**A proposal for local performance baselines**

**a contribution to the development of the Mai-Ndombe Emission Reduction Program**

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This document provides a technical proposal to develop local performance baselines under the Mai-Ndombe Emission Reduction (ER) Program. It aims to serve as a basis for discussion amongst ER-Program stakeholders.

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# Résumé

Ce document introduit le concept des Lignes de Base Localisées (LPB), qui modifient le niveau historique d'émission de référence produit par le programme ER à une estimation locale pour la déforestation future. Cela peut servir de base pour une utilisation optimisée des fonds pour la réalisation de réductions des émissions par les diverses activités prévues être financés dans le cadre de la mise en œuvre.

**Enoncé du problème**. Le NERF spécifie la moyenne des émissions historiques de la province de Maï-Ndombe. Cependant, la province est caractérisée par des risques de déforestation hétérogène. Certains secteurs / chefferies à proximité de Kinshasa sont exposés à un risque élevé de déforestation et de dégradation future; d'autres, situés dans des zones reculées, présentent un risque moindre de déforestation, principalement dû aux augmentations de la population locale,

Le programme de RE met en œuvre une gamme d'activités qui seront récompensées pour leur performance soit indirectement via un système de paiement proxy; ou directement si imbriqué. Offrir les mêmes paiements pour la conservation d'un hectare de forêt dans toute la province créerait deux problèmes:

* Premièrement, des paiements uniformes ne tenant pas compte du fait qu’un secteur peut avoir une tendance de déforestation à la hausse ou à la baisse (p.ex. en raison de la partie forestière restante très limitée) peut-être une façon inefficace de payer sur base de la performance. Certains secteurs bénéficieraient d’effets d’aubaine ; d’autres seraient confrontés à des difficultés de performer. Dans l’ensemble, les décaissements inappropriés de fonds limités peuvent réduire les chances du Programme RE à fonctionner de façon optimale.
* Deuxièmement, un paiement uniforme pour la conservation d'un hectare de forêt pourrait être injuste. Cela impliquerait qu'un secteur où vivent 10 personnes reçoive les mêmes paiements qu'un secteur où vivent 10 000 personnes. En effet, la densité de population diffère entre les secteurs de maximum 2 277% (min: Lokoloma 0,038 personnes / ha, max: Mongama, 0,859 personnes / ha). En supposant un paiement de 1 USD / ha pour stopper la déforestation se traduirait par des paiements de 26,5 USD par personne à Lokoloma, mais seulement 1,2 USD par personne à Mongama. Prenant en compte que la croissance démographique est un facteur clé de la déforestation, les paiements de conservation dans certaines régions peuvent être exagérément élevés comparé aux risques de déforestation; dans d'autres régions les paiements peuvent être top bas en considération des risques réels de déforestation et e dégradation des forêts .

Dans ce contexte, le Programme de RE a précisé dans son DPRE qu'il utilisera une carte des risques pour mettre en pratique ses activités d'atténuation. Ce document propose non seulement une carte des risques, mais simplement une estimation spécifique de la déforestation future pour chaque secteur et/ou chefferie.

**Quelles activités peuvent bénéficier des LPB?** Le programme RE prévoit de mettre en œuvre huit activités d'atténuation. Il est important de noter que les LPB ne peuvent pas être utilisés pour tous les huit activités. Certaines activités, telles que l'investissement dans le reboisement ou la régénération naturelle assistée, sont déterminées par les coûts en capital et en main-d'œuvre. Cependant, les LPB sont envisagés pour informer le développement des activités de conservation communautaire. Cette activité importante devrait contribuer à 60,9% des réductions d'émissions totales générées par le programme RE (voir le Document de Programme de Réduction d’Emissions). De plus, les LPB peuvent informer sur l'imbrication de grandes activités, c'est-à-dire qui ne bénéficient pas d'investissements PIF et de paiements à base de proxy, mais qui peuvent être attribuées directement pour leur performance.

**Considération des peuples autochtones.** Le plan de partage des bénéfices (PPB) prévoit que 2% de la valeur de l’ERPA nominale soient directement alloués aux populations autochtones vivant dans la zone du programme RE. En outre, les populations autochtones peuvent bénéficier de l'utilisation des LPB pour leurs activités d'atténuation. Les LPB peuvent être utilisés d’une part pour i) imbrication des activités d'atténuation des populations autochtones issu du paiement direct sur la performance; ou bien participer de façon alternative au schéma général de paiement proxy du Programme de RE (si non imbriqué).

**Réduction des coûts de Transaction**. La version actuelle du PPB prévoit que les projets peuvent être imbriqués et par conséquent recevront des paiements directs pour leur performance. Pour devenir admissible, le PPB prévoit que les projets pour être imbriqués, doivent élaborer leur propre référence et la documentation technique connexe menant à des coûts de transaction élevés et, éventuellement, une pluralité des approches de référence. LPB peut éclairer le processus d’imbrication en fournissant une référence commune, ce qui réduira considérablement les coûts de transaction pour être imbriqué.

**Cohérence avec le cadre méthodologique du FCPF.** Le MF détermine les règles pour le développement du NERF, le programme RE ainsi que son suivi et rapportage au Fonds Carbone du FCPF. Le NERF a été déterminé à un niveau d'émission de 42,07 millions de tonnes CO2 et un ajustement de 5,61 millions de tonnes CO2 pour prendre en compte une augmentation probable de la déforestation future. Il est important de noter que les LPB ne proposent pas de niveau d'émission alternatif pour la déclaration au FCPF.

Le NERF est basé sur les émissions historiques sur la période de référence, de 2004 à 2014. Les Bases de Performance Locales projettent toutefois la déforestation future au cours de la période ERPA 2018-2020. Les estimations d'émissions pour un secteur ne sont pas identiques. Cependant, la somme de tous les LPB correspond au NERF plus l'ajustement, tel qu'approuvé par le Fonds Carbone du FCPF et les pays donateurs. Par conséquent, les LPB respectent le cadre méthodologique, mais ne sont qu'un outil pour déterminer des paiements internes équitables et efficaces pour le rendement.

**Vue d’ensemble de l'approche méthodologique.** Le développement de bases de performances localisées suit plusieurs étapes illustrées par la figure 1 pour deux secteurs avec un niveau d'émission croissant (Bateke Sud, bleu, Mfimi, vert) et un avec un secteur avec un niveau d'émission décroissant (Kangara, rouge). Le point de départ de l'analyse forme le NERF tel qu'approuvé par le Fonds Carbone du FCPF. Ce NERF détermine des émissions spécifiques de 3,96 tCO2 par hectare de forêt qui sont identiques pour tous les secteurs.

Dans une prochaine étape, les LPB considèrent les superficies effectivement déboisées par secteur pendant la période de référence historique 2004 - 2014. Cela entraîne une augmentation des niveaux d'émission spécifiques pour Mfimi (6,96tCO2 / ha) et Bateke Sud (10,40tCO2 / ha), mais diminue le niveau d'émission de Kangara (2,33tCO2 / ha).

Enfin, nous effectuons une analyse de tendance. Si le secteur présente une tendance fiable, la tendance est utilisée pour prévoir la déforestation future au cours de la période de l'Accord d'Achat de Réduction des Emissions (de 2018 à 2022). Il en résulte une augmentation des émissions de référence par ex. pour Mfimi qui est alimenté par i.) L'ajustement spécifié par le programme RE et ii.) Une réduction du niveau d'émission historique des secteurs qui ont une tendance décroissante (par exemple Kangara) et des secteurs qui ont une tendance incertaine (par exemple Bateke Sud). Cet algorithme produit la référence de performance localisée finale, par ex. Mfimi 11,81 tCO2 / ha, Bateke Sud, 7,96 tCO2 / ha et pour Kangara 1,78 tCO2 / ha.

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| Figure 1: Example – du moyen au LPB |

Suivant l’analyse ci-dessus, Mfimi est identifié comme le secteur, avec le plus haut niveau d'émissions futures durant la période de l’ERPA (c.-à-d. émissions par hectare de forêt). Cette analyse est basée sur les trois critères suivants, i) la déforestation historique réelle dans le secteur, ii) une tendance fiable, qui permet de prévoir la déforestation future. L'augmentation de la déforestation future a été confirmée. iii) par l'augmentation de la population du secteur et il a également été confirmé que les zones forestières à déboiser pendant la période 2018-2022 existent (encore) et sont bien accessibles à partir des villages. Par conséquent, Mfimi recevra des paiements plus élevés pour la conservation d'un hectare de forêt (comparé aux secteurs à faibles niveaux d'émission) et pourra également être envisagé pour des investissements supérieurs à la moyenne dans les activités d'atténuation tout en respectant l'égalité d'accès aux fonds REDD +.

# Executive Summary

This paper introduces the concept of Local Performance Baselines (LPB), which amends the historic Reference Emission Level produced by the ER Program to a local estimate for future deforestation. This may serve as basis for an optimized utilization of funds regarding the achievement of emission reductions by the various activities planned to be financed in the course of implementation.

**Problem Statement.** The REL specifies the historic average emissions over the Mai Ndombe province. However, the Province is characterized by heterogenic deforestation risks. Some secteurs in proximity to Kinshasa are exposed to high risk of future deforestation and degradation; others located in remote areas, feature lower risk of deforestation, mainly driven by local population increments.

The ER Program implements a range of activities, which will be awarded for their performance either indirectly through a proxy based payment scheme, or directly if nested. Offering the same payments for conserving one ha of forest all over the province will create two problems:

* First, uniform payments disregarding whether the secteur exhibits an increasing or a decreasing trend of deforestation (e.g. due to limited, remaining forest areas) may be an ineffective means to pay for performance. Some secteurs would benefit from windfall effects; others would face difficulties to perform. Overall the ineffective disbursement of limited funds may reduce the ER Program’s chances to perform optimally.
* Second, uniform payments for conserving one hectare of forest may be unfair. It could imply that a secteur where 10 people live would receive the same payments as a sector where 10,000 people live. In fact the population density differs between secteurs by max 2,277% (min: Lokoloma 0.038 persons /ha, max: Mongama, 0.859 persons /ha). Assuming a payment of 1 USD/ha for stopping deforestation would translate into 26.5 USD payments per person in Lokoloma but only 1.2 USD per person in Mongama. Hence, considering that population growth is a key driver for deforestation, conservation payments in some regions may be exuberantly high in others very low, considering the actual risk of deforestation and forest degradation.

Against this background, the ER Program specified in its ER PD that it will use a risk map for putting its mitigation activities into practice. This paper proposes not only a risk map, but merely a quantitative forecast of future deforestation for each secteur or cheferie.

**Which activities may benefit from LPBs?** The ER Program foresees to engage in eight mitigation activities. It is important to note, that LPBs may not be used for all eight activities. Some activities, such as investment in reforestation or assisted natural regeneration are determined by capital and labor costs. However LPBs are envisaged to inform the development of community conservation activities. This important activity is expected to contribute 60.9% of the total emission reductions generated by the ER Program (cp. ER Program Document).

**Consideration of the Indigenous People.** The Benefit Sharing Plan (BSP) foresees 2% of the nominal ERPA value directly being allocated to the indigenous people living in the ER Program area. Additionally indigenous people may benefit from using the LPBs for their mitigation activities. LPBs may either be used for nesting mitigation activities owned by indigenous people resulting in direct payments for performance; or alternatively participate in the ER Program’s general proxy payment scheme.

**Reduction of Transaction Cost.** The current version of the BSP foresees that projects may be nested and hence will receive direct payments for their performance. In order the become eligible, the BSP foresees that projects to be nested shall develop their own baseline and related technical documentation leading to high transaction costs and possibly a plurality of baseline approaches. LPBs may inform the nesting process by providing a common baseline, which will substantially reduce the transaction costs of being nested.

**Consistency with the FCPF Methodological Framework**. The MF determines the rules and regulations for the development of the REL, the ER Program as well as its monitoring and reporting to the FCPF Carbon Fund. The REL was determined at an emission level of 42.07 million tCO2 and an adjustment in the amount of 5.61 million tCO2 to account for a likely increase of future deforestation. It is important to note that LPBs do not propose an alternative emission level for reporting to the FCPF.

The REL is based on historic emissions over the reference period, from 2004 to 2014. Local Performance Baselines however, project future deforestation during the ERPA period 2018-2022. As such, the emission estimates for one secteur are not identical. However, the sum of all LPBs correspond to the REL plus the adjustment as approved by the FCPF Carbon Fund and its donor countries. Consequently, LPBs respect the Methodological Framework, but are merely a tool for determining fair and efficient internal payments for performance.

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| Figure 2: Example - From Average Emissions to LPB |

**Summary of Methodological Approach**. The development of localized performance baselines follows several mayor steps exemplified by Figure 2 for two secteurs with an increasing emission level (Bateke Sud, blue; Mfimi, green) and one with a decreasing emission level (Kangara, red). The starting point of the analysis forms the REL as approved by the FCPF Carbon Fund. This REL determines specific emissions in the amount of 3.96 tCO2 per hectare forest which is identical for all secteurs.

In a next step, LPBs consider the actual areas deforested per secteur during the historic reference period 2004 - 2014. This results to an increase of the specific emission levels for Mfimi (6.96tCO2/ha) and Bateke Sud (10.40tCO2/ha), but decreases the emission level for Kangara (2.33tCO2/ha).

Finally, we conduct a trend analysis. If the secteur exhibits a reliable trend, then the trend is used to forecast future deforestation during the period of the Emission Reduction Purchase Agreement (i.e. 2018 - 2022) This results into an increase of baseline emissions for e.g. Mfimi fueled by i.) the adjustment specified by the ER Program and ii.) by decreasing the historic emission level of those secteurs which have a decreasing trend (e.g. Kangara) and by those secteurs which have an unreliable trend (e.g. Bateke Sud). This algorithm produces the final Localized Performance Baseline for e.g. Mfimi 11.81 tCO2/ha, Bateke Sud, 7.96 tCO2/ha and for Kangara 1.78 tCO2/ha.

Based on above analysis, Mfimi is identified as the secteur, with the highest future emissions level during the ERPA period. This analysis is based on the three criteria, i) actual historical deforestation in the sectuer, ii) a reliable trend, which allows to forecast future deforestation. The increase of future deforestation was confirmed iii) by the secteur’s increase of the population and equally it was confirmed that the forest areas to be deforested during the period 2018-2022 actually (still) exist and are well accessible from villages. As a consequence, Mfimi shall receive higher payments for conserving one hectare of forest (compared to secteurs with low emission levels) and may also be considered for above average investments into mitigation activities while respecting equal access to REDD+ funds from all secteurs / cheferies.

