important to note that, the costs of the restoration of the landscape of Mbalmayo (just like that of Douala-Edea) could be reduced considerably by taking into account the community work. In fact, within the framework of this project, we put forward the restoration by non-timber forest products (NTFPs) with a short production cycle (3 to 4 years to obtain fruits) capable of preserving the environment while providing many products (oil, fruit, firewood, etc.) to the communities. As the return on investment is short, some restoration

options such as agroforestry may be self-financing from the second year. However, in restoring the reserve primarily for conservation purposes, the contribution of community work should not be considered.

The summary of performance indicators for restoration options for Douala-Edea landscape is presented in annex 3. Overall, all the restoration options are profitable from the point of view of performance indicators (NPV > 0, CBR > 1, ROI > 0 and IRR > 10%). When notes that, the restoration of mangroves is the activity that requires the most significant investment (thus anticipating restoration through agroforestry). This can be explained by the high costs for the production of the plants. According to MINEPDED-RCM (2017). The high costs are due to the efforts made in the process of setting up nurseries and plantations. The challenge is to minimize these costs through the active participation of the populations. This is particularly the case in Madagascar (Lacroix et al, 2016) where mangrove restoration initiatives have been carried out jointly with local communities, thus considerably reducing the cost of the investment. Through many ecosystem services and in particular carbon sequestration, erosion control, bio-filtration (MINEPDED-RCM, 2017), it is observed that the restoration of mangroves is one of the activities the most profitable with an IRR > 40%. However, by excluding the carbon benefit in the model, the restoration of mangroves becomes a weakly profitable activity (NPV = 4,805 FCFA). It is important to note that a large part of the investment necessary for the restoration of mangroves can become non-monetary (contribution of community work), provided that the local communities are strongly involved. The restoration of the Douala-Edea park and the Mbalmayo reserve appears to be the least profitable plantation model (IRR = 19.42% and NPV = 352,055 FCFA). This result is very understandable because the restoration here is primarily done for conservation purposes.

Like the Waza landscape, the bamboo plantation model for the restoration of water bodies is very profitable. The adoption of its products and services by local populations, particularly in the Douala-Edea landscape, is growing.

3.3.1.3.8. Sensitivity analysis

The sensitivity analysis is used to assess how the change in inputs and the discount (margin tax rate) will affect such output as the net present value (NPV) of the restoration interventions. It appears that the NPV decreases as the discount rate increases.

It is shown by the Figure 39 that all proposed restoration interventions in Waza landscape are profitable up to 10% discount rate with high NPV noted in the creation of riparian buffers around water bodies and rivers, followed by restoration of community forests, and creation of new forest plantations on steep slopes and Agroforestry. Taking into account the other ecosystem values and services discussed in section 3.4, we realize the strong interest in restoring areas such as degraded mountains and degraded park which present many regulating services.

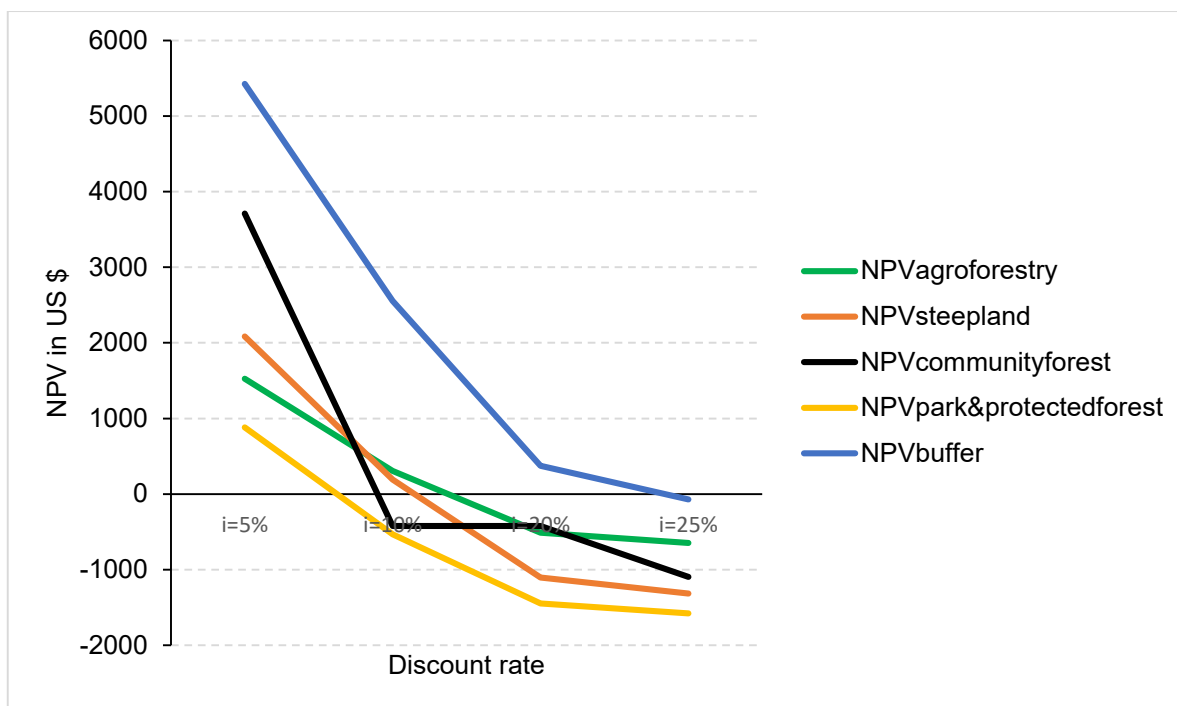


Figure 39. NPV sensitivity of restoration interventions in terms of the discount rate in Waza landscape

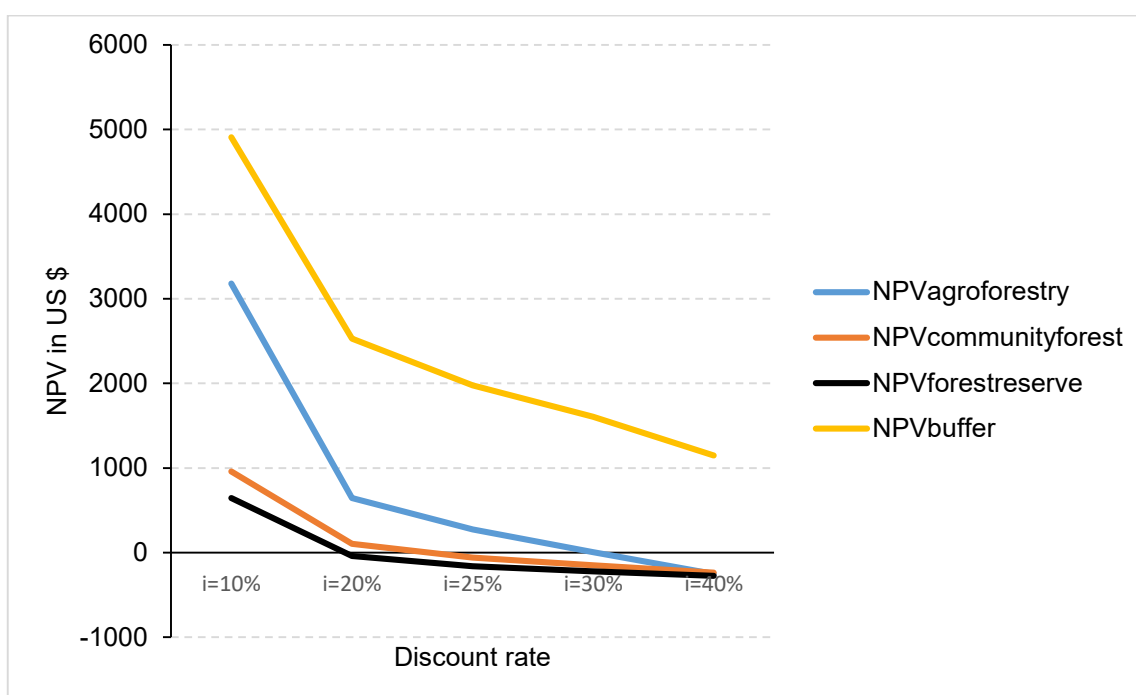


Figure 40. NPV sensitivity of restoration interventions in terms of the discount rate in Mbalmayo landscape

For Mbalmayo landscape (Table 46), the negative NPV appears at almost 20% for the restoration of the degraded reserve. This is understandable because the reserve is being restored first for conservation purposes. Overall, restoration in the Mbalmayo landscape (forest zone) is economically more profitable compared to Waza (Sahel zone where at the

discount rate of 25% all the NPVs are negative). It is also observed that, for the new agroforestry and the buffer zones, the NPVs remain positive above 30%. This proves, on one hand, that the paradigm shifts in cocoa cultivation (the change of selective cut for the introduction of NTFPs in plantations) beyond preserving the environment, will continue to generate substantial income for farmers. On the other hand, restoration by bamboo is a benefit to be seized. The outcome can be felt both ecologically and economically.

For Douala-Edea landscape, it can be seen from the Figure 41 that the NPV is a decreasing function of the discount rate. It goes up to 20% to have a negative NPV. This confirms the fact that restoration in the landscapes of Douala-Edea is economically profitable for all restoration options which is not the case for Waza landscape where it has been observed that the restoration of the park is not economically profitable from economic perspective. The restoration of the mangroves followed by the restoration of the buffer zone of water bodies appear to be the most profitable restoration options from the economic point of view. Indeed, up to the rate of 40%, these two options have positive NPVs. With regard to mangroves in particular, it is important to note that the restoration of this sensitive ecosystem generates many ecosystem goods and services (annex 5).

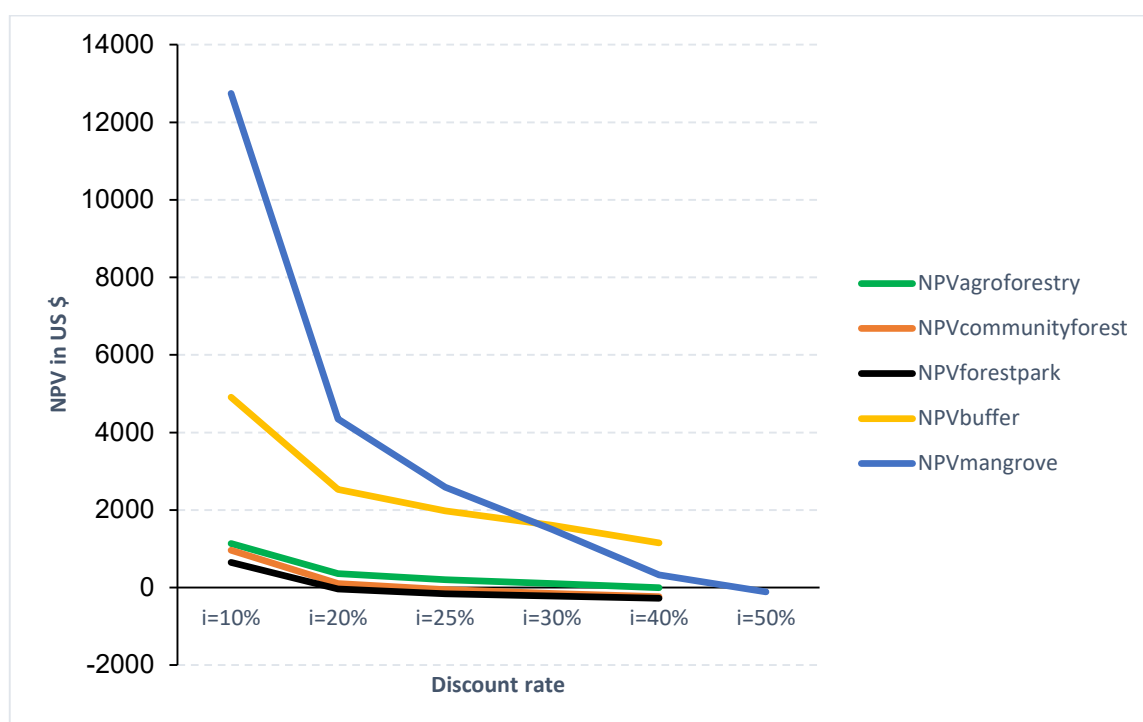


Figure 41. NPV sensitivity of restoration interventions in terms of the discount rate in Douala-Edea landscape

3.3.2. Carbon sequestration – Restoration co-benefits

It is worth highlighting the results of Carbon sequestered in the different forest landscapes according to the selected restoration options, illustrating the relevance of the increase in carbon storage in the three forest landscapes in terms of benefits. In the REDD+¹⁸ strategy

¹⁸ REDD+: Reducing Emissions from Deforestation and forest Degradation

and mainly in its Readiness Preparation Proposal (RPP), Cameroon envisages afforestation, restoration and reforestation for carbon sequestration and valuation of wood for different purposes depending on the agro-ecological zone (timber, firewood timber, etc.), in accordance with the directives of the National Plan for the Development of Plantations and the implementation of the National Plan to Combat Desertification.

Countries that use restoration to offset emissions want to find the most beneficial / cheapest way to do so. Carbon abatement curves use the information on the costs and benefits of restoration to estimate the benefits of carbon sequestration for each restoration transition. Figures 36, 37 and 38 show how much carbon each transition could capture if all restoration opportunities were implemented across different types of land use.

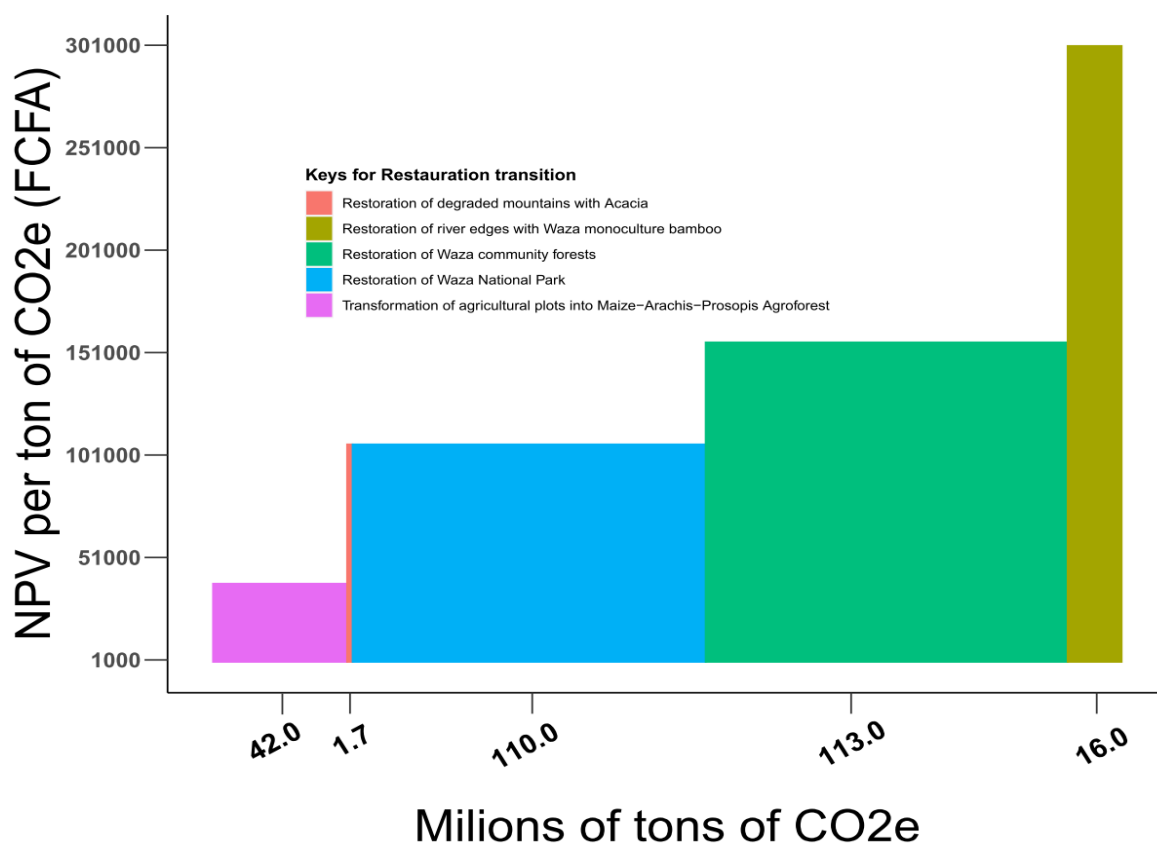
A carbon abatement curve has two dimensions:

- The dimension of benefits (costs): The height of each bar represents the additional benefits (costs) produced for each ton of carbon sequestered by the restoration transition.
- Volume dimension: The width of each bar represents the total amount of carbon that could be sequestered if all opportunity areas in each transition were restored (Ministry of Natural Resources of Rwanda, 2014).

The carbon benefits were calculated based on the constant mean annual increment (MAI) of the species used for each model.

3.3.2.1.1. Carbon benefits from the restoration of Waza landscape

The Figure 42 illustrates the carbon storage potential for each option chosen in the Waza forest landscape. It emerges from this figure that the restoration with bamboo in the surroundings of the ponds (pools) offers greater monetary value per hectare. This option is followed respectively by the restoration of community forests, the restoration of degraded mountains and the restoration of Waza National Park. Then comes last the transformation of traditional agriculture into agroforestry systems. Restoring community forests using Acacia trees would store an additional 113.5 million tons of CO₂e. For each ton of carbon stored through the restoration of community forest, 151,000 FCFA would be produced through additional NTFP, and wood production. The restoration of Waza National Park and its peripheral area could help sequester around 110.7 million tons of CO₂e. For each a ton of carbon stored through the assisted natural regeneration of the park, 101,000 FCFA would be produced through erosion control, biodiversity conservation and tourism. Reforestation of degraded mountains with acacia would store an additional 1.7 million tons of CO₂e and 101,000FCFA per ton stored would be produced through erosion control, soil fertility improvement, and livestock. Converting traditional agriculture to agroforestry systems (maize-prosopis for example) would store additional 42 million tons CO₂e and 51,000 FCFA for each ton of carbon stored would be produced through additional crop yield, reduced erosion and wood production.



Keys for Restauration transition

- Restoration of degraded mountains with Acacia
- Restoration of river edges with Waza monoculture bamboo
- Restoration of Waza community forests
- Restoration of Waza National Park
- Transformation of agricultural plots into Maize-Arachis-Prosopis Agroforest

Figure 42. Carbon abatement curve for Waza landscape

In terms of monetary value, by applying the cost of 7.5 USD (or 4,125 FCFA), the transformation of agricultural plots into agroforestry will make it possible to earn 173 billion, while the restoration of community forests would benefit around 468 billion. The restoration of the mountains would provide nearly 7 billion in monetary benefits. The restoration of the park and the edges of the ponds offer 456 and 69 billion FCFA respectively of opportunity. The Table 35 summarises the restoration options, costs and carbon benefits from the restoration of Waza landscape.

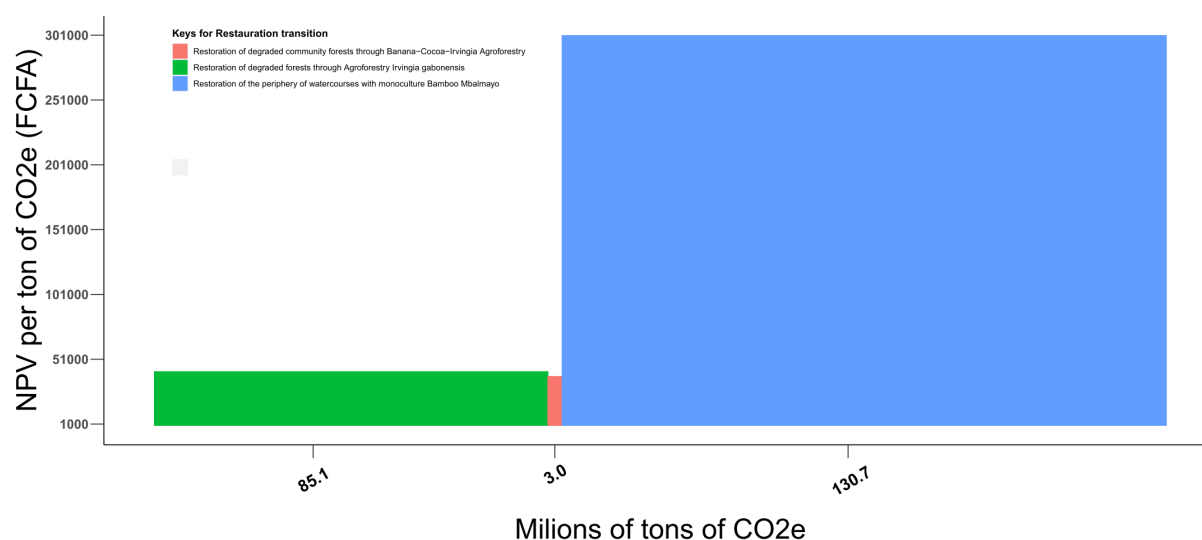
Table 35. Comparative table, the areas to be restored, carbon potential, costs and monetary value of Carbone sequestrated for Waza landscape

Performance economic Indicators	Agroforestry	Restoration of degraded mountains	Reforestation of Community forest	Restoration of degraded park	Riparian forests & buffer of water bodies
Areas to be restored(ha)	231,747.65	1,770.45	1,445.46	166,206.78	185,262.9
Selected tree species to use	Mais + peanuts + prosopis	Millet + acacia	Acacia + balanites + prosopis	Acacia (albida + Siberiana + nilotica)	Bamboo vulgaris
Restoration costs per ha (FCFA)	2,551,600	2,471,600	2,271,400	2,270,800	2,282,800
Restoration costs (million FCFA)	2,575	2,494	2,292	2,291	2,303
Carbon sequestered (million tons CO ₂ e)	42	1.7	113.5	110.7	16.0
Monetary values (billion FCFA)	173	7	468	456	69

3.3.2.1.2. Carbon benefits from the restoration of Mbalmayo landscape

As of Figure 43 shows, Cameroon has the potential to reduce up to 218.8 million tons of CO₂e emissions through selected restoration options for Mbalmayo landscape such as the reforestation of forest reserve, with the species *Irvingia gabonensis*, the reforestation of degraded community forests, the protection of rivers by riparian buffers and agroforestry of banana –Irvingia –cocoa production systems. The greatest potential to store carbon is by using bamboo to protect rivers and water bodies. Furthermore, the figure shows that restoring degraded forests and agricultural land with Irvingia could store around 85 million tons of CO₂e. For each ton of carbon stored through the restoration of natural reserve, 101,000 FCFA would be produced through erosion control, biodiversity conservation and tourism. Restoring community forests using Irvingia and Cocoa would store an additional 3 million tons of CO₂e. While the restoration of the peripheries of watercourses could help sequester around 130 million tons of carbon and create approximately 300,000FCFA in additional private benefits for each ton of carbon stored. Transitions that produce more public benefits, such as protection and restoration of degraded Natural reserve, create fewer private benefits for each ton of CO₂e that is stored and are less efficient means of storing carbon unless the buffer zones are managed by the communities around and the state or council administration would allow exploitation of non-timber forests products as private benefits (livelihoods) while public interests (research and conservation) remain for

the state and councils.



