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IMPLEMENTATION COMPLETION AND RESULTS REPORT

(IBRD LOAN 8474-BY, IBRD LOAN (AF) 8821-BY, GEF GRANT TF018741)

ON A LOAN IN THE AMOUNT OF US$40.71 MILLION
AND

EUR 12 MILLION (US$14.4 MILLION EQUIVALENT) FROM THE INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

AND

ON A GRANT

IN THE AMOUNT OF US$2.74 MILLION

FROM GLOBAL ENVIRONMENT FACILITY TRUST FUND

TO

THE REPUBLIC OF BELARUS

FOR THE

FORESTRY DEVELOPMENT PROJECT
October 20, 2022

Environment, Natural Resources and the Blue Economy Global Practice
Europe and Central Asia Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective February 17, 2022)

Currency Unit =	Belarusian Ruble (BYR)
2.55625 BYR =	US$1

FISCAL YEAR

July 1 - June 30

ABBREVIATIONS AND ACRONYMS

AF	Additional Financing
BFDP	Belarus Forestry Development Project
BFF	Boiler and Furnace Fuels
CPF	Country Partnership Framework
ENPV	Economic Net Present Value
ERR	Economic Rate of Return
ESMP	Environmental and Social Management Plan
EU	European Union
EX-ACT	EX-Ante Carbon-Balance Tool
FM	Financial Management
FSC	Forest Stewardship Council
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Greenhouse Gas
GRM	Grievance Redress Mechanism
IBRD	International Bank for Reconstruction and Development
ICR	Implementation Completion and Results Report
IRR	Internal Rate of Return
ISR	Implementation Status and Results Report
M&E	Monitoring and Evaluation
NPV	Net Present Value
PAD	Project Appraisal Document
PIU	Project Implementation Unit
PDO	Project Development Objective
RBF	Results-Based Framework
RUE	Republican Unitary Enterprise
SFE	State Forest Enterprise
SFM	Sustainable Forest Management
STEP	Systematic Tracking of Exchanges in Procurement
TTL	Task Team Leader
ToC	Theory of Change

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DATA SHEET

BASIC INFORMATION

Product Information

Project ID	Project Name
P147760	Forestry Development Project
Country	**Financing Instrument**
Belarus	Investment Project Financing
Original EA Category	**Revised EA Category**
Partial Assessment (B)	Partial Assessment (B)

Related Projects

Relationship	Project	Approval	Product Line
Supplement	P152636-Forestry Development Project	27-Mar-2015	Global Environment Project
Additional Financing	P165121-Belarus Forestry Development Project - Additional Financing	12-Mar-2018	IBRD/IDA

Organizations

Borrower	Implementing Agency
THE REPUBLIC OF BELARUS	BellesExport, Ministry of Forestry

Project Development Objective (PDO)

Original PDO

The Project Development Objective is to enhance silvicultural management and reforestation and afforestation, increase the use of felling residues and improve the public good contribution from forests in targeted forest areas.

[1] Datasheet is being updated as operations portal should reflect 'No RF changes' in restructuring/ additional financing section in 2019

FINANCING

		Original Amount (US$)	Revised Amount (US$)	Actual Disbursed (US$)
World Bank Financing				
P147760	IBRD-84740	40,714,000	40,713,937	40,713,937
P147760	IBRD-88210	14,400,000	14,400,000	13,813,849
P152636	TF-A1173	2,739,726	2,739,726	2,739,726
Total		**57,853,726**	**57,853,663**	**57,267,512**
Non-World Bank Financing				
Borrower/Recipient		0	0	0
Total		**0**	**0**	**0**
Total Project Cost		**57,853,726**	**57,853,663**	**57,267,512**

KEY DATES

Project	Approval	Effectiveness	MTR Review	Original Closing	Actual Closing
P147760	27-Mar-2015	30-Jul-2015	02-Apr-2018	31-Aug-2020	31-Aug-2021

RESTRUCTURING AND/OR ADDITIONAL FINANCING

Date(s)	Amount Disbursed (US$M)	Key Revisions
12-Mar-2018	24.48	Additional Financing
17-Sep-2018	34.57	Change in Loan Closing Date(s)
09-Apr-2019	38.71	
17-Jul-2019	40.84	Change in Components and Cost

KEY RATINGS

Outcome	Bank Performance	M&E Quality
Satisfactory	Satisfactory	Substantial

RATINGS OF PROJECT PERFORMANCE IN ISRs

No.	Date ISR Archived	DO Rating	IP Rating	Actual Disbursements (US$M)
01	29-Jun-2015	Satisfactory	Satisfactory	0
02	02-Dec-2015	Satisfactory	Satisfactory	0
03	01-Apr-2016	Satisfactory	Moderately Satisfactory	0
04	25-Oct-2016	Satisfactory	Moderately Satisfactory	1.44
05	18-Apr-2017	Satisfactory	Satisfactory	9.67
06	30-Oct-2017	Satisfactory	Satisfactory	18.13
07	03-May-2018	Satisfactory	Satisfactory	27.40
08	16-Nov-2018	Satisfactory	Satisfactory	36.44
09	16-May-2019	Satisfactory	Satisfactory	39.46
10	09-Nov-2019	Satisfactory	Satisfactory	41.75
11	15-May-2020	Satisfactory	Satisfactory	44.20
12	13-Nov-2020	Satisfactory	Satisfactory	52.40
13	18-May-2021	Satisfactory	Satisfactory	53.69
14	23-Aug-2021	Satisfactory	Satisfactory	54.53