# Introduction and Objective

In order to efficiently address deforestation and forest degradation, the Emission Reduction (ER) program (ERP) in the Mai Ndombe province (MNDP) will invest more resources into those areas, where threat of deforestation/degradation is high (i.e. priority areas), and fewer resources where threat is less. The latter areas may still benefit from the ER-Program, in particular from investments into reforestation, agroforestry and assisted natural regeneration. In order to identify the priority areas (i.e. areas with a likely increase in future emissions), in a first step, the ER-Program must downscale its Reference Emission Level (REL) to the desired spatial level.

The downscaled REL redistributes average historic emissions from deforestation and forest degradation within the ERP area (as determined by the ER Program) to appropriately reflect likely future deforestation and degradation emissions at local scale during the ERP’s time of operation, i.e. the period covered by the Emission Reduction Purchase Agreement (ERPA, i.e. 2018 – 2022). This should lead to the establishment of so-called ‘Local Performance Baselines’ (LPB). These local performance baselines only play a role in the internal benefit sharing process of the ER-Program. LPBs do not replace or alter the ER Program REL as described in the ER-PD in any way. The sum of the emissions of all local performance baselines corresponds to the total ER-Program REL increased solely by the adjustment granted by the Forest Climate Partnership Facility (FCPF), as stipulated in the ER Program Document.

The principal objective of developing local performance baselines is to provide local units within the ERP with a realistic baseline against which performance will be measured. As such, local performance baselines do also provide the basis for offering differentiated payments through the ER Program’s performance-based Payment for Environmental Services (PES) scheme. This shall allow for offering differentiated payments for the performance of e.g. forest conservation measures. Differentiated payments would imply higher payments per ha for one ha forest area conserved in secteurs with high risk and less payments in secteurs with low risk of deforestation and/or degradation.

This approach allows to deviate from determining future payments only from historic emissions. It will allow to offer payments e.g. in a secteur which had no / or little historic deforestation but is expected to have higher future emissions. At the same time the approach will result in reduced payments in those secteurs, which had high emissions during the historic reference period of the REL, but a reduced risk of future deforestation. E.g. the secteur Kangara exhibits a deforestation rate which is below the provincial average as well as a decreasing trend of deforestation. Hence the LPB emission level is reduced from the historic average of 3.96tCO2/ha to 1.78 tCO2. At the same time, the secteur Mfimi exhibits a deforestation rate above the provincial average with an increasing trend. Hence its LPB emission level was increased from 3.96tCO2/ha/yr to 11.81 tCO2/ha/yr. From the authors’ perspective this is the only way to directly measure performance at local scales.

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| Table 1: Overview ERP Mitigation Activities | |
| ID | Key Activities |
| AS1. | Agroforestry and improvement of cultivation techniques |
| AS2. | Perennial crops development in non-forest areas |
| ES1. | Assisted natural regeneration for charcoal production. |
| ES2. | Afforestation/Reforestation for charcoal production |
| FS1. | Reduced impact logging |
| FS2. | Conservation of local community forests |
| FS3. | Conservation concession |
| FS4. | Afforestation/Reforestation for lumber production |
| Other | WWC REDD+ Project |

The ER Program foresees to engage in eight mitigation activities. LPBs are envisaged to be used for two mitigation activities:

* First LPBs may inform the implementation of FS2 – Conservation of local community forests, for which communities may sign proxy-based contracts. These contracts currently foresee payments for the conservation of forests in the amount of 0.5 USD/ha for all areas of the Mai Ndombe Province. Using LPBs, this payment may be increased to account for higher risk of future deforestation in some areas, and decreased in areas of low risk. While being only one mitigation activity out of eight, FS2 is an important activity expected to generate 60.9% of the ERP’s overall emission reductions.
* Second, LPBs may serve as basis for the ER Program for engaging with nested activities of the private sector, i.e. activities which do not benefit from FIP investments and payments on proxy basis, but which may be directly awarded for their performance.

Another key issue is that the REL is an historical average based on the reference period 2004-2014 plus an adjustment. While this REL may accurately reflect baseline emissions for the entire ER-Program area during the ERPA period, such an average value may not address the specific emission levels of individual secteurs. Here, more local drivers or the local impacts of larger drivers are assumed to play a significant role, such as for example commercial land-use change, population density and growth, accessibility to forest resources and proximity of Kinshasa. Consequently, we argue that a downscaled REL must take into account more information to derive a local deforestation and degradation estimate than simply the historical average deforestation and degradation rates for a given spatial scale.

# Proposed Methodology for Calculating Local Performance Baselines

Since the local performance baselines are decisive for local benefit sharing, we propose to use a simple and transparent approach, which should be easily communicable to all stakeholders **and use transparently by the Program Manager.** However, although local performance baselines are only used for internal benefit sharing, the methods to calculate them need not be as sophisticated as for the ER-Program REL.

## Spatial Unit for Local Performance Baselines

Since the ER-Program is a governmental program, we propose to use administrative units to establish local performance baselines. Administratively, the Democratic Republic of the Congo (DRC) is divided into provinces, districts (formerly), territories, 'secteurs' or 'chefferies', 'groupments' and villages / so-called ‘terroirs’ when referring to their specific customary land area. Table 2 shows the administrative division of Mai-Ndombe province to the level of secteur / chefferie (the latter shown in italics), but excludes smaller administrative units such as ‘groupements’ and villages.

Table 2: Administrative Division of Mai-Ndombe Province

|  |  |  |  |
| --- | --- | --- | --- |
| Province | Former District | Territoire | Secteur / *Chefferie* |
| Mai-Ndombe | Mai-Ndombe | Inongo | Basengele |
| Bolia |
| Inongo |
| Kiri | Beronge |
| Lutoy |
| Pendjwa |
| Kutu | Kemba |
| Mfimi |
| Luabu |
| *Badia* |
| *Batere* |
| Oshwe | Entre Lukenie - LokoroNkaw |
| Lokolama |
| Lukenie |
| Kangara |
| Plateaux | Bolobo | *Bateke-Nord* |
| Yumbie | Mongama |
| Mushie | *Baboma-Nord* |
| Kwamouth | Bateke-Sud/TWA |

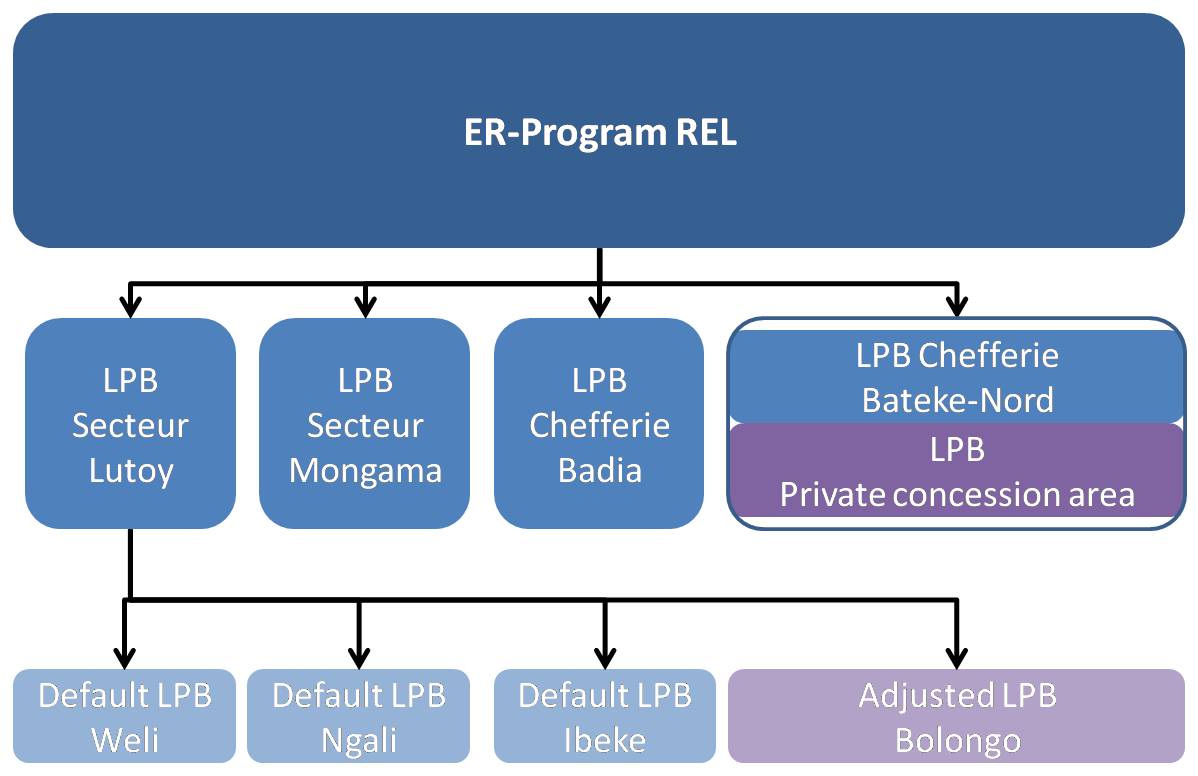
At present, the administrative level for which complete spatial datasets exist is the ‘secteur’ / ‘chefferie’ level. In consequence, as the default, we propose to use the 'secteur / 'chefferie' as the spatial unit for which a local performance baseline is calculated. These could be further subdivided as needed, if finer spatial information on administrative boundaries becomes available.

In case private sector actors **actively** participate in the ER-Program, another spatial layer **could be** added. By active participation we mean "a dedicated emission reduction activity against a local performance baseline and subject to a contractual arrangement with the ER-Program". In such cases, a private sector actor may perform against the LPB emission level of its sector. E.g. a local NGO represents 5 groupements located in secteur ‘A’. The groupements supported by the NGO engage into forest conservation and large-scale reforestation for charcoal production. The shape file of the five villages is available and the area makes up for 70% of the secteur. As the villages and NGOs opt for direct crediting, they perform against the 70% of the LPB value of secteur ‘A’.

The same could be envisaged for ER-Program activities operating at a smaller spatial scale than the ‘secteur’ or ‘chefferie’, e.g. ‘groupements’ or villages (e.g. or a community conservation area). The calculation of finer baselines though would need additional resources (i.e. currently no spatial boundary data available for groupements) and would lead to a higher complexity of the internal benefit sharing system. The question is whether these additional resources provide an additional benefit. This would only be the case if the deforestation or forest degradation rate at e.g. the ‘groupement’ level would be significantly different from deforestation and degradation at ‘secteur’ or chefferie level. As such, we propose that as a default, groupements or villages adopt the deforestation and forest degradation rate of their ‘secteur’ or ‘chefferie’ to calculate their local performance baselines for specific mitigation activities (e.g. community conservation areas). Following this approach allows concluding community conservation contracts based on future emissions of their secteur, instead of average emissions of the province.

Figure 3 illustrates this concept. Here, the emissions of the ‘secteurs’ and ‘chefferies’ of Lutoy, Mongama and Badia are determined by their Local Performance Baseline (LPB) comprising their entire territory. In contrast, the LPB of ‘chefferie’ Bateke-Nord is split into i.) the one for the ‘chefferie’ and ii.) one of a private concession area where specific private sector mitigation actions are implemented. Below the ‘secteur’ / ‘chefferie’ level, here shown at the example of Lutoy, the ‘groupements’ of Weli, Ngali and Ibeke would adopt an unadjusted local performance baseline that is calculated using the secteur's / chefferie's deforestation and/or forest degradation rate (including its trend if applicable). By contrast, the ‘groupment’ of Bolongo adopts an adjusted local performance baseline because it has demonstrated that its deforestation rate is higher than the one from Lutoy.

Figure 3: Downscaling the REL to Secteur/Chefferie level and to individual Mitigation Actions



## Parameters used to calculate Local Performance Baselines

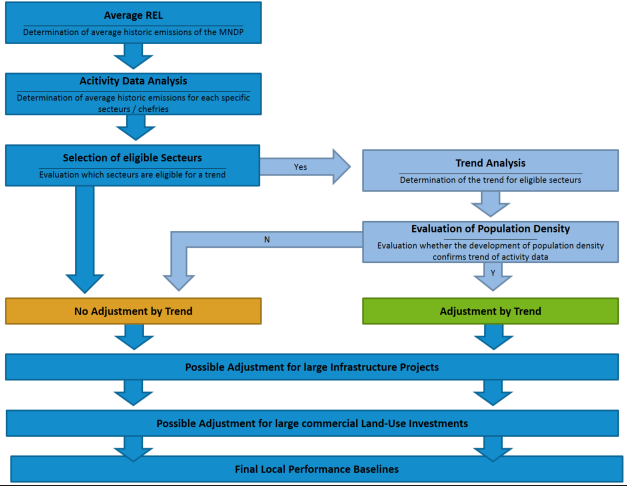
As starting point, we suggest using the following parameters for calculating local performance baselines (see Table 3).

Table 3: Parameters for deriving Local Performance Baselines

|  |  |  |
| --- | --- | --- |
| Parameters | Data source | Parameter type |
| Average annual emissions from deforestation and forest degradation during the reference period for MNDP | * Same dataset as used for the ER-Program REL | Mandatory base parameter |
| Specific historic emissions of one secteur | * Same dataset as used for the ER-Program REL * Global Forest Cover (Hansen et al. 2013 | Mandatory base parameter |
| Trend-based adjustment | * Global Forest Cover (Hansen et al. 2013)[[1]](#footnote-1) | Mandatory adjustment parameter |
| Remaining accessible forest area | * Forest extent: Same dataset as used for the ER-Program REL * Here: Global Forest Cover dataset (Hansen et al. 2013) * For accessibility: IUCN/WWF accessibility map for DRC (2017) | Mandatory restriction parameter |
| Development of population density | * http://www.worldpop.org.uk/data/ * summary/?doi=10.5258/SOTON/WP00072 | Optional adjustment parameter |
| Adjustment for large infrastructure projects | * Government or private sector records | Optional adjustment parameter |
| Adjustment for large commercial land-use investments (mining, plantations, logging) | * Government or private sector records | Optional adjustment parameter |
| Adjustments for other activities which would result in large changes of the emissions from deforestation and forest degradation during the reference period (e.g. sudden in-migration as a result of armed conflict in neighboring provinces) | * Government or other records | Optional adjustment parameter |

As indicated by the table above, not all parameters may necessarily apply to all secteurs / cheferies. The Figure below presents a decision tree, which illustrates the procedure for the application of relevant parameter.

