Annex 3b

Financial and Economic Analysis

to the GCF Funding Proposal

Land-based Mitigation and Adaptation through a Jurisdictional Approach in West-Kalimantan

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Version 6

Submitted by:

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1. Introduction

Please read this annex in conjunction with the Excel model “Annex 3a – EFA”.

The following document contains an overview of the results of the Economic and Financial Analysis (EFA) that was conducted for the GIZ GCF Funding Proposal “Land-based mitigation and adaptation through a Jurisdictional Approach in West Kalimantan”. It gives a short overview of the project scope and activities that are relevant to the EFA, then explains the EFA methodology, highlights key results of the financial and economic analysis and lastly, shares the sensitivity analysis that was conducted to test the robustness of the model.

2. Project scope and activities

The project scope and activities are documented in the Feasibility Study and the activity sheets that are included as Annex 2 of the Funding Proposal. For the EFA, a screening was carried out to identify the most relevant activities leading to land use changes and having a financial or economic impact.

Under Component 1, 100,000 hectares of forest will be placed under a strengthened regulatory framework where the implementation of High Biodiversity and Carbon Areas (i.e. HCV, HCS) will be supported. Under Component 2, 25,000 hectares will move from BAU and unsustainable land use to improved land use across several commodities. Under Component 3, new sustainable forest management plans (in the form of Social Forestry licenses) and communities with already existing licenses will be supported across a total of 200,000 hectares of forested area. Under activity 3.2.1.4 Forest restoration and rehabilitation of mangrove and peat forest ecosystems will conduct training and develop detailed-technical restoration plans that can be used to rehabilitate degraded peatland and mangrove ecosystems. The project will target 5,000 ha of peatland and 5,000 ha of mangrove. The total spatial scale of operations included in the EFA is thus 335,000 hectares and can be divided into activities with an impact through commodity land use changes and forestry land use change.

Other project considerations relevant to the EFA:

- Project activities promote the adoption of sustainable land management and aim to increase agricultural production, address drivers of deforestation and forest degradation and conserve biodiversity.
- Commodities taken into consideration are agricultural (oil palm, rubber, coffee, coconut, and pepper) and primary products (Non-Timber Forest Products (NFTPs)).

Error! Reference source not found. and **Error! Reference source not found.** show the underlying assumption of the model. The project will aim to transition from unsustainable agriculture to sustainable agriculture (**Error! Reference source not found.**) and from unsustainable to sustainable forest management (**Error! Reference source not found.**).

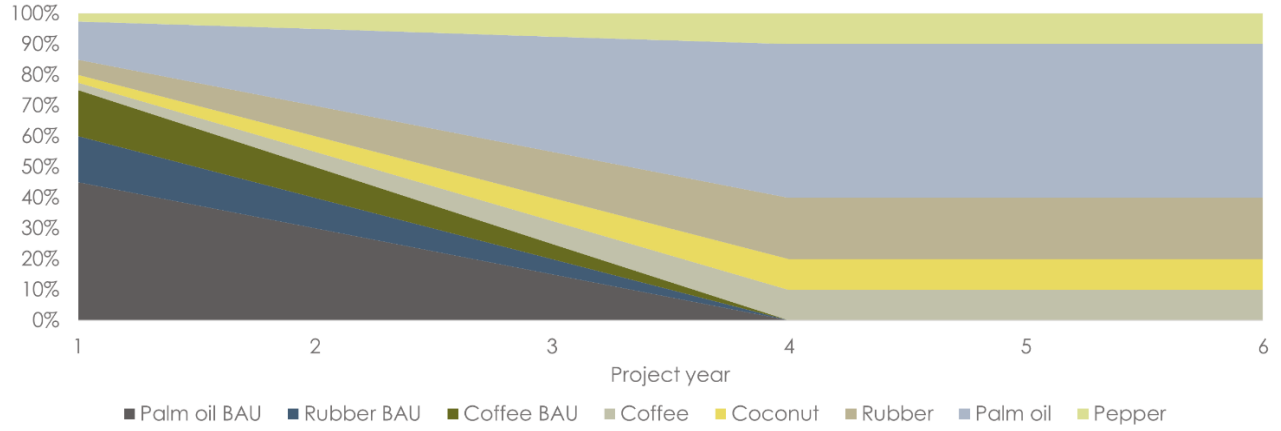
Component 1

Most activities of Component 1 are of a public good nature and will not generate financial reflows, even if they can contribute to further unlock climate finance. However, Activity 1.2.1 aims to strengthen the regulatory framework and implement High Biodiversity and Carbon Areas on 100,000 hectares of non-state forest land, with a strong focus on forest protection. This was estimated in the model by converting 100,000 hectares from Forest BAU to High Level Conservation land use.

Component 2

Component 2 promotes the transition to sustainable agricultural practices. A significant portion of the project budget is directed towards Activity 2.1.2 “Implementing and upscaling the adoption of proven approaches for reducing emissions and enhancing the sustainability and climate resilience of smallholders in key commodity supply chains (including agroforestry)” The objective of Component 2 is increased productivity, resilience and income of smallholders. Climate-resilient and sustainable farming and a supportive business ecosystem will increase productivity of commodities such as palm oil, rubber, coffee, cocoa, coconut, etc. The activities aim to create direct benefits for 10,000 farmers and the associated indirect benefits for families and communities (indirect benefits are not included in the economic model).