Keys for Restauration transition

- Restoration of degraded community forests through Banana-Cocoa-Irvingia Agroforestry
- Restoration of degraded forests through Agroforestry Irvingia gabonensis
- Restoration of the periphery of watercourses with monoculture Bamboo Mbalmayo

Figure 43. Carbon abatement curve for Mbalmayo landscape

The monetary costs associated with carbon sequestration are respectively 351 billion, 12 billion and 539 billion for the restoration of degraded forests, the restoration of community forests and the restoration of river edges. The Table 36 summarises the restoration options, costs and carbon benefits from the restoration of Mbalmayo landscape

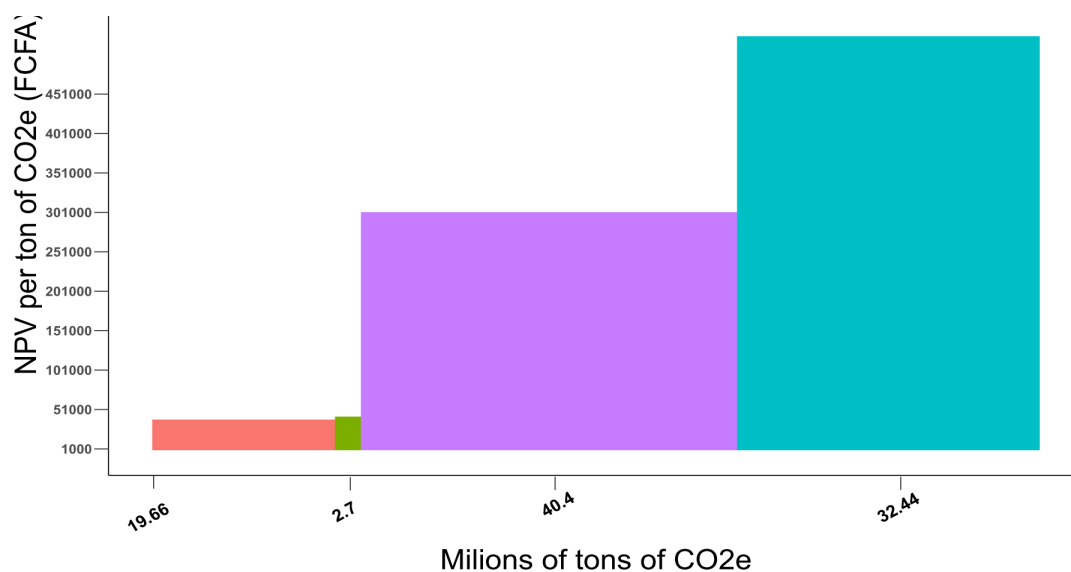
Table 36. Comparative table, the areas to be restored, carbon potential, costs and monetary value of Carbone sequestrated for Mbalmayo landscape

Performance economic Indicators	Agroforestry	Community Forest buffers	Reforestation of Forest Reserve	Riparian forests & buffer of water bodies
Total areas to be restored (ha) Mbalmayo	48,903.57	23,893.08	5,030.40	74,552.30
Selected tree species to use	Cacao + Ndo'o (Irvingia)	Ndo'o + safou	Bitter cola + safou + ndo'o	Bamboo
Restoration costs (million FCFA)	7,552	1,158	1,104	684
Carbon sequestered (million tons CO2e)	3.0	3.08	85.1	130.7

Performance economic Indicators	Agroforestry	Community Forest buffers	Reforestation of Forest Reserve	Riparian forests & buffer of water bodies
Monetary values (billion FCFA)	12.4	13	351	539

3.3.2.1.3. Carbon benefits from the restoration of Douala-Edea landscape

The analysis in Figure 44 illustrates the carbon storage potential of the four options chosen in the forest landscape of Douala-Edea. The figure shows that the restoration of degraded forests with the Irvingia species would store around 2.78 million tonnes of carbon. Restoring Irvingia and Cocoa forest landscapes would store around 19.66 million tonnes of CO₂e. Protection of river peripheries with bamboo in the vicinity of the ponds would store 40.45 million tonnes of CO₂e. Restoring degraded mangroves would store around 32 million tonnes of CO₂e. The monetary opportunities associated with the restoration of the various zones are 11.5 billion for the restoration of degraded forests, 81.05 billion for the restoration of agro-industrial areas, 166 billion for the restoration of the peripheries of rivers and rivers ponds and 133.19 billion for the restoration of mangroves



Keys for Restauration transition

- Restoration of degraded forest landscapes through Banana-Cocoa-Irvingia Ag
- Restoration of degraded forests by Agroforestry Irvingia gabonensis
- Restoration of mangroves in Douala Edéa
- Restoration of the periphery of watercourses with monoculture Bamboo Douala

Figure 44. Carbon abatement curve for Douala-Edea landscape

The Table 37 summarises the restoration options, costs and carbon benefits from the

restoration of Mbalmayo landscape

Table 37. Comparative table, the areas to be restored, carbon potential, costs and monetary value of Carbon sequestered for Douala-Edea landscape

Performance economic Indicators	Agroforestry	Community & council Forest	Park & forest reserve	Mangrove	Riparian forests & buffer of water bodies
Total areas to be restored (ha) Douala-Edea	101,160.18	37,912.90	13,194.23	8,950	41,007.76
Selected tree species to use	Macabo + Pistachio + ndo'o	Ndo'o + safou	Bitter cola + safou +ndo'o	Mangrove (Rhizophora racemose)	Bamboo
Restoration costs (million FCFA)	1,397	1,158	1,104	6,468	684
Carbon sequestered (million tons CO₂e)	19.66	2.78		32	40.45
Monetary values (billion FCFA)	81.05	11.5		133.19	166

3.3.2.1.4. Understanding the relationship between the carbon modelling and national plans and commitments

Cameroon has adopted the REDD + mechanism as a development tool that should help the country achieve the sustainable development goals that the government has set itself within the framework of Growth and Employment Strategy (DSCE) and of Cameroon Vision 2035 “*Cameroon pays emergent en 2035*”. As part of the National Development Strategy (SDN30), consideration of the environment and nature protection is reaffirmed. Thus, it incorporates the public policies that were initiated during the implementation period of the DSCE and took place through: (i) the national plan to combat desertification; (ii) the national strategy for the reduction of emissions from deforestation and forest degradation (REDD +); (iii) the Nationally Determined Contribution (NDC); and (iv) participation in the Great Green Walls initiatives hold back expansion of the Sahara and the African Forest Landscape Restoration Initiative (AFR 100).

SDN30 envisages: (i) strengthening actions for the sustainable management of natural resources (soil, flora, fauna, water); and (ii) take adequate measures for adaptation and mitigation of the effects of climate change. The restoration of degraded ecosystems therefore appears in this context as an opportunity that would not only conserve the

country's rich biodiversity, land restoration, carbon sequestration and increased economic income and livelihood of communities living in the vicinity of forest reserves. The analysis of carbon abatement in relation to net present value (NPV) from the private benefits therefore justify the importance of the choice of each restoration option. Because the carbon stocks for each intervention are estimated in millions of tons of carbon per year but more importantly estimate the private benefits from each restoration investment.

The Cameroon TRI Project is one of the twelve Child Projects of The Restoration Initiative (TRI) implemented by the International Union for Conservation of Nature (IUCN), the Food and Agriculture Organization of the United Nations (FAO) and the UN Environment Programme (UNEP) to contribute towards global efforts in support of the Bonn Challenge, the New York Declaration on Forests, the AFR100 Initiative, and the restoration priorities for the Republic of Cameroon.

3.4. Livelihood and Food security analysis

3.4.1. *Livelihood and food security in Waza landscape*

In the Waza landscape, subsistence activities are in order of importance: agriculture, animal husbandry, fishing and petty trade.

The staple foods for the diet are local cereals (millet, sorghum, corn and rice), oilseeds (peanuts, Nyebe, soybeans and sesame) and market garden products (tomato, onion, eggplant, okra, etc.). This production is partly intended for consumption and marketing. There are also other speculations such as cotton which is mainly intended for marketing (SODECOTON) and which generates significant income for farmers. This agriculture is favored by the presence of vast expanse of land in the landscape of Waza. However, the production tools are rudimentary and do not allow for significant yields. The consequence being the difficulty of operating large areas.

In addition, the area being of fragile ecology, the activity knows many disturbances in particular, with the floods (during the rainy season) and the extreme heat (during the dry season). In addition to these climatic disturbances, we also note the low degree of processing of products which means that the peasants do not derive an optimal income from the activity. One of the strategies for adapting and diversifying income is the increasing practice of arboriculture with species such as acacias which can provide many services to planters. The latter activity has as a corollary the exploitation of NTFPs which generates substantial income for the peasants.

Livestock plays an important role in the economic activity of communities. Depending on the origin of the herds, there are two types of breeding: sedentary breeding practiced by the populations of the area, large-scale transhumance breeding practiced mainly by pastoralists from neighboring countries, particularly Nigeria. This transhumance has accentuated the farmer-pastoralist conflict. In fact, nomadic Fulani herders who come very often from Nigeria (during the dry season in search of pasture), prune all the branches in their path. Herding by the inhabitants of the area is mainly carried out by herding tribes,

the Choa Arabs and the Fulbe. The locality of Petté is its stronghold, and for example, we have seen the GIC Espace Avenir Femmes de Pette, which makes dairy products (pasteurized milk, cheese and yogurt) from cow's milk. These products are marketed as far as Maroua (capital of the Region). More and more, the practice of animal husbandry is observed by other ethnic groups. Beyond profitability, animal husbandry is more practiced by reference to the social prestige it brings. Indeed, owning a large herd is synonymous with wealth. Cattle, sheep, goats, donkeys and horses are raised there. Small poultry farming is also observed in the villages. However, it should be noted that in recent years, the sector has seen a considerable decline in its herd, due to the phenomenon of hostage-taking of the children of pastoralists against payment of a ransom. In general, animal husbandry is the preserve of men, with women only involved in the marketing of products, especially cow's milk.

Fishing is an important economic activity, one of the lucrative activities in the villages. There are many natural pools with fish in Waza, Zina and Petté. The average duration of water in these ponds is six months, this varies depending on rainfall, flooding and the climate which favors the drying up of the ponds. The main species encountered in the area are: catfish, eels and carp.

Catfish the most popular species due to its high price when it sells to the markets. In addition, this activity generates a tax called parcel of fish which increases municipal revenues (in Waza in particular).

The trade sector is quite dynamic in the zone because of the geographical border position in Nigeria and Chad (to a certain extent) which makes it a transit zone par excellence. The products exported to its countries are mainly agricultural products, especially cereals. Imported products mainly consist of electronic devices, cosmetics, clothing and pharmaceuticals. We note the presence of periodic markets in most of the villages of the Waza landscape. However, the security situation in the region has a negative influence on this activity.



Figure 45. Women selling firewood and charcoal by the roadside in Waza & Pasteurized milk produced by the women of Petté

3.4.2. *Livelihood and food security in Mbalmayo landscape*

The main economic activities of the populations are agriculture, collection of NTFPs, fishing, hunting, sand extraction, crafts and tourism (Ecotourism site of Ebogo). Although these activities seem numerous, they just help to ensure the subsistence of the populations. Certainly, the problem of food security does not arise because the lands are fertile and nature generous. But one could nevertheless ask the question of food balance.

It is important to note that, in a low monetarized rural economy, farmers produce first for consumption, only the surplus production is marketed. Agriculture is therefore subsistence and focuses on food crops and more particularly cassava which holds the upper hand. Indeed, it remains the most cultivated speculation both at the individual level and of Associations and GICs on areas ranging from one to twenty hectares. Other crops (no less important) are macabo, plantain, corn, peanuts, sweet potatoes, yams, market gardeners (tomatoes) and even NTFPs (bitter cola, mango, djansens, hazelnuts, okok...). It should be noted that these crops are the choice of women who fully invest in them. They become the object of a commercial activity and transform the cassava into sticks and flour. As for cash crops, we distinguish first of all cocoa, then oil palm and fruit trees and are preferred crops for men. While it is true that access to food is relatively easy, a significant portion of the population continues to live in precariousness (day to day). The challenge of tomorrow is how to increase the quantities sold to market in order to significantly improve the living conditions of populations.

The forest plays a crucial role for the riparian communities of Mbalmayo. It contributes significantly to food security. Many NTFPs, both of animal origin (caterpillars, bush meat) and of plants (djansens, ndo'o, safou, okok, etc.) are harvested there. Fruit trees are also very popular with populations (citrus fruits in general). Fishery products occupy a prominent place in the supply of animal protein to households. Fishing is practiced in the dry season with the exception of Kanga fish which is done in the rainy season. But, in some localities like Akomyada, there is a conflict in the use of water resources between fishermen and sandblasters. This had the consequence of moving fishing activities from the dry season to the rainy season. This activity is practiced in the main rivers of the locality which are: Nyong, Mefou and So'o. This activity is the preserve of men and is done on line and net. In addition to Kanga, catfish and clarias are the main species fished. However, women also use traps and dams in streams.

Craftsmanship is an important activity and the main raw materials are:

- Rattan, a lianescent plant with which we make hoods used for transporting field products (food, firewood, etc.), chairs and other accessories on the back (of a woman).
- Raffia, which also makes chairs, but above all beds, and even children's toys.
- The wood with which craftsmen make mortars and pestles, drums, balafons etc.

3.4.3. *Livelihood and food security in Douala-Edea*

The means of subsistence of the populations revolve around the exploitation of fishery products

- 1) Fishing: this is the main income generation activity in the area. It employs more than 85% of the working population and is of two types: semi-industrial (dominated by Nigerians, Beninese, Ghanaians,) and artisanal (by locals). However, this activity is in the process of experiencing a decline due on the one hand to the increasingly noticed presence of Chinese trawlers on the high seas who practice wild fishing (not respecting any standard, very tight mesh of nets) and of another part of the destruction of the mangroves (Figure 47) in the fishing camps. It is important to note that, the mangrove is the place where most of the fish species come to reproduce. Unfortunately, this wood is the most used by the populations in the process of drying fish. Fishing is practiced almost all year round. This is favored by the diversification of water bodies, especially the kwakwa, which is navigable throughout the year. Proximity to the ocean is also a strong alternative, especially for players in semi-industrial fishing. However, in Dizangué at Lake Ossa, this is practiced over 8 months.
- 2) Shellfish (clams): They are the result of bivalve fishing (Figure 46) and as such, they occupy nearly 90% of the population. It was an activity reserved for women, but currently all family members are embracing it. It took over fishing among the local populations. A whole industry has been created around this activity, forcing the authorities to regulate the fishing calendar (January 15 - June 30) in order to ensure the survival of the species. The clams are sold locally to buyers coming from Bafoussam or Douala in the feed mills. An organization of the sector would make it possible to break the individualistic spirit which is the golden rule among local populations and thus generate substantial income.
- 3) Agriculture: previously hardly practiced, it has experienced a resurgence of interest in recent years, especially with the drop in fishing activities. The boom in this activity is due to farmers from other parts of the country (North-West). The main food crops are cassava, plantain, macabo, taro (kongo) and pistachio. For industrial crops, rubber and oil palm should be noted. The latter occupies an important place in the landscape of the zone, in particular in Dizangué where the 02 agroindustrialists SOCAPALM and SAFACAM, have plantations as far as the eye can see.
- 4) Breeding / is embryonic, subsistence and concerns poultry and small livestock.
- 5) Sand mining: Despite the enormous potential, sand mining remains a minor and disorganized activity. It is practiced at the family level, just for the satisfaction of the needs
- 6) Crafts: the potential is enormous but almost untapped because, dependent on tourism whose immeasurable potential (not valued) leaves all visitors with tears in their eyes.
- 7) agroindustrials, SAFACAM (Hévéa, oil mill and palm industry), SOCAPALM (oil mill, bought by the group to which SAFACAM is a subsidiary) which provides jobs to locals but poorly paid. The average salary of a local worker of 40,000 FCfa.

8) Winegrower: there is an association of palm and raffia wine pickers in Yassoukou

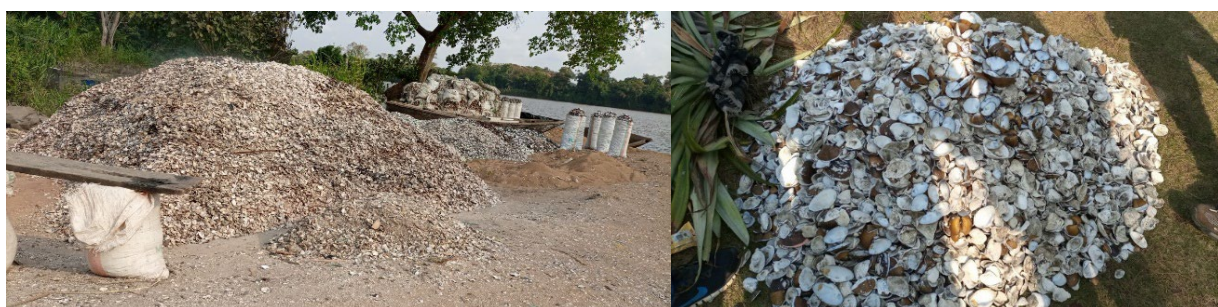


Figure 46. Extraction of clams in Nkaganzog (Mouanko) (Source: TRI Fieldwork, February 2021)



Figure 47. Mangrove wood (Matanda) stored at Yoyo for fish smoking (Source: TRI Fieldwork, February 2021)

3.5. Ecosystem services and biodiversity impacts from different restoration transitions

Some ecosystem values and services equally important for the ecological and socio-cultural heritage within the landscape are not included in the financial analysis (monetary valuation) due to its complexity in the evaluation criteria and insufficient data, however it matters highlighting them. These ecosystem services are but not limited to: erosion control, Improving water resources, biodiversity conservation, and socio-cultural values such as traditional medicine, religion and cults. Annex 6, 7, and 8 describes in details the ecosystem values and services gained through restoration of Waza, Mbalmayo and Douala-Edea landscapes.

3.5.1. Biodiversity

3.5.1.1. Biodiversity characteristics of Waza

The landscape is the habitat of endangered species (elephant, leopard, lion, damalisques, hypotragues, ibis, Buffon cobs, reed cobs, gazelles, Ruffirons, geese, egrets, ostriches and transit site for migrating birds) with vegetal formations sufficiently representative of the Sudano-Sahelian zone.

Tree diversity is marked by the predominance of species: *Acacia seyal*, *Guiera senegalensis*, *Combretum molle*, *Balanites aegyptiaca* and *Anogeissus leiocarpus*. The

3.5.1.2. Biodiversity characteristics of Mbalmayo

The forest landscape of Mbalmayo includes the forest zone and the humid forest zone.

The Mbalmayo forest reserve is included in the bioclimatic zone of dense humid evergreen forests (Morellet, 1952). Near the Nyong River and its tributaries, we observe a predominance of *Lophira alata* while in humid areas, but not inundated or marshy, we find populations of *Berlinia bracteosa*. The list of plant species in the reserve is presented. According to ONADEF, (1990), within the framework of a management inventory, the primary forest occupied 11% of the area of the reserve against 55% for the secondary forest which consisted of fallow land and several areas. times exploited. The rest of the reserve was made up of various types of formations: Swamp forests permanently flooded 8%; Periodically inundated swamp forests 10%; Raphials 6%; Regenerated or regenerating forests (forest plantations) 4% (Yonta, 1994). It is evident that this distribution has changed due to various agricultural activities and illegal logging which have undoubtedly reduced the proportion of primary forest.

It abounds in a large, rich and varied aquatic fauna, with several species of fish (endemic and exotic) in the Nyong River. Among the species commonly consumed by populations are: viper fish (*Parachara obscura*), catfish (*Clarias sp.*), Tilapia (*Oreochromis niloticus*), Kanga (*Heterotis niloticus*), carp (*Lutianus sp.*) And captain (*Lates niloticus*). The fishing potential has been assessed by World Fish (2005).

The terrestrial fauna consists mainly of the blue duiker (*Cephalophus monticola*); reptiles such as the Gabon viper, crocodile, monitor lizard (*Varanus ornatus*) and python (*Python sebae*); rodents such as palm kernels, squirrels, African porcupines and killer whales. Other wildlife species found in the area include civet, mongoose, tiger cat, pangolin and antelope.

Some animal species have become very rare in the reserve, such as gorillas and chimpanzees. The gorilla population would be reduced to 2 individuals and that of chimpanzees to 8 individuals. Some species have disappeared completely, this is the case of the red doe for example (JMN, 2005). There is an average of 250 to 300 species of birds in the area covered by the Mbalmayo Forest Reserve. It should also be noted the abundance of insects (butterflies and beetles) present in the area. Due to their abundance, their diversity and especially the tourist interest of these insects, a capture activity has developed and employs a certain number of young people in the tourist area of Ebogo.

According to Foahom (1993 in Owona, 2007), the Ebogo wetland is characterized by a bimodal Guinean climate with an average annual rainfall of 1600 mm distributed over two rainy seasons (March to June, then September to November). The average annual temperature is of the order of 23 ° C and the average humidity is 78. A soil map from ORSTOM (Office for Scientific and Technical Research Overseas) at 1 / 1000000e locates this area on the ground yellow desaturated ferralitic sesquioxides, the bedrock being a shale. As for sunshine, it reaches the threshold of 2000 hours per year (IITA, 1994). This area is home to a rich and diverse flora (around 100 species belonging to 32 different

floristic families). The Non-Wood Forest Products (NTFPs) which are derived from it (*Tetrapleura pentaclera*, *Irvingia gabonensis*, *Ricinodendron heudelotii*, *Cola nitida*, *Cola acuminata*, *Rauvolfia vomitoria*, etc.) are of great importance for the riparian populations and the economy of the Regions. from Central and South Cameroon. These products feed the local traditional pharmacopoeia and the market of Mbalmayo, which is the second in the region in terms of volume of trade in non-timber forest products. The fish fauna is abundant there and characterized by a wide variety of fish, crustaceans, and crabs found in the bodies of water of the Nyong River, the So'o River and other rivers that water this area. wet area.