Figure 4: Decision Tree for the Consideration of Parameter



Local performance baselines are calculated as follows:

**Equation 1**

Where:

|  |  |
| --- | --- |
|  | Is the local performance baseline for spatial unit i, in tons CO2e per year |
|  | Is the fraction of the ER-Program REL applicable to spatial unit i, in tons CO2e per year |
|  | Is the adjustment to the reference period REL applicable to spatial unit i based on observed trends in deforestation and forest degradation, in tons CO2e per year |
|  | Is the adjustment to the reference period REL applicable to spatial unit i based on population growth (or increase in population density) |
|  | Is the adjustment to the reference period REL applicable to spatial unit i based on large planned infrastructure projects that are very likely to be realized during the ERPA period, in tons CO2e per year |
|  | Is the adjustment to the reference period REL applicable to spatial unit i based on large planned land use projects that are very likely to be realized during the ERPA period, in tons CO2e per year |
|  | Is the adjustment to the reference period REL applicable to spatial unit i based on other activities that would cause emissions from deforestation and forest degradation that are very likely to happen or be realized during the ERPA period, in tons CO2e per year |

### Historical Average Emission Data

The average emissions from deforestation and forest degradation over the historic reference period are the base parameter for each local performance baseline. The value is derived from the ER-Program REL (not considering the adjustment) for each secteur, chefferie.

The ER-Program REL was originally derived using sampling and will soon be revised. The revision will be based on a stratified sampling system. Whether or not the sampling data can be used directly to determine local performance baselines is yet unclear and will depend on the sampling intensity.

Since the results are expected to be published only in early 2018, we use the Global Forest Change (GFC) dataset (Hansen et al. 2013)[[2]](#footnote-2) to illustrate the proposed methodology. The GFC data v1.3 was processed to consider the forest definition of DRC in terms of canopy cover, and then deforestation over a reference period was attributed to each secteur and chefferie. This allows determining the actual historic emissions of a secteur / cheferie.

### Deforestation Trends

While the REL for the ER-Program cannot be based on trends in deforestation and forest degradation, the ER-Program may still use trends for the development of local performance baselines while ensuring that the sum of local performance baseline corresponds to the reference emission level (including the adjustment stipulated in the ERPD). Observed and clear trends in deforestation and forest degradation provide a strong argument for adjusting average historical emissions.

As the revised ER-Program REL data is not available at this stage, we use the GFC data set to illustrate the application of trend data for adjusting local performance baselines (limited to deforestation). Use of the GFC dataset for trend analysis comes with certain limitations, which we describe below.

The GFC dataset is limited to deforestation data, as such trends in forest degradation cannot be assessed.

Looking at triennial[[3]](#footnote-3) GFC estimates for the ER-Program area for the period 2004-2015 (Figure 5) seems to indicate a clear upward trend in deforestation from the year 2010-2012 onwards. However, this may not necessarily be the case as the GFC dataset is not consistent over time in terms of methods and data. More specifically, two potential biases do exist:

* GFC employs Landsat 8 OLI data from 2013 onward. Landsat 8/OLI images may be more suitable to identify conversion of forest to non-forest compared to Landsat 7/ETM+;
* GFC conducted several updates of its underlying methodology (v 1.0 – v 1.3) which increased accuracy of detecting change. GFC’s methodology update to v 1.1 already included an *improved detection of smallholder rotation agricultural clearing in dry and humid tropical forests’*. This methodology was used for reprocessing of the GFC dataset for the years 2011-2015. The data for the periods 2001-2010 however is still evaluated using the previous methodology.

Both aspects may result into an overestimation of the actual trend.

Figure 5: Triennial Deforestation Estimates for the ER-Program area (GFC version 1.3)

In order to assess trends in deforestation at the level of secteur / chefferie while minimizing biases, we use the following method:

* We apply the GFC dataset version 1.0 for the period 2004-2012 to produce triennial estimates for 2004-2006, 2007-2009 and 2010-2012. This dataset is consistent in terms of a.) data (i.e. Landsat 5 and 7 and excluding Landsat 8 imagery) and b.) the forest loss detection algorithm.
* For secteurs and chefferies that show a clear upward trend during the period 2004-2012 (each subsequent estimate is higher than the previous one), we calculate triennial estimates for the period 2004-2015.
* We then consider the following secteurs and chefferies eligible for an adjustment which meet the following requirements:
  + **Requirement 1:** The deforestation data of the secteur shall exhibit a clear upward trend for the period 2004-2012, i.e. the activity data of each period (i.e. triennial deforestation estimates) is larger than the activity data of the previous period;
  + **Requirement 2:** The activity data of the period 2004-2015 is used to derive a linear trend line. The trend line features an R² of > 0.75-

The secteur is eligible for an adjustment if and only if the secteur meets both requirements. These limitations would not apply to the data generated for the revised REL, which may ultimately be used for determining local performance baselines. However, other restrictions may apply (high cloud cover in certain years, imagery availability, insufficient sampling intensity at secteur level etc.). As such a specific method to determine trends at secteur / chefferie or concession level may have to be developed once the new activity data is ready.

### Trend of Population Density

Population growth is considered as a key parameter fueling deforestation and forest degradation and hence was considered as input for the analysis. However, as secteurs have different spatial extends, we considered the trend of the population density (i.e. the increase or decrease of habitants per hectare) as parameter.

After evaluating different data sources[[4]](#footnote-4) providing spatial information on population density, it was decided to apply the dataset of AfriPop (2017)[[5]](#footnote-5). This is mainly due to the fact that the previous datasets feature a spatial resolution, which is inapt for the development of a risk map, i.e. data is presented on the level of districts or province but not on the level of secteurs. AfriPop however offers data with resolution of approx. 100m x 100m.

AfriPop is based on an algorithm, which combines contemporary population count data with detailed satellite-derived settlement extents to map population distribution. This considers substantial heterogeneity in settlement patterns, population concentration and spatial accessibility (Linard et al. 2012)[[6]](#footnote-6)

AfriPop estimates the population for the entire Democratic Republic of Congo for the year 2010 and 2015, which allowed to estimate spatially explicit growth rates at the level of secteur / chefferie. Rates range between 1.85% p.a. and 3.71% p.a. with a mean of 2.10%. These estimates largely correspond to other growth estimates such as INS, 2015 (min: 2.97%, max: 3.79%, average: 3.05% p.a.) and Ministère de l'Intérieur, (min: 2.72%, max: 7.60%, average: 3.61%).

Using the secteur-specific population data and growth rates, we estimated the population development for the period 2004 to 2015. The total population, i.e. sum over all 19 secteurs and chefferies increases from 1.34 million people in 2004 to 1.72 million people in 2015 (please refer to Annex I, Table 13).

Subsequently, we calculated the population density per secteur, as persons per ha (i.e. forest and non-forest) and its development for the period 2004 to 2015 using linear regression analysis. The results are presented in Annex 1, Table 14 and Figure 13). The resulting linear regression functions were used to extrapolate the population density for each secteur and chefferie for the ERPA period (2018 to 2022).

This data finally allowed to assess whether the trend of the population density confirms the deforestation trends:

* **Requirement 3**: A secteur / cheferie is eligible for a trend based adjustment if and only if the deforestation trend is confirmed by the trend of population data over the Emission Reduction Purchase Agreement (ERPA) period (i.e. 2018 – 2022).

### Forest Accessibility as possible Constraint

Any reference emission level or baseline presumes that there are sufficient forest resources available for deforestation or forest degradation during the baseline period. This is important to consider, in particular when using trend-based baselines, which result in higher deforestation estimates compared to historical averages. While Mai-Ndombe province still contains large amounts of forests (approx. 10.6 million ha), not necessarily all of them are accessible for use.

We define accessibility for the purpose of deforestation as "all forest areas that can be accessed within five hours travelling time from the nearest settlement". This is based on the assumptions that most deforestation is caused by local farmers and that they would travel up to five hours (one way) to grow crops or produce charcoal. This hypothesis is conservative compared to other studies in DRC and other central African countries.

To estimate the amount of accessible forest, we rely on a Congo Basin accessibility map provided by WWF[[7]](#footnote-7). Accessibility was determined by path distance from populated areas using a cost surface raster, which was developed by assigning travelling time to roads, rivers and land cover (cross-country). Rivers were assigned speeds and time to cross, based on the number of upstream cells. Maximum speed was determined from experience of traveling on the Congo River and from estimates suggested by tourist and shipping agencies (see Table 4).

Table 4: Determination of Speed for travelling by Boat

|  |  |  |
| --- | --- | --- |
| # of upstream cells | Speed (km/hr) | Time to cross |
| 0-250 | 1 | 6 |
| 250-5,000 | 2 | 3 |
| 5,000-10,000 | 5 | 1.2 |
| 10,000-75,000 | 10 | 0.6 |
| >75,000 | 15 | 0.4 |

The assigned travelling time for different road and land cover types (cross country) is provided in Table 5.

Table 5: Determination of Speed for travelling by Foot

|  |  |  |
| --- | --- | --- |
| Class | Speed (in km/h) | Time to cross 100m cell (in minutes) |
| Dense evergreen | 2.0 | 3.0 |
| Dense evergreen and semi-deciduous | 2.0 | 3.0 |
| Dense semi-deciduous | 2.0 | 3.0 |
| Semi-deciduous | 2.0 | 3.0 |
| Degraded and fragmented | 2.5 | 2.4 |
| Dense semi-deciduous | 2.0 | 3.0 |
| Dense semi-deciduous | 2.0 | 3.0 |
| Secondary semi-deciduous | 2.5 | 2.4 |
| Degraded and fragmented | 2.5 | 2.4 |
| Dense evergreen altitude | 2.0 | 3.0 |
| Seasonal flood pulse | 0.8 | 7.5 |
| Stable water level | 0.3 | 20.0 |
| Seasonal short pulse | 1.0 | 6.0 |
| Non flooded forests | 2.0 | 3.0 |
| Mangroves | 0.3 | 20.0 |
| Marrantacea | 1.5 | 4.0 |
| Non forest | 4.0 | 1.5 |
| Woodlands | 3.0 | 2.0 |
| Aquatic grassland | 0.3 | 20.0 |
| Swamp grassland | 0.3 | 20.0 |
| Water | 10.0 | 0.6 |
| Urban/bare area (from JRC settlements) | 6 | 1 |
| Roads | 12 | 0.50 |
| Logging Roads | 7.5 | 0.8 |

The Tobler hiking function (from 0-5km/hr which is the highest speed for flat terrain) was converted to time to travel across a 100m cell and rescaled from 1-5 to function as an impedance layer – where crossing an area of high slope is considered 5x more difficult than flat terrain (1 x speed identified by experts). The Tobler impedance was multiplied by the land cover time, and rivers and roads to produce a final cost layer (units of time \*10 for quicker calculations). The ArcGIS Path Distance function was used to estimate accumulative cost, with the SRTM data as a parameter to estimate actual surface distances.

The deforestation trend analysis indicates how many hectares forest would be lost during the ERPA period 2018 – 2022. The forest accessibility analysis allows to evaluate/validate that these hectares of forest lost are a.) actually available and b.) accessible within five hours form the closest village.

### Other possible Adjustment Parameters

There is the possibility that deforestation and forest degradation during the ER-Program Period could increase due to e.g. large infrastructure or land use projects being implemented, such as e.g. roads, hydropower, mining, tree plantations. Further, considering the potential for conflicts in DRC, immigration from neighboring provinces into selected secteurs or chefferies could also be possible. This would neither be reflected in the historical average nor necessarily in the trend, if deforestation and forest degradation as a result of such events did not occur during the reference period (or the period covered by the trend analysis).

While it is difficult to determine such adjustments at the provincial level, it could be easier to determine them for selected secteurs and chefferies through interviews with local administrations and major businesses in the area.

At this point in time, such adjustment factors could not be determined. We gathered and analyzed data from ‘Cellue Infrastructure’ (Road Construction agency), the Ministry of Agriculture and shape files of existing or planned mining areas. However, we did not find any evidence for planned infrastructure development or other large scale projects in the ER-Program area for the ERPA period. This hypothesis was also discussed and confirmed by stakeholders in a workshop on the 4th August 2017 (please refer to Annex III). Consequently, no further parameters for the development of a trend were considered at this stage.

## Methodology for Calculating Local Performance Baselines

The calculation of local performance baseline provided here is based on GFC data and may be updated once the new ERP’s reference emission level is available. Based on GFC data, local performance baselines were calculated as outlined below:

1. Calculation of activity data by secteur / chefferie over the reference period (2004-2014) based on GFC data v1.3. Following the Methodological Framework (MF) of the Forest Climate Partnership Facility (FCPF), the average annual activity data over the reference period were used as the activity data for the ER-Program period.

Compared to the average deforestation data over the total province, this provides detailed information on the historic emissions for each single secteur and serves as input for the further trend analysis.

Since the sum of all local performance baselines must correspond to the current REL and adjustment, we convert the activity data of each secteur / chefferie to an unadjusted local performance baseline, as follows:

**Equation 2**

Where

|  |  |
| --- | --- |
|  | Is the unadjusted local performance baseline for secteur / chefferie i, in tons CO2e per year |
|  | Is the average annual activity data over the reference period for secteur / chefferie i, in ha per year |
|  | Is the total average annual activity data over the reference period of all secteurs / chefferies of the ER-Program area, in ha per year |
|  | Is the non-adjusted REL of the ER-Program, in tons CO2e per year |

This results in an estimate of the emissions for one secteur based on the actual deforestation occurred during the historic reference period.

1. Where secteurs / chefferies were found to be eligible for an adjustment, activity data for the program period was calculated using the linear regression model fitted to the triennial estimates from 2004-2015 for GFC data v1.3.

The eligibility for the consideration of an increase of future emissions / deforestation trends is bound to having a reliable trend (please refer to Requirement 1 and Requirement 2 in section 2.2.2).

**Equation 3**

Where

|  |  |
| --- | --- |
|  | Is the adjusted local performance baseline for secteur / chefferie i, in tons CO2e per year |
|  | Is the adjusted annual activity data for the program period for secteur / chefferie i, in ha per year |
|  | Is the average annual activity data over the reference period for secteur / chefferie i, in ha per year |
|  | Is the unadjusted local performance baseline for secteur / chefferie i, in tons CO2e per year |

This results in an estimate of one secteur based on a forecast of deforestation occurring during the period 2018 – 2022 being the ERPA period.