Figure 1: Transition to sustainable agricultural land uses under component 2



Source: EFA

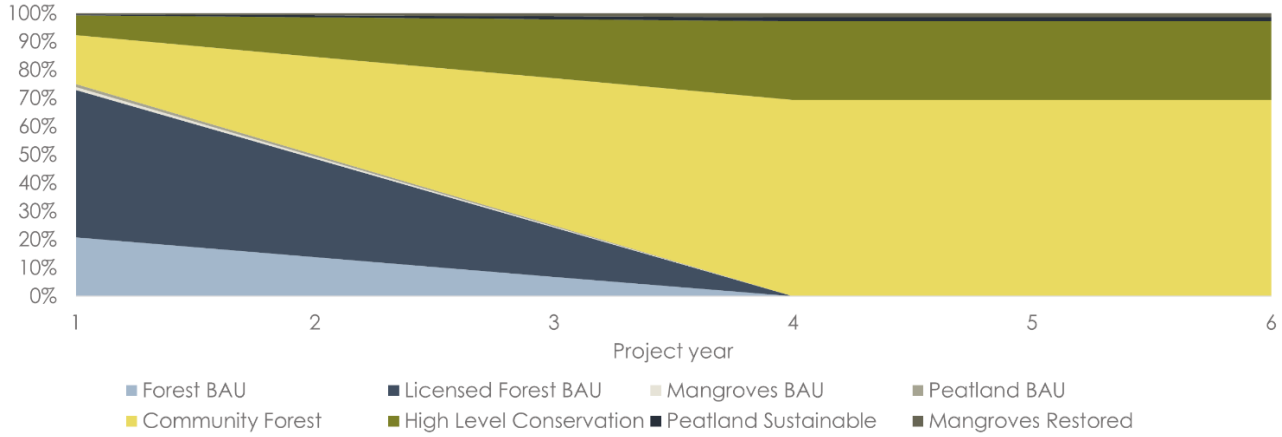
Component 3

Component 3 aims at the large-scale adoption of sustainable forest management practices for Production Forests and Protection Forests. Specifically, it aims to support official Forest Management Units (FMUs) and social forestry communities in the transition from unsustainable forest use, which results in the gradual depletion of economic value; this decline has been modelled at a rate of 2.6% per annum in line with the current rate of deforestation in Indonesia.[1] The NPV of such unsustainable practices can be high depending on the quality of the forest (~6,981 USD /ha). However, the revenues are declining over time and will slowly degrade the functionality of these forests. Under activity 3.2.1, 100,000 hectares of unlicensed forest are converted into sustainable licensed forest and 100,000 hectares of already licensed but unmanaged forest areas, management plans will be developed and finance for implementation will be provided. Under the sustainable management regime, NTFPs are assumed to be harvested at a sustainable rate. Not counted in the financial returns are the contribution of the restored/improved forest areas to delivering emissions reductions at scale.

Additionally, sub-activity 3.2.1. will lead to the restoration of degraded lands on 5,000 hectares of peatland and 5,000 hectares of mangrove restoration.

[1] https://www.globalforestwatch.org/dashboards/country/IDN/?location=WyJjb3VudHJ5IiwiSUROIl0%3D

Figure 2: Transition to sustainable forest management under component 1 and 3



Source: EFA

3. EFA methodology

3.1 Assumptions and data sources

Key assumptions

- A discount rate of 12.03% has been used for the **financial analysis.** It was calculated as the weighted average cost of capital (WACC) from the following parameters:
    - Indonesia's risk-free rate 0.05[2]
    - Indonesia equity risk premium 0.08[2]
    - Farming/agriculture unlevered beta 0.91[2]
    - Equity: 100%
- The **economic analysis** uses a social discount rate of 6% which shows a societal rate of time preference and includes, to some extent, the non-market value that society places on improved natural resource outcomes[3].
- Inflation adjustment in the **economic analysis**: all prices in the economic analysis factored in inflation at a rate of 2.5% (Indicator (bi.go.id)) in line with the target inflation rate of Bank Indonesia of 2.5±1%
- The model assumes that 20% of farmers are expected to drop out of the program as part of activity 2.1.2 in Component 2.
- The analysis also tested financial performance under loan conditions. The conditions to test the loan analysis were a 25% informal sector lending rate and a loan tenor of three years. It was assumed that 100% of the financing is debt-financed. The first-period costs are taken to be investment costs in all models (this covers the costs of land preparation and high-quality inputs for the commodity and plantation models, and for the forestry models, it covers the cost of licensing and forest rehabilitation to some extent).
- To factor in the possibility of a GCF concessional loan for public sector investment, which can be as low as 0% and up to 0.75%, with tenor of 20-40 years and grace period of 5-10 years, the model assumes an interest rate of 15%. Due to lack of data for the informal sector we use the formal sector as a proxy: We assume that for a local financial institution administrative expense, loan losses and capitalization rate to cover inflation and investment income from assets other than the portfolio remain unchanged. We do however assume that the concessional character of a GCF loan funding would reduce the costs of funds for the financial institution. Average cost of funds for a commercial bank which can get refinanced by the Indonesian Central Bank or international capital markets is assumed at around 7%-8%: Central Bank BI base rate is at 6.25%, Interbank lending rate is at 7.18%, bond issuance in local currency at the capital market have costs of between 7%-9%. In addition, longer grace periods offered by the GCF concessional funding would further reduce the cost of funds, though it is difficult to assume how much this would affect the interest rate. In contrast the costs of forex insurance/hedging would increase the actual costs of capital by at least a couple of percentage points. Therefore, we consider a reduction by 10 percentage points from the assumed 25% interest rates as a reasonable and conservative approach to an approximation of the financial impact of a GCF concessional loan.

[2] Damodaran, A. (2023). Country Risk: Determinants, Measures and Implications–The 2023 Edition. Measures and Implications–The.

[3] https://pubdocs.worldbank.org/en/115591526379293210/pdf/PAD-Annex-P159712-Economic-Financial-Analysis.pdf

- GHG benefits considered in the economic analysis with the outputs of a carbon ex-ante model and a carbon price based on the World Bank guidance on the shadow price of carbon starting at a price of EUR 40 per tCO2eq[4].

Data sources

- Data collected for this analysis has been a mix of literature review and stakeholder consultation (including GIZ, and EEs) as well as Indonesian government guidance on best practices and expected costs for coffee, palm oil and rubber plantations (see **Error! Reference source not found.**).
- The project budget has been provided by the GIZ team in their role as Accredited Entity.

Where to find data sources in the model

- Data sources can be found in the "*DATA*" tab in the Excel spreadsheet.

3.2 Methodology of revenue and benefit selection

3.2.1 Financial analysis

Based on the collected data and information available in the Feasibility Study of the Funding Proposal, the model defined cost and revenue flows for the BAU and the project scenario of different land uses in the project area.

The **land use changes** between the two scenarios are split into two model components:

a. **commodity** land use change of agricultural value chains (project component 2) and
b. **forestry** land use change (project components 1 & 3).

Under the model, it is assumed that **unsustainable agricultural activities** will change to **sustainable agricultural practices**. Consequently, the BAU scenario considers per value chain costs and revenues for unsustainable production and in the project scenario for sustainable and/or certified production. Depending on the value chain, the project will implement different activities to achieve the transition. Table 1 below shows an overview of illustrative project interventions that will impact cost and revenue changes between the BAU and the project scenario.