SECTORS AND THEMES

Sectors

Major Sector/Sector	(%)
Agriculture, Fishing and Forestry	**100**
Forestry	100

Themes

Major Theme/ Theme (Level 2)/ Theme (Level 3)	(%)
Private Sector Development	**100**
Jobs	100

Urban and Rural Development	**16**
Rural Development	16
Land Administration and Management	16
Environment and Natural Resource Management	**85**
Environmental Health and Pollution Management	36
Air quality management	12
Water Pollution	12
Soil Pollution	12
Renewable Natural Resources Asset Management	49
Biodiversity	39
Landscape Management	10

ADM STAFF

Role	At Approval	At ICR
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I. PROJECT CONTEXT AND DEVELOPMENT OBJECTIVES

Disclaimer: In light of the deteriorating operational environment resulting from the cumulative impact of the various restrictions and sanctions imposed on Belarusian financial institutions, as well as substantial restrictions on travel and access to materials and technology, the Bank suspended all projects in Belarus. The suspension went into effect on March 19, 2022. This ICR was finalized and submitted during the official Belarus portfolio suspension period.

A. CONTEXT AT APPRAISAL

Country Context

1. Belarus is a small state-dominated open economy with a population of about 9.5 million and gross national income (GNI) of US$6,720 per capita (Atlas methodology 2013). From 2001 to 2008, Belarus experienced high growth rates driven by trade and benefited from close economic ties and transit corridors between the Russian Federation and the European Union (EU). However, the global economic crisis of 2008–09 brought macroeconomic instability, soaring inflation primarily through lower export demand, and a marginal increase in poverty. At the time of the appraisal, the Belarussian economy was showing signs of recovery with slight increase in real gross domestic product (GDP) growth from 0.9 percent (2011) to 1.6 percent (2014) and a reduction in absolute poverty from 30 percent (2002) to 5 percent (2013) (World Bank Indicators). However, some challenges persisted, including high real inflation at 16.2 percent (2014) and poverty in rural areas at twice the level of urban areas.[2] Women and rural areas were largely left behind. To propel growth, Belarus planned to rely on (a) significant productivity gains driven by structural reforms, (b) reallocation of resources to private sector, and (c) social cohesion. With this vision, the Government prepared a plan for long-term economic development through 2030 and designed a medium-term structural reform program, which prioritized improved governance of state-owned enterprises, reform of state programs, industrial policy, and social protection.

Sector and Institutional Context

2. Forests are an important renewable resource for Belarus, covering at the time of appraisal 8.1 million ha or 39 percent of the country's territory[3] (the EU average is 42 percent[4]). They provide multiple environmental services including carbon sequestration of approximately 30,000,000 tCO_2eq (2013)[5]; raw material to a competitive forest industry; employment in the forest and forest products industries; woody biomass for generation of heat and power; and non-timber forest products for both commercial production and subsistence consumption by local communities, especially in rural areas. As part of Belarus's structural reform and long-term economic development agenda, the forestry sector took center stage as a significant contributor to its GDP—2.1 percent during the 2013 appraisal, of which 1.6 percent of GDP was contributed by the forest processing industry alone, with an export value of over US$1.2 billion.[6] The success of the sector was built on the robust health and growth of forests (in both standing volume and area); strong forest inventory; and the monitoring, prevention, and suppression of forest fire.

[2] Belarus - Poverty Assessment: Can Poverty Reduction and Access to Services Be Sustained, accessed here.
[3] As reported in the borrower's ICR.
[4] https://ec.europa.eu/eurostat/web/products-eurostat-news/-/edn-20180321-1#:~:text=Forests%20and%20wooded%20land%20cover,per%20capita%20in%20the%20EU.
[5] 2013 Belarus Forest Policy Note.
[6] 2013 Belarus Forest Policy Note.

3. Belarus has a centralized forest administration with the functions of state forest sector management[6] concentrated in the Ministry of Forestry with some of these functions (economic management and control) decentralized to regional bodies: state forest enterprises (SFEs) (see annex 9 for further details of institutional arrangements). A previous World Bank project (P008302) on forestry development (1994–2004) helped strengthen the Forest Code and legislation, forest cadaster, and monitoring and develop a national forest certification system and competitive timber sales methods, which were established in line with the country's first Forestry Development Strategic Plan (1997–2015). This has boosted log prices and volumes of timber sold, helping support the SFEs through increased standing timber sale fees and private sector revenue generation from harvesting services, sale of timber, and value-added products.

4. At the time of appraisal, the growth of the forestry sector and the private sector enterprises, industry, and people dependent on it, was threatened by the unmet growing demand for fuel from woody biomass, export of forest produce, and inputs for new SFEs. By 2015, the forestry sector needed to provide inputs to meet an interim target of 30 percent of boiler and furnace fuels (BFF)[7]) and maintain the supply of forest produce to ensure the profitability of 97 SFEs, all newly certified as sustainably managed under the Forest Stewardship Council (FSC) audit process.[8] Forest productivity gains were not sufficient to keep pace with the proposed levels of investment in wood processing with a projected shortfall of around 3 to 4 million m^3 per year by 2015, primarily in wood energy and pulpwood supply.[9]

5. Given this context, the Belarus Forestry Development Project (BFDP) was driven by the Government's interest in developing the forestry sector to respond to unmet demand and challenges[10] also identified by the Forest Policy Note 2013 (details in annex 6). Forest sector challenges studied at appraisal found[11] that silvicultural practices were resulting in high stocking densities, deadwood, and little light reaching the forest floor due to thinning on long cycles and high initial stocking densities. This limited forest productivity of young and middle-aged forests, which comprise 66.6 percent of the total forested area; windblow, snow events, fires, and drying of spruce stands and ash trees (about 6,000 ha annually) led to significant damage; lack of resilience of forest cultures and planting materials to climate change impacts further limited regenerative capacity and sustainability of the forest sector; there was insufficient government capacity with limited economic independence of SFEs given the centralized approach to planning and management of their activities; and limited engagement from all stakeholders and supplementary legal and regulatory frameworks. The ministry needed to be equipped with technical know-how, best practices, and technological advances for interventions in climate change, and biodiversity.