In addition, the area has experienced a small tourist activity for several years thanks to canoe trips and butterfly hunters. This innate tourism therefore only needs to be structured and developed in order to become an income-generating economic activity for local populations.

The site is home to the Black-helmeted Hornbill (*Ceratogymna atrata*) which inhabits the forest galleries along the Ntem River. This species plays an important role in the dissemination of forest species. There are also large and medium mammals such as the Nile monitor lizard (*Varanus niloticus*) and the African python (*python sebae* 5 LC); rodents such as the burrowing squirrel (*Euxerus erythropus*), atherurus (*Atherurus africanus*) and duiker (*Cephalophus sp.*), African civet (*Civettictis civetta*), dwarf buffalo (*Syncerus caffer nanus*), the long-tailed pangolin (*Manis tetradactyla*) and the buffoon Cob (*Kobus kob kob*) as well as a very important floral diversity for the maintenance of the biological diversity of the dense humid forest of Guinea-Congolese. As flora, there are mainly Moabi (*Baillonella toxisperma*), Sapelli (*Entandrophragma cylindricum*) and Ebony (*Diospyros crassiflora*).

The temporarily inundated swamps around the rivers, the strips of land that have emerged on the Nyong, provide feeding and breeding grounds for water birds such as the Brown Hunting Martin (*Halcyon badia*), the Spotted Dove (*Zenaida macroura*), the Pied Hawk (*Accipiter melanoleucus*), the Black-headed Oriole (*Oriolus larvatus angolensis*), the White and Black Spermate, etc. The site is also home to migratory water birds and also serves as a wintering area for these species of water birds.

Several species of fish (endemic and indigenous) have been identified in the Nyong River with the species commonly consumed by the populations: viper fish (*Parachanna obscura*), catfish (*Clarias sp.*), Tilapia (*Tilapia niloticus*), Kanga (*Heterotis niloticus*), carp (*Lutianus sp.*) And Nile perch (*Lates niloticus*) (World Fish Center in 2005). The Kanga (*Heterotis niloticus*), a species with limited habitat in the Nyong valley (endemic) to which the Ebogo wetland belongs. This species of fish is highly prized by populations for its organoleptic qualities. They constitute a source of income generation for the indigenous local populations.

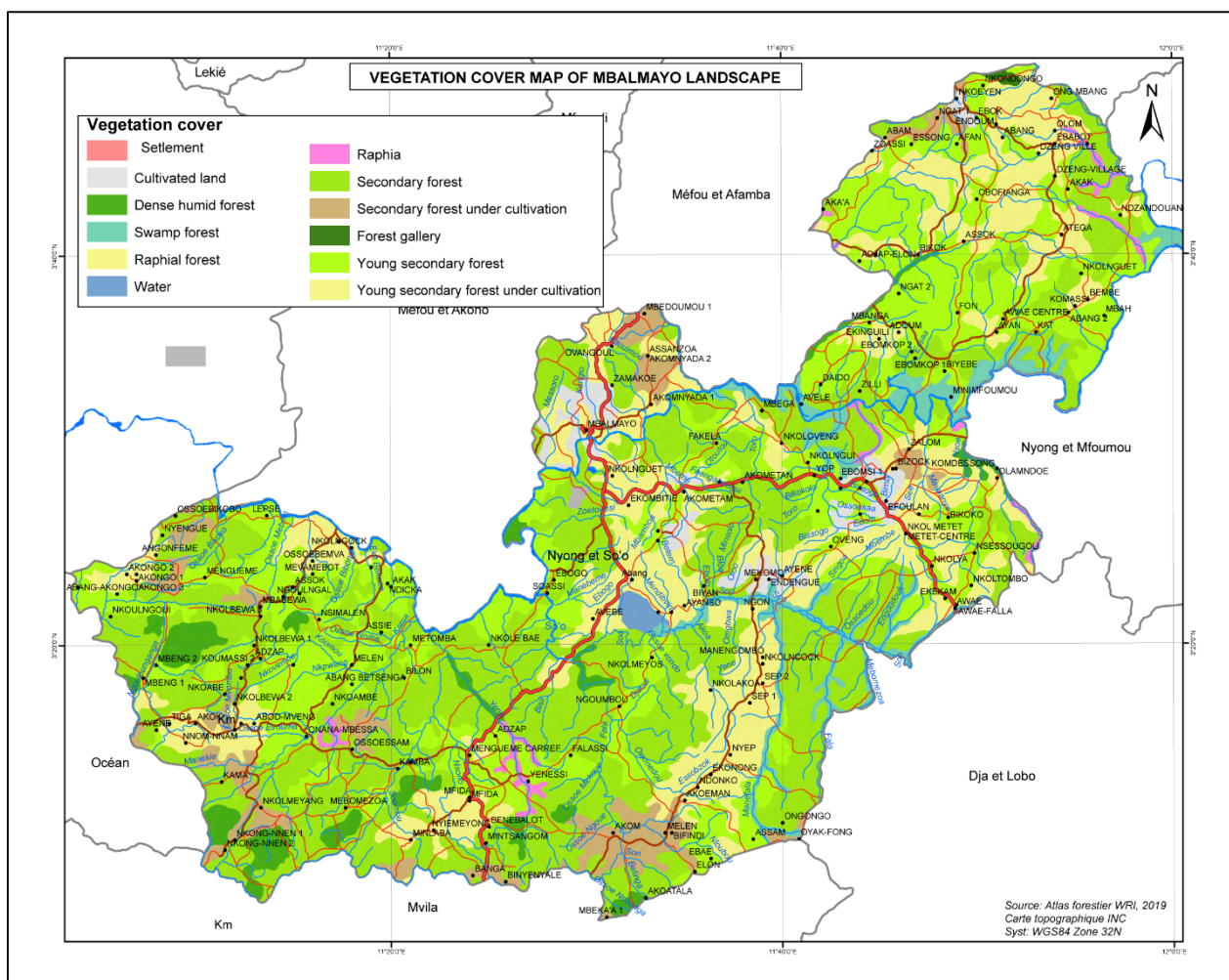


Figure 49. Vegetation cover map of Mbalmayo Landscape

3.5.1.3. Biodiversity characteristics of Douala-Edea

The Cameroonian coastal zone is characterized by varied ecosystems rich in biodiversity (De Kam et al., 2002). This particularly sensitive area is seeing its biodiversity increasingly threatened. Human activities including the creation of agro-industrial and agricultural zones, fishing and mining prospecting have caused the progressive degradation of the environment, the pollution of the coastal environment and the reduction of valuable biological resources (Nanko et al., 2010).

The landscape is made up of two main types of vegetation cover: a mangrove zone (with the humid forest), a forest zone and the aquatic zone. In the forest zone, the vegetation presents a diversification of species with a complete stratification of the large trees up to the herbaceous layer. The main exploitable species that exist are: moabi, iroko, fraquet, bibolo, bubinga, and beté.

it is also noting the presence of many NTFP intended for consumption (mango, safou, bitter cola, hazelnut...) or used in crafts (rattan, raffia and its derivatives, Chinese bamboo...). Table 38 gives the list of the main species of flora found in the forest zone of the landscape. The populations do not have the culture of planting trees but there are vast

plantations of palm trees and rubber trees (SAFACAM and SOCAPALM) which occupy a preponderant place in the landscape of Douala-Edéa (especially in Dizangué). Fruit trees are very popular with people and are generally planted in the yard, such as: mango, orange, guava, avocado and coconut.

Table 38: Main species of flora found in the forest zone of Douala-Edea landscape

Common Name	Scientific Name	Observations
Moabi	<i>Baillonella toxisperma</i>	Strong economic value
Bubinga	<i>Guibourtia tessmanii</i>	Plant with high medicinal value
Iroko	<i>Milicia excelsa</i>	Endangered
Movingui	<i>Distemonanthus benthamianus</i>	Plant with high medicinal value
Azobé	<i>Lophira alata</i>	Endangered
Fraké	<i>Terminalia superba</i>	
Mango	<i>Irvingia gabonensis</i>	NTFP highly prized for local consumption but declining compared to logging
Noisetier	<i>Coula edulis</i>	
Bitter cola	<i>Garcinia kola</i>	
Safoutier	<i>Dacryodes edulis</i>	
Ayous	<i>Triplochiton scleroxylon</i>	
Fromager	<i>Ceiba pentandra</i>	
Bambou de Chine	<i>Tribu bambuseae</i>	

The Douala-Edéa National Park, open to the Atlantic Ocean, contains various ecosystems including forests, lakes, swamps, mangroves and shorelines. An abundant fauna finds here a privileged habitat including certain species of particular interest for conservation. This is the case of the forest elephant (*Loxodonta africana cyclotis*), the manatee (*Trichechus senegalensis*), the chimpanzee (*Pan troglodytes*) and four species of sea turtles that frequent the coast of the reserve (*Chelonia mydas*, *Lepidochelys olivacea*, *Dermochelys coriacea* and *Eretmochelys imbricata*) (Angoni, 2011). The biological potential of the reserve is still poorly understood to this day along the coast line. Botanical and ornithological studies have been carried out in the mangroves while the floristic potential of the shorelines is not known. The most common trees and shrubs on the beaches are *Calophyllum inophyllum*, *Dalbergia ecastaphyllum* and *Terminalia catappa*. Note also the presence of coconut palms (*Cocos nucifera*) all along the beaches.

Mangroves and wetlands

Wetlands cover a large area of the landscape. As defined by the RAMSAR Convention, wetlands include a great diversity of habitats such as floodplains, rivers, lakes and mangroves. They have the ability to assimilate certain biodegradable wastes, providing important processing capabilities for substances such as excess nutrients and sediments, and improving water quality for downstream consumers by trapping toxic pollutants such

as heavy metals, which can, if necessary, be removed later for safe disposal.

The mangrove area of the landscape is that of the Cameroon estuary watered by the Sanaga, Kwakwa, Dibamba and Wouri rivers. These rivers carry a lot of alluvium and have an important flow with the fluvial mangroves which cover the banks of these courses, separated from the Atlantic forest. We meet the mangroves of Mouanko with sites like Mbiako, Yoyo 1 and 2 and Youme 1 and 2, the mangroves of Manoka with on the right bank fishing sites such as Manoka, Sandje, Betoune, Number 1 and 2 Creek, Ndigle, Logbayang, Doctor's Creeck, Missipi, Mokake and Youpwè. There are native species that are: *Rhizophora racemosa*, *Rhizophora harrisonii*, *Rhizophora mangle* (Rhizophoraceae), *Avicennia germinans* (Avicenniaceae), *Laguncularia racemosa*, *Conocarpus erecrus* (Combretaceae); and of an introduced species, *Nypa fruticans* (Arecaceae) with a very irregular spatial distribution because the different species tend to settle on different micro topographic configurations and different soil types (Mbog, 1998). There are 06 mangrove species in association with more than 40 other plant species considered as companion species (*Drepanocarpus lunatus*, *Dalbergia ecastaphylum*, *Hibiscus tiliaceus*, *Phoenix reclinata*, *Acrostichum aureum*, *Pandanus candelabrum*, *Raphia palma pinus*, *Sesuvium portulacastrum*, *Alchornea cordolia*, *Annona glaba*, *Elaeis guinensis*, *Athocleista vogeli*, *Bambusa vulgaris*, *Cocos nucifera*, *Eremospatha wendlandiana*, *Guiborutia demensei*, *Raphia palma-pinus*, etc).

Aquatic Fauna

We can distinguish aquatic mammals, reptiles, crustaceans, molluscs and fish. The mangrove areas are teeming with manatees (*Trichechus senegalensis*) in the Douala Edéa and Barracks National Park with a population estimated at more than 2,500 individuals around the 1980s throughout the country. Today, due to intensive poaching by fishing communities, this species no longer reaches 1000 individuals in the whole territory (CWCS 2000-2006), at least 30 individuals, caught in fishing nets are killed per year in the Douala Edéa reserve. Its flesh is appreciated by local riparian communities, and its oil highly prized in cosmetics. This is also the case with the Otter. Among the reptiles there are sea turtles with five species that frequent the mangrove area namely the green turtle (*Chelonia mydas*), the olive ridley turtle (*Lepidochelys olivacea*), the leatherback turtle (*Dermochelys coriacea*), the hawksbill turtle (*Eretmochelys imbricata*) and loggerhead (*Caretta caretta*) (Ayissi et al., 2003). Crustaceans present in all mangrove waters are numerous in the mouths of estuaries, such as *Nematopalemon hastatus* (crayfish or njanga), abundantly exploited in artisanal fishing by local communities. *Penaeus kerathurus* or tiger shrimp, *Parapenaeopsis atlantica*, *Panaeus notialis*, and several species of crabs that inhabit mangroves such as: *Ginossis pelii*, *Cardiosoma armatum*, *Geryon maritae*, *Panopeus africanus*, etc. molluscs (oysters or gastropods) and fish with the species: *Caranx hippos*, *Caranx spp.*, *Trachinotus teraia*, *Tilapia spp.*, *Pellonula afzeliusi*, *Arius gigas*, *Arius heudeloti*, *Arius parkii*, *Ethmalosa fimbriata*, *Sardinellaherensis*, *Plectorherensis*, *Pomadasyss spp.*, *Mugil cephalus*, *Pseudotolithus spp.*, *Dentex congoensis*, *Ilisha africana*, *Galeoides decadactylus*, *Polydactylus quadrifilis*, *Pomadasyss jubelini*, etc (Onequip, 2009).

Terrestrial Fauna

There are resident fauna located in the canopy of mangroves (mammals, reptiles, nesting birds, insects) and non-resident fauna not fixed in the zone of tidal swings (migratory birds and euryhaline animals) with part of their biological cycle. in mangrove ecosystems. These are dwarf crocodiles (*Orteolaemus tretraspis*), giant crocodiles (*Crocodylia*), Nile monitors (*Varanus niloticus*), African pythons (*Pithon selayi*), aquatic najas (*Boulangerina annulata*) for reptiles and blue monkeys (Cercopithecidae), antelopes such as sitatunga (*Tragelaphus spekei*), aquatic buckshot (*Hyemoschus aquaticus*), bush pigs (*Potamochoerus porcus*) for mammals.

CWCS, 2014 observed more than 125,000 birds there so endemic species are inherited by mangroves such as *Ardea Goliath* (Heron), *Bubulcus ibis* (Cattle keeper), *Butorides stratus* (Gray heron with green back), *Egretta alba* (Egret), *Numenius arquata* (courbis), *Phala crocarax africanus* (Cormorant) and *Tringa* Sp., African open beak and Scissor beak. Pelicans (*Pelicans refeseus*), black herons (*Egretta ardésiaca*), intermediate egrets (*Egretta garzetta*), sea swallows (*Sterna spp*), petrels (*Oceanites oceanicus*), knights (*Tringa spp*), African comorans (*Phalacrocorase africanus*), sandpipers (*Calidris spp*), riverbanks (*Limosa numernius arguata and N. phalopus*), plovers (*Charadrius*), gray parrots with red tail (*Prittacus eritracus*) hornbills, giant blue turacos (*Corythaeola cristata*), wild ducks, etc. are also encountered. There are over 70 species of waterbird that annually visit mangroves and the coastal zone (Ajonina et al, 2003; Ajonina et al, 2004; Ajonina et al., 2009).

4. Gender Considerations in FLR

4.1. Gender considerations in FLR Waza

Alongside agriculture, there is increasing exploitation of non-timber forest products. These products are consumed (generally the leaves, bark and fruits of trees such as baobab, balanite, moringa, etc.) or marketed (oil and gum arabic). A whole sector has been created around the exploitation of these NTFPs and there are as many men, young people as women. The latter play a major role in the chain of NTFPs with their association called "Union of cooperatives of the Far North" of which Ms. MANA Fadimatou is the president. This cooperative has branches in each of the 06 departments of the region. Mrs. Aïssatou Mohamat is the president of the departmental network of Mayo Sava (Mora) in the landscape of Waza. The main products produced and marketed are: neem oil, baobab (juice and powder), balanites (oil), acacia (gum) tamarind (juice and syrup) and moringa (powder). The involvement of women and men in the value chain of NTFPs in the Waza landscape is presented in the following table.

It appears from the previous table that both men and women are involved in the value chain of NTFPs. The role of men is predominant during the establishment of the plantation, while women intervene more from maintenance work (watering) then to harvesting and is responsible for processing and marketing. The dominance of men at the start of the cycle can be explained by the arduous nature of the work and much easier access to land for them. As NJOMAHA (2008) observes, women are mainly involved in the gathering of gum in the large natural Acacia stand and they enjoy independence in the management of funds generated by the activity. On the other hand, they intervene very little in *Acacia Senegal* plantations due to their poor access to land ownership and also to the nature of the activity which is culturally reserved for men in North Cameroon. However, a different picture appears in recent years, we observe women very involved in the establishment of forest plantations. This is particularly the case in Assa-hardi village (Mora district) where we observed during field investigations Chinese bamboo nurseries set up by women.

For women, the exploitation of NTFPs constitutes an activity capable of contributing substantially to household income, while for men it is only a third.

Restoration of the Waza landscape is therefore imperative to continue providing local communities with the products they need (firewood, seeds, bark, oil, etc.) while ensuring environmental protection.

4.2. Gender considerations in FLR Mbalmayo

Tree planting is a practice that is poorly observed in the communities bordering the Mbalmayo reserve. Since we are in a forest area, the tendency is to destroy the forest for the establishment of agricultural plantations (systematic felling). Forests have declined sharply and the local authorities of the ministerial departments in charge of natural resource management (MINFOF, MINEPDED and MINADER) have been raising awareness among the populations in recent years about the dangers of this practice. It is

nevertheless important to note that, the few woody species existing in degraded landscapes are encountered in cocoa plantations (they were left to serve as shade).

The management of trees in the landscape is made difficult by the absence of boundaries between the reserve and the lands allocated to riparian communities. We observe that populations exploit NTFPs of both animal origin (caterpillars, bush meat) and plants (djansens, ndo'o, safoutier, okok, ...) in the reserves and often in an anarchic manner. Women are heavily involved in picking *Gnetum africana* (Okok), collecting *Irvingia gabonensis* (ndo'o) and djansens while men are mostly picking. There is an imperative need to create a framework for consultation between the actors in charge of conservation and the residents.

Agroforestry practices are slowly gaining ground (introduction of ndo'o in plantations). People are beginning to realize that the forest is not endless and that they must plant trees that provide many services such as ndo'o, safou and bitter cola. Men and women each have a role to play in the restoration of the landscape of Mbalmayo. For men, this will include introducing trees that can serve as shade in cocoa plantations and for women to introduce trees into their plantations that can first provide them with firewood.

4.3. Gender considerations in FLR Douala-Edea

The forest plays a crucial role for the communities bordering the Douala-Edéa national park. It contributes to food security. Many NWFPs (djansang, ndo'o, safoutier, okok) are harvested. Fruit trees are also very popular with populations (citrus fruits in general). Traditionally, local populations have a culture of predators (extraction of resources and fishery species primarily in nature). Planting trees is therefore a practice that until now has primarily focused on fruit trees (mango, orange, avocado, coconut, etc.).

The management of trees in the landscape is made difficult on the one hand by the national park which occupies nearly 70% of Mouanko's territory and on the other hand by agro-industrial plantations. It is important to note that oil palm and rubber plantations occupy an important place in the area with the presence of 02 agro-industrialists (SOCAPALM and SAFACAM).

In the fishing camps, the mangrove tree (matanda) is used by women to smoke fish and men to make objects (it is one of the woods used in making canoes). The matanda is therefore highly prized by the communities living in the fishing camps. The excessive exploitation of matanda in the long term contributes to the destruction of spawning areas favorable to the reproduction of fish species, to the degradation of the mangrove flora and to the denaturation of the coasts.

It is therefore essential to restore this fragile ecosystem, especially since the population of the fishing camps is made up mainly of foreigners who do not always master and respect Cameroonian law on sustainable forest management.

4.4. Gender mainstreaming in FLR implementation

- Overall, the following points were (but not limited to) taken during the stakeholders consultations as key inputs to consider in the implementation of FLR activities:

- Sensitize local communities on current texts and legislation to promote conservation, sustainable and participatory management of forest ecosystems;
- Create an exchange platform between actors in charge of the conservation of protected areas in Cameroon and local communities;
- Support women in the processing and marketing of NTFPs. Experience shows that the latter are strongly involved in the transformation and marketing links of the NTFP value chains and they generally make the exploitation of NTFPs an income-generating activity;
- Strengthen the organizational and functional capacities of groups on community dynamics and train them on the sustainable management of natural resources and in particular of NTFPs which generate substantial income for communities.
- The technical know-how (taking into account climatic parameters, operating technique) of the growers must be strengthened. This will allow them to better manage the environment, while making the exploitation of forest resources an activity that can contribute significantly to household income.

5. Enabling Environment for FLR

5.1. SWOT Analysis for FLR implementation

The analysis of Strengths, Weaknesses, Opportunity and Threat of the restoration implementation in the Waza, Mbalmayo and Douala-Edea landscapes is presented in the Table 39.

