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Learning Brief

COMPARING APPROACHES FOR MEASURING DEFORESTATION IMPACTS IN PAPUA

GREEN ECONOMIC GROWTH PROGRAM FOR PAPUA PROVINCES

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CONTENTS

Green Economic Growth Programme (GEGP) for Papua Provinces

LEARNING BRIEF

BACKGROUND

The Green Economic Growth Programme for (GEGP) Papua Provinces focuses on community based economic development. The second pathway of the GEGP Theory of Change "*Papuan Communities and Farmers; Papuan communities self-reliant and active in agri-business development and other low carbon services*" identified an at-risk assumption "*Green agri-business activities do not lead to unintended unsustainable land use practices/use of resources by communities or others*". From the perspective of impact evaluation, it is important that the GEGP Monitoring Evaluation Research and Learning (MERL) team has reliable evidence that GEGP interventions are not contributing to an increase in forest degradation and deforestation. Assessing deforestation in areas where the GEGP is implemented, may also generate important lessons about the relationship between deforestation and GEGP interventions.

AIM AND OBJECTIVES

The aim of the assignment is to help establish a deforestation monitoring approach that can be employed by GEGP throughout the lifespan of their programme.

The objectives of this assignment are:

- Testing the assumption that GEGP activities are not contributing additionally to deforestation in areas which GEGP is targeting.
- Understanding, through a comparative assessment, the relative strengths and weaknesses of measurement approaches for deforestation impact assessment in a commodity supply chain programme such as GEGP.

Three methodologies were applied to estimate deforestation that has occurred prior to and since the start of the programme, and assess evidence for an increase or decrease in deforestation, at village and sub-district level, as a result of programme interventions. A separate *Background Document* describes each of these methodologies and the deforestation estimates (Objective 1). This *Learning Brief* focuses on a comparative assessment of the three methodologies to help establish a monitoring approach that can be employed by GEGP throughout the lifespan of their programme (Objective 2).

APPROACH

Methodologies Overview

The three methodologies used to assess evidence for increased or decreased deforestation in 4 target GEGP villages are:

- KPI8 Hectares Indicator (KPI8-HI or HI) –that compares observed deforestation to that expected according to a risk-based model. [1]
- KPI8 Historical Baseline (KPI8-HB or HB) – that compares observed deforestation to a historical average deforestation rate. [1]
- LTS Standard Operating Procedure (SOP) – that is similar to KPI8-HB but makes use of the Global Forest Watch (GFW) [2] platform.

Further details are provided in a separate *Background Document*.

Criteria for Comparison

The methodologies were assessed against six criteria grouped into three categories related to the input data, the implementation methods, and the results obtained (Table 1).

Table 1: Criteria used for comparison

	Criteria	Description
Input Data	*Accessibility*	Cost and ease of access of input data and level of technical skills required to access and process input data
	Appropriateness	Suitability of input data to the GEGP MERL objectives
Methods	*Ease of use*	Level of technical expertise and specific GIS software required to carry out the deforestation analysis
	Speed of implementation	Time taken to implement analyses and obtain results
Results	*Relevance*	Relevance of outputs from the analysis to the GEGP MERL objectives
	Uncertainty	Level of precision and uncertainty associated with the results.

Methodologies were scored against each criterion using a suitability scale where **+** = low, **++** = moderate and **+++** = high.

DEFORESTATION RESULTS

Full details of the results from analysis of deforestation using the three methodologies are provided in the *Background Document*. A summary for each of the sites is included below. Difference in results between the methodologies are taken into account in the Methodology Comparison section.

[1] The Key Performance Indicator 8 (KPI8) methodologies tested were derived for the Indonesia regional context by Daemeter Consulting, under the UK Space Agency funded Forest 2020 programme (Ecometrica, Daemeter, Hatfield, IPB, MoEF and LAPAN). These were applied and tested over 3 years under the DFID funded FLAG Evaluation and Monitoring programme.

[2] https://www.globalforestwatch.org/map

FakFak

Both HB and SOP methods estimated the same figures for expected and actual deforestation in the AOI within 2017 – 2019. The HI method estimated lower expected deforestation from the risk maps, compared to actual deforestation. This resulted in slightly higher forest loss than expected (see Table 2). At sub-district level, comparable results were generated with the HB and SOP estimating 6.7 ha and 6.5 ha of forest loss avoided respectively. The HI method generated a lower expected forest loss compared to the HB and SOP methods, which lead only to 1.1 ha of avoided deforestation estimated with HI.