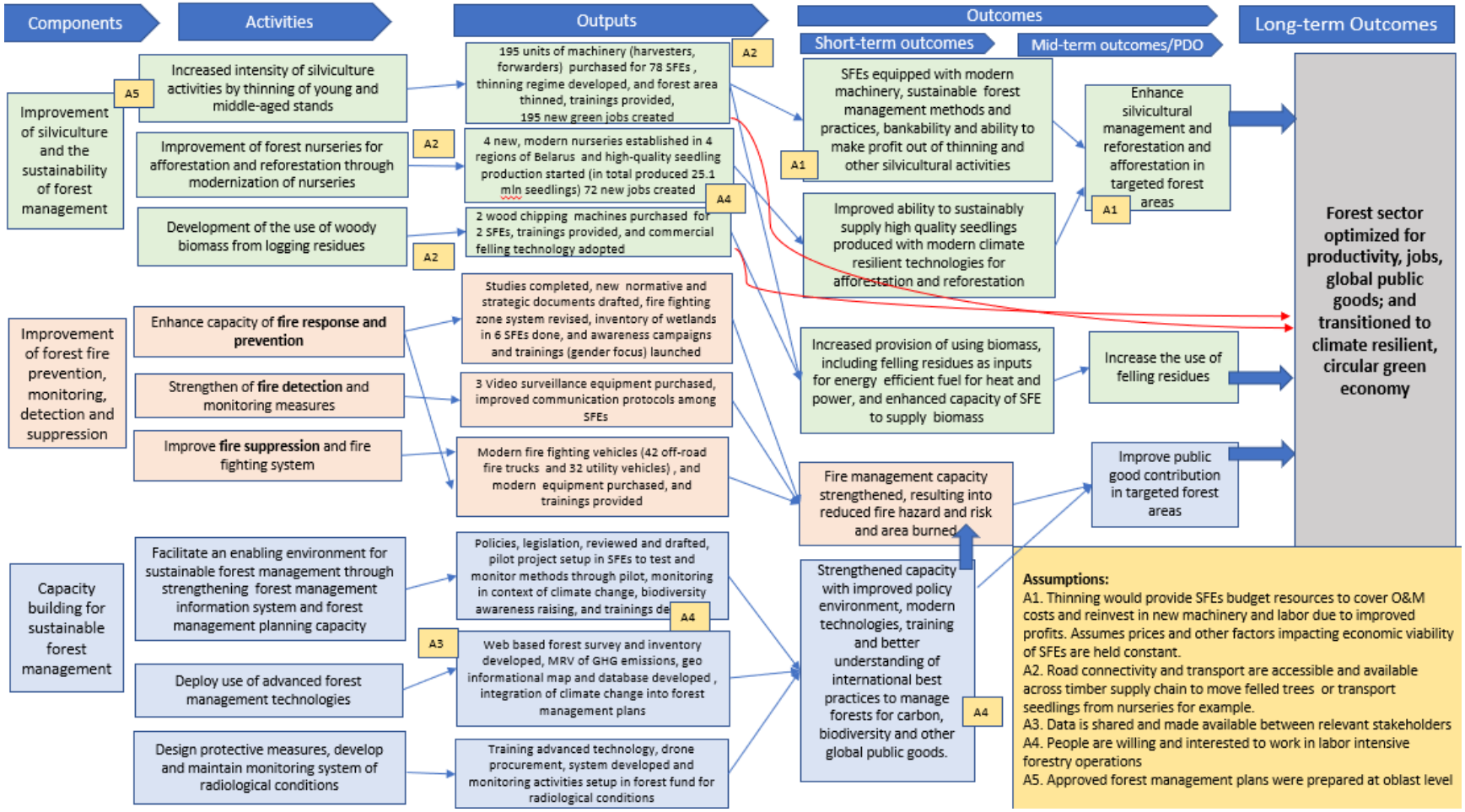
Theory of Change (Results Chain)

6. The Implementation Completion and Results Report (ICR) derived the Theory of Change (ToC) (figure 1) from the constraints and issues identified in the context section, higher-level objectives, Project Development Objectives (PDOs), components and description of activities, and the Results Framework in

[7] Wood-based biomass will play a crucial role in meeting national targets set at 32 percent of BFF to be supplied by 2020. According to Resolution No. 586, dated May 10, 2011, of the Council of Ministers of the Republic of Belarus.
[8] As part of the program for the endorsement of forest certifications encompassing 98 percent of forest cover and 55 percent FSC certified forest in 2015, which is now 86 percent of FSC certified area in 2021.
[9] Forest Policy Note 2013.
[10] In addition to challenges in the Forest Policy Note, the Ministry of Forestry identified lack of road infrastructure for forest supply chains as a challenge, recommending improving connection of forests to markets and trade routes; however, this was not pursued by the Ministry of Forestry.
[11] Outlined and supported by evidence collected during analytical exercise 'Forest Policy Note'.

the Project Appraisal Document (PAD) (Report No PAD1027). It illustrates the results chain, links between interventions, outputs and desired outcomes, and underlying assumptions. Unforeseen external factors that affected project outcomes included (a) increased timber prices improving the economic performance of SFEs, (b) bark beetle infestation affecting forest stock, (c) emergency following the 2016 storm, and (d) the coronavirus disease (COVID-19) pandemic in 2020–21. Despite the negative impacts, the project still achieved all its outcomes without compromising on delivery (see section 'Rationale for Changes and Their Implication on the Original Theory of Change' and annex 6).