1. If the sum of all secteur / chefferie adjustments exceed the adjustment of the ER-Program REL, then the sum of all local performance baselines would also exceed the ER-Program REL. In such **a**  case, local performance baselines would be downscaled
   1. using a ratio of the total adjustment as defined in the ERPD and
   2. using a ratio of a caped adjustment. As this cap exceeds the adjustment determined in the ERPD, the baseline emissions allocated under the CAP must be deducted from those secteurs, which are not eligible for an adjustment:

**Equation 4**

Where

|  |  |
| --- | --- |
|  | Is the adjustment as determined in the ERPD |
|  | Is a cap to the increase of activity data |

Once the new activity data is available, local performance baselines should be calculated based on the activity data for each secteur / chefferie and multiplied by the corresponding ER-Program emission factors.

# Calculating Local Performance Baselines

## Determination of the actual historic Emission Level per Secteur

The ER Program’s REL offers information of the total deforestation and related emissions over the historic reference period for the whole province. It assumes that in each secteur of the province, the specific emissions amount to 3.96tCO2 per hectare and per year. The first column (‘Initial REL’) of the table below presents the average value broken down to the area of a secteur / cheferie.

The column ‘actual annual activity data’ indicates the actual areas deforested area (i.e. net deforestation) per secteur / cheferie. These values differ substantially from average values, as the districts in the Southwest feature high population density and proximity to Kinshasa and hence experienced forest area losses during the reference period. Other secteurs in the north and east are located in remote areas and have experienced lower historic deforestation.

Table 6: Determination of the actual historic Emission Level per Secteur

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Territoire | Initial REL (in tCO2/yr) | Actual annual activity data (in ha) | Fraction of total activity data (in %) | Actual REL (in tCO2/yr) | Increase / Decrease of initial REL (in %) |
|
| **Basengele** | 2,881,292 | 3,120 | 9.3% | 3,912,545 | 136% |
| **Bolia** | 1,595,527 | 1,461 | 4.4% | 1,832,756 | 115% |
| **Inongo** | 3,549,231 | 1,903 | 5.7% | 2,386,756 | 67% |
| **Beronge** | 1,791,391 | 468 | 1.4% | 586,570 | 33% |
| **Lutoy** | 1,843,001 | 1,263 | 3.8% | 1,583,431 | 86% |
| **Pendjwa** | 1,118,717 | 1,262 | 3.8% | 1,583,177 | 142% |
| **Entre Lukenie** | 2,839,046 | 1,109 | 3.3% | 1,391,265 | 49% |
| **Kangara** | 3,649,205 | 1,708 | 5.1% | 2,142,314 | 59% |
| **Lokolama** | 6,605,084 | 746 | 2.2% | 936,119 | 14% |
| **Lukenie** | 2,929,076 | 1,399 | 4.2% | 1,754,926 | 60% |
| **Badia** | 843,571 | 899 | 2.7% | 1,127,108 | 134% |
| **Batere** | 732,312 | 998 | 3.0% | 1,251,393 | 171% |
| **Kemba** | 696,781 | 1,034 | 3.1% | 1,296,179 | 186% |
| **Luabu** | 1,435,856 | 1,670 | 5.0% | 2,094,156 | 146% |
| **Mfimi** | 1,422,051 | 1,992 | 5.9% | 2,498,158 | 176% |
| **Bateke Nord** | 1,147,499 | 1,926 | 5.7% | 2,415,103 | 210% |
| **Bateke Sud** | 3,553,579 | 7,441 | 22.2% | 9,331,525 | 263% |
| **Baboma Nord** | 3,105,871 | 2,603 | 7.8% | 3,264,100 | 105% |
| **Mongama** | 325,977 | 540 | 1.6% | 677,486 | 208% |
|  | **42,065,067** | **33,544** | **100.0%** | **42,065,067** |  |

Using the actual activity data allows to calculate **eee**e the actual REL for each secteur. The column at the left indicates how much the actual REL differs from the average REL for a specific secteur.

## Secteurs eligible for Adjustment and Determination of their Trend

While the section above determined the actual historic emission of each secteur, we now determine which secteurs are eligible for a trend-based adjustment. If so, the trend was considered to quantify the future deforestation during the ERPA Period.

Following the methodology discussed in Section 2, we determined a) the eligibility for an upward adjustment and b) the trend itself. The data per secteur is provided in Annex II. Based on the results, the following secteurs and chefferies were found to be eligible for an upward adjustment:

1. Bolia,
2. Inongo,
3. Beronge,
4. Lutoy,
5. Entre Lukenie-Lokoro Nkaw,
6. Lokolama,
7. Lukenie, and
8. Mfimi.
9. Baboma Nord

These nine secteurs /cheferies account for 38.6% of the total activity data / emissions based on the actual REL (see Table 7). The trend of only those nine secteurs was found to meet requirements 1-3 and hence was considered to be reliable.

Table 7: Secteurs and Chefferies elegible for an Adjustment (highlighted in bold font)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Input | | Adjustment based on Activity Data Trend | | |
| Secteur / Cheferie | Actual REL (in tCO2/yr) | Eligible for upward adjustment | Increase in activity data (in %) | Upward adjustment [tCO2] |
| **Basengele** | 3,912,545 | No | 0% | 0 |
| **Bolia** | **1,832,756** | **Yes** | **191%** | 3,497,957 |
| **Inongo** | **2,386,756** | **Yes** | **140%** | 3,340,903 |
| **Beronge** | **586,570** | **Yes** | **253%** | 1,486,232 |
| **Lutoy** | **1,583,431** | **Yes** | **165%** | 2,606,261 |
| **Pendjwa** | 1,583,177 | No | 0% | 0 |
| **Entre Lukenie** | **1,391,265** | **Yes** | **191%** | 2,652,720 |
| **Kangara** | 2,142,314 | No | 0% | 0 |
| **Lokolama** | **936,119** | **Yes** | **197%** | 1,841,370 |
| **Lukenie** | **1,754,926** | **Yes** | **189%** | 3,311,311 |
| **Badia** | 1,127,108 | No | 0% | 0 |
| **Batere** | 1,251,393 | No | 0% | 0 |
| **Kemba** | 1,296,179 | No | 0% | 0 |
| **Luabu** | 2,094,156 | No | 0% | 0 |
| **Mfimi** | **2,498,158** | **Yes** | **159%** | 3,976,398 |
| **Bateke Nord** | 2,415,103 | No | 0% | 0 |
| **Bateke Sud** | 9,331,525 | No | 0% | 0 |
| **Baboma Nord** | **3,264,100** | **Yes** | **121%** | 3,942,657 |
| **Mongama** | 677,486 | No | 0% | 0 |
|  | **42,065,067** |  |  | **26,655,809** |

Interestingly the secteurs exhibiting a reliable trend are located in the more remote and inaccessible areas of Mai Ndombe Province. Please note (refer to section 2.2.2) that these secteurs being eligible for an adjustment does not per se imply that their trend is higher than the trend of in-eligible secteurs, it merely implies that the trend of areas deforested is more reliable.

This aspect may be explained by the following hypothesis:

* Deforestation in the Mai Ndombe province is mainly fueled by a) producing agricultural products and charcoal for markets in Kinshasa and b) by population density (cp. ER Project Document).
* Agricultural products and specifically charcoal are subject to price fluctuations leading to fluctuation of deforestation pressure. Population growth on the other hand is a more stable driver for deforestation.
* Deforestation in those areas, which are too remote to ship products to Kinshasa are mainly driven by population development. This results in a steady and reliable trend of deforestation over time (new agricultural areas required for subsistence farming).
* Those secteurs on the other hand, that are located in proximity to Kinshasa, produce for supplying markets in Kinshasa and hence are subject to price fluctuations and as a consequence, fluctuating deforestation pressure.

The sectors in proximity to Kinshasa typically exhibit an unreliable deforestation trend. As future deforestation cannot be properly forecasted based on historic emissions, these sectors are not allocated with an upward adjustment.

For those secteurs / cheferies that exhibit a reliable trend, this trend was considered for estimating the forest areas lost during the period 2018 – 2022 following the methodology laid out in Section 2.2.2. As the secteur is eligible, this data was used to derive the trend for calculating the deforestation during the period 2018 – 2022.

Figure 6 provides an example of the trend analysis for the secteur Entre Lukenie-Lokoro Nkaw. The left figure (orange) is based on GFC v1.0 covering the years for 2004-2012. These datasets were used to determine whether the secteur is eligible for a trend-based adjustment. The forest area loss of each period is larger than in the period before (requirement 1 is met) and the R2 exceeds the threshold of 0.75 (requirement 2 is met). The figure to the right is based on GFC v1.3 and shows areas deforested for the period 2004-2015 (red). As the secteur is eligible, this data was used to derive the trend for calculating the deforestation during the period 2018 – 2022.

Figure 6: Triennial Deforestation Estimates and Trend based on GFC v1.0 and GFC v1.3

|  |  |
| --- | --- |
|  |  |

## Evaluation of the Development of Population Density

Table 8 presents the projections of population density for those secteurs and chefferies, which are determined to be eligible for an adjustment.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Table 8: Development of the Population Density during ERPA Period | | | | | | | | | |
| **Year** | **Bolia** | **Inongo** | **Beronge** | **Lutoy** | **Entre Luke** | **Lokolama** | **Lukenie** | **Mfimi** | **Baboma Nord** |
| 2016 | 0.111 | 0.160 | 0.135 | 0.129 | 0.042 | 0.037 | 0.037 | 0.193 | 0.108 |
| 2017 | 0.112 | 0.164 | 0.138 | 0.131 | 0.043 | 0.038 | 0.037 | 0.196 | 0.111 |
| 2018 | 0.114 | 0.167 | 0.140 | 0.133 | 0.043 | 0.038 | 0.038 | 0.199 | 0.114 |
| 2019 | 0.116 | 0.171 | 0.142 | 0.135 | 0.044 | 0.039 | 0.038 | 0.202 | 0.117 |
| 2020 | 0.118 | 0.174 | 0.144 | 0.137 | 0.045 | 0.040 | 0.039 | 0.205 | 0.119 |
| 2021 | 0.120 | 0.178 | 0.146 | 0.139 | 0.045 | 0.040 | 0.040 | 0.209 | 0.122 |
| 2022 | 0.121 | 0.182 | 0.149 | 0.141 | 0.046 | 0.041 | 0.040 | 0.212 | 0.108 |

When comparing the population density with the measured activity data of the reference period, there is a strong correlation for all eight selected secteurs / chefferies (R² min: 0.88, max: 0.95, average 0.92). The t-tests demonstrate that the correlations are significant for all secteurs and chefferies (p < 0.05).

This is not surprising, as smallholder-activities such as shifting cultivation was identified as one of the principal drivers of deforestation and forest degradation in the ER PD. Population growth exacerbates this problem.

Following the approach laid out in Chapter 2, these findings support the case for an adjustment for the nine secteurs and chefferies.

## Determination of accessible Forest Areas

Our analysis with regard to forest accessibility did not show any restrictions in terms of deforestation for any secteur or chefferie during the ERPA period. Specifically:

* The trends determined in Section 3.3 quantify the forested areas to be deforested during the period 2018 – 2022, per secteur / cheferie;
* The analysis of determines how many hectares forested areas are accessible within 5 hours from the closest village.

For each secteur, the analysis shows that area to be deforested during 2018-22 is smaller than the available forested areas accessible. Consequently, this analysis does not limit the trend of any secteur / village.

While Mai-Ndombe is a deeply rural province, it is rather densely settled. The accessibility map from WWF suggests that any place in Mai-Ndombe can be reached within 8 hours from the nearest settlement.

|  |
| --- |
| Figure 7: Patchy small scale Deforestation in remote Forest Areas |
|  |

It is also interesting to observe that deforestation, while concentrated around or near settlements, roads and rivers, is not limited to it. Even large blocks of seemingly inaccessible forest areas (no access by road, logging road or river) often show scattered patches of deforestation as far as 20 km or more from the next settlement (see Figure 7). This could be the result of errors or gaps in data (e.g. wrong classification or logging road data not complete) or local people are more mobile when it comes to deforestation than initially assumed.

## Adjusted local Performance Baselines

|  |  |
| --- | --- |
| Table 9: Input Data from EPRD | |
| **Item** | **Emissions [tCO2]** |
| Unadjusted REL | 42,065,067 |
| Adjustment | 5,611,789 |
| Total REL | 47,676,856 |

In a final step, we determine the localized performance baselines; Table 12 (page 29) presents the results. The left column labeled as ‘Input’ show all secteurs and for each secteur the average annual activity data, based on GFC v 1.3 data over the reference period followed by the unadjusted REL. The activity data originating from GFC was normalized using the results of the ERPD (compare Table 9), which ensures that the sum of emissions from local performance baselines corresponds with the final values of the approved ERPD. The next column indicates whether the secteur is eligible for an adjustment (yes/no) as determined in Section 3.1 and Annex II.

As discussed, we determine the average annual activity data for the ERPA period (i.e. 2018 – 2022) using the trends derived from:

* GFC v1.0 data for the period 2004 – 2012 (i.e. excluding Landsat 8 OLI data),
* GFC v 1.3 methods for the period 2004 – 2012) (i.e. improved algorithm but again excluding Landsat 8 OLI imagery), and
* GFC v 1.3 methods for the period 2004 – 2015 (i.e. improved algorithm and including Landsat 8 OLI imagery).

The latter was used to determine the overall adjustment, as it is deemed the most accurate estimate of activity data.

|  |  |
| --- | --- |
| Table 10: Parameter for Allocation of Adjustment | |
| **Item** | **Emissions (in tCO2/yr)** |
| Needed adjustment | 22,713,152 |
| Available adjustment | 5,611,789 |
| Balance | -17,101,363 |

In a final series of work steps, we determine the allocation of adjustment as granted in the ERPD and determine the upward adjustment of eligible secteurs as well as the downward adjustment of secteurs not eligible for an adjustment.