Table 1 Supported agricultural value chains under the project scenario

VALUE CHAIN	BUSINESS-AS-USUAL	PROJECT INTERVENTION
General for all value chains	• Lack of extension services • Unsustainable agricultural practices • Lack of cooperative systems; farmers are relying on middleman • Lack of access to finance/capital for farming activities and investments	• Solidaridad will apply its Farmer Field School approach to deliver trainings on: Good Agriculture Practices (GAP), Best Management Practices (BMP), Climate Smart Agriculture (CSA), agroforestry and peat management that align with regenerative agriculture principles • Trainings will also include: enhanced local value adding harvesting, storing &

[4] https://thedocs.worldbank.org/en/doc/911381516303509498-0020022018/original/2017ShadowPriceofCarbonGuidanceNoteFINALCLEARED.pdf

	• No traceability system in place for existing commodities • Farmer produce raw material with limited knowledge on further processing • Poor planting material and low or minimum inputs • Poor access to training; reliance on unsustainable methods • Uncertainty around markets/ fluctuation on commodities price	(post-harvest) processing of agricultural products to improve product quality • Improved market access of smallholder farmers with sustainable production by establishing and fostering farmer organizations and cooperatives, and by supporting farmers/cooperatives to achieve certification under common standards • Exploring and allocating funding potentials to finance the certification of farmers/farmer groups • Traceability systems for different agricultural supply chains will be developed, introduced and scaled up to trace goods and products to their origin and comply with traceability requirements of sustainability standards
Coffee	• Unsustainable practices farming system • No traceability system in place • Lack of market access • Lack of knowledge for better post-harvest product processing • Low or minimum inputs available	• Targeted farmers: 600 • Training for UTZ
Rubber	• Lack of market access • Lack of knowledge for better post-harvest product processing • Limited number of certified rubber plantations	• Targeted farmers: 2,400 • Training on FSC/PEFC/IFCC certification
Coconut	• No traceability system in place • Lack of market access • Lack of knowledge for better post-harvest product processing • Low or minimum inputs available • Lack of extension services • Low diversification of product	• Targeted farmers: 1,200
Palm Oil	• Lack of extension services • Unsustainable practices	• Targeted farmers: 6,000

	• Lack of cooperative systems; farmers are relying on middleman • Lack of financial access for farming activity • No traceability system in place • Poor planting material and low or minimum inputs	• Training required for certification requirements of ISPO/RSPO
Pepper	• Unsustainable practices • Lack of cooperative systems; farmers are relying on middleman • Lack of financial access for farming activity • No traceability system in place • Low or minimum inputs	• Targeted farmers: 1,200 (incl. other farming activities like bamboo, rattan, sugar palm, ecosystem services) • Training for UTZ/RA certification)

Regarding the assumed **forestry land use changes**, the model assesses the project areas moving from **unmanaged forest to community forest** (under Social Forestry License, project component 3) and a **forest BAU** to an established **High Level Conservation area** (project component 1).

As described in section 2, 100,000 hectares of unlicensed forest are converted into sustainable licensed community forest (Social Forestry) and for another 100,000 hectares of already licensed but unmanaged forest areas, management plans will be developed and funding for implementation will be provided. Under the sustainable management regime, NTFPs are assumed to be harvested at a sustainable rate in addition to legal coffee farming and are included as revenue streams in the financial model.

Additionally, the project will support the establishment of 100,000 hectares of High-Level Conservation Value areas under a conservation status. In terms of revenues the model takes into account that illegal coffee farming or other agricultural activities might have been carried out in the BAU scenario. In the project scenario only revenues from sustainably harvested NFTPs are considered.

Similarly, peatlands and mangrove areas are included as sustainably managed in comparison to the BAU. However, no revenues are considered for these areas in the financial analysis.

Table 2 The table below presents an overview of all revenues considered in the financial analysis. All the references can be found in the Annex of this document (p.**Error! Bookmark not defined.**).

Table 2: Revenue streams BAU and project scenario (FA)[5]

LAND USE TYPE	BAU	REVENUE (EUR/HA/ANNUM)	LAND USE TYPE	PROJECT SCENARIO	REVENUE (EUR/HA/ANNUM)
Agriculture	Coffee BAU	245[i]	Agriculture	Coffee	2,609[ii]
Agriculture	Rubber BAU	1,074[iii]	Agriculture	Rubber	1,985[iv]
Agriculture	Coconut BAU	/ (palm oil BAU data has been used)	Agriculture	Coconut	1,514[v]
Agriculture	Palm Oil BAU	1,152[vi]	Agriculture	Palm Oil	2,880[vii]
Agriculture	Pepper BAU	/ (coffee BAU data has been used)	Agriculture	Pepper	4,075[viii]
Licensed Forest BAU	Coffee NTFPs	55[ix] 110[x]	Community forest	Coffee NTFPs	92[xi] 110[xii]
Forest BAU	Coffee	55[xiii]	High Level Conservation	NTFPs	110[xiv]

[5] Please find all endnotes containing the sources in the annex section of this document.

3.2.2 Economic analysis

An **economic analysis** has been carried out considering the same BAU and project scenarios as the financial analysis for both project components: 1) commodity land use change of agricultural value chains (project component; and 2) forestry land use change (project component 1 & 3).

In addition to the costs and revenues considered in the financial analysis, the economic analysis evaluates the costs and benefits at the global level by incorporating **non-market externalities** that are not easily monetized, such as the **value of greenhouse gas (GHG) reductions**. Within the scope of this assessment other potential benefits such as health benefits, social welfare, and ecosystem services have not been included given the difficulties in quantifying these benefits.

The use of a social discount rate of 6% shows a societal rate of time preference and includes to some extent the non-market value that society places on improved natural resource outcomes[6].

Carbon inputs from the model were derived from an ex-ante estimate of an average of 2.2 million tCO2eq per annum over the first seven years of the project (see Annex 22 and the GHG note for assumptions on carbon calculations). Estimates of carbon prices vary widely. This economic analysis uses the World Bank guidance on the shadow price of carbon, starting at EUR 40 per tCO2eq.

Next to the value of sequestered carbon, for which there is good empirical evidence and defined prices, the project will also deliver significant **environmental and social benefits** that were not included in the model. Examples include the improved resilience to climate change risks and the protection and enhancement of ecosystem services such as clean air, water sequestration, soil improvement as results from project activities. The project is expected to result in direct adaptation benefits through increased resilience of 680,108 people (of which 50% are women) who reside in approximately 200 villages by strengthening their awareness of climate change risk and risk reduction practices like climate-resilient and low-emission agriculture and forestry practices. The value of the resulting ecosystem services would only add to the positive economic return if included in the EFA model. In Section 5 of this report the **environmental and social co-benefits** of the project are further described.