Figure 1. Theory of Change



Project Development Objectives (PDOs)

7. The PDO, as articulated in the PAD and the IBRD and Global Environment Facility (GEF) financing agreements, was to enhance silvicultural management and reforestation and afforestation, increase the use of felling residues, and improve the public good contribution from forests in targeted forest areas.

Key Expected Outcomes and Outcome Indicators

8. The main outcomes captured in the PDO were (a) improving silviculture and forest management effectiveness, (b) reducing the incidence of forest fire hazards, and (c) strengthening the recipient's capacity for sustainable forest management.

Expected Outcome 1: enhance silvicultural management and reforestation and afforestation in targeted forest areas

Key indicators:

- Area of young and middle-aged production forest thinned according to approved management plans
- Economic performance of participating SFEs enhanced
- Capacity to produce high quality seedlings increased

Expected Outcome: increase the use of felling residues in targeted forest areas

Key indicator:

- Average utilizable volume of harvested trees in targeted SFEs increased

Expected Outcome 3: improve the public good contribution from forests in targeted forest areas

Key indicator:

- Amount of carbon sequestered.

Components

9. The project was structured around three components, which are correlated to the three PDO outcomes.

10. **Component 1: Improvement of Silviculture and the Sustainability of Forest Management** (estimated total cost US$50.87 million; actual total cost US$52.07 million). This component supported the increased intensity of silviculture activities by thinning of young and middle-aged forest stands through the provision of necessary equipment (including harvesters and forwarders); the development of the use of woody biomass from logging residues to enhance the forest management productivity through the provision of necessary equipment (including heavy duty chipper machines); and the improvement of forest nurseries for afforestation and reforestation through the modernization of selected forest nurseries through, among other activities, (a) the carrying out of civil works, including construction of greenhouses, warehouses, cold stores, wells, and water storage facilities; (b) the provision and installation of new seeding lines, greenhouses, cooling machinery, and watering systems; and (c) the provision of other forest nursery equipment.

11. **Component 2: Improvement of Forest Fire Prevention, Monitoring, Detection, and Suppression** (estimated total cost US$4.88 million, actual total costs US$3.09 million). This component helped enhance

the borrower's capacity to respond to fire incidents through, among other activities, (a) the carrying out of public awareness activities, (b) the development of a firefighting zone system, (c) the carrying out of an inventory of depleted peat lands, (d) the strengthening of fire detection and monitoring measures through the provision of the necessary equipment, (e) the enhancement of communication mechanisms among state-owned forestry enterprises, and (f) the improvement of fire suppression efforts through the provision of modern firefighting vehicles and other firefighting equipment.

12. **Component 3: Capacity Building for Sustainable Forest Management** (estimated total cost US$2.10 million, actual total cost US$ 2.10 million). This component supported strengthening the borrower's capacity for sustainable forest management (SFM) through the facilitation of an enabling environment for SFM through, among other activities, (a) the review and update of the borrower's forest policy and legal framework and forestry sector strategy; (b) the development of the necessary methods and techniques to improve biological and landscape diversity in forest management, including through the piloting of new silvicultural approaches; and (c) the carrying out of training activities to raise awareness of state-owned forestry enterprises on international best practices in the forestry sector and strengthen the forest management information system and forest management planning capacity. The latter involved (a) the provision of equipment, (b) the development of a web-based interface for sharing information among relevant forest sector stakeholders, (c) the development of a geospatial map and database of potential forestry carbon (non-project) investments, (d) the development of a stronger system to monitor and plan activity in forests affected by radiation, and (e) training in the use of these advanced forest management technologies. In addition, the provision of support for the implementation and monitoring and evaluation (M&E) of the project, including execution of project audits and implementation and supervision of the site-specific Environmental and Social Management Plan (ESMP).

B. SIGNIFICANT CHANGES DURING IMPLEMENTATION (IF APPLICABLE)

13. The World Bank's Board of Executive Directors approved the project (P147760) for a loan in the amount of US$40.71 million and a grant from the GEF Trust Fund in the amount of US$2.74 million on March 27, 2015. The project became effective on July 30, 2015. The geographical distribution of project interventions is provided in annex 7.

14. During the six years of project implementation (2015–2021), significant changes included (a) an approval on March 12, 2018, of the AF Loan (165121) for EUR 12 million (equivalent to US$14.4 million) and (b) a Level II restructuring in September 2018 to enable a one-year no-cost extension of the GEF grant to August 31, 2021, to be in line with the new closing date of the parent project and AF.

15. The signing of the AF Loan Agreement took place on April 11, 2018, during the official opening of the new project-funded Ivatsevichi Forest Nursery. The AF was approved with a new closing date of August 31, 2021. The original PDO was not changed and the AF activities were in line with the original development objective. No new types of activities were introduced and the project design and implementation arrangements remained the same. The project Results Framework was revised and agreed to reflect the proposed AF investments and scale-up of some activities.