Considering the activity data trends of the eligible secteurs, the total needed adjustment amounts to 22.7 million tons/year. In a next step, we allocate the adjustment as determined in the ERPD (i.e. 5.61 million tCO2/year) to the eligible secteurs. This was done pro rata, i.e. using the ratio of activity data of each secteur compared to the sum of activity data of all secteurs eligible for adjustment. As a consequence, there is a balance of 17.1 million tCO2/year. As the available adjustment is already allocated, any increase of baseline emissions in one sector must lead to the reduction of baseline emissions in another secteur.

Now, increasing the baseline emissions of eligible secteurs by the remaining 17.1 million tCO2/yr would lead to decreasing the baseline emissions of ineligible also by 17.1%. In this case however, the ineligible secteurs / cheferies would assume 100% of the performance burden which is deemed to be inequitable.

|  |  |  |
| --- | --- | --- |
| Table 11: Determination of the Cap | | |
| **Item** | **Burden Share  (in %)** | **Burden (in tCO2/yr)** |
| Eligible Secteurs / Upward | 71% | 14,985,917 |
| Downward | 29% | - 6,058,103 |

Consequently, as stipulated by Equation 4, we capped the adjustment considering a burden sharing between eligible and ineligible secteurs. The burden sharing was done pro rata: based on the ratio of the activity data of eligible secteurs compared to the total activity data.

The eligible secteurs account for 71% of the activity data corresponding to 14.99 million tCO2/yr. On the other hand, the ineligible secteurs account for 29% of the activity data, which corresponds to 6.01 million tCO2/yr.

Following this burden sharing approach:

* the baseline emissions of eligible secteurs are increased by i) the available adjustment and ii) 29% of the increase of baseline emissions needed to meet their forecasted emission level over the period 2018 – 2022 (i.e. 6.06 million tCO2/yr);
* The baseline emissions of ineligible secteurs was reduced by the same 6.06 million tCO2/yr ensuring compliance with the FCPF Methodological Framework.

This approach results in the final performance baselines, which are increased for eligible secteurs and reduced for ineligible secteurs. The results are presented in Table 12.

Table 12: Determination of the Adjustment per Secteur

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Input Data | | | Adjustment based on Activity Data Trend | | | Allocation of Adjustments and Calculation of LPBs | | | |
| Secteur / Cheferie | Initial REL (in tCO2/yr) | Actual REL (in tCO2/yr) | Eligible for upward adjustment | Trend-based activity data (in ha/yr) | Upward adjustment (in tCO2/yr) | Allocation of ERPD Adjustment (in tCO2/yr) | Allocation of Upward Adjustment (in tCO2/yr) | Allocation of Downward Adjustment (in tCO2/yr) | Local Performance Baseline  (in tCO2/yr) |
| **Basengele** | 2,881,292 | 3,912,545 | No | 3,120 | 0 | - | - | - 917,603 | 2,994,941.83 |
| **Bolia** | 1,595,527 | 1,832,756 | Yes | 4,251 | 3,497,957 | 736,417 | 794,985.63 | - | 3,364,159 |
| **Inongo** | 3,549,231 | 2,386,756 | Yes | 4,567 | 3,340,903 | 703,353 | 759,292 | - | 3,849,401 |
| **Beronge** | 1,791,391 | 586,570 | Yes | 1,653 | 1,486,232 | 312,893 | 337,778 | - | 1,237,242 |
| **Lutoy** | 1,843,001 | 1,583,431 | Yes | 3,341 | 2,606,261 | 548,690 | 592,329 | - | 2,724,450 |
| **Pendjwa** | 1,118,717 | 1,583,177 | No | 1,262 | 0 | - | - | - 371,300 | 1,211,876 |
| **Entre Lukenie** | 2,839,046 | 1,391,265 | Yes | 3,225 | 2,652,720 | 558,471 | 602,887 | - | 2,552,624 |
| **Kangara** | 3,649,205 | 2,142,314 | No | 1,708 | 0 | - | - | - 502,434 | 1,639,880 |
| **Lokolama** | 6,605,084 | 936,119 | Yes | 2,215 | 1,841,370 | 387,660 | 418,491 | - | 1,742,269 |
| **Lukenie** | 2,929,076 | 1,754,926 | Yes | 4,040 | 3,311,311 | 697,123 | 752,566 | - | 3,204,615 |
| **Badia** | 843,571 | 1,127,108 | No | 899 | 0 | - | - | - 264,339 | 862,769 |
| **Batere** | 732,312 | 1,251,393 | No | 998 | 0 | - | - | - 293,487 | 957,906 |
| **Kemba** | 696,781 | 1,296,179 | No | 1,034 | 0 | - | - | - 303,991 | 992,188 |
| **Luabu** | 1,435,856 | 2,094,156 | No | 1,670 | 0 | - | - | - 491,139 | 1,603,016 |
| **Mfimi** | 1,422,051 | 2,498,158 | Yes | 5,163 | 3,976,398 | 837,142 | 903,722 | - | 4,239,022 |
| **Bateke Nord** | 1,147,499 | 2,415,103 | No | 1,926 | 0 | - | - | - 566,410 | 1,848,692 |
| **Bateke Sud** | 3,553,579 | 9,331,525 | No | 7,441 | 0 | - | - | - 2,188,509 | 7,143,017 |
| **Baboma Nord** | 3,105,871 | 3,264,100 | Yes | 5,747 | 3,942,657 | 830,039 | 896,053 | - | 4,990,192 |
| **Mongama** | 325,977 | 677,486 | No | 540 | 0 | - | - | - 158,890 | 518,596 |
|  | **42,065,067** | **42,065,067** |  | **54,800** | **26,655,809** | **5,611,789** | **6,058,103** | **- 6,058,103** | **47,676,856** |

Figure 8 and Figure 9 illustrate the results of the proposed local performance baseline algorithm. Figure 8 presents the LPB emission values per secteur / cheferie. The results indicate that Bateke Sud, Bamboma Nord and Mfimi are the most important secteurs for addressing emissions from deforestation. When considering the emissions per secteur, please note that the secteurs have different forest areas. Bateke Sud is among the secteurs with the largest forest areas (897124ha) while Mongama is among the smallest secteurs (82,295ha). Secteurs with large emission levels may require over-proportional investments into mitigation activities (e.g. investments into agroforestry, funding of assisted natural regeneration etc.) compared to other secteurs.

Figure 9 presents the specific emissions per secteur / cheferie, i.e. emissions per ha of forest. This gives an estimate for the future emissions per hectare of forest. The results indicate that Mfimi, Bolia and Bateke Sud need to be offered highest performance based payments in forest conservation contracts.

Figure 8: Local Performance Baselines - Future Emissions per Secteur

Figure 9: Local Performance Baselines – Future Emissions per Hectare

Figure 10 below illustrates the overall results by comparing the original average emission level (based on the REL of the ERPD) with the final results of the localized performance baselines after applying the burden sharing approach to cap the trend. The maximum increase of a sector’s emission level amounts to 205%. Secteurs with an increase between 205% and 137% are indicated with an intense red; secteurs with an increase between 137% and 68% are colored in orange, the range of 68% to 0% is represented by yellow. The same approach was applied for secteurs where LPB result into a decrease compared to the average emissions. These secteurs are indicated in variations of green. Consequently, red represents areas with high risk of future deforestation / high future emission levels while green represents areas with below average risk of future deforestation / low future emission levels.

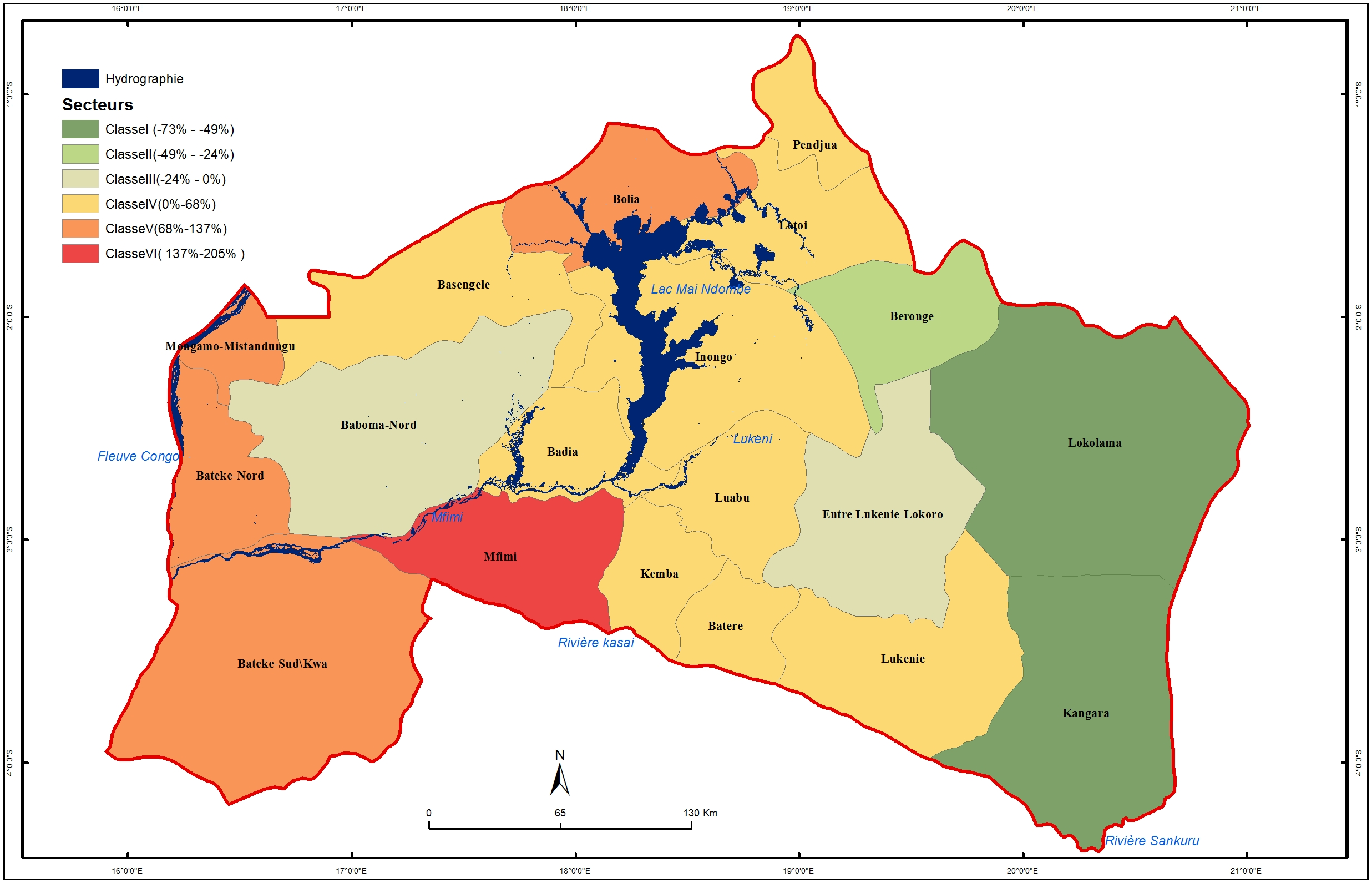
The following approach was chosen to determine the future deforestation risk of each individual secteur:

* Calculate historic deforestation data,
* Trend analysis and modeling of future deforestation data,
* Assessment of reliability of the trend modeling through statistical analysis;

The following data / parameter were used to conduct a quality control analysis of the risk mapping exercise:

* Population growth and
* Forest area availability and forest accessibility.

Figure 10: Deforestation Risk Map



This approach leads to differentiated localized performance baselines. As discussed, some secteurs exhibit increasing trend (please refer e.g. to Figure 11). Others exhibit a decreasing trend (please refer to Figure 12).

Figure 11: Deforested Areas in Bolia (actual, average and trend)

Figure 12: Deforested Areas in Mongoma (actual, average and trend)

The blue line illustrates actual deforestation during the period 2004-2014, the blue dotted line refers to a linear interpolation between the end of the reference period and the beginning of the trend (which was derived from data 2004-2015). The red line refers to the average emissions, as determined by the ER Program Document and is the baseline against which secteurs and agents engaging in mitigation activities in these secteurs would have to perform in absence of LPBs.

These two examples exemplify the importance of the local performance baselines. In absence of LPBs:

* In the first example, agents combating deforestation in Bolia would be credited against the red dotted line. These agents hey would have to reduce forest area loss from 4,684 ha/yr (average of the deforestation forecast 2018-2022, blue line) to 1,403 ha/yr (average of the MNDP, 2004-2014, red line) before generating any emission reduction.
* In analogy agents living in Mongoma face a forecast of forest area losses of 184ha/yr (blue dotted line), while their historic average amounts to 361 ha/yr (average of the MNDP, 2004-2014, red line). As a consequence, agents may significantly increase their deforestation activities while still receiving payments.

**Consequently, Local Performance Baselines offer the basis for more equitable payments for emission reductions while enhancing the overall efficiency of the ER Program and increasing its chance for performance.**

# Conclusions & Recommendations

The results of our analysis show that some secteurs exhibit a strong increasing deforestation trend, while others show no trend or a decreasing trend. Consequently, we see a need for local performance baselines in order to

1. Increase the effectiveness of ER Program investments into priority areas (e.g. for alternative livelihoods and conservation payments) and
2. Allow local mitigation activities to perform against a local baseline offering fair payments for actual efforts / avoiding payments for windfall effects.

While we could not use the actual REL data of the ER-Program (as based on sampling and will be updated), our analysis of activity data indicates that deforestation in several secteurs and chefferies within the ER-Program shows a clear and reliable upward trend. As such, the simple application of the ER-Program deforestation rate to each sector, chefferie or other spatial unit would not be just and could make it impossible for those secteurs / chefferies with increasing deforestation levels to perform. In reverse, secteurs / chefferies with decreasing levels of deforestation would benefit from a "one size fits all" approach. The aim of establishing local performance baselines must thus be to redistribute the overall reference emission level as realistically and thus fair as possible among the various secteurs and chefferies.

Another conclusion from our analysis is that the sum of all local performance baselines could well exceed the ER-Program REL (including the adjustment).

The data and methods used here are not based on the updated REL and hence have to be considered to be preliminary. However, the available data indicates an overall strong increase of deforestation and related emissions exceeding the adjustment. In this case, the consideration of a strong trend of one secteur comes on the expenses of other secteurs.