3.3 Model introduction and data flow

Figure 3 provides a schematic outline of the information flow within the model. The figure shows information flowing from left to right; however, in the Excel model, the main summary and settings tabs are found at the front (or left-hand side of the model).

In the "*Settings*" tab it is possible to adjust the conditions for the time horizon, type of project finance, loan or grant financing and these will flow through to all of the different cashflow models. The model also provides an analysis of how the financial returns of the investment would look only considering the investment of the GCF (without other co-finance).[7] Furthermore, in the

[6] https://pubdocs.worldbank.org/en/115591526379293210/pdf/PAD-Annex-P159712-Economic-Financial-Analysis.pdf

[7] It is worth noting that the project's actions focus on building capacities of farmers, farmer cooperatives, local government staff, including through farmer field schools covering a range of topics including good agricultural practices/ climate smart agriculture, introduction of high conservation value areas, local value adding practices (e.g. harvesting and storing, post-harvest processing to improve product quality, business management and financial literacy, among others. It also will support farmers to better understand and meet certification requirements and will develop and implement traceability systems for different agricultural supply chains, in alignment with the international sustainability requirements, that will strengthen market access.

"Settings" tab, the model can be configured to simulate different scenarios regarding carbon price and financing mechanism, and adjustments for the sensitivity analysis can also be made here.

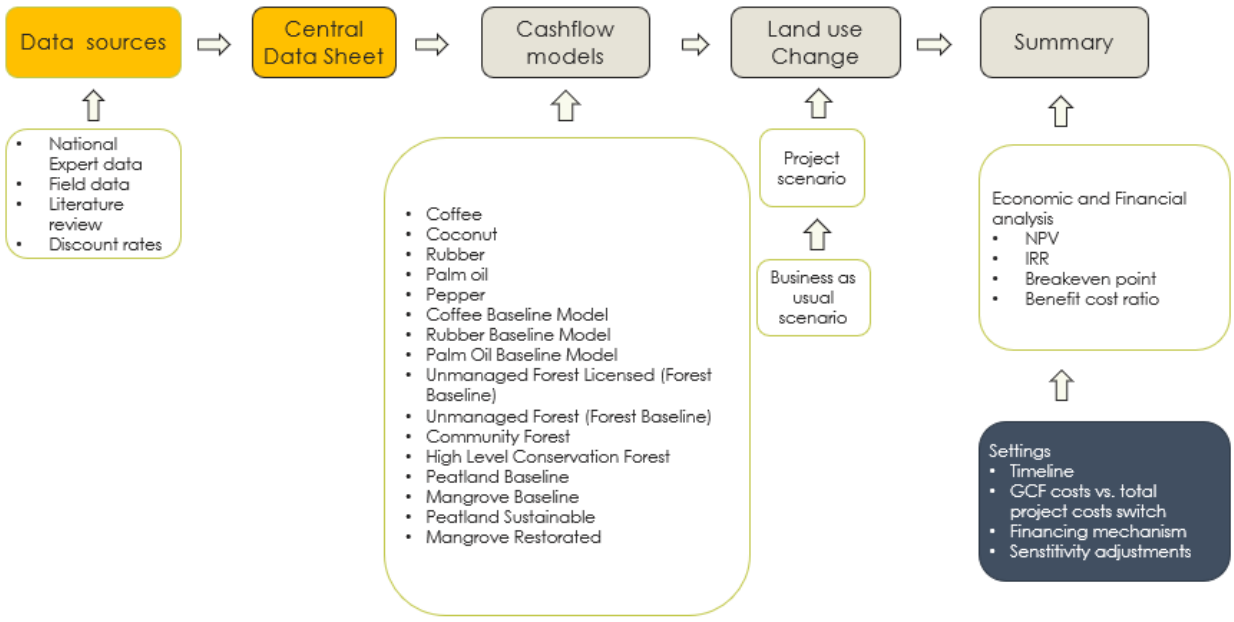


Figure 3: Schematic outline of Excel model and information flow

The main landscape level results can be retrieved from the sheets "*Summary_LandscapeEA_Landscape_results*" and "FA_Landscape_results" and the cash flow results can be found in the "*Summary_Cashflow*" tab. The cashflow models represent per hectare models of the changed land use that is anticipated under the project scenario. The model then contains several tabs that combine the per hectare models at the landscape level – these are called the "*Project_hectares*" and "*Project*" tabs, "*Baseline_hectares*" and "*Baseline*" tab. To highlight the different impacts of the project components, the Excel contains tabs that are showing the commodity land use change (project component 2) and the forestry land use change (project component 1 & 3) separately. All main indicators have been calculated as part of a financial (see section 4), as well as an economic analysis (that includes additional costs and benefits of non-market externalities, such as GHG benefits, see section 5).

The model of the EFA takes into account how the total project budget of 100,194,751.09 million EUR will be spent across the three different components of the project. The budget can be adjusted in the second to last sheet "*Project_Costs".*

The project's 100,194,751.09 € budget will be distributed as outlined in Table 3 Component 1: Institutional & Regulatory Frameworks (31%) and Component 3: Management, protection and rehabilitation of forest and peatland ecosystems (34%) receive the most funding. Component 2

receives 24%, and the rest of the funding is distributed among Monitoring and Evaluation (M&E), contingencies, and Project Management Consultancy (PMC).

Table 3: Project funding by area – see “Project_Costs” tab in the model

BUDGET ELEMENT	PROJECT TOTAL (€)	(OF WHICH) GCF FUNDED (€)
Component 1	30,926,682	13,094,902
Component 2	19,781,506	12,084,394
Component 3	37,878,512	27,840,771
Monitoring and Evaluation	4,311,200	2,579,146
Contingencies	1,071,422	1,071,422
Project Management Costs (PMC)	6,225,428	2,814,117
Total	100,194,751	59,484,751

Source: Funding proposal

4. Results of the financial analysis

The following descriptions are based on calculations in the following tabs in the Excel Sheet:

- FA_Landscape_results
- Results_Cashflow_models

The financial analysis focuses on the activities of each component of the project that have the potential to generate financial benefits through land use change. For the financial analysis a 12.3% discount rate was applied (see 3.1 Assumptions and data sources). Income and cost revenue streams were modelled over the project lifespan of 20 years. For example, in the palm oil BAU scenario, a farmer cultivates one hectare using traditional practices and family labour making an annual return of 1,152 EUR/ha. This covers an estimated EUR 159 in annual labour costs and other costs for small equipment. At a 12.3% discount rate, the NPV of BAU palm oil cultivation on one hectare of land over 20 years is EUR 838. Similarly, the coffee and rubber BAU models are based on traditional, low input level cultivation practices.