Table 39. SWOT analysis matrix for the FLR implementation

SWOT Analysis matrix at landscape level (Waza)	
<p>Strengths</p> <ul style="list-style-type: none"> • Strong commitment of the central and local leadership for FLR • Local communities have a good knowledge of seed and seedlings production using native and exotic species present in the landscape • strong agreement between communities and local leadership in combatting desertification • Great capacity of communities to come together for a goal • Strong presence of TFPs (PTFs) that can finance the restoration 	<p>Weaknesses</p> <ul style="list-style-type: none"> • Low synergy and coordination of actions and interventions in favor of natural resource management and community development • Insufficient capacity to support and monitor restoration initiatives by sectors and research institutions • The absence of zoning or land allocation plan: transhumance corridors exist but are increasingly contested and occupied by the crops, especially in the flooded areas • The livestock / farming conflict is perceptible in the landscape (conflict over water resources between breeders and farmers) • Insufficient level of monitoring of reforestation programs in some cases • Presence of restriction of the rights to women to enjoy ownership of land, while most of the agricultural activities and collection of NTFPs fall to them. • Difficult access to water for watering seedlings planted and protecting them from destruction by livestock; • forestry budget still limited
<p>Opportunities</p> <p>opportunities?</p> <ul style="list-style-type: none"> • Availability of land, large areas suitable for restoration • Strong support from local populations • Successful reforestation experiences exist and are just waiting for scale up on a large scale • The species planted are of multiple uses and have a strong potential of value addition. The example of balanitis is obvious: soil fertilization for 	<p>Threats</p> <ul style="list-style-type: none"> • Extreme weather conditions (drought /flood) making the cost of afforestation very high • Security issues, the terrorist threat continues to act on some parts of the Waza landscape • Illegal logging in the park

<p>agriculture, fodder for cattle, consumption of leaves and production of oil from seeds.</p> <ul style="list-style-type: none"> • Existing market for NTFP products. 	
<p>SWOT Analysis matrix at landscape level (Mbalmayo)</p>	
<p>Strengths</p> <ul style="list-style-type: none"> • Political will to develop forest plantations • Presence of many local structures that can support restoration: ENEF, ANAFOR, FODER, IRAD, etc. • Women easily collaborate with men in the implementation of activities within the family and the community 	<p>Weaknesses</p> <ul style="list-style-type: none"> • Low synergy and coordination of actions and interventions in favor of natural resource management and community development by the different categories of local actors • The absence of zoning or land allocation plan • Poor organization of individuals for community initiatives • Low state capacity to curb illegal logging as well as poor forest management practices in the landscape and mainly in Reserves
<p>Opportunities</p> <ul style="list-style-type: none"> • Support of local populations who are increasingly aware of the significant loss of forest cover • Proximity to the market (Yaoundé) for the sale of NTFPs 	<p>Threats</p> <ul style="list-style-type: none"> • Complex land situation: demographic growth and strong pressure on land and forest resources have for a long time forced local populations to encroach on Reserves • Persistence of land conflicts between communities and reserve managers • Illegal logging on reserves discourages private initiatives. • Poor governance and community participation around the management of the reserve
<p>SWOT Analysis matrix at landscape level (Douala-Edea)</p>	
<p>Strengths</p> <ul style="list-style-type: none"> • Political will to develop forest plantations • The classification of the reserve as a national park with the corollary of the liberation of the enclaves for the local communities. • Presence of NGOs in the landscape (CWCS, AVDD, CAMECO...) and very active in conservation and/or able to support restoration in the landscape 	<p>Weaknesses</p> <ul style="list-style-type: none"> • Low synergy and coordination of actions and interventions in favor of natural resource management and community development by the different categories of local actors • The absence of zoning or land allocation plan • Poor organization of individuals for community initiatives • Large-scale oil palm monoculture experiments by agro-industrialists remain a challenge in restoration. • the conservation services and MINFOF do not have sufficient capacity to curb illegal logging in the landscape and mainly in the Park • Difficulties in accessing quality seeds and plants • Low availability of land, exacerbated by population growth and increased displacement of populations • Encroachment of the Reserve, the Park, poaching, illegal exploitation • Low ownership of local development projects and programs by communities

<p>Opportunities</p> <ul style="list-style-type: none"> • Strong support from local communities looking for an alternative activity to oil palm • The process of developing the park development plan has already been initiated and must be continue 	<p>Threats</p> <ul style="list-style-type: none"> • Low capacity for reconversion of certain communities which continue to live in nostalgia for fishing activities which in the past were very profitable • Strong presence of immigrants (Nigerians, Benibois, etc.) who have great difficulty in adopting good practices in the sustainable management of forest resources • The large-scale tourism development project will create new demands for lands
<p>SWOT Analysis matrix at national level</p>	
<p>Strengths</p> <ul style="list-style-type: none"> • Political commitment to reforestation and FLR, in full transition; • Strategic framework for the restoration of forest landscapes in Cameroon defined; • The National Forest Plantation Development Program (PNDPF) and before will allow the State of Cameroon to start the implementation of “2nd generation forestry” and to migrate from the “reforestation” paradigm to that of “development”. forestry and forestry value chains”; • Ongoing review of the forest policy and its implementation instruments, in order to align them with the new requirements in terms of forest management, restoration and promotion of certification as well as good forest governance; • High availability of degraded lands and forests to be restored; • Plethora of partners with rich experience (GEF, FAO, IUCN, INBAR, MINFOF, MINEPDED, national NGOs) engaged in the process; • The FLEGT voluntary partnership agreement, which is part of strengthening forest governance and the fight against illegal logging; • Sectors and research and development institutions have significant technical capital and experimental results (species, management systems, studies, information, experiences) transferable 	<p>Weaknesses</p> <ul style="list-style-type: none"> • Sources of financing and national funds available to initiate large, fairly limited reforestation programs; • Low synergy and collaboration between actors whose complementarity is essential for the structuring of relations and the harmonization of the interventions of the various actors at the national and landscape levels; • Limited knowledge on FLR tools by the technical Institution Authority (MINIEPDED) responsible for coordinating FLR activities; • Insufficient capacities at the national and decentralized levels in terms of support, monitoring of reforestation initiatives, technical support for local actors by sectors and research institutions; • Limited capacity of the state to curb illegal logging as well as poor forest management practices. this allows innovative illegal activities to flourish; • Terms of operationalization of incentive measures, as promoted by the texts (financial support - article 75 of the framework law, free technical support to promoters of plantation forests - article 7 decision setting the modalities for putting planted NTFPs into circulation, etc.) not yet fixed; • Weak ownership by the municipalities of the missions and powers in terms of promoting reforestation activities in urban areas and forest reserves transferred by the State; • Limited capacity of municipalities for planning and development, apart from project support; • The precariousness of user rights granted to communities and the difficulty these actors have in asserting land rights over their land; • More or less severe restriction of the rights of women to enjoy ownership of land, while most of the agricultural activities and collection of NTFPs fall to them;

<p>to restoration initiatives;</p> <ul style="list-style-type: none"> • Practices favorable to the protection of trees and to reforestation carried out by the communities, particularly in the Far North region. 	<ul style="list-style-type: none"> • Production capacities of plants and seeds remain low • Limited knowledge of stakeholders on the socioeconomic potential of restoration;
<p>Opportunities</p> <ul style="list-style-type: none"> • Commitment to the AFR 100 initiative to work by 2030, for the restoration of an estimated area of 12 million hectares of forests; • Cameroon's commitment to the CAFI process • Existence of numerous programs focused on reforestation and restoration (Restoration Project of the banks of the Benue River, Restoration Project of degraded ecosystems in the Far-North Region of Cameroon, etc.); • Existence of Special Fund (SFDF, EF) to finance the implementation of reforestation activities; • The decentralization process initiated and the transfer of skills; • The spatial planning process initiated; • Support from local populations who are increasingly aware of the significant loss of forest cover; • Opportunity to Forest Investment Plan (FIP) which is an opportunity for future financing of restoration programs 	<p>Threats</p> <ul style="list-style-type: none"> • Poverty and a way of life of communities mainly focused on the exploitation of natural resources, on practices favorable to deforestation and/or degradation of land and forests; • The absence of zoning or land allocation plan and persistence of land conflicts; • Possibility of perceiving restoration as a competitive activity with production lands; • Illegal exploitation and poor security of restored and/or reforested areas (invasion by communities, intrusion of domestic and wild animals, bush fires and forest fires), despite the control measures and strategies put in place; • No real follow-up programs, beyond the 3 years necessary for their empowerment and capitalization of the achievements of the various FLR initiatives and development of experiences in the long term; • Little public interest in bamboo; • Strong centralization of procedures for acquiring documents related to the management of planted forest resources and especially NTFPs. • Time-limited civil society funding.

5.2. National Policies and Strategies relative to FLR

Cameroon has several sectoral policies and laws relevant to forest landscape restoration (FLR) whose harmonization and alignment with the requirements of the FLR process will ensure its success. The Table 40 analyzes these policies, laws and national strategies and identifies, where applicable, the area that need to evolve.

Table 40. National policies, laws, strategies and development priorities related to FLR

Sectors	Overview of the national policies, laws, related strategies and programs	Actions needed to ensure effective implementation of FLR
Forestry	<p>The new consideration given to forests in the outcome of Rio will lead Cameroon to define an all-encompassing forestry policy, the objective of which will be to "preserve and develop the economic, ecological and social functions of forests, within the framework of integrated management which ensures sustainable conservation and use of forest resources and ecosystems" and reflected by the adoption of law 94/01 of January 20, 1994 related to the regime of forests, wildlife and fishing and its decrees of application.</p> <p>Some legal guidelines formulated by law and other texts to support restoration</p> <ul style="list-style-type: none"> - Promoting and supporting activities related to restoration of degraded areas - Reforestation of state land, management of state forests - Forests owned by individuals, land reforested by individuals - The obligation for urban municipalities to respect, in cities, an afforestation rate of at least 800 m² of wooded areas per 1,000 inhabitants, reinforced by the transfer of skills in terms of promoting reforestation activities in urban perimeters and forest reserves granted - The obligation of Silviculture activity in the DFP and therefore the practical arrangements were specified by circular letter N ° 0086 / L / MINFOF / CAB of May 18, 2016 - The ban on the exploitation of poles in the national domain set by Circular No. 0059C / MINFOF / CAB of April 21, 2016 relating to the exploitation of poles in the national domain - The prohibition of causing, without prior authorization, a fire likely to cause damage to the vegetation of the national forest domain - Taking incentive measures when necessary to encourage restoration - Restriction of user rights in defended or reforested areas - The "agroforestry book", attesting the right of ownership over the planted resources - Relevant strategies and programs - The National Forest Plantation Development Program (PNDPF), which allows the State of Cameroon to start implementing "2nd generation silviculture" and to migrate from the 	<ul style="list-style-type: none"> ✓ Specify the practical modalities of exploitation of private planted forests; ✓ Specify the content and operationalization modalities of technical assistance, as promoted by the texts (reforestation incentive measures - article 19 of the forest law, free technical support to promoters of plantation forests - article 7 decision fixing the modalities for putting planted NTFPs into circulation, etc.); ✓ Specify the content of the regeneration tax, taking into account the problem observed on the NTFP regeneration tax; ✓ Propose an outline for a Simple Forest Management Plan for individuals, provided for in article 39 paragraph 1 of the forestry law; ✓ Apply to the DFMP the silvicultural activity obligation specified by circular letter N ° 0086 / L / MINFOF / CAB of 18 May 2016; ✓ Decentralization of the procedure for obtaining the agroforestry logbook and management of planted forest resources and especially NTFPs.

Sectors	Overview of the national policies, laws, related strategies and programs	Actions needed to ensure effective implementation of FLR
	<p>“reforestation” paradigm to that of “development”. forestry and forestry value chains”;</p> <ul style="list-style-type: none"> - The National Plan for the Development of NTFPs (PND-PFNL) relates to the development of a green economy around NTFPs through restoration; - Strategy 2020 of the forestry sub-sector, which provides in its Sub-component 1.3 for regeneration and reforestation with the objective of promoting regeneration, reforestation and agroforestry activities to increase forest production capacities; - The FLEGT voluntary partnership agreement, which is part of strengthening forest governance and the fight against illegal logging; - Traditions which protect certain species with cultural (sacred and medicinal) and economic values. 	
Environment		
	<p>Law No. 96/12 of 05 August 1996 establishing a framework law relating to environmental management is the law of orientation in environmental matters in Cameroon. it recalls the need for incentive measures to be taken to encourage restoration without specifying the practical modalities. Article 75.- "Any operation contributing to curbing erosion, effectively combating desertification, or any afforestation or reforestation, any operation contributing to promoting the rational use of renewable resources, particularly in the savannah areas and the part northern part of the country benefits from support from the Fund provided for by this law".</p> <p>Also, it specifies the obligation (1) that the holders of mining titles or career titles to restore the exploited sites or to pay the financial cost of the reclamation operations carried out by the competent administration. and (2) that holder of project which risks damaging the environment for carry out EIAs.</p> <p>In the department of Nyong & So'o, the delegate issued an Order prohibiting the ignition of bush fires.</p> <p>Relevant strategies and programs:</p> <ul style="list-style-type: none"> - The Strategic Framework for FLR in Cameroon, spanning the forest and environmental sector, highlights the orientations to facilitate the operationalization of the FLR process in Cameroon and lead to a strategic document reflecting the context and the needs of each agro zone - 	<ul style="list-style-type: none"> ✓ Specify the content and practical arrangements allowing actors to benefit from financial support from the National Environment Fund; ✓ Rapidly develop a national forest landscape restoration strategy taking into account the policies, strategies and contributions of the various sectors and leading to clearly identified integrated and responsible programs.

Sectors	Overview of the national policies, laws, related strategies and programs	Actions needed to ensure effective implementation of FLR
	<p>ecological;</p> <ul style="list-style-type: none"> - The National REDD + Strategy aims to contribute to climate stabilization by reducing GHG emissions resulting from deforestation and forest degradation, conservation of forest carbon stocks, increase in forest carbon stocks and sustainable forest management, while improving the livelihoods of local communities and forest-dependent populations while ensuring economic and social development that is just, equitable and sustainable. In its variation, it formulates a range of strategic options, including FLR. Other options are not far removed from the objectives pursued by FLR. - The national action plan to combat desertification, the strategic objectives of which include, among others, the development and participatory management of space, the sustainable management of natural resources, the restoration of degraded lands, etc. - The vision of the National Strategy for the sustainable management of mangroves and other coastal ecosystems in Cameroon is also reflected in the FLR process, by supporting the government's efforts to achieve the following objective: "mangroves and all ecosystems coastal areas of Cameroon are conserved, protected and managed in a participatory manner, and contribute to maintaining ecological balances and the well-being of populations ”. 	
<p>Agriculture & Livestock</p>		
	<p>The National Agricultural Investment Program (PNIA) is the agricultural sub-sector of the National Rural Sector Development Strategy (SNDSR). It targets second-generation agriculture, which is characteristic of the need to modernize the main factors of production and increase agricultural areas, which may lead to the destruction of plant formations and biodiversity. However, he specifies that the exploitation of agricultural plots, whatever their size or status, must contribute to the good management of natural resources and the protection of the environment and be part of a green economy logic. The same applies to the strategy document for the livestock, fisheries and animal husbandry sub-sector is the reference document which indicates the need for each program, action or activity to be developed to necessarily take into account the related aspects. Sustainable management of all available natural resources.</p> <p>Transhumance corridors exist but are increasingly contested and occupied by the crops,</p>	<ul style="list-style-type: none"> ✓ The definition of an integrated approach for the harmonization of policies and actions of the agriculture and livestock sectors with FLR; ✓ The zoning of the territory can help identify sites that can accommodate this type of practice to be implemented in a concerted manner.

Sectors	Overview of the national policies, laws, related strategies and programs	Actions needed to ensure effective implementation of FLR
	especially in the flooded areas.	
Land tenure		
	<p>Land tenure in Cameroon is governed by ordinances 74/1 and 74/2 of July 6, 1974 relating to land and state land tenure. These ordinances characterize the predominance of state ownership in the allocation and management of forests in Cameroon which grants them to private entities and communities under the conditions set and rejects traditional forms of land appropriation for the benefit of the sole system of 'registration. The creation of the national domain nevertheless allowed the coexistence of written law and customary rights in all their diversity. However, the claim of village communities on the management of the national domain is a local reality.</p>	<p>The difficult and ambiguous coexistence between customary law and private property is at the origin of this precariousness observed in the land regime at the local level. Consequently, the current land tenure system requires reforms to be an incentive for FLR, in particular through:</p> <ul style="list-style-type: none"> ✓ harmonization of land policy with other national policies; ✓ recognition of community ownership over land and natural resources and the facilitation of private, and gender equity in land tenure system; ✓ facilitating access to land administration; ✓ facilitating access to land for local populations.
Land Use		
	<p>Law No. 2011/008 of 06 May 2011 on Orientation for the Planning and Sustainable Development of the Territory; has provided for the development of planning and land use planning tools at national (ZNAT National Zoning Plan and National Land Use Planning and Sustainable Development Plan SNADDT), regional (regional land use planning and sustainable development plan) SRADDT) and local levels or the Local Planning and Sustainable Development Plans (PLADDT) which propose land security mechanisms for each use and user, and actions and investments necessary for sustainable development and protection of the land and environment. A Guide to the preparation of PLADDTs has been drawn up by the Cameroonian government. These different tools allow better coordination of development actions down to the level of the territory.</p>	<ul style="list-style-type: none"> ✓ The acceleration and finalization of the spatial planning process initiated at the national and regional level; ✓ Development of an allocation plan in each landscape. ✓ The local level is not yet the subject of much attention

Sectors	Overview of the national policies, laws, related strategies and programs	Actions needed to ensure effective implementation of FLR
Water and energy		
	<p>The energy sector in Cameroon is regulated by law n ° 2011/022 of December 14, 2011 regulating the electricity sector. The National Energy Action Plan for Poverty Reduction (PANERP) 200-2016 is the policy planning tool. It is based on the close link between access to modern energy services and reduction of the pressure on biomass, especially in the northern zone, as well as on the link between poverty and pressure on natural resources. It incorporates, for example, the requirement to considerably reduce the use of fuelwood in favor of improved stoves and domestic gas.</p>	<p>While energy efficiency is now a national priority, the wood energy sector is not sufficiently integrated into Cameroon's legal framework to discourage excess cutting of wood for charcoal business in wood scarce areas.</p>
Mining		
	<p>Law n ° 2016/017 of December 14, 2016 reviewed from the modified mining code and law n ° 99-013 of December 22, 1999, on the petroleum code, regulate the exploration and development of mineral and petroleum resources. These two texts subtly establish the principle of the availability of national lands for the exploration / exploitation of mineral and petroleum resources, excluding zones of prohibition or protection established by MINMINDT in conjunction with the administrations concerned. Also, they prescribe measures to be taken to limit the negative impact of mining on land and forests and on the environment in general.</p> <p>However, it is a rapidly changing sector whose challenges could prove to be major for economic growth and irreversible impacts on forest resources and restoration initiatives.</p>	<p>In the land management system, the mine is a priority resource, highlighting the need for harmonization with other policies.</p>
Regional and local development		
	<p>The 2004 law on the orientation of decentralization and setting the rules applicable to municipalities and regions. It sets out the powers transferred to CTDs by the State. The procedures for exercising certain powers transferred to the Communes in terms of promoting reforestation activities in urban areas and forest reserves granted have been clarified by Decree No. 2012 / 0878.PM of March 2, 2012. These powers relate to the creation of communal timber and alignment plantations in urban perimeters and the renewal of forest resources in granted forest reserves (article 1) and complements article 33 of the forest law cited above. The law establishing the General Code of CTDs, at the same time as it maintains the powers transferred to both Municipalities and Regions, broadens them, in order to allow better application of the principle of subsidiarity vested in CTDs.</p>	<p>The decentralised entities have tools for implementing the management of forestry resources sustainably however the capacity for monitoring of implementation still to be strengthened</p>

5.3. Governance and Institutional Analysis

Because of the cross-cutting, multidisciplinary and inclusive nature of the FLR initiative, and the "landscape" approach it advocates for several sectors whose fields of action lie in the areas concerned by the forest and the open land will contribute significantly to the success of the FLR. However, in line with the commitment made in February 2017 by the Ministries in charge of forests and the environment under the New Partnership for Development of Africa (NEPAD), in support of climate action, MINEPDED and MINFOF are the two key stakeholders in the implementation of the FLR in Cameroon.

Based on the recommendations made by the FLR Policy Framework Document and exchanges during the fieldwork, other state institutions will need to make their contributions to the FLR process. These are the Ministry of Agriculture and Rural Development (MINADER), the Ministry of Livestock and Animal Industries (MINEPIA), the Ministry of Economic Planning and Land Development (MINEPAT), the Ministry of Domains, Cadastre and Land Affairs (MINDCAF), the Ministry of Energy and Water (MINEE), the Ministry of Decentralisation, and Local Development (MINDDEVEL), the Ministry of Scientific Research and Innovation (MINRESI), the Ministry of Mines, Industry and Technological Development (MINIMIDT), the National Agency for Support for Forest Development (ANAFOR), the Institute for Agricultural Research for Development (IRAD) and the National School of Waters and Forests (ENEF).

MINEPDED is responsible for the development and implementation of the Government's policy on environmental preservation and nature protection. It is responsible, among other things, for the integration of environmental considerations into all national plans and programmes and is concerned about the issues of deforestation and forest degradation and the resulting land degradation. It is also the focal point of the various Conventions on the Environment and Conservation Protection, the Convention on Biological Diversity (CBD), the United Nations Framework Convention on Climate Change (UNFCCC) and the United Nations Convention on Combating Desertification (UNCCD). In fact, it liaises between the various secretariats of the Conventions and the Government of Cameroon and is responsible for ensuring the permanent monitoring of the implementation of their guidelines at the national level. Given these cross-cutting environmental expertise, it is desirable that MINEPDED continue to provide technical coordination of restoration initiatives within the framework of the forest landscape restoration. MINEPDED could also easily catalyze the mobilization of funds for FLR projects and programs, facilitate the implementation of monitoring and evaluation systems for efforts, as well as support for the internalization of the FLR by other sectoral administrations, and provide reporting for the accounting of restoration efforts (MINEPDED, 2020).

MINFOF is at the heart of Cameroon's forest resource management policy. Its missions aim to "perpetuate and develop the economic, ecological and social functions of Cameroon's forests, within the framework of an integrated management that ensures, in a sustained and sustainable way, the conservation and use of forest resources and ecosystems." Through its cell of The Monitoring of Regeneration, Reforestation, and

Sylvicultural and extension promotes regeneration, reforestation and agroforestry activities to increase forest production capacity according to the guidelines formulated by the forest and wildlife subsector strategy. Also, the sub-direction of the promotion and transformation of NTFPs has, as part of its NTFPs development plan, identified the opportunity to increase the production capital of NTFPs through restoration. MINFOF on the basis of these tree planting skills could support the restoration alongside with MINEPDED and contribute to the facilitation of procedures (agroforestry logbook, consignment note (transport permit) for the transport of NTFPs products, etc.)

MINADER is responsible for the development and implementation of the Government's plant production policy. It can, in an integrated approach and through the heads of agricultural posts and centres of education and community action, play the role of mentoring and supporting local actors for smart agricultural practices with regard to the restoration of land productivity through agroforestry systems and protecting land against erosion through establishment of hedgerows trees in agricultural land. Improving varieties and multiplication of fruit trees plants is also one of the key restoration actions that will contribute to multiple restoration goals including food security, nutrition, tree diversity and income generation for rural communities.