Such a situation may occur if the REL including the adjustment does not represent the future emissions over the ERPA period. The reason of this potential issue may lie in the Methodological Framework of the FCPF which prescribes the use of a ‘historical average REL’. If the historic REL plus the adjustment do not allow for a realistically represent future emissions, then both the ER-Program as a whole, but also local actors with local performance baselines need to over-perform in order generate emission reductions. We see several options to address such a possible situation:

**1. Recalculation and negotiation of the adjustment:** Calculation of local performance baselines can be considered as a finer scale analysis of deforestation (and degradation). As such, a good local deforestation analysis may be more accurate than a larger scale analysis. The Mai Ndombe ER-Program already receives the maximum possible adjustment following the currently valid FCPF methodology. However, if this adjustment is not enough to set a realistic REL, then a renegotiation of the adjustment may have to be considered.

**2. Establishment of a Burden-sharing Process:** If the ER-Program REL cannot be changed, then the gap between the "real" REL and the "set" REL has to be closed. This means that the missing baseline emissions need to be redistributed among the secteurs, chefferies and private concession holders. We see different options for this:

**a. Equal burden sharing:** The local performance baseline of each secteur / chefferie is reduced in relation to its share of the total REL (as in our example). For example, a secteur, which holds 10% of the total ER-Program REL, would also take a reduction of 10% of the missing baseline emissions.

**b. Favor active secteurs and chefferies:** It may be unlikely that the ER-Program will carry out mitigation activities in each secteur and chefferie with the same intensity. As such, the ER-Program could attribute all secteurs and chefferies where more mitigation activities take place a realistic as possible local performance baseline. This would ensure that activities do not need to over-perform in order to gain emission reductions. The difference between the sum of all local performance baselines and the ER-Program REL would then be deducted from the local performance baselines of those secteurs and chefferies, where no mitigation activities take place.).

However, either option does not offer a final solution for an increasing trend which exceeds the historic REL plus the adjustment. In case of a) activities in each secteur or chefferie need to over-perform in order to gain emission reductions. In case of b) activities in active secteurs or chefferies may perform against realistic baselines; yet, the underperformance in "passive" secteurs would need to be compensated by the ER Program and resulting into reduced benefits for performing agents.

The situation described in our illustrative example may or may not come to bear. Hence, as first step, it is thus recommend to update local performance baselines according to this methodological approach using the new activity data, once it becomes available.

# Annex I: Population Data and underlying Trends

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Table 13: Forecast Deforestation based on Increase of Population Density | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|  | Bolia | | | Inongo | | | | Beronge | | | Lutoy | | | | Entre Luke | | Lokolama | | | | Lukenie | | Mfimi | | |  | |
| Year | Density (c/ha) | Def. (ha/yr) | | Density (c/ha) | | Def. (ha/yr) | | Density (c/ha) | | Def. (ha/yr) | Density (c/ha) | | Def. (ha/yr) | | Density (in c/ha) | Def. (ha/yr) | Density (c/ha) | | Def. (ha/yr) | | Density (c/ha) | Def. (ha/yr) | Density (c/ha) | | Def. (ha/yr) | Average Density | Total Def. |
| 2004 | 0.089 | 1,877 | | 0.117 | | 3,471 | | 0.109 | | 587 | 0.104 | | 2,355 | | 0.034 | 1,407 | 0.030 | | 1,189 | | 0.029 | 1,877 | 0.156 | | 3,805 | 0.084 | 16,568 |
| 2005 | 0.091 | 1,877 | | 0.121 | | 3,471 | | 0.111 | | 587 | 0.106 | | 2,355 | | 0.034 | 1,407 | 0.031 | | 1,189 | | 0.030 | 1,877 | 0.159 | | 3,805 | 0.085 | 16,568 |
| 2006 | 0.093 | 1,877 | | 0.124 | | 3,471 | | 0.113 | | 587 | 0.108 | | 2,355 | | 0.035 | 1,407 | 0.031 | | 1,189 | | 0.031 | 1,877 | 0.162 | | 3,805 | 0.087 | 16,568 |
| 2007 | 0.094 | 3,405 | | 0.127 | | 4,923 | | 0.115 | | 870 | 0.110 | | 3,158 | | 0.035 | 2,393 | 0.032 | | 1,485 | | 0.031 | 2,802 | 0.165 | | 4,734 | 0.089 | 23,770 |
| 2008 | 0.096 | 3,405 | | 0.131 | | 4,923 | | 0.118 | | 870 | 0.112 | | 3,158 | | 0.036 | 2,393 | 0.032 | | 1,485 | | 0.032 | 2,802 | 0.168 | | 4,734 | 0.090 | 23,770 |
| 2009 | 0.098 | 3,405 | | 0.134 | | 4,923 | | 0.120 | | 870 | 0.114 | | 3,158 | | 0.037 | 2,393 | 0.033 | | 1,485 | | 0.032 | 2,802 | 0.171 | | 4,734 | 0.092 | 23,770 |
| 2010 | 0.100 | 4,302 | | 0.138 | | 6,922 | | 0.122 | | 1,826 | 0.116 | | 4,684 | | 0.037 | 4,700 | 0.034 | | 3,246 | | 0.033 | 6,073 | 0.174 | | 6,561 | 0.094 | 38,315 |
| 2011 | 0.101 | 4,302 | | 0.141 | | 6,922 | | 0.124 | | 1,826 | 0.118 | | 4,684 | | 0.038 | 4,700 | 0.034 | | 3,246 | | 0.033 | 6,073 | 0.178 | | 6,561 | 0.096 | 38,315 |
| 2012 | 0.103 | 4,302 | | 0.145 | | 6,922 | | 0.126 | | 1,826 | 0.120 | | 4,684 | | 0.039 | 4,700 | 0.035 | | 3,246 | | 0.034 | 6,073 | 0.181 | | 6,561 | 0.098 | 38,315 |
| 2013 | 0.105 | 10,244 | | 0.149 | | 10,578 | | 0.129 | | 3,718 | 0.122 | | 7,791 | | 0.040 | 6,904 | 0.036 | | 4,854 | | 0.035 | 8,615 | 0.184 | | 12,447 | 0.100 | 65,151 |
| 2014 | 0.107 | 10,244 | | 0.153 | | 10,578 | | 0.131 | | 3,718 | 0.125 | | 7,791 | | 0.040 | 6,904 | 0.036 | | 4,854 | | 0.035 | 8,615 | 0.188 | | 12,447 | 0.102 | 65,151 |
| 2015 | 0.109 | 10,244 | | 0.156 | | 10,578 | | 0.133 | | 3,718 | 0.126 | | 7,791 | | 0.041 | 6,904 | 0.037 | | 4,854 | | 0.036 | 8,615 | 0.190 | | 12,447 | 0.104 | 65,151 |
| 2016 | 0.111 | 10,367 | | 0.160 | | 9,467 | | 0.135 | | 3,880 | 0.129 | | 8,219 | | 0.042 | 7,987 | 0.037 | | 5,235 | | 0.037 | 615 | 0.193 | | 12,463 | 0.105 | 58,233 |
| 2017 | 0.112 | 11,193 | | 0.164 | | 10,007 | | 0.138 | | 4,208 | 0.131 | | 8,787 | | 0.043 | 8,601 | 0.038 | | 5,634 | | 0.037 | 1,215 | 0.196 | | 13,331 | 0.107 | 62,977 |
| 2018 | 0.114 | 12,020 | | 0.167 | | 10,547 | | 0.140 | | 4,536 | 0.133 | | 9,355 | | 0.043 | 9,216 | 0.038 | | 6,034 | | 0.038 | 1,815 | 0.199 | | 14,199 | 0.109 | 67,721 |
| 2019 | 0.116 | 12,847 | | 0.171 | | 11,086 | | 0.142 | | 4,865 | 0.135 | | 9,922 | | 0.044 | 9,830 | 0.039 | | 6,433 | | 0.038 | 2,415 | 0.202 | | 15,068 | 0.111 | 72,466 |
| 2020 | 0.118 | 13,673 | | 0.174 | | 11,626 | | 0.144 | | 5,193 | 0.137 | | 10,490 | | 0.045 | 10,444 | 0.040 | | 6,832 | | 0.039 | 3,015 | 0.205 | | 15,936 | 0.113 | 77,210 |
| 2021 | 0.120 | 14,500 | | 0.178 | | 12,166 | | 0.146 | | 5,521 | 0.139 | | 11,058 | | 0.045 | 11,059 | 0.040 | | 7,232 | | 0.040 | 3,615 | 0.209 | | 16,804 | 0.115 | 81,954 |
| 2022 | 0.121 | 15,327 | | 0.182 | | 12,705 | | 0.149 | | 5,850 | 0.141 | | 11,625 | | 0.046 | 11,673 | 0.041 | | 7,631 | | 0.040 | 4,215 | 0.212 | | 17,672 | 0.116 | 86,698 |
| **CorrelationCoeficient** | | | **0.93567708** | | **0.946200801** | | **0.909420632** | | | | | **0.936261067** | | | **0.927323516** | | **0.882983426** | | | **0.907253927** | | | | **0.934816899** | |  | |
| **t-test** | | | **1.19649E-06** | | **1.92515E-09** | | **2.76454E-06** | | | | | **7.36124E-08** | | | **6.10598E-07** | | **3.30215E-07** | | | **.35431E-06** | | | | **8.50689E-08** | |  | |
|  | | | | | **Min** | | | | **Max** | | | | | **Average** | | | |  | | | | | | | | | |
| **Population Density** | | | | | 0.029 | | | | 0.212 | | | | | 0.100 | | | |
| **Deforestation (in ha/yr)** | | | | | 587 | | | | 17,672 | | | | | 6,175 | | | |
| **CorrelationCoeficient** | | | | | 0.88 | | | | 0.95 | | | | | 0.92 | | | |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Table 14: Population per Secteur and per Year (2004-2015) | | | | | | | | | | |
| **Year** | **Basengele** | **Bolia** | **Inongo** | **Beronge** | **Lutoy** | **Pendjwa** | **Entre\_Luke** | **Kangara** | **Lokolama** | **Lukenie** |
| 2004 | 85,328 | 52,597 | 148,459 | 58,768 | 60,824 | 26,565 | 28,872 | 35,106 | 59,224 | 26,417 |
| 2005 | 86,904 | 53,569 | 152,440 | 59,854 | 61,949 | 27,056 | 29,406 | 35,806 | 60,318 | 26,906 |
| 2006 | 88,510 | 54,559 | 156,527 | 60,960 | 63,094 | 27,555 | 29,950 | 36,520 | 61,433 | 27,405 |
| 2007 | 90,145 | 55,567 | 160,724 | 62,086 | 64,261 | 28,065 | 30,504 | 37,249 | 62,568 | 27,913 |
| 2008 | 91,811 | 56,593 | 165,033 | 63,233 | 65,449 | 28,583 | 31,069 | 37,992 | 63,724 | 28,430 |
| 2009 | 93,507 | 57,639 | 169,458 | 64,401 | 66,659 | 29,111 | 31,643 | 38,750 | 64,901 | 28,957 |
| 2010 | 95,234 | 58,704 | 174,002 | 65,591 | 67,892 | 29,649 | 32,229 | 39,523 | 66,100 | 29,493 |
| 2011 | 96,993 | 59,788 | 178,667 | 66,803 | 69,147 | 30,197 | 32,825 | 40,311 | 67,321 | 30,040 |
| 2012 | 98,785 | 60,893 | 183,458 | 68,037 | 70,426 | 30,755 | 33,432 | 41,115 | 68,565 | 30,596 |
| 2013 | 100,610 | 62,018 | 188,377 | 69,294 | 71,728 | 31,323 | 34,051 | 41,935 | 69,831 | 31,163 |
| 2014 | 102,469 | 63,164 | 193,428 | 70,574 | 73,054 | 31,901 | 34,681 | 42,772 | 71,121 | 31,741 |
| 2015 | 104,031 | 64,127 | 197,329 | 71,650 | 74,168 | 32,388 | 35,210 | 43,465 | 72,206 | 32,226 |
| **Year** | **Badia** | **Batere** | **Kemba** | **Luabu** | **Mfimi** | **Bateke\_Nor** | **Bateke\_Sud** | **Baboma\_Nor** | **Mongama** | **Total** |
| 2004 | 107,558 | 46,861 | 73,010 | 59,642 | 116,616 | 100,323 | 87,786 | 90,823 | 89,735 | 1,354,515 |
| 2005 | 111,547 | 47,727 | 74,359 | 60,744 | 118,771 | 103,022 | 89,407 | 93,581 | 91,392 | 1,384,759 |
| 2006 | 115,684 | 48,609 | 75,732 | 61,866 | 120,965 | 105,793 | 91,059 | 96,423 | 93,081 | 1,415,726 |
| 2007 | 119,975 | 49,507 | 77,132 | 63,009 | 123,199 | 108,638 | 92,742 | 99,351 | 94,801 | 1,447,434 |
| 2008 | 124,424 | 50,422 | 78,556 | 64,173 | 125,475 | 111,561 | 94,455 | 102,368 | 96,552 | 1,479,903 |
| 2009 | 129,039 | 51,353 | 80,008 | 65,359 | 127,793 | 114,561 | 96,200 | 105,476 | 98,336 | 1,513,152 |
| 2010 | 133,825 | 52,302 | 81,486 | 66,566 | 130,154 | 117,643 | 97,977 | 108,679 | 100,153 | 1,547,201 |
| 2011 | 138,788 | 53,268 | 82,991 | 67,796 | 132,558 | 120,807 | 99,787 | 111,979 | 102,003 | 1,582,072 |
| 2012 | 143,936 | 54,252 | 84,525 | 69,049 | 135,007 | 124,057 | 101,631 | 115,380 | 103,888 | 1,617,786 |
| 2013 | 149,274 | 55,255 | 86,086 | 70,324 | 137,501 | 127,394 | 103,509 | 118,883 | 105,807 | 1,654,364 |
| 2014 | 154,811 | 56,275 | 87,677 | 71,624 | 140,041 | 130,821 | 105,421 | 122,493 | 107,762 | 1,691,829 |
| 2015 | 158,642 | 57,133 | 89,013 | 72,715 | 142,176 | 133,465 | 107,028 | 125,180 | 109,405 | 1,721,556 |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Table 15: Population Density per Secteur (in capita/ha, per year) | | | | | | | | | | | | | | | | | | |
| **Year** | **Basengele** | | **Bolia** | | **Inongo** | | **Beronge** | | **Lutoy** | | **Pendjwa** | | **Entre\_Luke** | | **Kangara** | | **Lokolama** | |
| 2004 | 0.089 | | 0.089 | | 0.117 | | 0.109 | | 0.104 | | 0.076 | | 0.034 | | 0.031 | | 0.030 | |
| 2005 | 0.091 | | 0.091 | | 0.121 | | 0.111 | | 0.106 | | 0.077 | | 0.034 | | 0.031 | | 0.031 | |
| 2006 | 0.093 | | 0.093 | | 0.124 | | 0.113 | | 0.108 | | 0.079 | | 0.035 | | 0.032 | | 0.031 | |
| 2007 | 0.095 | | 0.094 | | 0.127 | | 0.115 | | 0.110 | | 0.080 | | 0.035 | | 0.032 | | 0.032 | |
| 2008 | 0.096 | | 0.096 | | 0.131 | | 0.118 | | 0.112 | | 0.081 | | 0.036 | | 0.033 | | 0.032 | |
| 2009 | 0.098 | | 0.098 | | 0.134 | | 0.120 | | 0.114 | | 0.083 | | 0.037 | | 0.034 | | 0.033 | |
| 2010 | 0.100 | | 0.100 | | 0.138 | | 0.122 | | 0.116 | | 0.085 | | 0.037 | | 0.034 | | 0.034 | |
| 2011 | 0.102 | | 0.101 | | 0.141 | | 0.124 | | 0.118 | | 0.086 | | 0.038 | | 0.035 | | 0.034 | |
| 2012 | 0.104 | | 0.103 | | 0.145 | | 0.126 | | 0.120 | | 0.088 | | 0.039 | | 0.036 | | 0.035 | |
| 2013 | 0.105 | | 0.105 | | 0.149 | | 0.129 | | 0.122 | | 0.089 | | 0.040 | | 0.036 | | 0.036 | |
| 2014 | 0.107 | | 0.107 | | 0.153 | | 0.131 | | 0.125 | | 0.091 | | 0.040 | | 0.037 | | 0.036 | |
| 2015 | 0.109 | | 0.109 | | 0.156 | | 0.133 | | 0.126 | | 0.092 | | 0.041 | | 0.038 | | 0.037 | |
| Trend | 122% | | 122% | | 133% | | 122% | | 122% | | 122% | | 122% | | 124% | | 122% | |
| **Year** | **Lukenie** | **Badia** | | **Batere** | | **Kemba** | | **Luabu** | | **Mfimi** | | **Bateke\_Nor** | | **Bateke\_Sud** | | **Baboma\_Nor** | | **Mongama** |
| 2004 | 0.029 | 0.307 | | 0.173 | | 0.207 | | 0.129 | | 0.156 | | 0.208 | | 0.052 | | 0.066 | | 0.632 |
| 2005 | 0.030 | 0.318 | | 0.176 | | 0.211 | | 0.132 | | 0.159 | | 0.214 | | 0.053 | | 0.068 | | 0.643 |
| 2006 | 0.031 | 0.330 | | 0.179 | | 0.215 | | 0.134 | | 0.162 | | 0.220 | | 0.054 | | 0.070 | | 0.655 |
| 2007 | 0.031 | 0.343 | | 0.182 | | 0.219 | | 0.137 | | 0.165 | | 0.225 | | 0.055 | | 0.072 | | 0.667 |
| 2008 | 0.032 | 0.355 | | 0.186 | | 0.223 | | 0.139 | | 0.168 | | 0.231 | | 0.056 | | 0.074 | | 0.680 |
| 2009 | 0.032 | 0.368 | | 0.189 | | 0.227 | | 0.142 | | 0.171 | | 0.238 | | 0.057 | | 0.076 | | 0.692 |
| 2010 | 0.033 | 0.382 | | 0.193 | | 0.232 | | 0.144 | | 0.174 | | 0.244 | | 0.058 | | 0.078 | | 0.705 |
| 2011 | 0.033 | 0.396 | | 0.196 | | 0.236 | | 0.147 | | 0.178 | | 0.251 | | 0.059 | | 0.081 | | 0.718 |
| 2012 | 0.034 | 0.411 | | 0.200 | | 0.240 | | 0.150 | | 0.181 | | 0.257 | | 0.060 | | 0.083 | | 0.731 |
| 2013 | 0.035 | 0.426 | | 0.204 | | 0.245 | | 0.152 | | 0.184 | | 0.264 | | 0.061 | | 0.086 | | 0.745 |
| 2014 | 0.035 | 0.442 | | 0.207 | | 0.249 | | 0.155 | | 0.188 | | 0.271 | | 0.062 | | 0.088 | | 0.759 |
| 2015 | 0.036 | 0.453 | | 0.210 | | 0.253 | | 0.158 | | 0.190 | | 0.277 | | 0.063 | | 0.090 | | 0.770 |
|  | 122% | 147% | | 122% | | 122% | | 122% | | 122% | | 133% | | 122% | | 138% | | 122% |