The BAU commodity models represent simple costs and revenues associated with production for coffee, rubber and palm oil. These include costs such as land preparation, planting, maintenance (weeding and pruning) and harvesting, as well as farm gate level revenues.

For the commodities, the improved land uses involve more investment towards professionalization and efficiency. For example, in the case of palm oil, the effect of enhanced capacities for labour and higher inputs were included, among other items. Detailed itemized costs are presented in the Excel model. For the forestry models, the forest BAU model includes a model of illegal coffee farming income from non-timber forest products, which is reduced over time at a rate of 2.6% per annum, in line with ongoing deforestation in Indonesia. These areas are converted into licensed, managed forest areas which include the cost of acquiring licensing, rehabilitation of forests and patrolling in the forested areas. For detailed information on the itemized costs please see the Excel model Annex 03_Financial and Economic Analysis.

Key financial performance indicators were calculated for BAU and project land uses for the discounted cashflows over the first 20 years and are listed in Table 4. A look at the values in the NPV column shows that most of the project NPVs are more attractive than their BAU counterparts. Furthermore, land degradation due to unsustainable management practices will reduce yields and thus revenue streams in the future if BAU activities were to be continued. Conservatively, this assumption was not considered in the model. For instance, the BAU coffee production system has an NPV of 1,417 € while the sustainable coffee production promoted by project activities under component 2 has an NPV of 5,990 €. The land uses affected by project components 1 and 3 increase in NPV from unsustainable forest BAU (320 €) and licensed forest BAU (1,011 €) to high-level conservation forest (847 €) and community forest (1,149 €). Peatland and mangroves in the BAU have an NPV of 0 € because there are no cost nor revenue streams associated with the land use (however, there are substantial carbon benefits and other ecosystem benefits from these land uses). The negative numbers under “Project other land use” peatland and mangroves are due to the costs that the restoration activities incur. Because carbon benefits are not considered in the financial analysis, there are no revenue streams and this is why the figures are negative. The analysis of NPVs of the different cashflow models emphasize the impact potential of the project and the potential for scalability. The financial attractiveness of the land uses promoted by the project activities increase the likelihood of a sustainable development and permanence.

The IRRs were calculated for all land uses. Land uses that do not show an IRR either do not have a negative cashflow (e.g., the coffee BAU scenario does not require an initial investment) or the sum discounted cashflows is negative (e.g., the row “other land use peatland” does not have an IRR because the restoration activities are associated with costs, but there are no revenue streams considered in the financial analysis). For palm oil, significant capacity gaps, risk aversion, access to finance for the transition period and the need for immediate and continuous cash from the oil palm plantation, impose barriers for smallholders to transition from unsustainable to sustainable production systems (see section 7 in the annex for further explanations).

The breakeven points for the different land uses indicate that the sustainable land uses have periods of no cumulative net positive income for a period of 3 – 11 years. This highlights the need for external investment to promote sustainable land use within the project area. It also underpins the argument of additionality, as land uses promoted by the project components 1-3 in the absence of the project face investment barriers. Uncertainty and risk aversion prevent smallholder farmers from investing in sustainable development.

Table 4: Results of per hectare cashflow models for the without-project scenario (WOP) for unsustainable and more sustainable land use managements. Note that this assumes that the transition to the sustainable land use managements was self-funded by smallholders.

	MODEL	NPV (EUR)	IRR (%)	BCR (RATIO)	BREAKEVEN POINT (YEARS)
Unsustainable land use	Coffee BAU	1,417		3.2	0
	Rubber BAU	2,170		1.3	0
	Palm oil BAU	838		1.1	0
	Licensed forest BAU	1,011			0
	Forest BAU	320		5.2	0
	Peatland BAU	-			0
	Mangroves BAU	-			0
Sustainable land use	Coffee	5,990	34%	1.7	4
	Rubber	2,680	21%		7
	Coconut	-333	10%	0.4	11
	Palm Oil	1,661	39%		3
	Pepper	1,926	18%	1.1	7
	Community forest	1,149		5.7	0
	High Level conservation	847		11.3	0
	Peatland	-1,452		0.0	21
	Mangroves	-3,540		0.0	21

The financial analysis has also been extended for the entire suite of activities across the 385,000 hectares of land for which project activities are foreseen to make changes to the land management. The landscape level analysis is essentially the same discounted cashflow analysis but involves upscaling of the per hectare models described in section **Error! Reference source not found.** to the landscape level (including for example 5,000 hectares of rubber plantations,

12,500 hectares of palm oil, etc.), as well as including the project level implementation costs of the planned activities[8].

Results of the financial analysis of the whole project (including all components and project costs) are presented in Table 5. The results show that there is a significant improvement over BAU land uses in terms of NPV, however the benefit cost ratio is lower, reflecting the much higher associated costs. This strengthens the justification for the project intervention, because due to the high costs and the risk-aversion of smallholders it is unlikely that investments would be undertaken in the absence of the project. The figures for total costs and revenues include the project costs borne by the project proponents as well as the costs incurring for the transition in land use management for smallholders and communities. In order to show the returns to GCF financing, without including project costs that will be covered by co-finance, returns have also been calculated for GCF financing by including only the GCF component of project costs.

Table 5: Financial results from GCF investment perspective over the landscape area

ECONOMIC INDICATOR	UNIT	INCLUDING TOTAL PROJECT COSTS	ONLY GCF FINANCING	BAU
NPV	EUR	318,059,062	347,765,245	302,678,447
BCR	Ratio	1.8	1.9	4.3
Total revenue	EUR	2,017,237,421	2,017,237,421	899,574,744
PV total revenue	EUR	715,516,789	715,516,789	393,499,347
Total cost	EUR	870,138,017	829,428,017	225,564,064
PV total cost	EUR	397,457,726	367,751,544	90,820,901

The results of the individual components are presented in **Error! Reference source not found.**. These results are split into component 2 which addresses agricultural production systems and component 1 and 3 which are associated with forest land use changes. Note that only the project costs associated with each component are included (not monitoring, PMC and contingency

[8] With palm oil, the project largely focuses on working with Forest Management Units (FMUs) to map and monitor forest encroachment and implement national policy (also on forest restoration), supporting farmers in production forest areas to convert to agroforestry, training farmers on sustainable, climate resilient oil palm production, helping farmers to register their land and obtain formal titles, and working with MSPs to make sustainable management plans for community landscapes and sensitizing farmers on the importance and interface of sustainable management, forest protection and restoration. In addition, investments and sourcing are secured from partner companies, where support is provided to strengthen the mapping, traceability and monitoring of land use, and support is provided to farmers to empower them to increase yields but also improve their business and financial management capacities, which are key steps towards obtaining certification (e.g. ISPO or RSPO). Together, these activities will help derisk smallholder sourcing by international companies. More detailed information on the specific actions are provided in the Feasibility Study (Annex 2a) in Chapter 5.6.6

costs)[9]. The project case shows a significant financial return over the BAU. The IRR could not be determined in all the cases because the project does not run into negative net revenues in the early stages of the investment (in other words, the investment or project costs are less than the net revenue of the project activities overall).