16. In 2019, the Government requested a formal revision of outcome targets in line with the AF and redistribution of funds toward Component 1. However, because the request was made too close to project

completion, it was instead agreed to reallocate funds of the AF without making any changes to the Results Framework indicators. [12]

17. The project also responded to external factors and unforeseen events (see section 'Other Changes') through redistribution of funds across activities and components while continuing to ensure timely delivery.

Revised PDOs and Outcome Targets

18. The PDO was not revised. PDO targets were updated during the AF. Details in annex 6 (Supporting Documents) and table 6.2 (Achievement of Outcomes at a Glance).

Revised PDO Indicators

19. The PDO indicators were not revised.

Revised Components

20. Components were not revised; however, funds were redistributed and scaled up. The details are provided in the section below.

Other Changes

Rationale for Changes and Their Implication on the Original Theory of Change

21. The redistribution of funds between components of the project was led by two sets of reasons and ensured timely delivery and achievement of the PDO. First, in 2015, there was a shortage of government funds and increase in costs, which required that the construction work of new nurseries was covered by project funds. In 2018, the AF helped address a gap in financing for some of the activities under the parent project that resulted from the Government budget constraints due to macroeconomic imbalances and scaled up investments in forest nurseries and some low-impact forest harvesting equipment.

22. Second, the project also responded to external factors and unforeseen events. In 2016, an emergency was declared in response to the windblow in Minsk Oblast and funds were mobilized to procure additional harvesting equipment. In 2019, due to a large dieback of forests after the bark beetle infestation, the Ministry of Forestry decided to redistribute the funds under the AF loan and instead of the planned three nurseries only one in Mogilev could be constructed and fully equipped. The savings were used to purchase 31 additional multipurpose harvesting machines , additional nursery equipment and machinery. Finally, in 2020–2021, due to the COVID-19 pandemic, some cost savings from the switch to virtual mode for in-person study tours in the EU enabled revision of some GEF-funded activities. With these changes in the redistribution of funds and scale of funds with the AF loan, the project was completed on time, all the supplied equipment is in use, and the outcomes were achieved.

23. A more detailed discussion is provided in annex 6 (Supporting Documents).

[12] This is being updated in the portal which currently as of 22.02.2022 reflects incorrectly change in RF in 2019.

II. OUTCOME

A. RELEVANCE OF PDOs

Assessment of Relevance of PDOs and Rating

24. **Alignment with strategy.** The PDO is aligned with the current Country Partnership Framework (CPF, Report No. 123321-BY) for Belarus for FY18–FY22, Focus Area 3 'Improving Contribution of infrastructure to Climate Change Management, Economic Growth, and Human Development'. The project remains highly relevant by (a) contributing toward targets in the CPF: 2,100,000 tCO_2eq emission reductions per year,[13] through PDO indicator 5, which reports reductions of over 1,010,838 tCO_2eq emissions per year. Increased thinning also raises climate resilience through reduced water stress[14] and fire fuel loads; (b) meeting the target value of the CPF outcome indicator (Supplementary Progress Indicator 12a: 4 lines for container-grown seedlings of climate change adaptive tree species) as result of the BFDP; (c) contributing to 'increased production and use of renewable energy resources' in the World Bank Group-supported projects by providing timber harvested during intermediate felling and used as feedstock for reliable heat and electricity through PDO Outcome 2; and (d) creating new jobs and developing human capital in the forestry sector (details in the efficacy section).

25. It also aligns with long-term outcomes under Focus Area 1 'Creating Opportunities for Private Sector to Grow and for More Efficient Public Investment'. Thinning the main harvest at clear-cut stage has higher proportion of high-value log assortments[15] and achieving the ideal dimensions for sawmilling earlier than otherwise. This creates a more value-focused and dynamic forest sector, with positive distribution effects for both public and private participants. Increased volume of raw material for high-value sawn wood production is a particularly strong private sector benefit. By improving economic performance of SFEs and reducing payback periods, the project has helped improve the bankability of SFEs and their ability to access finance and credit under IBRD or other financing sources (for details refer to section on 'Mobilizing Private Sector Financing'). The project is also aligned with and contributes to the 'World Bank Europe and Central Asia Green Transition'; 'Green Resilient Inclusive Development Strategy', the Europe and Central Asia Climate Change Action Plan, the World Bank Forest Action Plan, and GEF indicators and outcomes.

26. **Alignment with government programs.** The PDO is aligned with (a) the Program of Socio-Economic Development for 2016–2020, specifically under its fourth Focus Area: Promotion of the Green Economy,[16] Sustainable Natural Resource Management, and Environmental Protection, which identify biodiversity conservation and environmental technologies to enhance environmental protection as key priorities. Component 3 activities helped support inputs of forestry to the 'green economy principles'; (b)

[13] Infographic summary of targets of Country Partnership Framework 2018–2022.*https://www.worldbank.org/en/country/belarus/publication/cpf-2018-2022.*

[14] Kang et al (2014) The effect of forest-thinning works on tree growth and forest environment, Forest Science and Technology, 10:1, 33-39, DOI: 10.1080/21580103.2013.821958; Ma et al (2018) Moderate thinning increases soil organic carbon in Larix principis-rupprechtii (Pinaceae) plantations, Geoderma, Volume 329, 2018, Pages 118-128, https://doi.org/10.1016/j.geoderma.2018.05.021.