Table 2: Overall results during the project period 2017-2019: Expected, Actual and Avoided Deforestation in FakFak

	AOI			AOI_SD		
FakFak	KPI8-HI	KPI8-HB	SOP	KPI8-HI	KPI8-HB	SOP
Expected (2017-2019) *	0.7	1.2	1.2	7.6	13.2	13.5
Project Actual (2017-2019)	1.2	1.2	1.2	6.5	6.5	7.0
Avoided Deforestation	-0.5	0.0	0.0	1.1	6.7	6.5

Jayapura

A major difference was observed in Jayapura, both at village and Sub-District level, between HB and SOP methods. This is explained by the presence of an oil palm plantation, which is excluded from the HB analysis, but included in the SOP analysis. This meant the SOP method calculated higher forest loss compared to the HB method (1,021 ha vs the 335 ha, respectively; see Table 3) during the project period (2017 – 2019). As this forest loss occurred within the oil palm plantation, it is unlikely to be related to programme activities.

The HI method produced lower values of expected deforestation compared to the HB method, both at village and Sub-District levels. This resulted in lower values of avoided deforestation compared to the HB method (207 ha vs 312 ha at village for HI and HB methods, respectively, and 312 ha vs 346 ha at Sub-District level for HI and HB methods, respectively; see Table 3).

Table 3: Overall results during the project period 2017-2019: Expected, Actual and Avoided Deforestation in Jayapura

	AOI			AOI_SD		
Jayapura	KPI8-HI	KPI8-HB	SOP	KPI8-HI	KPI8-HB	SOP
Expected (2017-2019) *	480	585	720	550	681	819
Project Actual (2017-2019)	273	273	958	335	335	1021
Avoided Deforestation	207	312	-238	215	346	-202

Jayawijaya

Comparable results were obtained with the three methods, both at village and Sub-District levels, in Jayawijaya, with deforestation figures in 2017 and 2018 considerably higher than the figures of expected deforestation. This resulted in more deforestation than expected during the Assessment Period compared to what the risk maps (HI) or historical deforestation baseline (HB and SOP) predicted. Slightly lower figures of expected deforestation are calculated with the HI method, making the estimates of increased deforestation slightly higher compared to the other two methods (32 ha calculated with HI method, compared to 27 ha calculated with HB and SOP, at village level; see Table 4). Comparable results occur at Sub-District level.

Table 4: Overall results during the project period 2017-2019: Expected, Actual and Avoided Deforestation in Jayawijaya

	AOI			AOI_SD		
Jayawijaya	**KPI8-HI**	**KPI8-HB**	**SOP**	**KPI8-HI**	**KPI8-HB**	**SOP**
Expected (2017-2019) *	4	9	9	9	18	18
Project Actual (2017-2019)	36	36	36	41	41	42
Avoided Deforestation	-32	-27	-27	-32	-23	-24

Makimi

Comparable results were obtained with the three methods, both at village and Sub-District levels, in Makimi, with deforestation figures in 2017-2019 considerably higher than the figures of expected deforestation from the risk maps (HI) and the historical deforestation baseline (HB and SOP; see Table 5). Slightly lower figures of expected deforestation are calculated with the HI method, making estimates of increased deforestation slightly higher compared to the other two methods (25 ha calculated with HI method, compared to 22 ha calculated with HB and SOP, at village level; see Table 5). At sub-district level, the difference between expected and actual deforestation obtained from the HI method is even larger, which results for increase in deforestation of 286 ha as opposed to 182 and 180 ha obtained with HB and SOP methods, respectively (see Table 5).

Table 5: Overall results during the project period 2017-2019: Expected, Actual and Avoided Deforestation in Makimi

	AOI			AOI_SD		
Makimi	**KPI8-HI**	**KPI8-HB**	**SOP**	**KPI8-HI**	**KPI8-HB**	**SOP**
Expected (2017-2019) *	9	12	12	283	387	381
Project Actual (2017-2019)	34	34	34	569	569	561
Avoided Deforestation	-25	-22	-22	-286	-182	-180

METHODOLOGY COMPARISON

The results of the suitability assessment are summarized in Table 6. Further details of the scoring, and a discussion of the strengths and limitations of each methodology are provided below.