Table 6: Financial results over the landscape area, by component

ECONOMIC INDICATOR	UNITS	PROJECT COMPONENT 2 (COMMODITY)	BAU COMPONENT 2 (COMMODITY)	PROJECT COMPONENT 1 AND 3 (FORESTRY)	BAU COMPONENT 1 AND 3 (FORESTRY)
Financial results					
NPV	EUR	32,945,448	30,503,240	293,879,575	284,741,578
BCR	Ratio	1.1	1.2	3.1	6.4
Total revenue	EUR	840,542,768	532,631,194	1,177,406,354	761,009,373
PV total revenue	EUR	282,844,134	214,458,118	432,677,829	337,707,518
Total Cost	EUR	615,135,981	456,872,919	243,103,620	131,546,953
PV total cost	EUR	249,898,686	183,954,879	138,798,254	52,965,940

Analysis of financing mechanisms in the WOP scenario

Two financing mechanisms for transitioning to sustainable land uses in the absence of the project (WOP scenario) were modelled and compared: self-financing versus commercial loans.

[9] Information how to split these costs between the two components was not available, and the amounts are very small compared to overall costs.

In addition to the results of the economic model, research was undertaken to assess potential loans available for the target beneficiaries (smallholders and forest communities) of the project in West Kalimantan.

There is a Revolving Fund Facility (*Fasilitas Dana Bergulir,* FDB) loan scheme under the Indonesian Environmental Fund (BPDLH) that targets forestry companies, Social Forestry (SF) Communities, and individuals that manage forestry businesses (see section 3.5.2 in the Feasibility Study for further information).[10] It is regulated under Perdirjen BPDLH 13/BPDLH/2020. The FDB aims to distribute funds to beneficiaries as low-interest loans for business activities that support, for example, community forest management, industrial plantation forests, or community plantation forests. However, it is challenging for communities to receive such a loan due to the collateral requirements. The SF permit cannot be used as collateral as is the case for a plantation permit. Debtors usually need to provide cash from other sources to be used as collateral. Also, the loan scheme does not include readiness financing and one of the main objectives of the GCF project is to create enabling conditions to prepare communities to be able to access alternative funding sources. For this to be a viable option, basic requirements like creating business associations in the villages, building business cases and supporting access to Social Forestry licenses is required. At the time of writing there are two projects in West Kalimantan making use of the BPDLH loan scheme (Crab and honey projects in Kubu Raya and a honey project in Kapuas Hulu). The project aims to address the access barriers so that the loans are an option to continue sustainable forest practices after the project period.

Additionally, the FDB targets forest rehabilitation activities consequently the loans are not targeted at smallholders in need of enhanced climate-resilient agricultural practices to decrease climate change risks and vulnerabilities – activities that the project will support through capacity development under component 2.

All in all, despite the theoretical access to finance from loans, the main group of project beneficiaries realistically do not have access to such loans. In addition to the described collateral requirements and the forest focus of the FDB, the risk aversion of smallholders and the period until the land use change breaks even pose a barrier to land use change under a loan financing mechanism. Thus, a GCF grant would be the most efficient and effective financial instrument. After the enabling conditions have been prepared through the project, the loan options are a good opportunity to ensure the sustainability of measures from social forestry measures of component 3.

The hypothetical commercial loan conditions are described in 3.1. The Results, detailed in Table 7 show that under both financing mechanisms most of the sustainable land use managements are financially viable. However, both scenarios face barriers in reality. The self-financing of land use change to more sustainable production systems requires that smallholders have available savings that they can invest. This is not the case for the vast majority of smallholders in the project region. Furthermore, the breakeven points of 3-11 years pose a barrier with regards to the risk aversion of smallholder farmers. The commercial loan scenario faces similar barriers regarding breakeven points and risk aversion. Furthermore, access to commercial loans for smallholders in the project area is restricted.

[10] https://bpdlh.id/donors/2aedf45e-a351-4f47-aef3-d96b563b7705

Table 7: Comparison of financing mechanisms for sustainable land management in the WOP scenario

MODEL	SELF-FINANCING		COMMERCIAL LOAN	
	NPV	**Breakeven point**	**NPV**	**Breakeven point**
Coffee	5,990	4	5,624	4
Rubber	2,680	7	2,361	7
Coconut	-333	11	-546	11
Palm Oil	1,661	3	1,166	4
Pepper	1,926	7	1,561	7
Community forest	1,149	0	1,129	0
High level conservation	847	0	845	0
Peatland	-1,452	-	-1,786	-
Mangroves	-3,540	-	-4,354	-

Analysis of the financing mechanisms in the WP scenario

GCF guidelines for financial and economic analysis[11] stipulate that the analysis should assess the implications of loan financing for implementing the project land use changes. Given that the project does not intend to provide concessional finance for the land use change this step is not technically needed, however it was included for completeness and to compare financial implications of a hypothetical loan finance option.

For that purpose, the NPVs for different financing mechanisms were calculated. The results are depicted in Table 8**Error! Reference source not found.**. The first column assumes that smallholders receive a concessional loan to finance the land use change. The general conditions for this concessional loan are described in 3.1 Assumptions and data sources. The second column represents a scenario in which investment costs are borne by a grant.

The comparison shows that grant financing maximizes the benefit of project participants. For the coconut production system, the grant is the only financing mechanism that yields a financially attractive NPV. Therefore, grant financing is necessary to incentivize smallholder farmers to diversify their production systems which is an important adaptation strategy in the face of climate change. The NPVs under the loan scenario are mostly also positive. However, that does not mean that this scenario is a viable option for all smallholders with regards to the breakeven points.