[15] Thinning is a long-term investment in the ability to produce an increased proportion of straight, knot-free, and even-grained timber from targeted tree species, which has a much better potential for use in added-value applications. While providing an intermediate income and volume production from forest stands, it can also recover timber volume from trees which would otherwise be lost to death and decay due to being crowded out.

[16] https://www.economy.gov.by/en/green_economy-en/.

the National Program on Climate Change for 2013–2020,[17] Intended Nationally Determined Contribution (INDC) in 2015,[18] Nationally Determined Contribution (NDC) in 2020,[19] and Paris Agreement, which identify priorities to expand forest ecosystems, restore peatland swamps to act as a carbon sink (reduce emissions), and improve the legal framework and capacity; (c) the Forestry Development Strategic Plan for 2015–2030 and the Forest Code (effective 2017), which prioritize improvement of legislative and normative and legal basis with the development of new methods and technologies on forest monitoring, planning, and inventory; upgrading of forest fire zoning; monitoring of forest radioactive contamination; and training of specialists on modern technologies. The project outcomes are also informed; (d) indicators for monitoring achievement of six Sustainable Development Goals (SDGs) on forests under the United Nations Strategic Plan for Forests 2017–2030. PDO Outcome 2 is also indirectly aligned to meet; (e) national targets set under the Strategy of the Energy Potential Development in Republic of Belarus, No. 1180, with 32 percent of BFF to be supplied domestically by 2020 through recycling of woody biomass as feedstock for fuel; and (f) development of state program Belarusian Forest for 2021–2025, to expand woodland areas.[20]

27. **Rating: High.** The project's objectives remain highly relevant with the country's current development priorities and with the World Bank's country and sectoral assistance strategies.

B. ACHIEVEMENT OF PDOs (EFFICACY)

Assessment of Achievement of Each Objective/Outcome

28. To access the project's outcomes, intended objectives are inferred from the project's key associated outcome targets.

PDO Outcome 1: Enhanced silvicultural management and re/afforestation

29. **Uptake of new thinning regime with modern machinery and technology has led to enhanced silvicultural management, creating new jobs and additional value in the forest industry and the economy.** To enhance silvicultural management,[21] the project conducted more thinning of young and middle-aged production forest (PDO indicator 1) using an intermediate felling approach to improve the structure and productivity of these forests according to the approved management plans through 78 SFEs, covering almost all (98 percent) of SFEs[22] in Belarus. The project has met its target, despite bark beetle infestations in 2018, which resulted in falling short of interim targets for 2018–2020 as there was a priority placed on sanitary clear cutting to remove dead and dying trees affected by the infestation before undertaking other types of harvesting. This resulted in the area thinned increasing 26 percent over baseline, surpassing the target by 2,000 ha. Investment in 195 new harvesters and forwarders with higher

[17] National Program on climate change mitigation measures for 2013–2020 (Resolution No. 510 of the Council of Ministers of the Republic of Belarus).
[18] To reduce emissions by at least 28 percent by 2030 compared to 1990.
[19] In 2021, Belarus submitted an updated NDC aiming "to reduce greenhouse gas emissions by at least 40 percent from the 1990 level by 2030, inclusive of the LULUCF sector and subject to using international financing mechanisms to introduce the best available technologies for achieving greenhouse gas emissions reduction."
[20] Ministry of Forestry of the Republic of Belarus. 2021. "Belarus Drafts State Program Belarusian Forest for 2021–2025." Press release September 10, 2021 (Link); Resolution No. 52 of the Government of Belarus as of January 28,2021
[21] Enhanced silvicultural management is not explicitly defined in the PAD or subsequent AF project paper; however, this has been clarified and detailed in the ICR sectoral context. Refer to challenges summarized from the Forest Policy Note (2013) and annex 6.
[22] Because almost all SFEs were under the project scope, building counterfactual evidence was not possible; however, efficiency gains from modern machinery have been presented to substantiate gains from forest productivity.

capacity, efficiency, and productivity contributed to this achievement.[23] This was supplemented by soft investments including (a) introduction of a new thinning regime and associated regulatory reform[24] to clarify grounds for harvesting and (b) advanced training of over 405 forestry specialists for using the modern machinery. The successful combination of physical investments and soft skills development has led to the sustainability of a new thinning regime with long-term outcomes including (a) about 6,500 additional truckloads of timber entering the market annually,[25] and (b) creation of 195 new jobs as machine operators in rural areas. As outlined in section A, an optimized thinning strategy yields significant long-term gains to the forest sector as a whole.

30. **Forest productivity gains from thinning have equipped SFEs with SFM practices and contributed to their profitability, supported bankability, and acted as a catalyst for private sector growth and jobs.** As a result of new skills and equipment for thinning, the increase in forest productivity helped SFEs generate net profit (PDO indicator 2[26]) of over US$46.6 million, which is three times the project's final year target. In the first few years of implementation, the project was able to achieve one to twofold increases over targeted profits, and for Years 5 and 6 profits rose sharply as Belarussian SFEs enjoyed favorable domestic and export revenues.[27] The increase in profitability is due to a combination of increased operational efficiency, increased sales volumes, and strongly improved unit sales prices.[28] A sales bridge analysis (examining the separate effects of actual volume and price on budgeted revenues) was not possible because the required data were not available. Performance was indeed positive: not only was the target met, but the economic viability of SFEs[29] improved to such an extent that they became the third largest taxpayers in the targeted areas,[30] allowing strong reinvestment in the forest resource and catalyzing private sector job creation through expanded production volume and availability of high-quality logs.