Figure 13: Linear Regression Lines of Population Density over Time per Secteur

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Figure 14 Relation between Deforestation and Population Density per Secteur

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# Annex II: Deforestation and underlying Trends

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Table 16: Activity Data per Secteur (GFC v1.3) | | | | | | | | | | | | | | | | | | | | |
| Year | Basengele | Bolia | Inongo | Beronge | Lutoy | Pendjwa | Entre Lukenie | Kangara | Lokolama | Lukenie | Badia | Batere | Kemba | Luabu | Mfimi | Bateke Nord | Bateke Sud | Baboma Nord | Mongama | Sum |
| Forest 2000 | 768,014 | 422,765 | 921,658 | 459,734 | 483,235 | 299,879 | 732,566 | 943,749 | 1,679,091 | 759,374 | 227,490 | 199,971 | 191,238 | 387,066 | 387,073 | 315,445 | 1,007,855 | 818,330 | 89,023 |  |
| Non-forest 2000 | 48,311 | 81,891 | 160,691 | 638 | 18,594 | 324 | 3,670 | 40,728 | 3,064 | 9,473 | 72,306 | 32,407 | 109,968 | 7,901 | 251,710 | 97,056 | 446,284 | 367,978 | 32,539 |  |
| 2001 | 2,247 | 1,465 | 1,856 | 454 | 1,179 | 555 | 1,186 | 494 | 907 | 1,360 | 2,017 | 1,175 | 1,292 | 2,032 | 2,272 | 1,780 | 14,688 | 2,456 | 284 | **39,698** |
| 2002 | 638 | 1,136 | 980 | 917 | 1,168 | 763 | 1,236 | 1,438 | 1,270 | 1,357 | 1,696 | 617 | 889 | 1,292 | 1,915 | 1,464 | 4,475 | 1,162 | 31 | **24,443** |
| 2003 | 694 | 394 | 634 | 123 | 215 | 518 | 224 | 732 | 197 | 617 | 347 | 308 | 342 | 937 | 303 | 574 | 1,600 | 613 | 181 | **9,553** |
| 2004 | 759 | 401 | 753 | 43 | 182 | 417 | 80 | 794 | 249 | 58 | 806 | 140 | 241 | 317 | 482 | 2,831 | 11,437 | 2,737 | 727 | **23,453** |
| 2005 | 2,564 | 1,140 | 2,015 | 343 | 1,565 | 979 | 689 | 1,106 | 265 | 807 | 513 | 1,557 | 1,266 | 1,560 | 2,562 | 2,128 | 7,895 | 2,406 | 400 | **31,761** |
| 2006 | 2,828 | 66 | 203 | 116 | 268 | 302 | 435 | 2,908 | 504 | 741 | 237 | 89 | 50 | 173 | 213 | 74 | 37 | 483 | 947 | **10,674** |
| 2007 | 1,385 | 712 | 787 | 180 | 821 | 1,198 | 413 | 616 | 265 | 684 | 417 | 343 | 579 | 625 | 650 | 4,636 | 9,110 | 5,032 | 364 | **28,820** |
| 2008 | 727 | 1,070 | 2,023 | 72 | 944 | 1,319 | 354 | 884 | 94 | 449 | 1,321 | 1,115 | 1,503 | 2,408 | 2,939 | 1 | 158 | 450 | 11 | **17,842** |
| 2009 | 2,050 | 1,132 | 1,403 | 492 | 938 | 1,472 | 1,280 | 2,097 | 912 | 1,266 | 491 | 231 | 362 | 618 | 463 | 242 | 1,021 | 592 | 78 | **17,139** |
| 2010 | 6,218 | 2,091 | 3,876 | 679 | 2,160 | 2,337 | 668 | 1,602 | 658 | 870 | 1,698 | 1,084 | 1,204 | 1,855 | 4,049 | 3,381 | 19,024 | 4,385 | 674 | **58,514** |
| 2011 | 829 | 1,063 | 947 | 421 | 1,057 | 967 | 1,985 | 633 | 665 | 2,259 | 563 | 796 | 299 | 832 | 679 | 2,064 | 9,051 | 3,359 | 304 | **28,773** |
| 2012 | 4,021 | 528 | 1,102 | 462 | 792 | 985 | 1,370 | 3,526 | 1,456 | 2,068 | 477 | 394 | 279 | 780 | 887 | 963 | 6,188 | 2,795 | 675 | **29,749** |
| 2013 | 7,392 | 5,028 | 4,102 | 1,048 | 2,262 | 1,737 | 2,634 | 2,140 | 1,297 | 3,716 | 1,239 | 2,238 | 2,250 | 4,545 | 2,488 | 1,500 | 5,015 | 2,557 | 736 | **53,923** |
| 2014 | 5,547 | 2,846 | 3,725 | 1,287 | 2,900 | 2,173 | 2,294 | 2,487 | 1,847 | 2,476 | 2,123 | 2,990 | 3,337 | 4,656 | 6,501 | 3,364 | 12,919 | 3,835 | 1,027 | **68,334** |
| 2015 | 2,715 | 893 | 1,227 | 847 | 1,506 | 1,729 | 980 | 1,028 | 1,010 | 1,182 | 577 | 2,018 | 1,438 | 1,946 | 1,664 | 750 | 8,115 | 1,371 | 291 | **31,285** |
| Forest 2015 | 727,401 | 402,801 | 896,026 | 452,248 | 465,277 | 282,427 | 716,735 | 921,265 | 1,667,496 | 739,464 | 212,965 | 184,877 | 175,907 | 362,491 | 359,006 | 289,693 | 897,124 | 784,097 | 82,295 |  |