Table 8: Comparison of financing mechanisms for sustainable land management in WP scenario

FINANCIAL INDICATOR	CONCESSIONAL LOAN		GRANT FINANCING	
	NPV	**Breakeven point**	**NPV**	**Breakeven point**
Coffee	5,908	4	7,580	2
Rubber	2,609	6	4,072	5
Coconut	-381	11	594	9
Palm Oil	1,550	2	3,813	0
Pepper	1,844	6	3,516	4
Community forest	1,144	0	1,235	0
High level conservation	846	0	857	0
Peatland	-1,527	-	0	0
Mangroves	0	-	0	0

[11] https://www.greenclimate.fund/document/annex-vi-economic-and-financial-analysis-efa-guidance

To conclude the analysis of different financing mechanisms, *Table 9* depicts the barriers the four different financing mechanisms face. It becomes evident that grant financing is the only viable option for the project.

Table 9: Barrier analysis for different financing mechanisms in the without-project (WOP) and with-project (WP) scenarios.

	WOP		WP	
Financing mechanism	Commercial loan	Self-funding	Concessional loan	Grant
Barriers	• Access to commercial loans • Time to reach breakeven • Risk aversion • Negative NPVs	• Lack of savings • Time to reach breakeven • Risk aversion	• Time to reach breakeven • Risk aversion	

5. Results of the economic analysis

The following descriptions are based on calculations in the following tabs in the Excel Sheet:

- EA_Landscape_results
- Project

In this section, the results of the intervention at the landscape level are presented. The economic analysis applies to the entire project and uses the project budget (GCF contribution and GCF plus co-finance) in economic NPV and IRR calculations. The lifetime of the project (period over which the project will bear its entire environmental benefits and socioeconomic co-benefits) is estimated at 20 years[12].

The overall economic results for the model were calculated for project and BAU scenarios. There are two separate sets of economic results provided; one from the perspective of the GCF, which includes only costs borne by the GCF. The second set of economic results includes all project costs paid by the contributing funds (in other words including contributions from GIZ/ BMZ, Solidaridad, the Government of Indonesia and other partners).

Returns have also been calculated for GCF financing by including only the GCF component of project costs. The results are represented in Table 10. The analysis indicates that the project is financially even more attractive from a GCF perspective. Including the value of carbon, and using a 6% social discount rate[13], the intervention generates significantly improved returns relative to the financial case.

[12] This excludes the project's mitigation impact, as that is calculated against a FREL and only for the duration of the project implementation period.

[13] http://intresources.worldbank.org/INTOPCS/Resources/380831-1360104418611/Discount_Rate_TechnicalNote.pdf

Table 10: Economic results from GCF investment perspective over the landscape area

ECONOMIC INDICATOR	UNITS	INCLUDING TOTAL PROJECT COSTS	ONLY GCF FINANCING	BAU
NPV	EUR	1,148,465,452	1,182,878,919	425,199,554
BCR	Ratio	3.1	3.3	4.2
Total revenue	EUR	2,701,841,152	2,017,237,421	899,574,744
PV total revenue	EUR	1,700,489,386	715,516,789	559,140,797
Total cost	EUR	870,138,017	829,428,017	225,564,064
PV total cost	EUR	552,023,934	367,751,544	133,941,243

Source: see Excel model for details

Table 11 shows the returns to component 2 and component 1 and 3 separately. Carbon sequestered under Component 1 and 3, and under Component 2 have been modelled separately and allocated to each of the economic analyses below. Under Component 2, the total carbon sequestered over 7 years is 3,868,857 tCO_2e. Under component 1 and 3, the total carbon sequestered is 11,549,087 tCO_2e.

Table 11: Economic results over the landscape area, by component

ECONOMIC INDICATOR	UNIT	PROJECT COMPONENT 2 (COMMODITY)	BAU COMPONENT 2 (COMMODITY)	PROJECT COMPONENT 1 AND 3 (FORESTRY)	BAU COMPONENT 1 AND 3 (FORESTRY)
Economic results					
NPV	EUR	232,691,074	44,985,701	926,177,018	398,746,540
BCR	Ratio	1.6	1.2	6.3	6.1
Total revenue	EUR	1,009,737,246	532,631,194	1,692,815,608	761,009,373
PV total revenue	EUR	599,599,274	316,279,477	1,101,189,730	476,859,880
Total cost	EUR	615,135,981	456,872,919	243,103,620	131,546,953
PV total cost	EUR	366,908,200	271,293,777	175,012,712	78,113,340

As outlined in the methodology section of this report, the project is aiming at additional **environmental and social co-benefits** that were not included in the Economic Analysis. The following list is a non-exhaustive list of **environmental and social co-benefits**. Please refer to chapter 8 in the Feasibility Study (Annex 2) for further information.

- **Improvements in soil quality, water retention, erosion control**, and **excessive sedimentation** due to reduced deforestation and degradation of soils. Forest protection towards reduced deforestation, forest degradation, and biodiversity loss will be conducted to through several measures, among others, forest patrol support to FMU organizations (capacity and resources); law enforcement and coordination with key law enforcement institutions; funding support to IPs to protect and manage forests within social forestry concessions.
- **Reduction of fire threats** and risks due to unsustainable AFOLU management, including poor peatland management, thereby reducing the **health impact** on respiratory diseases resulting from forest fires.
- **Conservation of the unique biodiversity of West Kalimantan's protected areas** and beyond securing ecosystem services and providing habitat for endangered species through the development of biodiversity management plans (RPKH).
- **Improvement of food security** through the adoption of sustainable agricultural practices in the long term.

- Improved productivity and income of smallholders and improved livelihood and the creation of alternative livelihood will enhance access to **health and education services** and quality, thereby improving social safety nets for the local population.
- The recognition of natural resources through social forestry and other Community Based Forest Management schemes provides **tenure security** and assurance for the local population over natural resources. The specific IPs on-granting mechanism will support IPs communities to receive tenure rights through the official *adat* recognition (official recognition of the "indigenous" status) to be able to obtain land rights or forest use and access rights (e.g. through *hutan adat* social forestry licenses).
- **Increased economic growth and job creation**. Capacity building will be provided to the communities, specifically targeting women and young generations. Improved capacity allows the community to develop and implement their business systematically leading to innovation and fostering economic growth and job creation at local levels.
- **Further economic growth and job opportunity creation** will be supported through climate-resilient business case development, and access to the market and financial mechanisms. **Traceability systems** for different agricultural supply chains will be developed, introduced, and scaled up to trace goods and products to their origin and comply with sustainability standards. The ability of SMEs to access financial services will increase the size and portfolio of investment within the province and improve the scale of business. Robust cooperation will also be developed with large enterprises to invest in sustainable supply chains that benefit smallholders and SMEs directly.