31. **Through re/afforestation with improved quality of seedlings, Belarus's forests have contributed to increased global public benefits, including carbon sequestration and climate resilience.** To enhance re/afforestation, the project successfully established and modernized four nurseries (intermediate

[23] The higher capacity of the equipment contributes to increases in intensity of harvesting 45 cm^3 per ha versus 30 cm^3 per ha before the project, increase in efficiency by reducing time and increasing coverage of area to be thinned; easy maneuverability between forest stands to allow for vehicles to pass without causing damage; and higher productivity (see technical efficiency section) replacing 13 chainsaw workers in laboring and hazardous conditions or older less productive machines.
[24] Inclusion into the Provision of the Ministry of Forestry No. 68 dated December 2019, valid as of July 2021.
[25] Based on assumption of 35 m^3 per truck and PDO indicator 4 of 7 m^3 per ha extra being harvested (20 percent) due to intensified thinning by 87 harvesting machines.
[26] The indicator measures the excess of revenue over expenditures inclusive of all financing sources for participating SFEs and the target is exceeded by 294 percent. Almost all SFEs in Belarus are under the scope of this project.
[27] According to the Ministry of Forestry reports, 55 percent of the harvested wood in 2018 was sanitary felling to stop the spread of the bark beetle and 75 percent of all harvested wood affected became low grade, with felled timber lying in warehouses and deteriorating in quality or rotting on the forest floor. The price surge could have been in response to an increase in demand for domestic timber with the declaration of the Presidential program to process low-grade commercial timber into wood chips and fuel pellets from 2019–2021. Source: Belarus Country Overview to Aid Implementation of the EU Timber Regulation (EUTR), accessible here.
[28] No further information was available to estimate the share of the price increase in the market for timber resources in the net profit increase of SFEs.
[29] Over BYR 200 million (US$82.3 million) was invested in the forest sector in the first eight months of 2020, which is a 72 percent increase from the same period of 2019. Proceeds from forestry and hunting amounted to BYR 315 million (US$129.6 million) compared to the target of BYR 264 million (US$108.6 million), an 8 percent increase over the same period of the last year. Source: UNECE, page 10. https://unece.org/sites/default/ files/2021-12/ece-tim-dp-88-covid-impact-eecca-web.pdf.
[30] https://www.worldbank.org/en/news/feature/2020/04/23/forest-innovations-towards-sustainable-and-efficient-forestries-in-belarus.

indicator A) and built capacity to produce high-quality (container grown) seedlings (PDO indicator 3). This was monitored through the number of seedlings produced with two rotations each for two planting seasons of the forest nurseries in Ivatsevichy SFE and Glubokoe State Experimental Forestry Enterprise, three rotations in the Republican Seed and Selection Center, and one rotation in Mogilev nursery (see details in annex 7 on the geographical coverage). At the end of the project, the target was met (106 percent) with realized capacity of over 25.1 million seedlings. This was despite reducing the number of nurseries to be established and reallocating funds toward machinery for thinning (see para 23 and details in section B). This outcome was achieved through (a) the upgrade to modern high-capacity nursery technology and practices for closed root/containerized seedlings; (b) an increase of the base capacity of each new nursery by using higher-capacity cassettes combined and satellite nurseries to complete seedling maturation, leading to an increase in the annual capacity to more than 25.1 million seedlings per year after the project versus 1 million per year during appraisal; and (c) training of all new personnel. This resulted in meeting long-term outcomes of (a) provision of public good in the form of climate-resilient seedlings, which have an improved survival rate (95 percent versus bare root before project of approximately 75 to 80 percent)[31] and increased the wind and snow resistance of mixed stands relative to traditional monocultures of this commercially important species; (b) longer planting season for container-grown seedlings (allowing more efficient use of resources and lower capital investment in storage and distribution); (c) need for 20 percent less planting material per ha;[32] and (d) 4,000 trees per ha[33] density per ha of reforestation, much higher than similar activities in Kazakhstan (2,000 trees per ha)[34] and in China (474 trees per ha).[35] In the future, the Ministry of Forestry plans to use this innovative technology for at least 20 percent of forest crops. Targeted efforts to establish high-quality forests using commercially desirable tree species that are well matched to current and future climate and that favor productive thinning measures will ensure (a) the public good of carbon sequestration (through the highest mean maximum annual increment at shorter rotations) and (b) opportunities for substitution (through biomass for energy and high-quality sawn wood for construction) are maximized. During the ICR mission, the first deputy minister was most proud of the investment in these four new nurseries, considering it a breakthrough which has led to the creation of forest culture of more climate-resilient seeds and biodiversity characteristics on over 6,000 ha annually for reforestation and creation of 72 new jobs, of which 32 are seasonal in nurseries and fostered social inclusion of women, who held 70 percent of these jobs.

[31] As reported by the Ministry of Forestry during ICR mission. This is in line with other projects in the region and with the Kazakhstan Forestry Project (P078301), which achieved an increase of 30 percent in survival rates in Irtysh pine forest because of a switch to closet root container seedlings from 30 to 60 percent. It is to be noted, that an increase from 75 percent to 98 percent is a more significant achievement than 30–60 percent. Similar projects, such as P125021 in Hunan, show evidence that mixing seedlings and diverse forest cultures have statically significant higher density (by 8 to 9 percent), flexural strength (65 to 68 percent), elasticity (71 to 73 percent), and compression strength (11 to 13 percent) in the main trunk of stands. These improved physical properties are expected to increase the wind and snow resistance of mixed stands relative to traditional monocultures of this commercially important species.