MINEPIA's action can be crucial in the Waza landscape through its policy of developing pastoral activities and managing integrated and secure agro-pastoral resources (land, water, pasture). It will also be able to help regulate fishing activities and develop a sustainable fishing and fish industry.

MINMIDT is responsible for the Government's mining and industrial policy and technological development strategies in the various sectors of the national economy. Its intervention can be crucial, for example, the issuance of mining and quarries permits in the landscapes should be done together with note for restoration fees. More importantly put an extra effort to regulate the collection of sand in the rivers. Second, in conjunction with the local administration, the communities should be empowered both technical skills and financial facilitation in order to transform the local processing of NTFPs at individual level become promising local agro processing industry generating more income to the farmers.

MINEPAT is responsible for zoning policy. It can, through the implementation of planning and land use tools, contribute to securing the allocation of priority/definitive spaces. It must be involved very early in the year to reduce the risk of conflict on restored land. It can also facilitate budget planning for funding restoration initiatives in the landscape

MINCAF can facilitate the FLR by developing and implementing land security mechanisms tailored to the needs of investors and local communities by integrating gender and disadvantaged people.

MINDDEVEL as the guardianship of decentralised local authorities (CTDs) can, by relying on the PNDP, play a role in the development of local planning tools incorporating the FLR.

MINEE's local watershed management and water management policy can contribute to increased water availability at restoration sites, especially in the Waza landscape. It should also, in consultation with MINEPIA and MINMIDT, support initiatives to restore the banks of rivers identified in the landscapes by regulating the activities (fishing, sand extraction) carried out around the identified rivers (Nyong, Sanaga, and Logone). Also, through its policy of promoting energy efficiency can accompany communities to reduce pressure on forests and to restore for wood-energy purposes.

MINRESI, ENEF, IRAD and ANAFOR, in their respective roles of providing the provision of appropriate technological innovation, can intervene in the identification of species to be restored, the management and improvement of seeds, the provision of vegetative or genetic material (seeds) and the accompaniment of the actors to the production of plants, the planting and the maintenance of the plots.

These technical ministries and research and development institutions have a significant technical capital and results of experiments (species, management systems, studies, information, experiments) transferable to communities and restoration initiatives.

However, these structures tend to work on sector basis and their actions are often compartmentalized (not connected/isolated). This weak harmonization of policies and actions results in conflicts of interest and competence between them. They have insufficient resources (human, material and financial resources) to optimize their interventions on the ground. The level of corruption of some local government officials does not seem to play a role in the FLR's favour, whether for the support of the communities at the grassroots level or for the control and enforcement of the laws. Moreover, the level of decentralization of ANAFOR and IRAD seems to do not meet the needs of local and community actors and the results of their positive research and experiences are poorly capitalized and very little valued.

It is therefore important to strengthen the collaboration and harmonization of the policies and interventions of these actors around the FLR. The overlapping intra-sectoral competences between, for example, MINFOF and MINEPDED, update this need and need to be clarified by taking into account the need to strengthen the authority of MINEPDED. The reflections carried out in the context of the development of the national environmental management plan, in reference to the establishment of a responsible structure for its implementation, have, in their time, raised the complexity of finding an optimal scenario of implementation of a cross-cutting environmental policy to several sectors and fields of application.

It is also crucial to strengthen the logistical and financial capacity of these institutions to consider plural and concerted support and technical assistance of local actors to meet their needs, as well as to strengthen their monitoring and law enforcement missions. The representation of institutions such as ANAFOR and the Landscape Scale is equally crucial.

The role of decentralised entities in the FLR implementation

The Deputy Governor “Sous-Prefet” is at the Centre of the implementation of all government actions at the division level. It is therefore the ideal leader of the restoration program at the landscape level, because the divisional head has the necessary authority to instruct the participation of all stakeholders in local consultations. He/she will support conflict management (land conflicts, sectoral conflicts) facilitating cross-sector procedures and strengthening control and enforcement of resource management laws in and around conservation areas (Order Maintenance Forces). It is therefore necessary that the divisions leaders are sufficiently informed on the FLR actions in place as to provide its support it deserve.

The Mayors, as part of the decentralisation, a number of administrative capacities and skills have been transferred to them, namely, the creation of council forests, alignment of plantations in urban areas and the renewal of forest resources in the forest reserves etc. As a local development promoter and taking these skills into account, they are among the preferred players in community meetings. They should coordinate and organise the restoration process on their territory with the support of the sectors, but given its relative authority with local actors, it has been suggested that they support the administrative authority (the Governor). In this way, they will contribute to the planning and implementation of local restoration policy in collaboration with sectoral administrations. They will play the role of mentoring populations and facilitating the process of information and conflict management between different stakeholders. They have a good command of the territory, the activities and living conditions of the populations as well as the problems they face and should contribute to the prioritization of interventions, as well as activities that will accompany the restoration (energy efficiency, alternatives to firewood and charcoal). As local elected officials, the heads of the municipalities are in principle in better position to produce results.

The low ownership of transferred restoration skills, a misunderstanding of the issues associated with them and the consideration of short-term interests at the expense of the longer term are the major challenges of this category of actor. In addition to the fact that the municipal executive does not have much capacity in the environment, other than waste management, it often prioritizes the needs related to socio-economic development. In addition, insufficient resources, apart from project support, is another challenge. Some municipalities have within them a framework for communal consultation, set up as part of the National Participatory Development Programme (PNDP). These managers have village-level anchors and are responsible for the federation and monitoring of all initiatives implemented in the commune, but they do not work.

Accompanying them to the awareness and appropriation of the missions assigned to them in the field of reforestation is crucial. They can, by good awareness, form leading players in the financing of restoration through funds transferred by the STAT, by the Special Fund for Equipment and Intercommunal Intervention (FEICOM) and taxes. Restoration-specific lines can be freed from their planning, with opportunities to create communal nurseries,

for example. The strengthening of the technical team of the municipalities, their capacities as well as the strengthening of their collaboration with traditional sectors and chiefdoms are also necessary.

The role of Communities in the implementation of FLR

The people are the privileged actors on which the project focuses its hopes of restoration, because they have customary rights over most of the land to be restored. Their roles will be instrumental in setting up nurseries, planting, monitoring and maintenance of restored plots and mobilizing local resources (in kind and cash) to contribute to the self-financing of activities. Yet they live in conditions of poverty. Their way of life is mainly focused on the exploitation of natural resources, and on practices that promote deforestation and/or degradation of land and forests. They are not very organized and are quite individualistic, with the exception of the communities of the Waza landscape. They feel that they are being left to their own devices because they receive very little support from the administrations and the town hall. The level of ownership of local development projects and programmes by local development projects and programmes is very low, due to their low participation in the design and planning process of projects. They perceive conservation projects as a succession of prohibitions with no real benefits for them. The existence of competing interests in the management of natural resources and precisely in conservation areas is a major constraint. It is time that the communities take ownership of the ongoing restoration project outputs. If support mechanisms throughout the process are to be put in place, communities must play their part, without which the project would not yield good results. Given the specificity given to women and young people, especially in the Waza landscape, it is desirable that their commitment be made beyond the activities of the group, through specific activities. They can easily contribute to the production of a local seed and plant production chain, as well as to watering. Funds from the sale of these plants could be capitalized, among other things, for the maintenance of the plots. Schools can also be involved in supporting the restoration of collective spaces.

A strong adherence of these players to the restoration process is therefore envisaged. Changing their mentalities and practices in favour of the FLR, their organization, their awareness and building their capacity are the key to the success of restoration in each landscape. Awareness needs to focus more on the economic, environmental and social interests of restoration. Fortunately, practices favourable to the protection of trees and reforestation carried by communities are observed in the different landscapes. It is quite well anchored in the Waza landscape, due to the services rendered by the trees and the harsh climate. However, in order to achieve the objectives, this enthusiasm must be reinforced by:

- 1) support for the populations in setting up community nurseries;
- 2) clarifying and securing the rights to the parcels to be restored. Security measures should also be taken for those who have already started restoration initiatives;
- 3) capacity building of farmers on sustainable management techniques for forest plantations and the promotion of sustainable management practices for endangered

- species (for example balanites in Waza);
- 4) supporting restoration from improved and short-cycle varieties of endogenous species on which economic opportunities are proven and putting in place guarantee mechanisms on profits (development of value chains for NTFPs products, creation of market opportunities for NTFPs and carbon market, ...);
 - 5) training of beneficiaries in business planning and income management
 - 6) support / sensitization of communities on the need for the involvement of young people and women for a better contribution to restoration activities. Local organizations can contribute to this awareness and particularly in the landscape of Waza;
 - 7) regular monitoring of the planter to enable them to appropriate new techniques in silviculture / agroforestry
 - 8) putting in place mechanisms to enhance the economic potential/services rendered from conservation areas to the various parties involved, including communities;
 - 9) The ability through restoration project to provide solutions to the economic problems of communities by alternatives that communities can easily replicate. In the village of Mevia (Douala-Edea landscape), it became clear that solving the "Salvinia" invasion of the lake is the major claim of the communities, because they have a strong impact on fisheries yields and without which they would not be motivated to participate in the FLR.

Moreover, capacity building should also take into account the requirement for the creation and maintenance of community nurseries, the establishment and monitoring of restored plots, good practices in reforestation and restoration, depending on species and taking into account local knowledge and values. It would be important to identify at the community level the technical leaders, members of the community who will be trained and able to support the whole community in the production chain of plants (choice of species, selection of seeds, production of improved plants. , etc.) and restoration monitoring, to strengthen their empowerment. GIZ has produced a manual on technical routes for reforestation in dry savannah areas suitable for the Waza landscape which deserves to be exploited and popularized. Such a manual, adapted to the landscapes of Mbalmayo and especially of Douala-Edéa, due to the structure of the soils and the lack of knowledge by the communities in the agroforestry could also be produced and popularized. Also, collaboration and mutual aid between peasants must be promoted in order to facilitate mutual exchanges with the champions of restoration. Identifying stakeholders based on their personal contributions, ensuring that they have available land, targeting their specific needs and applying participatory approach in the process of engaging local stakeholders in all restoration initiatives or projects will make it possible to reduce the risk of conflict.

Traditional chiefdom and local and political elites

The traditional chiefs are "auxiliaries of the administration", assist the administrative authorities in their missions of supervising the populations. They have a good knowledge of their territories, of the legitimate owners of the land as well as of the problems facing the communities. In the landscapes of Douala-Edea and Mbalmayo, they do not exercise

real authority over the populations and represent more the link between the populations and the administration, of which it constitutes the basic pillar. However, in the Waza landscape, they hold a strong traditional power, which they use to structure and organize interventions and behaviors. It is desirable that they supervise the restoration process at the village level. They could thus help to convey information, raise awareness and mobilize the financial and physical contributions necessary for the implementation of collective actions. Play a role in choosing the people and plots to engage in the restoration process and conflict resolution. They should participate in higher-level consultations and bring all the complaints of the populations to the administration, town hall and partners. They could also contribute to the monitoring of restored plots as well as to the monitoring of illegal activities taking place in the landscape. In the Waza landscape, they could help influence and educate a positive community dynamic towards restoration and encourage them to participate.

The sensitization and capacity building of the communities must be deployed by taking particular account of the traditional authorities in their role of securing land, sensitive to gender.

The political elites are a source of funding and support for initiatives at the local level. The communities could thus submit specific requests to them (plants, boreholes, etc.).

Civil society organizations

Civil society here includes non-governmental organizations, associations and other forms of groupings of interests that intervene at the national level or directly in the landscapes. It is extremely active in the targeted landscapes and takes part in major discussions on various themes, development and sustainable management of resources, restoration, improvement of the living conditions of populations, etc. For example, CWCS has supported the process of reclassifying the site. Douala-Edéa reserve in a national park which made it possible to begin work on the development of its development plan and to reconsider the configuration of the immediate landscape of the park as well as the interventions of the actors who are installed there. It also gave rise to the establishment of consultation frameworks for the management and participatory monitoring of the Park. She believes that one of the great challenges to be taken up in this landscape is the establishment of a mechanism to strengthen the application of the law and the control of illegal activities in and around the Park. Also, several international and national NGOs are currently working on other restoration projects in the targeted landscapes (FODER, CWCS, IUCN, CADEPI, GIZ, UNDP, NRC, LWF, etc.). From their experiences, they will have to participate in consultations and provide advisory support to administrations and other local services, such as awareness, training, monitoring, community organization ... Because their interventions are often limited in time, because dependent on external support, it would be important to identify and popularize existing FLR funding opportunities and above all carry out advocacy actions with donors to strengthen their contributions.

The private sector

The contribution of the private sector can be crucial in this restoration process, as their

activities contribute to deforestation and land degradation. There are in the landscapes, several categories of operators in the private sector working in a formal or informal context, namely large producers (cotton, sorghum, pineapple, palm oil, firewood, etc.), large transhumant herders., wood processing industries; all with relative / great responsibility for deforestation. It is therefore important that they participate in discussions organized at the landscape and/or community level. During these meetings, discussions will be held in order to develop mechanisms leading to their commitment to landscape restoration initiatives. These could be: strategies to minimize their impacts on the environment and the living conditions of populations and to commit them to financing restoration activities. On this last point, municipal restoration taxes, partnership development, upgrading of specifications, corporate social responsibility and / or certification are all levers on which to count to encourage them to assume a certain number of responsibilities. However, these companies are sometimes very powerful, which makes it difficult to mobilize them and invite them to processes at both national and local levels. Also, their interest in social and environmental matters remains weak. The Division or subdivision manager “Préfet” could thus use their authority to encourage their intervention.

The need for good governance around FLR: how operational?

The FLR strategic framework document noted the need for consultation frameworks at the national, agro-ecological, regional, and landscape zone scales for effective FLR implementation. The field surveys noted the need for the establishment of village-level committees to plan and structure the implementation and monitoring of FLR activities at this level. Indeed, the non-existence of a multi-stakeholder consultation framework strictly speaking constitutes one of the major challenges to be taken up. This weak synergy and collaboration between actors whose complementarity is essential for the structuring of relations and the harmonization of interventions at the landscape level must absolutely be corrected, taking into account:

- the need to empower municipalities in the coordination of restoration actions at the local level;
- the need to set up a monitoring and evaluation system to ensure the sustainability of actions beyond the duration of the project, to perpetuate the achievements of the project and above all to initiate reflections on the future prospects of strengthening restoration initiatives at the landscape scale;
- the need to build a participatory dynamic around the zoning of the landscape and the development / updating of development plans for conservation areas;
- the need to put in place a mechanism to strengthen the application of laws and the control of activities in and around conservation areas, the implementation of which should go beyond the sole responsibility of NINFOF and be the responsibility of other sectors and powers therefore skills are complementary.

The proposed structure is a restoration committee at the departmental level, with anchoring at the village level (Village landscape committee).

The departmental committee will be the body for consultation, planning and management

of the restoration process

MINEPDED, whose skills in environmental matters are transversal, will ensure technical coordination. He would be assisted by MINFOF, which has the skills for planting, in conjunction with other sectors. The Mayors will have to work alongside with the departmental committee for the planning and coordination of activities in their respective localities. All the other categories of actors identified in the landscapes will also have to participate.

An environmental watch committee, a body for dialogue and monitoring at village level will be in charge of organizing community actors around the restoration at village level. The Akomnyada II village, for example proposed that the existing development committee also take charge of coordinating restoration activities at this village level. The Akomnyada II community also proposes that communities wishing to participate in restoration activities be encouraged to join this development committee. It is important that representatives of women and youth participate in these committees.

5.4. Tenure system analysis in relation to FLR

Security of tenure and multi-sectoral land use policies are the foundation for effective local governance and successful FLR. Combined with securing the right to the planted tree, these can determine:

- 1) if local communities, the private sector and other actors can invest in the area of intervention and that investment will be sustainably maintained;
- 2) whether the communities will benefit from restoration investments, and
- 3) whether they will be encouraged to participate in the FLR's large-scale efforts.

The analysis of the legal rules governing access to land and ownership of planted trees and the governance system that establish the management of forestry and land resources is therefore crucial, in order to identify factors that could promote or limit the development of FLR projects from the private perspective and to formulate the levels on which to intervene to improve the national and local context.

5.4.1. Land tenure

The land regime in Cameroon distinguishes three categories of land, private land, public domain land and national lands. Private lands are those owned by individuals or corporations, communities or the state. The lands in the public domain are owned by the state for the benefit of the Cameroonian people. National domain lands are categorized into two categories. Land in the first-class national domain, i.e., residential land, cropland, planting, grazing and rangeland whose occupation results in obvious control and probative development. It is on this land that the customary, individual and family law of the communities is based; they have the opportunity to obtain formal property rights. Those of the second-class national domain include land free of effective occupation. Hunting and picking rights are recognized to communities over the latter. However, they claim collective

and community customary rights, which are ignored by the legislation.

The state may authorize specific registrations and assignments on these national lands under the conditions set out in the law. Indeed, access to land ownership is conditioned by the registration procedure and obtaining a land title, the only document proof of land ownership in Cameroon. It is open to individuals or corporations, communities and the state and guarantees its holder the rights of possession and exclusive use. Land lease is also one of the mechanisms for appropriation of land rights, granted by a private owner. Except that in this case, it gives its beneficiary the sole right to use the resource for a fixed period of time. Moreover, the rights of use granted to the communities are all intended for personal use, and cannot in any way give rise to commercial transactions, even if in practice there is a significant development of rentals and sales. In the case of rentals, tenants are not allowed to practice perennial crops on leased sites. The reason being that planting a tree is one of the ways in which land can be claimed.

The increase of land transactions on customary land in defiance of the law reflects communities' sense of considering themselves legitimate owners of land they believe they own from their ancestors. The recurrence of land disputes between these communities and legal owners is the logical consequence. Indeed, village-wide land management is done in the same way as customary law, and communities do not always find it in the interest of registering their land. The traditional chief is the unavoidable guarantor of this management. He can actually inform about the different owners of the village. It also has the power to grant unoccupied land to the plaintiffs, subject to special conditions. Its role was endorsed by law through its participation in the Advisory Committee¹⁹ to ensure that land applications are in line with customary realities but, above all, that they do not deprive people of space for their activities. The Commission has the authority to examine land disputes at the territorial level, whether in the context of a registration procedure or any land dispute found on customary lands. However, it is customary for traditional chieftdom to be the first level of management of these conflicts. The formal judicial system is generally not favoured, as it requires travel to urban centres, payment of various costs and costs, and lengthy procedures.

Another important element to note is the ability of women to benefit from land ownership guaranteed by law. However, traditional practice and sometimes rights are characterized by more or less significant restrictions on their rights to enjoy or use land on land securely. (Samuel Nguiffo, 2020). In most areas, especially those where land is plentiful, women are allowed to own land through their home families. But in other regions they cannot inherit, because they are bound to go to get married. After marriage, they cultivate their husband's land and are considered to own the crops, but in most cases do not own the land (USAID, undated). Yet they are recognized as the main driver of agricultural production. They are also the most involved in the collection of NTFPs.

¹⁹ Created by ordinance n ° 74-1 of July 6, 1974, fixing the land tenure system, the advisory commission is the territorial management body of the national domain. It is chaired by the head of division "Sous-Préfet" and must include the chief and two village notables.

5.4.2. *Forest tenure*

The ownership regime for forests is defined by land and state legislation, as well as by the provisions of the forest law. In addition to the above considerations, the 1994 Forest Act classifies the forest domain into two main developments: the permanent forest area and the non-permanent forest domain.

The permanent forest area consists of land permanently earmarked for forest and wildlife habitat, namely state forests, classified and registered in the name of the state and communal forests, which fall within the private domain of municipalities. State forests include, on the one hand, protected areas for wildlife (national parks, wildlife reserves, wildlife sanctuaries, buffer zones, etc.) and forest reserves (production forests, protection forests, teaching and research forests, reforestation perimeters...). The non-permanent forest area is made up of forest land that can be used for non-forest uses and is fully seated in the national domain. It includes: community forests, private forests and national forests. Community forests are allocated to communities for management. The forests of individuals are forests planted by individuals or legal persons and based on their private domain. Forests in the national domain are the residual category; they do not fall into any of the categories mentioned above. They do not include orchards and agricultural plantations, fallows, ancillary woodlands of a farm, or pastoral or agro-forestry facilities. However, after rebuilding the forest cover, old fallows and agricultural or pastoral lands, which are not subject to title, can be re-considered as national domain forests and managed as such. Also, a right of use is granted to the riparian populations, to exploit all forest, wildlife and fisheries products with the exception of protected species for personal use. As with land rights, they may be temporarily or permanently suspended when necessary.

Therefore, the state, municipalities, village communities, and individuals exercise all rights arising from property on their forests, subject to restrictions under the forest and land law. It can therefore be remembered that the ownership of the trees is strongly linked to land ownership and regulated by the planning scheme set out in the forest law. It is guaranteed for communal forests, forests under the private domain of the state and forests of individuals. In the case of community forests and other forests in the national domain, it is not guaranteed. The Community Forest Management Agreement is the recognized factor of partial securing of forest resources (25 years renewable) and no land security.

Moreover, customary practice would be that persons with legitimate and locally recognized claims to a parcel of land should have property rights over the trees on that land. If someone has only temporary rights to use a parcel of land, the owner of the use does not have ownership rights over the existing trees.

5.4.3. *Major land categories and forest land issues*

Restoration opportunities identified in the various landscapes concern private state land, community forest lands, customary lands of the national domain (buffer zone, agricultural land, etc.) and urban central and public lands. Overall, these opportunities are part of a

context marked by a high availability of degraded land, except that they are the subject of competition for their appropriation by the different categories of actors involved, exacerbated by the population boom and displacement.

(1) The State's private forests concern the various conservation areas identified in the landscapes: Waza National Park, Mbalmayo and Zamakoé Reserves, Douala Edéa National Park and Lake Ossa Wildlife Reserves. As in most of Cameroon's conservation areas, they are all classified in the private domain of the state, but registration in the name of the state has yet to be formalized. These are land permanently earmarked for forest and wildlife. They are therefore not likely to be converted to other uses. Normally, restoration on these areas should not be a problem and planted trees should be owned and developed by the state and its management bodies. However, land conflicts and illegal deforestation practices within the boundaries of these areas, under the passive and/or complicit gaze of certain public officials, constitute the main threat to the sustainability of this option. There are significant conflicts over land ownership and the use of natural resources in and around these conservation areas. The question of the legitimacy of these spaces by riparian communities (MINFOF, 2015) is superimposed on this problem. However, each situation is specific and requires specific solutions.