6. Sensitivity analyses

The following descriptions are based on calculations in the following tabs in the Excel Sheet:

- EA_Landscape_results
- FA_Landscape_results

Conducting the sensitivity analysis for the EFA posed significant challenges due to the complexities and uncertainties associated with the impacts of various Shared Socioeconomic Pathways (SSP) scenarios on agricultural commodity prices. Given the unpredictable nature of these impacts, it was not feasible to directly correlate SSP scenarios with specific sensitivity levels. To address this, we employed a wide sensitivity analysis, examining a range of potential outcomes by varying revenue estimates by up to 50%. This approach allowed us to account for a broad spectrum of possible financial outcomes without the need to assign specific SSP scenarios to each sensitivity level.

The sensitivity analysis followed a once-at-a-time (OAT) approach. Revenues were adjusted by ten percent reductions and costs by ten percent increases up to 50. Furthermore, the EA tested different assumptions on the carbon price. To run the model in these different scenarios, the model parameters in the "Settings" tab of the Excel file were adjusted accordingly. The results are presented in the following, separated for FA and EA.

Financial analysis

Results of the sensitivity analysis in FA (Table 12 and Table 13) show that the sustainable land use management promoted by the project remains profitable over most sensitivity levels. Only the 50% revenue loss scenario brings a negative NPV. Overall, this demonstrates the resilience of the project activities in coping with the uncertainties posed by climate change.

Table 12: Sensitivity analysis lower revenues in the financial analysis.

FINANCIAL RESULTS		***10%***	***20%***	***30%***	***40%***	***50%***
NPV	EUR	246,507,384	174,955,705	103,404,026	31,852,347	-39,699,332
BCR	Ratio	1.6	1.4	1.3	1.1	0.9
Total revenue	EUR	1,815,513,679	1,613,789,936	1,412,066,194	1,210,342,452	1,008,618,710
PV total revenue	EUR	643,965,110	572,413,431	500,861,752	429,310,073	357,758,394
Total cost	EUR	870,138,017	870,138,017	870,138,017	870,138,017	870,138,017
PV total cost	EUR	397,457,726	397,457,726	397,457,726	397,457,726	397,457,726

Table 13: Sensitivity analysis higher costs in the financial analysis.

FINANCIAL RESULTS		***10%***	***20%***	***30%***	***40%***	***50%***
NPV	EUR	278,313,290	238,567,517	198,821,745	159,075,972	119,330,199
BCR	Ratio	1.6	1.5	1.4	1.3	1.2
Total revenue	EUR	2,017,237,421	2,017,237,421	2,017,237,421	2,017,237,421	2,017,237,421
PV total revenue	EUR	715,516,789	715,516,789	715,516,789	715,516,789	715,516,789

Total Cost	EUR	957,151,818	1,044,165,620	1,131,179,421	1,218,193,223	1,305,207,025
PV total cost	EUR	437,203,499	476,949,271	516,695,044	556,440,817	596,186,589

Economic analysis

The results of the sensitivity analysis within the EA also show the robustness of the project and are positive across all sensitivity levels of revenues and costs (see Table 14 and

Table 15).

Table 14: Sensitivity analysis lower revenues in the economic analysis.

ECONOMIC RESULTS		*10%*	*20%*	*30%*	*40%*	*50%*
NPV	EUR	978,416,513	808,367,575	638,318,636	468,269,697	298,220,759
BCR	Ratio	2.8	2.5	2.2	1.8	1.5
Total revenue	EUR	2,431,657,037	2,161,472,922	1,891,288,807	1,621,104,691	1,350,920,576
PV total revenue	EUR	1,530,440,447	1,360,391,509	1,190,342,570	1,020,293,632	850,244,693
Total cost	EUR	870,138,017	870,138,017	870,138,017	870,138,017	870,138,017
PV total cost	EUR	552,023,934	552,023,934	552,023,934	552,023,934	552,023,934

Table 15: Sensitivity analysis higher costs in the economic analysis.

ECONOMIC RESULTS		*10%*	*20%*	*30%*	*40%*	*50%*
NPV	EUR	1,093,263,058	1,038,060,665	1,038,060,665	982,858,272	872,453,485
BCR	Ratio	2.8	2.6	2.6	2.4	2.1
Total revenue	EUR	2,701,841,152	2,701,841,152	2,701,841,152	2,701,841,152	2,701,841,152
PV total revenue	EUR	1,700,489,386	1,700,489,386	1,700,489,386	1,700,489,386	1,700,489,386
Total cost	EUR	957,151,818	1,044,165,620	1,044,165,620	1,131,179,421	1,305,207,025
PV total cost	EUR	607,226,327	662,428,721	662,428,721	717,631,114	828,035,901

In general, an economic cost-benefit analysis weights the potential economic benefits of a project against the costs. By including shadow prices for CO_2e, the environmental impacts and long-term economic benefits of emission reductions can be better captured. Comparable shadow prices for CO_2e also ensure comparability between different programs and therefore facilitates decision-making and the prioritization of projects that contribute to achieving climate goals. However, as an additional sensitivity analysis for the EA, the model was run with different carbon price assumptions. The results are depicted in Table 16. They show that the carbon price assumption does have a significant impact on the model output. However, it also shows that while the most extreme carbon price assumptions differ by a factor of 8 and higher, the outputs differ only by a factor of <2. This underpins the stability of the model predictions over a wider range of carbon price assumptions.

Table 16: Economic analysis of the WP scenario on the landscape level with different carbon price assumptions.

ECONOMIC INDICATOR	UNITS	5€/TCO2E	10€/TCO2E	20€/TCO2E	40€/TCO2E	SHADOW PRICE
NPV	EUR	634,333,561	695,795,199	818,718,475	1,064,565,027	1,147,583,746

BCR	Ratio					
Total Revenue	EUR	2.1	2.3	2.5	2.9	3.1
Total discounted revenue	EUR	0	0	0	0	0
Total cost	EUR	2,090,067,605	2,162,897,789	2,308,558,157	2,599,878,894	2,701,091,831
Total discounted cost	EUR	1,186,357,495	1,247,819,133	1,370,742,409	1,616,588,961	1,699,780,759

7. Annex

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