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| --- | --- | --- |
| **Secteur** | **GFC v 1.3** | **GFC v 1.1** |
| **Basengele**   |  |  | | --- | --- | | Forest extent 2000 [ha] | 768,014 | | Forest extent 2000 [%] | 94% | | Average annual forest loss 2004-2014 [ha] | 3,120 | | Average annual forest loss 2011-2015 [ha] | 4,101 | | 2011-2015 Percentage of 2004-2014 | 131% | | Average annual deforestation rate 2001-2015 | 0.35% |   Interpretation:   * + - No clear trend for the period 2004 - 2012 and weak R², irrespective of GFC version 1.0 or 1.3 for years 2011 and 2012     - Strong increase in period 2010-2012 also due to improved algorithm (approx. 2,500 ha)     - Recommendation: No adjustment to the average historical REL |  |  |
| **Bolia**   |  |  | | --- | --- | | Forest extent 2000 [ha] | 422,765 | | Forest extent 2000 [%] | 84% | | Average annual forest loss 2004-2014 [ha] | 1,461 | | Average annual forest loss 2011-2015 [ha] | 2,072 | | 2011-2015 Percentage of 2004-2014 | 142% | | Average annual deforestation rate 2001-2015 | 0.31% |   Interpretation:   * + - - Clear linear trend for the period 2004 - 2012 and strong R² for GFC v1.3 data.     - - Using GFC 1.0 data for years 2011 and 2012, linear trend is weaker     - Recommendation: Upward adjustment of the average historical REL |  |  |
| **Inogno**   |  |  | | --- | --- | | Forest extent 2000 [ha] | 921,658 | | Forest extent 2000 [%] | 85% | | Average annual forest loss 2004-2014 [ha] | 1,903 | | Average annual forest loss 2011-2015 [ha] | 2,221 | | 2011-2015 Percentage of 2004-2014 | 117% | | Average annual deforestation rate 2001-2015 | 0.19% |   Interpretation:   * + - Clear trend for the period 2004 - 2012 and strong R², irrespective of GFC version 1.0 or 1.3 for years 2011 and 2012     - Recommendation: Upward adjustment of the average historical REL |  |  |
| **Beronge**   |  |  | | --- | --- | | Forest extent 2000 [ha] | 459,734 | | Forest extent 2000 [%] | 100% | | Average annual forest loss 2004-2014 [ha] | 468 | | Average annual forest loss 2011-2015 [ha] | 813 | | 2011-2015 Percentage of 2004-2014 | 174% | | Average annual deforestation rate 2001-2015 | 0.11% |   Interpretation:   * + - Clear trend for the period 2004 - 2012 and strong R², irrespective of GFC version 1.0 or 1.3 for years 2011 and 2012     - Recommendation: Upward adjustment of the average historical REL |  |  |
| **Lutoy**   |  |  | | --- | --- | | Forest extent 2000 [ha] | 483,235 | | Forest extent 2000 [%] | 96% | | Average annual forest loss 2004-2014 [ha] | 1,263 | | Average annual forest loss 2011-2015 [ha] | 1,703 | | 2011-2015 Percentage of 2004-2014 | 135% | | Average annual deforestation rate 2001-2015 | 0.25% |   Interpretation:   * + - Clear trend for the period 2004 - 2012 and strong R², irrespective of GFC version 1.0 or 1.3 for years 2011 and 2012     - Recommendation: Upward adjustment of the average historical REL |  |  |
| **Pendjwa**   |  |  | | --- | --- | | Forest extent 2000 [ha] | 299,879 | | Forest extent 2000 [%] | 100% | | Average annual forest loss 2004-2014 [ha] | 1,262 | | Average annual forest loss 2011-2015 [ha] | 1,518 | | 2011-2015 Percentage of 2004-2014 | 120% | | Average annual deforestation rate 2001-2015 | 0.39% |   Interpretation:   * + - No clear trend for the period 2004 - 2012 when using GFC version 1.0 for years 2011 and 2012     - Strong increase in period 2010-2012 also due to improved algorithm (approx. 2,400 ha)     - Recommendation: No adjustment to the average historical REL |  |  |
| **Entre Lukenie**   |  |  | | --- | --- | | Forest extent 2000 [ha] | 732,566 | | Forest extent 2000 [%] | 100% | | Average annual forest loss 2004-2014 [ha] | 1,109 | | Average annual forest loss 2011-2015 [ha] | 1,853 | | 2011-2015 Percentage of 2004-2014 | 167% | | Average annual deforestation rate 2001-2015 | 0.14% |   Interpretation:   * + - Clear trend for the period 2004 - 2012 and strong R², irrespective of GFC version 1.0 or 1.3 for years 2011 and 2012     - Recommendation: Upward adjustment of the average historical REL |  |  |
| **Kangara**   |  |  | | --- | --- | | Forest extent 2000 [ha] | 943,749 | | Forest extent 2000 [%] | 96% | | Average annual forest loss 2004-2014 [ha] | 1,708 | | Average annual forest loss 2011-2015 [ha] | 1,963 | | 2011-2015 Percentage of 2004-2014 | 115% | | Average annual deforestation rate 2001-2015 | 0.16% |   Interpretation:   * + - No clear trend for the period 2004 - 2012 and weak R², irrespective of GFC version 1.0 or 1.3 for years 2011 and 2012     - Recommendation: No adjustment to the average historical REL |  |  |
| **Lokaloma**   |  |  | | --- | --- | | Forest extent 2000 [ha] | 1,679,091 | | Forest extent 2000 [%] | 100% | | Average annual forest loss 2004-2014 [ha] | 746 | | Average annual forest loss 2011-2015 [ha] | 1,255 | | 2011-2015 Percentage of 2004-2014 | 168% | | Average annual deforestation rate 2001-2015 | 0.05% |   Interpretation:   * + - Clear trend for the period 2004 - 2012 and strong R², irrespective of GFC version 1.0 or 1.3 for years 2011 and 2012     - Recommendation: Upward adjustment of the average historical REL |  |  |
| **Lukenie**   |  |  | | --- | --- | | Forest extent 2000 [ha] | 759,374 | | Forest extent 2000 [%] | 99% | | Average annual forest loss 2004-2014 [ha] | 1,399 | | Average annual forest loss 2011-2015 [ha] | 2,340 | | 2011-2015 Percentage of 2004-2014 | 167% | | Average annual deforestation rate 2001-2015 | 0.17% |   Interpretation:   * + - Clear trend for the period 2004 - 2012 and strong R², irrespective of GFC version 1.0 or 1.3 for years 2011 and 2012     - Recommendation: Upward adjustment of the average historical REL |  |  |
| **Badia**   |  |  | | --- | --- | | Forest extent 2000 [ha] | 227,490 | | Forest extent 2000 [%] | 76% | | Average annual forest loss 2004-2014 [ha] | 899 | | Average annual forest loss 2011-2015 [ha] | 996 | | 2011-2015 Percentage of 2004-2014 | 111% | | Average annual deforestation rate 2001-2015 | 0.43% |   Interpretation:   * + - Clear linear trend for the period 2004 - 2012 and strong R² for GFC v1.3 data.     - Using GFC 1.0 data for years 2011 and 2012, there is no clear linear trend     - Recommendation: No adjustment to the average historical REL |  |  |
| Batere   |  |  | | --- | --- | | Forest extent 2000 [ha] | 199,971 | | Forest extent 2000 [%] | 86% | | Average annual forest loss 2004-2014 [ha] | 998 | | Average annual forest loss 2011-2015 [ha] | 1,687 | | 2011-2015 Percentage of 2004-2014 | 169% | | Average annual deforestation rate 2001-2015 | 0.50% |   Interpretation:   * + - No clear trend for the period 2004 - 2012 and weak R², irrespective of GFC version 1.0 or 1.3 for years 2011 and 2012     - Recommendation: No adjustment to the average historical REL |  |  |
| **Kemba**   |  |  | | --- | --- | | Forest extent 2000 [ha] | 191,238 | | Forest extent 2000 [%] | 63% | | Average annual forest loss 2004-2014 [ha] | 1,034 | | Average annual forest loss 2011-2015 [ha] | 1,520 | | 2011-2015 Percentage of 2004-2014 | 147% | | Average annual deforestation rate 2001-2015 | 0.53% |   Interpretation:   * + - No clear trend for the period 2004 - 2012 and weak R², irrespective of GFC version 1.0 or 1.3 for years 2011 and 2012     - Recommendation: No adjustment to the average historical REL |  |  |
| **Luabu**   |  |  | | --- | --- | | Forest extent 2000 [ha] | 387,066 | | Forest extent 2000 [%] | 98% | | Average annual forest loss 2004-2014 [ha] | 1,670 | | Average annual forest loss 2011-2015 [ha] | 2,552 | | 2011-2015 Percentage of 2004-2014 | 153% | | Average annual deforestation rate 2001-2015 | 0.42% |   Interpretation:   * + - No clear trend for the period 2004 - 2012 and weak R², irrespective of GFC version 1.0 or 1.3 for years 2011 and 2012     - Recommendation: No adjustment to the average historical REL |  |  |
| **Mfimi**   |  |  | | --- | --- | | Forest extent 2000 [ha] | 387,073 | | Forest extent 2000 [%] | 61% | | Average annual forest loss 2004-2014 [ha] | 1,992 | | Average annual forest loss 2011-2015 [ha] | 2,444 | | 2011-2015 Percentage of 2004-2014 | 123% | | Average annual deforestation rate 2001-2015 | 0.48% |   Interpretation:   * + - Clear trend for the period 2004 - 2012 and strong R², irrespective of GFC version 1.0 or 1.3 for years 2011 and 2012     - Recommendation: Upward adjustment of the average historical REL |  |  |
| **Bateke Nord**   |  |  | | --- | --- | | Forest extent 2000 [ha] | 315,445 | | Forest extent 2000 [%] | 76% | | Average annual forest loss 2004-2014 [ha] | 1,926 | | Average annual forest loss 2011-2015 [ha] | 1,728 | | 2011-2015 Percentage of 2004-2014 | 90% | | Average annual deforestation rate 2001-2015 | 0.54% |   Interpretation:   * + - No clear trend for the period 2004 - 2012 and weak R², irrespective of GFC version 1.0 or 1.3 for years 2011 and 2012     - Recommendation: No adjustment to the average historical REL |  |  |
| **Bateje Sud**   |  |  | | --- | --- | | Forest extent 2000 [ha] | 1,007,855 | | Forest extent 2000 [%] | 69% | | Average annual forest loss 2004-2014 [ha] | 7,441 | | Average annual forest loss 2011-2015 [ha] | 8,257 | | 2011-2015 Percentage of 2004-2014 | 111% | | Average annual deforestation rate 2001-2015 | 0.73% |   Interpretation:   * + - No clear trend for the period 2004 - 2012 and weak R², irrespective of GFC version 1.0 or 1.3 for years 2011 and 2012     - Recommendation: No adjustment to the average historical REL |  |  |
| **Bamboma Nord**   |  |  | | --- | --- | | Forest extent 2000 [ha] | 818,330 | | Forest extent 2000 [%] | 69% | | Average annual forest loss 2004-2014 [ha] | 2,603 | | Average annual forest loss 2011-2015 [ha] | 2,783 | | 2011-2015 Percentage of 2004-2014 | 107% | | Average annual deforestation rate 2001-2015 | 0.28% |   Interpretation:   * + - Clear trend for the period 2004 - 2012 and strong R², irrespective of GFC version 1.0 or 1.3 for years 2011 and 2012     - Recommendation: Upward adjustment of the average historical REL |  |  |
| **Mongama**   |  |  | | --- | --- | | Forest extent 2000 [ha] | 89,023 | | Forest extent 2000 [%] | 73% | | Average annual forest loss 2004-2014 [ha] | 540 | | Average annual forest loss 2011-2015 [ha] | 607 | | 2011-2015 Percentage of 2004-2014 | 112% | | Average annual deforestation rate 2001-2015 | 0.50% |   Interpretation:   * + - Downward trend for the period 2004 - 2012 and weak R², irrespective of GFC version 1.0 or 1.3 for years 2011 and 2012     - Recommendation: No adjustment to the average historical REL |  |  |

# Annex III: Aide Mémoire de le Réunion sur LPB

**Compte rendu de la réunion sur le concept pour le développement de lignes de base de performance locale comme contribution au plan de partage des avantages dans le cadre du Programme de Réduction des Emissions de Maï-Ndombe**

Date : 4 Août 2017

Lieu : Salle de réunions du WWF-RDC

Heure : 9.00-11.00

* Au cours de cette réunion d’échange, l’approche statistique de l’analyse envisagée a été présentée aux différentes parties prenantes et discutée. Il a été noté que chaque « paramètre » devant entrer en ligne de compte pour le développement des lignes de base localisées devrait être représenté par un coefficient et une variable, entre autre :
  + Le coefficient représente le poids qu’on peut associer à chaque variable ;
  + La variable représente des données annuelles (p.ex. données annuels sur la population de chaque terroir.
  + Le « explandandum » est le risque de déforestation supposée se produire dans le futur,  est représenté par la somme des variables et leurs coefficients ;

Sur cette base, deux options ont été relevées pour associer différents poids aux variables retenues, notamment :

i) Calculer les poids au travers d’une analyse de régression. Cette analyse peut être limitée par les nombres d’observation sujets à des complications dans le passé ;

ii) Au cours d’un atelier, les poids devront être choisis et affectés par les parties prenantes sur appréciation des experts.

Par ailleurs, différentes sources de données ont été discutées, en l’occurrence de données sur la population. A ce sujet, les “Zones de santé” ont été identifiées une source de données intéressante au niveau de terroirs/chefferies, auxquelles il a été ajouté également les “Comités locaux de développement” déjà actifs sur le terrain. Sauf que s’agissant des données pouvant provenir des zones de santé, les réalités soulevées en discussion ont mis en lumière leur limite d’autant plus que seuls les aspects natalité / mortalité ont été pris en compte en terme de données collectées et en plus pas sur la population entière.  
Comme alternative, il a été suggéré d’utiliser la base des données mondiale en ligne « LandScan global population » qui pourrait offrir des estimations sur la population sur une base annuelle. A cela, il peut être associé également AfriPop/Worldpop, une autre base des données SIG (Système d’Information Géographique) en ligne avec des archives d'accès ouvert d'ensembles de données démographiques spatiales à une résolution de 100m x 100m, source de données recommandée par OSFAC.

* La dimension des « lignes de base de performance localisées » a été également discutée, dont deux points sous-mentionnés :
  + Son excellence Monsieur le Ministre Provincial à l’Environnement/Maï-Ndombe a demandé de la considération équitable des peuples autochtones dans le partage des avantages ce quelque soit les conclusions des analyses, car la non équitabilité pourrait être une source sérieuse de conflit. A cela, il a été précisé, que le plan de partage de bénéfices (PPB) prévois une partie fixe qui est attribue au peuple autochtone. Cette partie fixe (comme les coûts d’opération du Programme de Réduction des Emissions (ERP)) est considérée avant le réinvestissement dans les activités d’atténuation ;
  + Il était discuté que les lignes de base de performance localisées permettraient d’améliorer l’équitabilité du PPB, notamment :
    - Sur base du NERF, p.ex. si une chefferie qui couvre 10,000ha de forêt (où habite seulement une personne) arrive à stopper la déforestation dans son terroir, cela produirait une Réduction d’Emissions (RE) par ha. Sur base d’un prix de 5 USD/RE, le terroir produirait 50,000 USD par an, c.à.d. par personne
    - Si dans le même terroir vivent 10,000 personnes, dans le même cas, une personne gagnera 5 USD/an pour stopper la déforestation ;
    - Cet exemple montre que lignes de base de performance localisées peuvent augmenter l’équitabilité du partage de bénéfices ;
* D’autres paramètres ont été discutés, pouvant être considérés dans le développement des lignes de base de performance localisées. A cet effet, aucun nouveau projet d’infrastructure dans la région n’a été signalé
* En fin de réunion, il a été convenu que le WWF et la GFA vont finaliser le développement des lignes de base de performance localisées et organiser une autre rencontre dans 4 à 6 semaines pour présenter les résultats des analyses et également discuter de l’affectation des poids aux paramètres dans le contexte tel que mentionné ci-dessus.

# Annex IV: Concept for the Development of local performance baselines

1. Hansen, M. C., P. V. Potapov, R. Moore, M. Hancher, S. A. Turubanova, A. Tyukavina, D. Thau, S. V. Stehman, S. J. Goetz, T. R. Loveland, A. Kommareddy, A. Egorov, L. Chini, C. O. Justice, and J. R. G. Townshend. 2013. “High-Resolution Global Maps of 21st-Century Forest Cover Change.” Science 342 (15 November): 850–53. Data available on-line from: <http://earthenginepartners.appspot.com/science-2013-global-forest>. [↑](#footnote-ref-1)
2. Hansen, M. C., P. V. Potapov, R. Moore, M. Hancher, S. A. Turubanova, A. Tyukavina, D. Thau, S. V. Stehman, S. J. Goetz, T. R. Loveland, A. Kommareddy, A. Egorov, L. Chini, C. O. Justice, and J. R. G. Townshend. 2013. “High-Resolution Global Maps of 21st-Century Forest Cover Change.” Science 342 (15 November): 850–53. Data available on-line from: <http://earthenginepartners.appspot.com/science-2013-global-forest> [↑](#footnote-ref-2)
3. Comparison of triennial estimates is considered to be more credible for trend analysis, as single year estimates may significantly under or overestimate deforestation because of cloud cover [↑](#footnote-ref-3)
4. Ministere du Plan et Révolution de la Modernité, Institut National de la Statistique, 2015, Annuaire statisique, INS- RD Congo 2015; Institut National de la Statistique, 2015, Annuaire statisique, INS- RD Congo 2015 [↑](#footnote-ref-4)
5. See http://www.worldpop.org.uk/data/summary/?doi=10.5258/SOTON/WP00072

   http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0031743 [↑](#footnote-ref-5)
6. Linard, c., Gilbert, M., Snow, R., W., Noor,A., M., Tatem, A., J., 2010, Population Distribution, Settlement Patterns and Accessibility across Africa in 2010. [↑](#footnote-ref-6)
7. WWF 2017, [Forest Accessibility Congo Basin](http://panda.maps.arcgis.com/home/item.html?id=cbd5b852b0a24ec9ae17ff9eef5e9a17) [↑](#footnote-ref-7)