Waza National Park

While pressures due to the influence of populations in Waza National Park exist, these are less severe compared to other conservation areas. They are characterized by: facilities related to agricultural and pastoral activities, illegal timber harvesting, bushfires, poaching and illegal fishing. The reality is that the areas of influence of the riverside populations in Waza Park go up to 5 km inside the park from its boundary. This is favoured by the presence of 17 villages located on the very edge of the park (Remi Jiago, 2018). In the park's buffer zone, there are agricultural areas characterized by the fields of decline around the park and the rainy season fields, around the villages. These spaces gradually encroach on the park's boundaries. Incursions by transhumant herders and the collection of wood to fuel local and commercial demand for firewood and/or service are the major cause of deforestation and are at the root of conflicts between park authorities and local residents. Also, transhumance trails, grazing areas, wildlife migration routes and park boundaries are poorly known and unrealized. The park's development plan expired in 2019 and has not yet been revised. The threat of terrorist groups from neighbouring countries has forced the withdrawal of technical and financial partners, who normally accompany the conservation department to the management of the Park. The restoration option in the park will face the challenges of securing its boundaries but especially its development following a participatory dynamic, to better regulate collection activities and encroachments.

The forest reserves of Mbalmayo and Zamokoe

The management of these reserves has been entrusted to ANAFOR, IITA, ENEF and the Commons. At the time of their creation, enclaves were granted to communities to secure their customary lands and plantations. The Mbalmayo reserve has two community

enclaves (Ebogo-1200 ha and Bilik-250 ha) and 10 individual enclaves of about 2 hectares. The majority of individual enclaves have been registered (Lucie Félicité Temgoua et al., 2008). Communities feel they have no knowledge of the boundaries of the reserves and the enclaves that have been granted to them. Moreover, with the lack of land and the population boom, they are increasingly settling on reserves²⁰ and claiming customary rights. They are implicitly resistant to the idea of disengaging from these rights and agree to destroy the restoration and research activities undertaken by recognized managers. The lack of a development plan, the lack of arable land needed for a growing population, the lack of security of communities' rights over their enclaves, and the persistence of land conflicts between these populations and reserve managers are the main challenges in restoring these reserves. In addition, the services of MINFOF and especially the various managers do not have sufficient capacity to curb illegal activities in and around these reserves.

Douala-Edea National Park and Lake Ossa Wildlife Area

These conservation areas are surrounded by three agro-industry including the Swiss farm, SAFACAM and SOCAPALM. Several other plantations, family and/or individual exist in the area (400 ha, 100 ha, etc.). Traditional agriculture, once poorly practiced, has seen a resurgence of interest in recent years, especially with the fall in yields of fishing activities. The growth of this activity is also due to farmers from other parts of the country (northwest). Yet little land is available for the development of anthropogenic activities. The communities live very poorly in the park and are unhappy to see multiple illegalities there when they have only prohibitions. The process of transferring the reserve to a park has resulted in the decommissioning of 40% of degraded and community-occupied land. However, three new enclaves have been defined: Malimba-Yoyo with 3,243.5 ha, Souelaba-Mbiako with 6,478.4 ha and Bonabwaba-Boloy, with a total area of 885.5 ha. But the problem of land availability persists. The project of the planned tourist complex in Yoyo is an aggravating factor. The consequence is an uncontrolled exploitation of resources, amplified by the complicity and/or inadequacy of the means of monitoring by the local administration. The trend of deforestation and especially mangrove forests is a major challenge. As in the case of Waza, the restoration of Douala-Edea park and lake Ossa reserve will face the challenges of securing boundaries. It will also be necessary to take into account the need to secure the lands of the enclaves.

In the immediate landscape of the Lake Ossa Wildlife Reserve, SAFACAM extensions have led over the years to the encroachment of the reserve by the company and to the grabbing of customary community lands. The available land is owned by either SAFACAM or the Ossa Lake Reserve. Faced with this low availability of land, communities have invaded the reserve and are carrying out agricultural activities there. Clarifying the rights of actors within the reserve and obtaining the consent of communities is the obligatory prerequisite for this option.

²⁰ About 83% of the population living around the Mbalmayo reserve practice agriculture in the interior of the forest reserve. (Lucie Félicité Temgoua, 2008).

(2) Community forest lands have the distinction of being based in the national domain, that is, land that is not titled and is subject to non-forest uses. Through the management agreement, the state grants communities the right to manage forest resources.

Also, customary properties exist in these forests. Normally, trees planted within the boundaries of these forests would be managed by and on behalf of the communities, according to the provisions to be provided by the simple forest management plan. The customary owners on whom the restoration would be carried out could also claim rights. The exploitation of trees on individual customary lands in community forests has often been a major problem and trade-offs to re-start timber dividends, taking into account the owner of the field from which the resource was harvested. It is therefore important that restoration in these types of titles takes into account separately each of these types of land (community and individual). There is greater confusion when it comes to defining the legal guarantor of the community forest; management entities, as provided for by the legislation, are not always recognized by the community as a whole.

(3) The customary lands of the national domain, including the lands in the buffer zones, are occupied by communities for housing, agricultural activities and grazing. Grazing activities are specific to the Waza landscape and there are three livestock systems, the mobile pastoral system, known as transhumance, the agro-pastoral system and the sedentary system. No recognition of property rights is recognized on these lands and the state may assign them for other purposes at any time. On these lands are based customary rights individuals and/or families, managed in collaboration with traditional chiefs. If they are given the opportunity to obtain title deeds by law, they do not see the need to take steps. This land insecurity is one element, among others, that can block the intensification processes of tree planting. Without real assurance of being able to conserve the land, the population will not find interesting to invest in FLR business as they will not be assured on the ownership of the outcomes and its transfer to descendant generations.

Similarly, with population movements in these sites studied, rental land is recurrent and should also be considered as part of the restoration. But the fact that tenants in the customary regime do not have the right to practice perennial crops there is likely to severely limit these restoration opportunities.

The low land availability observed in the landscapes of Douala-Edea, Mbalmayo and mountain areas of the Waza landscape combined with population growth is conducive to land claims and opportunities to convert restored land to other uses. It is therefore important that restoration is not perceived by the actors as a competitive activity on production lands, which are already very weak in these landscapes.

The peculiarity of the flooded areas identified in the Waza landscape is that they constitute at the same time areas of crops of decline and reception of pastors for the transhumance of the dry season. To access it, animals must cross flood fields. In some cases, consultations lead to the definition of transhumance corridors for access to pasture and water. But pastoral space is increasingly contested and the corridors of transhumance occupied by the fields, which causes more conflict (Gonné Bernard et al.

2017). Reforested plots can overlap with grazing areas.

5.4.4. Major challenges posed by land and forestry regimes on restoration opportunities

Overall, two major challenges related to the development of the FLR are foreseen:

(1) Weak governance of land and lack of coordination of actors around land management

The land in Cameroon is the object of apprehensions and appropriations both competing and divergent revealing the heterogeneity of the orientations of individual or collective social actors on this subject (Marie Ngo Nonga, 2018). The lack of a land use plan is the main cause of this weak governance. In the absence of this governmental tool that can guide its development action, the allocations and hoarding of spaces are mainly a function of the balance of power between the actors and the issues involved, whether public, private or collective. This situation is not conducive to good consultation and collaboration between the various sectors and other actors involved in the processes of appropriation of the national domain. The immediate consequences are: the low availability of land for the development of anthropogenic activities, exacerbated by the population growth and the persistence of land use conflicts, characterized by the overlapping of activities and titles on the same spaces.

(2) The precarious use rights granted to communities and the difficulty these actors have in asserting land rights on land.

The difficult and ambiguous coexistence between customary law and private property is at the root of this precariousness. It is characterized by the recognition of the right of use and enjoyment to communities and the rejection of traditional property in favour of the registration system alone. It poses the challenge of securing the land of reforested areas, met by Cameroon's reforestation programme. To facilitate the accession of community actors to the reforestation process, circular letter No. 0031/LC/MINFOF/SG/DG/CSRRV of 15 February 2013 gave these actors the opportunity to present any other documenting their right of use or customary on space. This was not enough to generate community enthusiasm. In 2020, the TRI project facilitated the adoption of Decision No. 0034/D/MINFOF/CAB of 05 February 2020 setting out the terms of the release of NFPs from plantations. This decision introduces the "agroforestry book", in this case the forestry book, attesting to the right of ownership over the planted trees and forests, issued by the departmental delegate at the request of any promoter of the planted PFNL. While this measure is to be welcomed, it is still insufficient. It does not confer any legal ownership over the restored land, as the state may, at any time, assign it for other purposes.

5.4.5. The following land related factors will facilitate FLR investments

(1) Accelerating and finalizing the national and regional land-use planning process

The Law No. 2011/008 of May 06, 2011 of Orientation for Planning and Sustainable Development of the Territory provided for the development of planning and planning tools at the national level (National Zoning Plan ZNAT and National Land Development and Sustainable Development Scheme SNADDT), Regional (Regional Planning and Sustainable Development Scheme of the SRADDT Territory) and Local or Local Land Development and Sustainable Development Plans (PLADDT). These planning tools are underway at the national and regional levels. However, the government has not yet initiated the development of local plans.

(2) Developing a land use plan in each landscape

It is important that before any restoration initiative begins, a land use plan for each landscape is developed and adopted. It will clarify the status of land in the landscape and especially around conservation areas with positive repercussions on land conflicts and the motivation of local actors to invest sustainably in them. On the basis of land use and economic production systems on the ground, the needs of local actors in terms of resources, their constraints, their priority, their vision of land-sharing, will be collected, so as to lead to specific allocations and the clarification of rights, with a view to better use of land and natural resources. It is important that this activity be conducted in parallel with the development and/or updating of conservation area development plans.

(3) The materialization of the limits of different land uses

It should also lead to visible markings (terminals, painting on trees, planting of alignment) of the boundaries of conservation areas, buffer zones, pasture areas of corridors and transhumance tracks.

(4) Focus on land on which formal property rights are secured

This will contribute to the long-term security of restoration investments.

(5) Securing the rights of actors on land both on customary rights on the national domain and in classified forests

In conservation areas, it will be important to clarify the security of enclave lands, where they exist. As part of the development plans, it will be possible to identify agricultural plots held by communities within reserve boundaries and to allow, under certain conditions, to formalize restoration. In such a system, communities would own the plantations but not the land. This is necessary in the forest reserves of Zamakoe, Mbalmayo and wildlife in Lake Ossa and will help limit potential conflicts due to the removal of communities on land

they exploit. They should produce guarantees that their spaces will not be subject to use change. The area of the Mbalmayo reserve assigned to the commune (12,000ha) could also be asked to create a community management area in which restoration activities could be carried out by the communities. Furthermore, the continuation of the restoration operations envisaged in the various conservation areas should be conditional on the expression of free, informed and duly formalized community consent. It is important that the 100 m of shoreline around the lake sitting on the private SAFACAM estate be returned to the Ossa Lake Wildlife Reserve to serve as a buffer zone and on which restoration initiatives from the Bamboo will be conducted.

Measures will need to be taken to update community forest GSPs to integrate the proposed restoration process while taking care to clarify in a concerted manner the ownership and management mechanisms of the trees to be planted.

On the customary lands of the national estate exploited by the communities, the agroforestry logbook will be the element of securing the rights to the trees planted. But it is important that these lands are secure. The ongoing land law review process has provided an opportunity to formulate a number of proposals in favour of securing it, including the recognition of property rights on community customary lands, facilitating access to land administration, facilitating access to land for local populations including women. However, until these reforms can be successful, it is important that MINDCAF, in consultation with other stakeholders and once the zoning is finalized, provide these players with guarantees on their land. Clarifying the status of land in and around the reserve can have an impact on the motivation to build more sustainable dwellings, motivating to invest in perennial crops. It better protects their rights in the face of expropriations.

On the other hand, if it is considered that these lands can be sold or leased with conversion potential, it is important that the beneficiaries of restoration projects provide guarantees that their spaces will not be subject to a change of use.

Agreements between landlords and tenants will be required to clarify the ownership rights of the owners of the planted trees and associated environmental services, as well as their obligations to manage and maintain the plots.

Awareness and education of traditional authorities and populations is essential to encourage them to grant substantial land rights to women.

(6) Establishing participatory land management structures at the landscape and village level

It will promote local conditions for consultation and dialogue and negotiation between land users to prevent conflicts and allow a peaceful outcome of land disputes between actors. The purpose of creating and/or updating existing conflict management committees will be to take care of the proposed FLR consultation frameworks at the landscape and village level. This undertaking must take into account the essential role of traditional

leaders and now that of the municipalities.

5.5. Assessment of key success factors for forest landscape restoration











The assessment team conducted key informant interviews, community consultations and desk research, to better understand the situation related to the key success factors for forest landscape restoration in Cameroon. The results of this assessment were compiled within the framework of the Rapid Restoration Diagnostic (Rapid Appraisal), to assess the key success factors required to allow restoration to occur at sub-national scale.









Analysis of historical cases of restoration revealed three common themes to successful restoration:




- 1. A clear motivation:** Decision-makers, landowners, and/or citizens are inspired or motivated to restore forests and trees on landscapes;
- 2. Enabling conditions in place:** These include ecological, market, policy, social, and institutional conditions;
- 3. Implementation capacity and resources:** Capacity and resources are in place and mobilized to implement restoration on a sustained basis.

The Rapid Restoration Diagnostic tool can be found in Annex 9. It is important to note that not all factors are required in order to be successful. In the results tables below, the column labeled “Ability to Improve” refers to the effort require to improve the situation related to the feature, with “High” being the most probable to change and “Low” being the most difficult to change. Preliminary findings include:

Table 41. Restoration Diagnostic Analysis

Key success factors	Current situation	Rationale	Ability to Improve
A CLEAR MOTIVATION			
Restoration generates economic benefits		Agroforestry; Firewood; Community Work, Neem Oil	
Restoration generates socio-cultural benefits		Cults, medicinal products, NTFPs	
Restoration generates environmental benefits		Soil protection, climate, GHGs emissions reduced	
Benefits of restoration are publicly communicated		Creation of Community forests, Private forests	
The restoration opportunities are identified.		Opportunities for traders (neem oil, NTFPs exploitation, biological pesticide, skin and hair oil, soaps, etc.	High
Crisis situations have leverage effects.		Drought reduction Windbreak	
Law requiring restoration exists and are enforced		Law No. 96/12 of August 5, 1996 on the framework law on environmental management Law 94/01 of January 20, 1994 on forestry, wildlife and fishing regulations Mining Code 2004 Need for reinforcement	High
ENABLING CONDITIONS IN PLACE			
Soil, water, climate and fire conditions are adequate.		Water remain challenge for survival of plant trees especially in Waza and Mbalmayo landscapes Need for water wells in restoration zones	High
No plant or animal can interfere with the restoration.		Human – wildlife conflicts Farmers – pastoralist conflicts	Very High
Local seeds, seedlings or source populations are readily available.		The harvest of neem tree seeds in Waza, and Cocoa in Mbalmayo and palm seeds in Douala-Edea are already a usual practice. Needs for other adapted plants seeds	Very High
Competing demands		Learn how to make organic charcoal	Very

Key success factors	Current situation	Rationale	Ability to Improve
(e.g. food, fuel) from degraded forest land are decreasing.		from rice straw Strengthening of techniques and technology related to energy efficiency	High
Value chains for products and services from restored forests exist.		NFTPs exist, however need to be upgraded to SMEs for women and youths and to improve value addition from art to small and medium industries adapted to communities. NFTPs Market chain need to be well understood and developed	Very High
Ownership of land and natural resources is guaranteed.		Communities do not always find it interesting to register their land. Recurrence of land disputes between these communities and legal owners	Very High
Policies and laws affecting restoration are aligned and streamlined		Laws and policies governing forests exist but are not adequately enforced. Government to avail the resources for monitoring and law enforcement.	High
There are restrictions on the deforestation of the remaining natural forests.		The restrictions exist however, since the livelihoods depend much on forest resources, these restrictions are not fully enforced. Creation of alternative livelihoods, jobs for the communities would reduce pressure on forests.	Very High
Restrictions on deforestation are enforced.		Weakly applied. Need to be improved Laws and regulations enforcement need to be improved	Very High
Local communities are empowered to make decisions about restoration.		The traditional chiefs play a role in choosing the people and plots to engage in the restoration process and conflict resolution. Women (Waza do not have equal right to land as of men)	High
Effective institutional coordination is in place.		Roles and responsibilities for restoration are clearly defined for MINEPDED, MINFOF and their parastatal agencies. Municipalities have within them a consultation framework responsible for validating any development	High

Key success factors	Current situation	Rationale	Ability to Improve
		initiative at the level of the locality.	
IMPLEMENTATION CAPACITY & RESOURCES			
Incentives and funding are readily available.		MINFOF incentives have often been available. Some communities have benefited but not on a large scale. Creating restoration basket in which all fines related to deforestation and malpractices in land management could serve in community finance for restoration.	Very High
Effective results monitoring and an evaluation system are in place.		Establish Consultation Framework for Economic and Social Development Creation of village land use action plans	Very High
The first successes are disseminated.		Community radio exists but does not work.	Very High

**In place****Partly in place****Not in place**

6. Financing forest landscape restoration

The purpose of this part is to prepare the continuation of the study and to highlight the funding models for the implementation of this plan. Globally, it is necessary to mobilize more than 300 billion USD per year to restore the degraded landscapes of our planet and to achieve the Sustainable Development Goal (SDG) 15.3 aimed at combating desertification, restoring landscapes and degraded soils (including areas affected by desertification, drought and flooding) and strive to end landscape degradation by 2030.

While the government of Cameroon is facing the needs of funding for various priorities due to various challenges (national security, infrastructure, social challenges, development, etc.) and multiple development cooperation and multilateral agreements worldwide shows its limits in terms of growth, the long-term financing solutions could rely on the private sector and instruments that allow sustainable self-financing, such as environmental funds. Indeed, there are many ways to raise the necessary funds for Forest and Landscape Restoration (FLR). These include resources for development cooperation, climate finance, non-governmental organizations (NGOs), national budgets, environmental funds, crowdfunding and private sector investment.

Within the framework of the financing linked to the national budget, the subdivisions and divisions could within the framework of the transfer of powers, finance certain restoration activities (through funds transferred by the State (BIP-reforestation fund) or own generated income. However, these funds are very limited and remain insufficient since the spaces to be restored are vast. The financing obtained from MINEPDED at the municipal level is generally around twenty million. Other sources of financing exist at the national level. The source of restoration funds could come from:

- ✓ Direct state funding (environment fund and forestry fund), supported respectively by MINEPDED and MINFOF
- ✓ Mining companies (rehabilitation fund for degraded sites)
- ✓ Funding from development partners (UNDP, GIZ, INBAR etc.)
- ✓ The development of projects related to the restoration of forest landscapes
- ✓ Government to fast track the Forest Investment Program (FIP) opportunity and REDD+ and carbon market funding. Forestry Investment Program (FIP) for Rwanda aims to finance the country's forestry research strategy and actions, including diversification of species for forestry and agroforestry. FIP could enhance knowledge and practices of farmers in agroforestry and stabilisation of landscapes, value chain improvement of NTFPs, improving tree planting material.
- ✓ Payment for Ecosystem Services (PES) offers a potential source of revenue for financing landscape restoration activities. Protecting catchments for hydroelectric dams and water supply plants would increase revenues from electricity and water sales. Institutions managing utilities could be approached about allocating part of their budgets to restoration for sustainable watershed management.

At community level, sum forest income activities should be raised by:

- ✓ Promoting community forest initiatives to finance restoration (exploitation of dead wood in community forests)
- ✓ Creating funds favorable to restoration (village, municipal and regional etc.)
- ✓ Organize in association and set up projects at community level and seek funding.
- ✓ Individual and community financing through income generated from NTFPs, and community works.

6.1. Funding needs for restoration with agroforestry in Waza

The total area of land to be restored with the new agroforestry is 231,748 hectares. Table 42 shows the budget estimates for the establishment of agroforestry systems and the contribution of communities living in Waza landscape.

Table 42. Budget estimates for agroforestry in Waza

Costs	5 years (million \$)	25 years (million \$)	Cost (\$/ha)
Monetary (\$)	476.5	476.5	2,056
Non-Monetary, contribution of community work (\$)	472.4	608.5	2,626
Total (\$)	948.9	1,085.1	4,682
Total area to be restored (ha)	231,748		

6.2. Funding needs for restoration of degraded mountains of Waza

The high mountainous areas to be restored are estimated to 1,770 hectares. Table 43 shows the budget estimates for the restoration of degraded mountains and the contribution of communities using the upland mountains of Waza landscape.

Table 43. Budget estimates for restoration of highly steep land of Waza

Costs	5 years (million \$)	25 years (million \$)	Cost (\$/ha)
Monetary (\$)	3.5	3.5	1,983
Non-Monetary, contribution of community work (\$)	3.5	4.5	2,552
Total (\$)	7.0 M	8.0	4,535
Total area to be restored (ha)	1,770		

6.3. Funding needs for the restoration of community forests in Waza

The total area of community forests to be restored is 144,546 hectares. Table 44 shows the budget estimates for the rehabilitation of community forests and the contribution of communities through community works in Waza landscape.

Table 44. Budget estimates for community forest restoration in Waza

Costs	5 years (million \$)	25 years (million \$)	Cost (\$/ha)
Monetary (\$)	269.8	269.8	1,867
Non-Monetary, contribution of community work (\$)	247.7	332.6	2,301
Total (\$)	517.5	602.4	4,168
Total area to be restored (ha)	144,546		

6.4. Funding needs for the restoration of the degraded areas of Waza park

The total area of land to be restored in the park is 166,207 hectares. Table 45 shows the budget estimates for the rehabilitation of degraded park areas in Waza landscape.

Table 45. Budget estimates for assisted Natural regeneration of the Waza park

Costs	5 years (million \$)	25 years (million \$)	Cost (\$/ha)
Monetary (\$)	594.9	692.5	4,167
Non-Monetary, contribution of community work (\$)	-	-	-
Total (\$)	594.9	692.5	4,167
Total area to be restored (ha)	166,207		

6.5. Funding needs for the protection of water bodies and riparian buffers in Waza

The total area of land to be used in the creation of riparian buffers around water bodies is 185,263 hectares. Table 46 shows the budget estimates for the establishment of riparian buffers and creation of buffer zones around water bodies as well as the contribution of communities through community works in Waza landscape.