Table 6: Comparison assessment results

		KPI8-HI	KPI8-HB	SOP
		Methodology's Baseline Approach		
	Criteria*	Deforestation risk map generated from spatial datasets	Assessment of historical gross deforestation adjusted to exclude plantations	Rapid assessment of historical gross deforestation, based on freely available global datasets
Input Data	*Accessibility*	+	++	+++
	Appropriateness	+++	+++	++
Methods	*Ease of use*	+	++	+++
	Speed of implementation	+	++	+++
Results	*Relevance*	++	+++	++
	Uncertainty	+	+	+

* see Table 1 for definitions

KPI8-Hectares Indicator

The main aim of this methodology is to make an assessment of annual deforestation risk maps, based on Country-specific anthropogenic factors.

Table 7: KPI8-HI assessment and scores

	Criteria	KPI8-HI Assessment	Score
Input Data	*Accessibility*	Forest area based on freely available data that can be downloaded from the GFW platform [2], and the boundaries on concessions / plantations for Indonesia, which use is restricted only to national use. Additionally, anthropogenic dataset (e.g. roads, land cover, soil, etc) are necessary to produce the annual risk maps, and might not always be easily accessible. Data is processed and analysed on desktop therefore requiring technical skills for its use.	+
	Appropriateness	Such data enables the user to produce annual deforestation risk maps, taking into account Country-specific boundaries on concessions / plantations as well as other anthropogenic factors.	+++
Methods	*Easy to use*	This method requires installation of GIS software and advanced expertise to process and analyse the geospatial data	+
	Speed of implementation	This method requires producing risk maps on annual basis, therefore working on long time-series can be a slow and laborious process. This can be semi-automated through programming or modelling, increasing however the level of expertise required.	+

Results	*Relevance*	Results enable the user to produce annual deforestation risk maps considering Country-specific information, and expected deforestation results are produced as geospatial maps and figures, and annual forest loss information.	++
	Uncertainty	This method considers Country-specific factors in estimating deforestation based on annual risk maps; however, the definition of the risk categories has not been validated on ground information therefore difficult to assess accuracy.	+

Strengths

- Deforestation risk maps are produced on an annual basis taking into consideration the local context in terms of anthropogenic factors, cultivability, extractability and unprotected/protected status.
- Results are provided as annual expected deforestation figures as well as geospatial maps of risk classified into 5 risk categories

Limitations

- The generation of the risk maps is a time-consuming process, as it is needed to be done annually, and it requires technical expertise.
- The method involves some assumptions, including the percentage of forest loss based on the risk level and the factors used (ACEU factors) assumed to have effect on deforestation. However, some factors, such as anthropogenic and cultivability, could be validated on the deforestation data.
- The accuracy of estimation of the expected deforestation depends greatly on the data used for generating risk map.
- The risk categories are not validated against actual deforestation. This is not currently included in the analysis, although it could be possible to undertake with the currently datasets available, and it would improve the applicability of this method by providing an accuracy assessment to the results obtained.
- Requires access to Ministry of Environment and Forestry (MoEF) datasets for concession boundaries.

KPI8-Historical Baseline

The HB methodology compares observed deforestation to the average annual deforestation within a defined Baseline Period. Plantations are excluded from the analysis, so deforestation figures relate only to natural forest areas.

Table 8: KPI8-HB assessment and scores

	Criteria	KPI8-HB Assessment	Score
Input Data	*Accessibility*	Uses forest loss data that is freely available for download from the GFW platform [2]. Data on boundaries of timber and oil palm concessions is available from the MoEF, under agreement. Input data must be loaded using GIS software requiring a basic level of technical skills.	++
	Appropriateness	Input data enables the user to make an of annual forest loss in natural forests at a resolution of 30 meters.	+++
Methods	*Ease of use*	The analysis method requires use of GIS software and some expertise to process and analyse the geospatial data	++
	Speed of implementation	This method requires manual processing and analysis on GIS software. This can be semi-automated through programming or modelling, increasing however the level of expertise required.	++

Results	*Relevance*	Results enable the user to make an assessment gross deforestation in an AOI can comparison of historical trends to those during the programme period. Results are produced as geospatial maps showing the location of deforestation and figures, and annual forest loss information.	+++
	Uncertainty	The main source of uncertainty (other than those associated with the forest loss dataset) is the assumption that without programme interventions deforestation in the AOI would occur at the average annual rate during the Baseline Period – which may not be the case if external factors affect drivers of deforestation. Uncertainty in estimates of baseline deforestation also depends on the variation between years in the Baseline Period.	+

Strengths

- Excluding plantations from the deforestation analysis means that results are focused on loss of natural forest that is likely to be more relevant to the GEGP MERL objectives
- Results are provided as geospatial maps, which enables visualisation of the location of deforestation that may help determine whether observed patterns are likely to be related to programme activities.