Table 46. Budget estimates for the establishment of riparian buffers and protection of water bodies in Waza

Costs	5 years (million \$)	25 years (million \$)	Cost (\$/ha)
Monetary (\$)	337.5	337.5	1,822
Non-Monetary, contribution of community work (\$)	302.5	438.5	2,367
Total (\$)	640.0	776	4,189
Total area to be restored (ha)	185,263		

The total budget estimates for identified restoration options for the Waza landscape is summarized in Annex 3.

6.6. Funding needs for establishment of agroforestry systems in Mbalmayo

The total budget estimates for identified restoration options for the Mbalmayo landscape is summarized in Annex 4.

The total area of land to be restored with the new agroforestry is 48,904 hectares. Table 47 shows the budget estimates for the establishment of agroforestry systems and the contribution of communities living in Mbalmayo landscape.

Table 47. Budget estimates for the establishment of agroforestry systems in Mbalmayo

Costs	5 years (million \$)	25years (million \$)	Cost (\$/ha)
Monetary (\$)	44.3	44.3	906
Non-Monetary, contribution of community work (\$)	93.3	627.2	12,826
Total (\$)	137.7	671.6	13,732
Total area to be restored (ha)	48,904		

6.7. Funding needs for the restoration of community and council forests in Mbalmayo

The total area of community and council forests to be restored in Mbalmayo with the tree species with multiple usage (Ndo'o and safou) is 23,893 hectares. Table 48 shows the budget estimates for the rehabilitation of community forests and council forests as well as the contribution of communities living in Mbalmayo landscape.

Table 48. Budget estimates for the restoration on community forests and council forests in Mbalmayo.

Costs	5 years (million \$)	25 years (million \$)	Cost (\$/ha)
Monetary (\$)	13.5	13.5	565

Costs	5 years (million \$)	25 years (million \$)	Cost (\$/ha)
Non-Monetary, contribution of community work (\$)	6.1	36.8	1,541
Total (\$)	19.6	50.3	2,106
Total area to be restored (ha)	23,893		

6.8. Funding needs for the restoration of natural reserves in Mbalmayo

The total area of natural reserves to be restored in Mbalmayo is amounting to 5,030 hectares. Table 49 shows the budget estimates for the rehabilitation of the natural reserve in Mbalmayo landscape.

Table 49. Budget estimates for the restoration of the natural reserve in Mbalmayo.

Costs	5 years (million \$)	25 years (million \$)	Cost (\$/ha)
Monetary (\$)	3.6	10.1	2007.3
Non-Monetary contribution of community work (\$)	-	-	-
Total (\$)	3.6	10.1	2007.3
Total area to be restored (ha)	5,030		

6.9. Funding needs for the establishment of riparian forests and creation of buffers around water bodies in Mbalmayo

The water bodies to be protected with buffer zones in the landscape of Mbalmayo have an area of 74,552 hectares. Table 50 shows the budget estimates for the creation of buffer zones around water bodies, and the recreation of riparian forests as well as the contribution of communities through community works in Mbalmayo landscape.

Table 50. Budget estimates for the creation on buffer zones around water bodies and establishment of riparian forests in Mbalmayo

Costs	5 years (million \$)	25 years (million \$)	Cost (\$/ha)
Monetary (\$)	27.1	27.1	362.9
Non-Monetary, contribution of community work (\$)	10.9	65.7	880.7
Total (\$)	38	92.7	1243.7
Total area to be restored (ha)	74,552		

The total budget estimates for identified restoration options for the Mbalmayo landscape

is summarized in Annex 4.

6.10. Funding needs for restoration with agroforestry in Douala-Edea

The total budget estimates for identified restoration options for the Douala-Edea landscape is summarized in Annex 5.

The total area of land to be restored with the new agroforestry is about 101,160 hectares. Table 51 shows the budget estimates for the establishment of agroforestry systems and the contribution of communities through community works in Douala-Edea landscape.

Table 51. Budget estimates for the establishment of agroforestry systems in Douala-Edea

Costs	5 years (million \$)	25 years (million \$)	Cost (\$/ha)
Monetary (\$)	83.6	83.6	826
Non-Monetary, contribution of community work (\$)	43.6	173.6	1,716
Total (\$)	127.2	257.1	2,542
Total area to be restored (ha)	101,160		

6.11. Funding needs for the restoration of community and council forests in Douala-Edea

The total area of community and council forests to be restored with is 37,913 hectares. Table 52 shows the budget estimates for the rehabilitation of community forests and council forests and the contribution of communities through community works in Douala-Edea landscape.

Table 52. Budget estimates for the restoration of community forests and council forests in Douala-Edea.

Costs	5 years (million \$)	25 years (million \$)	Cost (\$/ha)
Monetary (\$)	21.22	21.22	565
Non-Monetary, contribution of community work (\$)	9.74	58.43	1,541
Total (\$)	31.17	79.86	2,106
Total area to be restored (ha)	37,913		

6.12. Funding needs for the restoration of the degraded park areas in Douala-Edea

The total area of the parks to be restored in Douala-Edea is estimated to 13,194 ha. Table

53 shows the budget estimates for the rehabilitation of degraded park areas in Douala-Edea landscape.

Table 53. Budget estimates for restoration of degraded park areas in Douala-Edea

Costs	5 years (million \$)	25 years (million \$)	Cost (\$/ha)
Monetary (\$)	9.5	26.5	2007.3
Non-Monetary, contribution of community work (\$)	-	-	-
Total (\$)	9.5	26.5	2007.3
Total area to be restored (ha)	13,194		

6.13. Funding needs for the restoration of degraded mangrove areas in Douala-Edea

The total degraded mangroves areas to be restored in Douala-Edea is estimated to 8,950 hectares. Table 54 shows the budget estimates for the rehabilitation of degraded mangrove areas and the contribution of communities through community works in Douala-Edea landscape.

Table 54. Budget estimates for restoration of degraded mangrove areas in Douala-Edea

Costs	5 years (million \$)	25 years (million \$)	Cost (\$/ha)
Monetary (\$)	39.5	39.5	4,412.8
Non-Monetary contribution of community work (\$)	7.94	65.8	7,348.6
Total (\$)	47.4	105.3	11,761.5
Total area to be restored (ha)	8,950		

6.14. Funding needs for the establishment of riparian forests and creation of buffers around water bodies in Douala-Edea

The water bodies to be protected with buffer zones and creation of riparian forests in the landscape of Douala-Edea have an area of about 41,008 hectares. Table 55 shows the budget estimates for the creation of buffer zones and riparian forests as well as the contribution of communities through community works in Douala-Edea landscape.

Table 55. Budget estimates for the creation on buffer zones around water bodies and establishment of riparian forests in Douala-Edea

Costs	5 years (million \$)	25 years (million \$)	Cost (\$/ha)
Monetary (\$)	14.9	14.9	362.9
Non-Monetary contribution of community work (\$)	6.02	36.1	880.7
Total (\$)	20.9	51	1243.7
Total area to be restored (ha)	41,008		

The total budget estimates for identified restoration options for the Douala-Edea landscape is summarized in Annex 5.

7. Conclusions and Recommendations

7.1. What does the analysis of Cameroon's three sub-national landscapes restoration potential tell us about the types of opportunities and appropriate restoration strategies?

7.1.1. Agroforestry is the core pillar of FLR opportunity in the Waza, Mbalmayo and Douala-Edea subnational landscapes of Cameroon, community participation constitutes a key to FLR success.

The engagement of communities in the initiative to restore the landscapes targeted by agroforestry is the strategy that can lead to more success, if a number of conditions are actually met. Most of the land that can be restored is either community land or is subject to conflict between communities and other recognized owners. In this case if these communities by their agricultural activities are considered as enemies of forests, they can constitute the quickest and easiest solution to increase the tree cover by the introduction into their agricultural plots of native species of high value. economic and / or cultural. They will also ensure the monitoring and collection of field data on the survival and growth of seedlings, in collaboration with technical institutions. The growing popularity of agroforestry techniques in the Waza landscape provides an opportunity for this approach. However, in the landscape of Douala-Edea and Mbalmayo this practice remains weakly practiced. Indeed, the land is still very fertile and the peasants do not realize the need to plant trees (especially legumes) on the same plot with the crops. In addition, the cultural habits of the populations of the Douala-Edea landscape, strongly anchored in fishing, induce little interest in agricultural activity. They will therefore need special and constant support to increase the chances of success. A local technical management team should be set up, bringing together beneficiary communities, NGOs, landscape restoration focal points as well as technical agents from forestry, agricultural and / or livestock posts.

7.1.2. Improved productivity of community forests and public reserves through assisted regeneration and community participation is crucial to sustainable protection of classified forests.

Planting trees is not the only approach to consider when restoring landscapes. The need to consider the opportunities for assisted natural restoration in classified forests and on cultivated land emerged. This approach will be supported by mechanisms for protection,

participatory forest management and assistance in the natural regeneration of young shoots of woody species in degraded areas, in order to effectively contribute to the restoration of plant cover. As part of the development / updating of management plans for classified forests, it will be a question of engaging the populations in a critical analysis of the state of their land in order to achieve awareness and decision-making. to act to reverse the negative trends observed in the state land, plant cover and biodiversity in general. It will not be a question of simply consulting them but considering them as the essential partners and actors in the sustainable management of these spaces. The change in their perception of these spaces is also crucial and will be made possible by mechanisms for valuing the economic potential / services provided by these forests for them. The negotiation within the framework of this management plan of specific resource use agreements will make it possible to establish integral conservation zones, controlled extraction zones and agricultural zones.

The community integration process will lead to the clarification of the rights of use and conditions of access by the populations in the reserve spaces so as to reduce their impacts (bush fires, clearing, etc.). Also, the strengthening of legality and forest control, taking into account community surveillance based on successful experiences (village vigilance committee, under the control of the village chief) is one of the key success factors of restoration. In addition, direct regeneration assistance could prove very useful in the Waza landscape, with a strong contribution from transhumant herders and farmers. It will consist in the identification and materialization of natural rejects or "wildlings" existing in the plots and the implementation of protection and other actions promoting their regeneration (staking, surface plowing, pruning, etc.). It would therefore be important to explore the possibility of setting up an agro-sylvo-pastoral system in which the herders coming to graze the cattle in the dry season could contribute through good pruning techniques to the maintenance of the plantation. and soil fertilization.

7.1.3. Restoration of mangroves will improve the marine ecosystem services and the halt biodiversity loss

The mangrove occupies an important place in the landscape of Douala-Edea. It presents a restoration opportunity of 8,950 hectares. This opportunity is made for conservation purposes but also for exploitation (lawful cutting of timber). This is an opportunity to remember that mangrove forests play a fundamental role in the well-being of the populations in the area, by providing marketable goods in great demand (firewood, timber, charcoal, medicinal plants, etc.) as well as high added value but non-market services (soil protection, water regulation, climate regulation and recreational opportunities). They are also spawning grounds for several species of fish and other aquatic and marine species (MINEPDED, 2017). To increase the chances of success of this option, it will be necessary to take into account the illegal pressures exerted on this type of forest and to assure inclusive management mechanisms into the reforestation of mangrove degraded area, based on the participation of the community living in the area. Improve smoking rooms and searching for alternatives energy would reduce the pressure on mangrove resources.

The process of developing the Management plan for the Douala-Edea National Park had made it possible in its time to produce a Neco-zoning of mangroves highlighting degraded, protective and timber harvested mangroves. Also, a vigilance committee had been set up in each fishing camp as well as management rules assigned to each area. Except that the slow speed observed in the process of finalizing this plan has negatively influenced the implementation of these recommendations, which are still relevant today. The consistency of the restoration initiatives identified on this site is necessary for an optimization of efforts and strategies.

7.1.4. Steep slopes, water ponds and riparian areas need to be protected and creation of additional water sources for tree watering is essential in FLR activities especially in Waza landscape

Respectively 37,893 ha, 72,871 ha and 5,584 ha of protective buffer zones for degraded water bodies have been identified in the landscapes of Douala-Edea, Mbalmayo and Waza. In addition, 95,963 ha, 5,940 ha, 4,714 ha for protective forests on very steep degraded land. The analysis models propose the restoration of these particular spaces by bamboo and, incidentally, agroforestry systems. These opportunities will offer considerable societal benefits, such as erosion control, improving water quality, reducing flooding in line with the needs of the communities and especially the forest law and the law on the regime. the water. In the specific case of the banks of watercourses, the establishment of bamboo stands in the buffer zones will help reduce the phenomenon resulting from the mechanical action of the water which tears off the constituent soil particles leading to its degradation. and its recoil and at the same time reducing the downstream deposition load.

They could also act as a natural buffer, helping to protect against high winds, storms, landslides, floods, all without forgetting its water filtration and purification capacities (Kiran Paudyal et al. 2019). At the edge of the ponds these bamboo forests will reduce the rate of water runoff, lengthen the period of humidity during the dry season, favorable to infiltration and supply of groundwater and create shade and conditions of ideal temperature for animal shelter. They can also present interesting economic opportunities for communities, thanks to their rapid growth, because they can be exploited from the third year, with a high annual regeneration after cutting it and a high production of biomass (Yen and Lee, 2011), capitalizable through the production of firewood. In addition, the need to apply sustainable management practices to ensure a good and large quantity production but specially to prevent their development haphazardly appeared and will promote the evolution of the idea according to which bamboo would be an invasive species competing with cropland.

7.1.5. The promotion of alternatives to the exploitation of forests should be one of the key FLR components.

The livelihoods of the local communities established on the outskirts of the conservation areas identified in the landscapes are highly dependent on agriculture, animal husbandry, fishing and the exploitation of natural resources. Yet they feel that the state and conservation bodies have more regard for forests and biodiversity. They most often have conflicting relationships with these conservation areas, which they consider to be a succession of prohibitions with no real benefit to them. Therefore, providing solutions to the specific needs of populations as well as alternatives that can contribute to the diversification of household income sources should be considered. They should encourage communities to get involved in restoration activities, provide alternatives to the commercial use of forest resources and reduce the pressure on these resources. They are based on the principle that farmers will invest their time in a more lucrative activity and that they will abandon certain practices, if other sources of income are available. There are many alternative sources of income and restoration-related needs specific to each landscape:

Waza landscape

- Promote the production of ecological charcoal from rice straw, invasive species;
- Promote the manufacture of improved stoves;
- Promote the manufacture of organic fertilizers from neem cake;
- Develop a plant production sector;
- Promote large-scale fodder cultivation to minimize the movement of pastoralists to grazing areas;
- Restore overexploited grazing areas and secure them;
- Build pastoral wells in grazing areas;
- Provide the necessary inputs for the maintenance of the plots;
- Build water points, in this case potable, in restoration sites;
- Build bunds to fight against floods;
- Clarification of statutes on land.

Mbalmayo landscape

- Promote the production of ecological charcoal;
- Develop a plant production sector;
- Promote breeding activities to reduce pressure on wildlife resources;
- Promote the manufacture of improved stoves
- Clarification of statutes on land.

Landscape of Douala Edea

- Promote the manufacture of improved smokehouses for smoking fish;
- Development of a plant production sector;

- Promote the production of ecological charcoal from oil palm branches;
- Promotion of fish farming activities and snail farming to reduce pressure on fishery resources.
- Construction of water points, in this case potable in restoration sites
- Provide solutions to the problem of “Salvinia”, specifically in the village of Mevia;
- Clarification of statutes on land.

7.2. What does the analysis tell us about the current bottlenecks and constraints to achieving Cameroon’s restoration potential?

7.2.1. *Availability of quality seedlings, fast growing, and easily accessible to communities*

Access to quality plants (seeds), fast growing seedlings remains a major challenge for the success of the forest landscape restoration projects in Cameroon. The agencies in charge of production do exist, ANAFOR (National Forest Development Support Agency) and IRAD (Agronomy and Development Research Institute) to name but a few. The plants produced by these agencies are not widely known and the prices are beyond the means of communities. In Mbalmayo for example, it was observed that an improved bitter cola plant produced by IRAD is worth 2,000 FCFA. These prices are high given the purchasing power of the communities. To this price, we must add the cost of transport which is not negligible. In Mbalmayo and Douala-Edea, the communities have a real interest in the domestication of NTFPs, but due to the lack of improved plants, they are satisfied with the few NTFPs (Ndo’o, Bitter cola, Safou, Djansen, etc.) still found in the forests or opt for fruit trees when the opportunity lends itself. The training of nurserymen and the establishment of permanent nurseries within the communities living within the landscapes to be restored is highly desirable.

7.2.2. *Knowledge and technical capacities on mixed restoration approaches*

In the landscape of Waza, it was observed that, the populations have a great motivation for the restoration of the dry landscape. Moreover, they have a good experience of reforestation programs and even know the species adapted to their ecosystem. However, in previous projects, the expected results have not always been achieved. An accusing finger is regularly pointed at the lack of maintenance and insufficient follow-up on the part of the bodies or administration in charge at the local level on one hand, and to the water scarcity on the other hand. In Mbalmayo and Douala-Edea, a similar observation is made at the level of the monitoring of plantations and much more, the populations must be built on the respect of the silvicultural practices. Emphasis must be placed on the choice of species to plant, respect for the number of plants per hectare and suitable associations, in particular, for the agroforestry system. Indeed, experience shows that in forest areas

the custom is to practice "all things" (all crops in the same plot), as the land is very often fertile.

7.2.3. *Village mangrove monitoring committee*

The services offered by mangrove ecosystems that are half terrestrial and half marine are well established. They constitute the peculiarity of the landscape of Douala-Edea and play a crucial role for the living communities in the camps. Indeed, mangroves provide vital ecosystem services which include: regulatory services ranging from coastal zone stabilization, carbon sequestration to improving the micro and macroclimate; support services, supporting the food chain, spawning ground and habitat for many other marine and aquatic animals. However, this ecosystem is declining in the Douala-Edea landscape. Mangroves (matanda) are the first alternative for communities living in fishing camps for fuelwood and timber needs. Women use it to smoke fish and it is an input in the manufacture of canoes by men.

The fishing camps are mainly made up of foreigners who do not always understand and respect the law in terms of sustainable management of forest resources. Although, mangroves can regenerate quickly, current practices do not facilitate it (flush cutting and non-compliance with the cutting diameter). Indeed, the regeneration of this type of forest is very fast when assisted, whereas a mangrove cut to the surface does not regenerate easily on its own. The strong involvement of local communities in the management of this ecosystem is essential for the success of the restoration of this landscape so that the rotation periods and cutting techniques are respected. In addition, specific legal texts for the sustainable management of this ecosystem are imperative.

7.2.4. *Establishment of agro-pastoral wells in the Waza landscape*

A retrospective look at the reforestation projects in the Sudano-Sahel zone shows us that the availability of water is a crucial factor of success. It is important to remember that this landscape is ecologically fragile with extreme climatic variations where flooding is observed during the rainy season and very high temperature during the dry season. In addition, the latter, which lasts 9 months, makes the maintenance of forest plantations difficult, especially during the first two years. The construction of agro-pastoral wells (already effective in certain agro-pastoral projects) therefore presents itself as a solution to be envisaged within the framework of the restoration of the Waza landscape.

7.3. From the identified opportunities and constraints what are the main areas of action that need to be addressed?

Based on the analysis made in this report and following the group discussion the assessment team had with key stakeholders and communities, identify the opportunities

and constraints are associated with each forest landscape visited. The core constraints are the search for funding, the low participation of communities in reforestation and forest landscape restoration activities, the lack of alternative for subsistence, the conflicts between farmers and herders in the cattle breeding areas, the excessive cutting of wood for various uses (firewood and charcoal, lack of land for the communities living in the islands (Douala-Edea). However, opportunities exist and some communities are ready to seize them. These communities have demonstrated their commitment in the meaning of restoration initiatives in the forest landscape of Waza for example, some communities practice reforestation using *Azadirachta indica*, in the landscape of Mbalmayo, the latter practice agroforestry and in the Douala-Edea area, the populations practice agriculture as a subsistence activity and fishing. The following recommendations must be made:

- Raise awareness and train local communities in environmental restoration and protection activities;
- Train the population in the management of nurseries, their maintenance and other vegetative propagation techniques;
- The government and partners in restoration should create seed banks and nurseries for plants of high economic value in each region. These banks and nurseries must be adapted to each region;
- Develop income-generating activities with an emphasis on value chains;
Develop consultation frameworks to curb conflicts at the local level;
- The state budget through MINEPDED, MINFOF and decentralized territorial communities should take restoration activities into account, since this activity also generates both financial and non-financial resources;
- Develop alternative sources to wood energy (gas, improved stove, etc.);

7.4. Next steps to support forest landscape restoration in Cameroon?

The selected landscape restoration options are, on the one hand, alternatives for subsistence activities for the communities and, on the other hand, a means of strengthening the forestry resources and restoring forest ecosystems. However, their implementation must be supported by the current national political context as well as national and international strategy documents. This perspective also reveals the land issue that stigmatizes the local momentum.

In general, support is needed for the management and conservation of the remaining forests, savannahs and mangroves in protected areas and RAMSAR sites (which can be found throughout the landscape).

7.4.1. *Community participation in FLR activities:*

- ✓ Improving community agricultural techniques and adoption of agroforestry production systems;

- ✓ The restoration of the forest landscape must not be disconnected from the subsistence activities carried out in the communities, it must take into account the local socio-economic and cultural context with a package of diversified activities and oriented towards the resolution of constraints related to the implementation of FLR activities.
- ✓ Producers (fishermen and workers in related trades, wood cutters, sand operators, etc.) co-management actions should aim at the organization of producers, coordination, harmonization of interventions, contribution to the rehabilitation of degraded areas, sharing of common benefits, etc. This development can build on functioning local institutions while creating new ones.
- ✓ Participate in the safeguarding of protected forests (protected savannah, mangroves etc.) by setting up inspection committees within the communities working closely with conservators, Local administration in avoid illegal harvesting of wood and unauthorized marketing of wood resources.
- ✓ The development of regulations on the main activities undertaken in forest ecosystem hotspots.
- ✓ The promotion of best management practices drawn from traditional know-how, including at the level of the promotion of achievements linked to local community organizations.
- ✓ The association of concrete pilot actions with awareness-raising actions by promoting development initiatives led by local populations.

In a way, this is to encourage and consider the development and implementation of participatory plans for the exploitation and restoration of forest and mangrove resources aimed at sustainable use within landscapes with all the stakeholders concerned.

7.4.2. Institutional arrangements

There is a need to revise forest and land legislations so as to incorporate participatory considerations relating to the protection and sustainable management of forest resources and community land tenure while ensuring the concrete implementation of international instruments relating to elements of the marine, Sahel, forest and coastal environment to which Cameroon is a part.

Attention should be given to the application of the legal framework with regard to the realization of environmental impact assessment for any project or important work likely to affect the bio-ecological balance of the ecosystems. Exploitation activities such sand, cutting of timber, firewood, clams, etc., should involve communities as much as possible in order to avoid unnecessary conflicts between investors and local population.

The following recommendations were formulated for better coordinated FLR actions

- ✓ The establishment of collaboration platforms between decision-makers and communities and communication strategies to avoid conflicts of jurisdiction between different administrations.
- ✓ Strengthening the intervention capacities of public services, local communities and

NGOs involved in resource management.

- ✓ For mangroves and transhumance areas, it is necessary to develop an adaptive and collaborative cross-border strategy with a view to channeling intra and sub-national activities in the different ecosystems while referring to the consultation frameworks, the development of co-management initiatives and cross-border initiatives with Nigeria, which is the country closest to the three landscapes.
- ✓ Strengthen the participation of local populations, local mangrove harvesting monitoring committees in order to help resolve the problem of insufficient public officials in charge of mangrove management control and monitoring.
- ✓ Strengthen the capacity of public services and other organizations involved in the management of natural resources and protection of environment.
- ✓ Management support for protected areas for monitoring development and management of biodiversity.
- ✓ Strengthen the capacity of existing NGOs and associations in order to promote the concerted management of resources, to harmonize interventions in the sense of contributing to the limitation of degradation and the rehabilitation of degraded areas.
- ✓ Develop co-management initiatives at the community level with Cooperatives, GICs which are not yet open so that they can continue the work started with the support of NGOs.
- ✓ Set up, with the participation of the local populations, local committees to supervise the exploitation of mangroves, timber, clams, etc. to support and assist the public officials in charge of management control and oversight.

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Annexes

Annex 1. Statistics on land cover change over 10 years from 2010 to 2020

Waza landscape						
Land cover	2010	2020	%2010	%2020	Difference	Rate/yr
Water body	2,260.49	11,399.80	0.34	1.70	1.36	0.14
Woody savannah	246,983.09	254,761.48	36.80	37.96	1.16	0.12
Shrub savannah	153,374.00	28,604.97	22.85	4.26	(18.59)	(1.86)
Degraded savannah	38,917.52	52,397.65	5.80	7.81	2.01	0.20
Settlement	79.12	15,570.78	0.01	2.32	2.31	0.23
Grass savannah/ farmland	121,505.45	208,633.41	18.10	31.08	12.98	1.30
Humid savannah	108,067.54	99,819.12	16.10	14.87	(1.23)	(0.12)
Total	671,187.21	671,187.21	100.00	100.00		

Mbalmayo landscape						
Land cover	2010	2020	%2010	%2020	Difference	Rate/yr
Farmland	52,166.85	92,082.32	14.04	24.77	10.74	1.07
Settlement	2,613.85	7,613.57	0.70	2.05	1.35	0.13
Dense forest	218,949.22	190,774.09	58.91	51.33	(7.58)	(0.76)
Degraded forest	72,112.07	66,619.84	19.40	17.92	(1.48)	(0.15)
Humid forest	5,408.28	3,540.39	1.46	0.95	(0.50)	(0.05)
Water bodies	1,441.24	1,293.40	0.39	0.35	(0.04)	(0.00)
Secondary forest	24,725.82	16,493.72	6.65	4.44	(2.21)	(0.22)
Total	371,679.33	371,679.61	100.00	100.00		

Douala Edea						
Land cover	2010	2020	2010%	2020%	Difference	Rate/yr
Farmland	20,191.00	58,161.82	4.32	15.72	11.40	1.14
Settlement	11,104.10	20,909.74	2.38	5.65	3.28	0.33
Water body	23,521.28	22,547.24	5.03	6.09	1.06	0.11
Bare soil	42.26	438.53	0.01	0.12	0.11	0.01
Degraded forest	38,644.17	54,279.66	8.27	14.67	6.40	0.64
Degraded mangrove	47,452.81	8,950.01	10.15	2.42	(7.73)	(0.77)
Dense forest	244,650.40	142,758.04	52.34	38.59	(13.75)	(1.38)
Dense mangrove	78,171.08	24,498.09	16.72	6.62	(10.10)	(1.01)
Agro-industrial Plantations	3,679.95	35,407.06	0.79	9.57	8.78	0.88
Total	467,457.05	369,970.19	100.00	100.00		

Annex 2. Costs and Benefits for planting one hectare of acacias-balanites - prosopis

No	designation	Qty	Unit price (in Fcfa)	comment
Inputs - Costs				
1	Weeding	1	20 000	
2	Acacia Plants	93	300	6x6
3	Balanites Plants	93	300	6x6
4	Plants prosopis	93	300	6x6
5	Picketing	1	20 000	
6	Hole making and planting	1	500	40 Cm x40 Cm 300 hole and grounding 200
7	Maintenance (Watering, weeding, bowl around plants,...)	9	90,000 to 120,000	Watering occurs in the first 2 years only and during the dry season (9 months). 2 times a day (morning and evening) 3 to 4 women for 1ha for an estimated value of 500 in the morning and 500 in the evening per woman (depending on the planting system). More generally, plants should be well maintained for the first 3 to 4 years.
8	Firewall	1	16 000	The firewall is made on the basis of 2 m by inside and 2 m by outside on the line of the living hedge or dead hedge or on the barbaged wire
Outputs - Profits				
1	Firewood	1 stere	5 000	From the fifth year The wood is sold by 1m ³ . 1m ³ - 5,000 To make the analysis plausible, the 5- year rotation system is applied.
2	Balanites oil	1 L	10 000	From the eighth year The oil of balanites has countless virtues although currently little popularized. Production is growing and can go beyond 10 l per foot.
3	Arabic gum	1 cup	500	From the fifth year The importance of this product is no longer to be demonstrated. The optimal harvest is 15 cups/feet/year.
4	fodder	1tasse	100	Acacias, balanites and prosopis are all forage plants. The leaves of balanites are palatable to livestock and consumed by humans. This essence has great cultural value in the landscape. Indeed,

No	designation	Qty	Unit price (in Fcfa)	comment
				its bark (powder) is used to attract fish (it brings the fish from the fed to the surface) and thorns to wean the vaux. Its fruits are eaten and the seed (core of the fruit) is pressed to obtain the oil. Because of its hardness, the wood of the balanites is prized in the manufacture of charcoal and many objects of arts.
5	Carbon sequestration			Carbon benefits were calculated based on the constant mean annual increment of the species used for each model.

Annex 3. Summary of performance economic indicators for restoration opportunities of Waza landscape

Performance economic Indicators	Agroforestry	Plantation on Steep land	Reforestation of Community forest	Restoration of degraded park	Riparian forests & buffer of water bodies
Total areas to be restored (ha)	231,747.65	1,770.45	1,445.46	166,206.779	185,262.888
Waza landscape					
Cost and income model for one hectare					
Monetary cost/ha (initial outlay) (\$)	2,056	1,982.75	1,866.79	4,166.61	1,821.65
Non-monetary costs/ha (contribution of community work) (\$)	2,626	2,552.3	2,300.92	-	2,366.97
Total costs (\$)	4,682	4,535.05	4,167.71	4,166.61	4,188.62
% of non-monetary costs over total costs	56 %	56 %	55 %	0 %	57 %
Cost discounted (\$)	3,687.57	3,560.23	3,247.19	3,246.18	3,183.15
Income discounted (\$)	3,992.88	3,752.36	6,955.44	2,715.17	5,735.83
NPV, Net Present Value (\$)	305.31	192.13	3,708.25	-531.013	2,552.69
CBR, Cost Benefit Ratio	1.08	1.05	2.14	0.84	1.8
ROI, Return on Investment (rate of return)	0.95	1.44	6.08	1.023	2.84
IRR, Internal rate of return (%)	13.74	11.48	18.98	8.12	24.2
Costs / profit over 25 years					
Monetary cost (million \$)	476.51	3.51	269.84	692.52	337.5
Non-monetary costs (million \$)	608.5	4.52	332.59	-	438.5
Total costs (million \$)	1,085.1	8.027	602.43	692.52	776
Total discounted costs (million \$)	854.59	6.3	469.37	539.54	589.72
Total discounted income (million \$)	925.34	6.64	1,005.38	451.28	1,062.64

Source: ROAM Waza economic survey data, 2021

Annex 4. Summary of performance economic indicators for restoration opportunities of Mbalmayo landscape

Performance economic Indicators	Agroforestry	Community Forest buffers	Reforestation of Forest Reserve	Riparian forests & buffer of water bodies
Total areas to be restored (ha)	48,903.57	23,893.08	5,030.40	74,552.30
Mbalmayo landscape				
Cost and income model for one hectare				
Monetary cost (initial outlay) (\$)	906.6	565.14	2,007.34	362.94
Non-monetary costs (contribution of community work) (\$)	12,825.7	1,541.28	-	880.73
Total costs (\$)	13,732.3	2,106.42	2,007.34	1,243.67
% of non-monetary costs over total costs	93 %	73 %	0 %	71 %
Cost discounted (\$)	5,027.32	1,038.068	948	629.54
Income discounted (\$)	8,208.59	1,996.67	1,593.97	5,537.75
NP Net Present Value (\$)	3,181.28	958.61	645.97	4,908.21
CBR, Cost Benefit Ratio	1.63	1.92	1.68	8.8
ROI, Return on Investment (rate of return)	0.998	2.36	2	11.4
IRR, Internal rate of return (%)	30.23	21.22	19.42 %	More than 50 %
Costs / profit over 25 years				
Monetary cost (million \$)	44.34	13.50	10.10	27.06
Non-monetary costs (million \$)	627.23	36.83	-	65.66
Total costs (million \$)	671.57	50.33	10.10	92.72
Total discounted costs (million \$)	245.85	24.8	4.77	46.93
Total discounted income (million \$)	401.43	47.7	8.02	412.85

Source: ROAM Mbalmayo economic survey data, 2021

Annex 5. Summary of performance economic indicators for restoration opportunities of Douala-Edea landscape

Performance economic indicators	Agroforestry	Community & council Forest	Park & forest reserve	Mangrove	Riparian forests & buffer of water bodies
Total areas to be restored (ha)	101,160.176	37,912.90	13,194.23	8,950	41,007.76
Douala-Edea landscape					
Cost and income model for one hectare					
Monetary cost (initial outlay) \$	826.05	565.14	2,007.34	4,412.84	362.94
Non-monetary costs (contribution of community work) \$	1,715.60	1,541.28	-	7,348.62	880.73
Total costs \$	2,541.65	2,106.42	2,007.34	11,761.46	1,243.67
% of non-monetary costs over total costs	67.5 %	73 %	0 %	62 %	71 %
Cost discounted (\$)	1,419.23	1,038.068	948	6605.86	629.54
Income discounted (\$)	2,555.36	1,996.67	1,593.97	19,348.52	5,537.75
NPV, Net Present Value (\$)	1,136.13	958.61	645.97	12,742.66	4,908.21
CBR, Cost Benefit Ratio	1.8	1.92	1.68	2.93	8.8
ROI, Return on Investment (rate of return)	1.81	2.36	2	4.17	11.4
IRR, Internal rate of return (%)	39.5	21.22	19.42 %	47.43	More than 50 %
Costs / profit over 25 years					
Monetary cost (Million \$)	83.56	21.22	26.48	39.5	14.88
Non-monetary costs (Million \$)	173.55	58.43	-	65.8	36.12
Total costs (Million \$)	257.11	79.86	26.48	105.3	51
Total discounted costs (Million \$)	143.57	39.36	12.51	59.12	25.82
Total discounted income (Million \$)	258.5	674.7	21.03	173.17	227.1

Source: ROAM Douala-Edea economic survey data, 2021

Annex 6. Ecosystem values and services from the restoration of the Waza landscape

Restoration interventions	Ecosystem Services	Impacts	Comments & Explanations
Riparian buffers & protection of water bodies with bamboo	Carbon emissions mitigation	+++	Because of its rapid growth, bamboo has a high potential for carbon sequestration.
	Erosion control	+++	Bamboo plays a major role in stabilizing the soil, especially the banks of streams.
	Improving water resources	+++	The extensive root system of bamboo allows it to bind soils and raise groundwater.
	biodiversity	+++	As the landscape of Waza is severely degraded, any restoration initiative even by bamboo improves the local micro-climate and flora. Bamboo can be used as a habitat and food for some wildlife species
	Socio-cultural	++	Bamboo is often used in the manufacture of arts objects
Agroforestry	Carbon emissions mitigation	++	The tree species selected for agroforestry have minimum potential for carbon sequestration
	Erosion control	++	Tree tops intercept raindrops, reduce splash erosion and runoff.
	Improved soil fertility	+++	The species selected are legumes that have the property of significantly improving soil fertility
	biodiversity	+++	The combination of trees and crops is likely to improve the biological diversity of a highly degraded landscape like Waza.
	sociocultural	++	Landscape beautification, contribution to food security.
Restoration of the degraded park areas	Carbon emissions mitigation	++	Planted forests have less carbon storage potential than natural forests.
	Anti-erosive control	++	The restoration of the park by planting species will contribute to soil stabilization.
	Improved soil fertility	+++	The species selected are legumes that contribute significantly to improving soil fertility
	biodiversity	+++	The landscape of Waza is severely degraded, its restoration will improve the flora and create a habitat for the fauna.
	Socio-cultural	++	Medicinal plants, beautification of the landscape
	Carbon emissions mitigation	++	Planted forests have less carbon storage potential than natural forests.

Restoration interventions	Ecosystem Services	Impacts	Comments & Explanations
Restoration of degraded mountains	Anti-erosive control	++	Restoration of mountains degraded by acacias will significantly reduce erosion
	Improved soil fertility	+++	The species selected are legumes that contribute significantly to improving soil fertility
	biodiversity	+++	The restoration of degraded mountains will improve the local micro-climate and flora. It can provide habitat for avifauna, act as shade and provide a grazing area for livestock.
	Socio-cultural	++	Medicinal plants, beautification of the landscape
Restoration of community forests	Carbon emissions mitigation	++	Planted forests have less carbon storage potential than natural forests.
	Anti-erosive control	++	Tree tops should intercept raindrops, reduce splash erosion and runoff.
	Improved soil fertility	+++	The species selected are legumes that contribute significantly to improving soil fertility
	biodiversity	+++	The combination of different tree species will improve the flora and provide habitat for avifauna
	Socio-cultural	+++	Selected species have many medicinal attributes and also contribute to beautification of the landscape
Legend	+: Low; ++: Medium to moderate; +++: Strong		

Annex 7. Ecosystem values and services from the restoration of the Mbalmayo landscape

Restoration interventions	Ecosystem Services	Impacts	Comments & Explanations
Riparian buffers and protection of water bodies with Bamboo	Carbon emissions mitigation	+++	Because of its rapid growth, bamboo has a high potential for carbon sequestration.
	Anti-erosive control	+++	Bamboo plays a major role in stabilizing the soil, especially the banks of streams.
	Improving water resources	+++	The extensive root system of bamboo allows it to bind soils and raise groundwater.
	biodiversity	++	Bamboo can be used as a habitat and food for some wildlife species
	sociocultural	++	Bamboo is often used in the manufacture of bow objects

Restoration interventions	Ecosystem Services	Impacts	Comments & Explanations
Agroforestry	Carbon emissions mitigation	++	The woods involved in agroforestry do not have a high potential for carbon sequestration
	Anti-erosive control	+++	Tree tops should intercept raindrops, reduce erosion and runoff.
	Improving water resources	+++	Agroforestry holds a large amount of water gradually released in the humus of their soils to feed rivers and shoals
	biodiversity	++	Significant improvement in biodiversity requires the conservation of native species.
	sociocultural	+++	Introduced species are NTFPs that, beyond being consumed, are medicinal plants.
Restoration of the forest reserve	Carbon emissions mitigation	++	Planted forests have less carbon storage potential than natural forests.
	Anti-erosive control	+++	Tree tops should intercept raindrops, reduce erosion and runoff.
	Improving water resources	+++	Planted species are likely to retain a large amount of water gradually released to feed rivers and shoals in the humus of their soils.
	biodiversity	+++	As the Mbalmayo reserve is severely degraded, the combination of selected species will make a significant contribution to improving the local microclimate and flora.
	sociocultural	+++	Selected species have many medicinal properties and also contribute to landscape beautification.
Restoration of community forests	Carbon emissions mitigation	++	Planted forests have less carbon storage potential than natural forests.
	Anti-erosive control	+++	Tree tops should intercept raindrops, reduce erosion and runoff.
	Improving water resources	+++	Planted species are likely to retain a large amount of water gradually released to feed rivers and shoals in the humus of their soils.
	biodiversity	++	The combination of different species will still improve the flora and provide potential habitat for wildlife
	sociocultural	+++	Planted species have many medicinal properties and also contribute to landscape beautification.
Legend	+: Low; ++: Medium to moderate; +++: Strong		

Annex 8. Ecosystem values and services from the restoration of the Douala-Edea landscape

Restoration interventions	Ecosystem Services	Impacts	Comments & Explanations
Riparian buffers and protection of water bodies with Bamboo	Carbon emissions mitigation	+++	Because of its rapid growth, bamboo has a high potential for carbon sequestration.
	Anti-erosive control	+++	Bamboo plays a major role in stabilizing the soil, especially the banks of streams.
	Improving water resources	+++	The extensive root system of bamboo allows it to bind soils and raise groundwater.
	biodiversity	++	Bamboo can be used as a habitat and food for some wildlife species
	sociocultural	+++	Bamboo is often used in the manufacture of arc objects. It can also be used for the development of ecotourism sites as currently observed in Dizangué
Agroforestry	Carbon emissions mitigation	++	The tree species involved in agroforestry do not have a high potential for carbon sequestration
	Anti-erosive control	+++	Tree tops should intercept raindrops, reduce splash erosion and runoff.
	Improving water resources	+++	Agroforestry holds a large amount of water gradually released in the humus of their soils to feed rivers
	biodiversity	++	Significant improvement in biodiversity requires the conservation of native species.
	sociocultural	+++	Introduced species are NTFPs that, beyond being consumed, are medicinal plants.
Restoration of the park	Carbon emissions mitigation	++	Planted forests have less carbon storage potential than natural forests.
	Anti-erosive control	+++	Tree tops should intercept raindrops, reduce erosion and runoff.
	Improving water resources	+++	Planted species are likely to retain a large amount of water gradually released to feed rivers and shoals in the humus of their soils.
	biodiversity	++	The restoration of the park goes to improve the local microclimate and flora and hence create a habitat for the fauna.
	sociocultural	+++	Planted species have many medicinal properties and also contribute to landscape beautification.
Restoration of community	Carbon emissions mitigation	++	Planted forests have less carbon storage potential than natural forests.

Restoration interventions	Ecosystem Services	Impacts	Comments & Explanations
forests and council forests	Anti-erosive control	+++	Tree tops should intercept raindrops, reduce erosion and runoff.
	Improving water resources	+++	Planted species are likely to retain a large amount of water gradually released to feed rivers and shoals in the humus of their soils.
	biodiversity	++	The combination of different species will still improve the flora and provide potential habitat for wildlife
	sociocultural	+++	Planted species have many medicinal properties and also contribute to landscape beautification.
Restoration of Mangroves	Carbon emissions mitigation	+++	The mangroves of the Douala-Edéa landscape have a high potential for carbon sequestration.
	Anti-erosive control	++	Mangroves contribute to the stabilization of the coastal zone, and protect fishponds
	Improving water resources	++	Water storage and groundwater recharge Phreatic; Removal of pollutants from water and surrounding soils.
	biodiversity	+++	The restoration of the landscape is done by an indigenous species.
	sociocultural	+++	Mangroves have cultural and spiritual value for local communities. The communities who live in the vicinity of mangrove depend heavily on it and it is the place where many fish species are extracted.
Legend	+: Low; ++: Medium to moderate; +++: Strong		

Annex 9. Rapid Restoration Diagnostic Tool

WRI and IUCN published a “Rapid Restoration Diagnostic” that helps identify which success factors already exist and which are currently missing within landscapes being considered for restoration. It is designed to help decision-makers identify factors that must be addressed before investing large amounts of human, financial, or political capital in forest landscape restoration. The preliminary version of this diagnostic was used in Rwanda. Key success factors for forest landscape restoration is shown in Table 1.

Table 1: Key success factors for forest landscape restoration

Theme	Feature	Key success factor
Motivate	Benefits	• Restoration provide economic, environmental, social and cultural benefits

Theme	Feature	Key success factor
	Awareness	<ul style="list-style-type: none"> • Benefits of restoration are publicly communicated • Opportunities (e.g., where, how much) for restoration are identified
	Crisis event	<ul style="list-style-type: none"> • Crisis events are leveraged
	Legal requirements	<ul style="list-style-type: none"> • Law requiring restoration exists and is enforced
Enable	Ecological conditions	<ul style="list-style-type: none"> • Soil, water, climate, and fire conditions are suitable for restoration • Plants and animals that can impede restoration are absent • Native seeds, seedlings, or source populations are readily available
	Market conditions	<ul style="list-style-type: none"> • Competing demands for alternative use for degraded lands are declining • Accessible markets for products from restored areas exists
	Policy conditions	<ul style="list-style-type: none"> • Land and natural resource tenure are secure • Policies affecting restoration are aligned and streamlined • Restrictions on clearing natural forests exists and is enforced
	Social conditions	<ul style="list-style-type: none"> • Local people are empowered to make decisions about restoration • Local people are able to benefit from restoration
	Institutional conditions	<ul style="list-style-type: none"> • Responsibility for restoration is clearly defined • Effective institutional coordination is in place
Implement	Leadership	<ul style="list-style-type: none"> • National and/or local restoration champions exist • Sustained political commitment exists
	Knowledge	<ul style="list-style-type: none"> • Restoration “know-how” relevant to candidate landscapes exists • Restoration “know-how” transferred via peers or extension services
	Technical design Financing and incentives	<ul style="list-style-type: none"> • Restoration design is technically grounded and climate resilient • “Positive” incentives and funds for restoration outweigh “negative” incentives for status quo • Incentives and funds readily accessible
	Feedback	<ul style="list-style-type: none"> • Effective performance monitoring and evaluation in place • Early wins are communicated

Source: IUCN and WRI (2014). A guide to the Restoration Opportunities Assessment Methodology (ROAM): Assessing forest landscape restoration opportunities at the national or sub-national level. Working Paper (Road-test edition). Gland, Switzerland: IUCN. 125pp