Limitations

- The historical trend is assumed to represent the business as usual scenario through an averaging of annual deforestation. However, this simplification of historical trend may not represent well the impact of policies and nature-driven catastrophes in the AOI or other factors that may change during the Assessment Period relative to the Baseline Period. Many factors affect the likelihood of deforestation and this approach treats all forest as equally likely to be deforested.
- Requires expertise on using and combining geospatial datasets and products as the analysis is performed manually.
- Requires access to MoEF datasets for concession boundaries.

SOP

This methodology involves a rapid assessment of gross deforestation, based on freely available global datasets with a minimum of technical expertise required.

Table 9: SOP assessment and scores

	Criteria	SOP Assessment	Score
Input Data	*Accessibility*	All input data is freely available and easy to access data from the GFW platform [2], without restrictions. The analysis of the Tree Loss data on the AOIs is done completely by the GFW platform, therefore no geospatial skills are required.	+++
	Appropriateness	Input data enables the user to make a rapid assessment of gross deforestation, but the dataset does not distinguish between natural forest and plantations.	++
Methods	*Ease of use*	This method can be quickly applied anywhere in the world as it is based on the same GFW data and processing methods. No technical skills nor software are required as the analysis is done entirely by the GFW platform online.	+++
	Speed of implementation	Method is fast to implement and results are generated within seconds.	+++

Results	*Relevance*	Results enable the user to make an assessment of historical gross deforestation an AOI can comparison of historical trends to those during the programme period. Location of deforestation is shown in the online tool, but further analysis of the data is not possible.	++
	Uncertainty	As for KPI8-HB.	+

Strengths

- Doesn't require GIS software or technical expertise to be implemented
- Doesn't rely on external datasets other than the boundary of the AOI
- Produces results within seconds after having uploaded the project area boundary on the GFW platform

Limitations

- As for KBI8-HB the assumption that average annual deforestation will occur during the Assessment Period at the same rate as the Baseline Period is a simplification that does not take account of differences in the likelihood of deforestation of different areas of forest. This limitation is compounded by the inclusion of plantations in deforestation estimates as these areas are certainly exposed to different drivers of deforestation than natural forest areas.
- The GFW Tree Cover Loss dataset does not distinguish natural forest from other forest, i.e. includes timber and oil palm plantations, so timber harvesting or clearing of oil palm will be recorded as deforestation. Maps showing the location of plantations are available with GFW however, and if these occur within the AOIs they can be used to determine whether 'deforestation' in the Baseline Period or Assessment Period occurred within plantations.
- Results are only shown as annual deforestation figures, and data on the location of deforestation is not provided, preventing further analysis.
- The selection of tree cover canopy density on the GFW platform is restricted to specific thresholds: >10%, >15%, >20%, >25%, >30%, >50%, >75%. The threshold of >75% was chosen, to be in line with the threshold used by the HI and HB methods of >80%. This was deemed compatible given the distribution of forest cover histogram generated by MoEF (Figure 2 of the Background Document), which suggests that only a small portion of MoEF forest cover have 75%-80% tree cover density.
- Pre-processing data through the GFW online platform is unknown, and might generate some minor inaccurate results compared to the same data downloaded and analysed on a desktop, due to the global projection vs country-specific projected data.

RECOMMENDATIONS FOR GEGP FOR 2022 ANALYSIS

For a basic assessment (without further analysis) use SOP for areas where plantations are not present. If screening on GFW suggests presence of plantations, then use KPI-HB.

To enable more detailed exploration of observed patterns, e.g. by linking to proximity GEGP sites, or understanding forest type or legal designations of land where deforestation is occurring, use KPI-HB and conduct further analyses on the deforestation maps.

The KPI-HI could provide some benefits over the other two methods as it does not assume that deforestation will occur at an average annual rate, and relates expected deforestation to specific characteristics of the landscape. In this case, a final deforestation risk map that incorporates anthropogenic factors should be produced by the project team and key stakeholders, as informants to that process. The amount of deforestation expected in each risk class is somewhat arbitrary however, and could be improved with regional analysis of historical rates of deforestation in the different risk classes. The requirement to generate an annual risk map for each year means a relatively high level of technical expertise is required for this approach, however, so it is only really encouraged in areas where the historical rate of deforestation is not expected to give a good indication of future deforestation in the AOI for example if all of the cultivable land was converted to agriculture during the Baseline Period.