[32] This is in line and in the range of other projects in the region where planting costs reduced by 32 percent in Kazakhstan as example ICR Review for P078301 - accessed here.

[33] Source: EX-Ante Carbon-Balance Tool (EX-ACT): across five years 46 million seedlings (on rotation twice) were planted on over 11,490 ha, with a density of 4,000 trees per ha.

[34] Upgrading of nurseries led to 117 million seedlings with replanting of over 56,500 ha. Source ICR Review P078301, accessible here.

[35] 15.5 million seedlings from upgradation of two nurseries for reforestation of 32,651 ha. Source ICR Review Hunan Project P125021, accessible here.

32. **Increased capacity to respond to emergencies/natural disasters has prevented further damage to forests from the impacts of climate change and forest fire.** Capacity building toward fire prevention, detection, monitoring, and suppression has led to reduced damage and coverage of forest fires and avoided loss of forest, snow, and wind events. Because of external factors that also influenced the outcome, including a hurricane-strength windblow in 2016 and the bark beetle infestation in 2018 (details in Section B), attribution to the project is difficult. As a result of project activities, detection, monitoring, and identification of fires were improved. The Ministry of Forestry also provided funded video surveillance systems to modernize forest fire detection and monitoring. Communication and awareness-building on fire prevention was strengthened, as evidenced by the wide scope of project outreach: a video on awareness campaign[36] with over 2 million views on YouTube, 15,000 people reached through the Telegram channel, TV coverage and information hosted on the Ministry of Forestry's website with over 300 page views. This resulted in an improved public good through a 27 percent decrease in the area of coverage under fire[37] over the course of the project.[38]

PDO Outcome 2: Increase in the use of felling and residues

33. **Use of felling residues to generate energy for heat and power in Belarus has reduced fire risk, optimized forest production, and accelerated the transition to circular economy.** To track the use of felling waste in participating SFEs, the area where intermediate felling was carried out was compared to the volume of harvested wood (PDO indicator 4). The resulting ratio before the project started was at 28.50 m^3 per ha and the project achieved its target in the final year of a ratio of 35 m^3 per ha, which is an intensity that relates well to the productivity of Belarusian forests and matches best practices in France (23.2–35.0 m^3 per ha)[39] and Finland (20–40 m^3 per ha).[40] This was done through the procurement of 2 woodchipper machines (instead of 11 as planned in the original PAD[41]); training of personnel for its operation; and capacity building for technology for commercial felling in line with best practices that consider socioeconomic benefits, protect biodiversity, nutrients, and maximize carbon sequestration potential of forest stands. In the long term, the continued application of this technology helps (a) reduce fire risk by using felled waste left in the forest, (b) optimize sustainable production (quality and quantity), and (c) accelerate transition to a circular economy by providing a sustainable source of feedstock to meet growing energy demand. As per EX-ACT estimations shared by borrower, project activities using felled

[36] Link to the video on awareness campaign on forest fires is here, the rest can be found here.
[37] Data shared during final mission revealed that forest fire coverage had been declining from 2015–2016; however, the effects of high winds and bark beetle infestation increased fire hazards, causing fire damages to increase from 107 ha in 2016 to 7,389 ha in 2018.
[38] Comparing the average annual area damaged by fire (using Moderate Resolution Imaging Spectroradiometer, MODIS) in 2011–2015 with the average annual area damaged during the project (2016–2020) shows a 27 percent reduction (Global Forest Watch 2014). However, data provided by the PIU did not corroborate with MODIS data and reported 7,389 ha in 2018–2019, 6,725 ha in 2019–2020, and 436 ha in 2021.
[39] According to the French National Forest Inventory, deadwood represents an average of 23.2 m^3 per ha in the forests of metropolitan France and in southwestern France, was on average 35 m^3 per ha. Source: Bessaad, A., I. Bilger, and N. Korboulewsky. 2021. "Assessing Biomass Removal and Woody Debris in Whole-Tree Harvesting System: Are the Recommended Levels of Residues Ensured?" *Forests 2021* 12 (6): 807. https://doi.org/10.3390/f12060807.
[40] For the first to third commercial thinning , the average volume of biomass residue is in the 20–40 m^3 per ha range. https://www.eubia.org/cms/wiki-biomass/biomass-resources/challenges-related-to-biomass/recovery-of-forest-residues/.
[41] As confirmed by the Ministry of Forestry during the World Bank supervision missions back in 2016, the ministry relied on its own resources to supply nine woodchipper machines to SFEs. This allowed the redistribution of funds to the pressing need to finance the construction of new nurseries.

waste were estimated to be used to replace gas for heating by an equivalent of 500,000 MwH per year with 30% wood used for bioenergy and 20% from wood waste.[42]

PDO Outcome 3: Improve the public good contribution from forests in targeted forest areas

34. **Improved capacity to sustain ecosystem service provision (biodiversity, climate change, and reduced forest fire) from Belarussian forests using innovative technology/modern methods.** Capacity-building efforts have strengthened the forest management planning system through research and new approaches to assess climate change and biodiversity influences on structure, condition, and nature of forest stands leading to a reduction in the area damaged by fire by 27 percent versus the five years before the project. The Ministry of Natural Resources and Environmental Protection reported as one of its major successes the identification and protection of peatlands, which are a critical store of carbon and highly fire prone. By transferring an area of 6,679 ha of peatlands to the State Forest Fund database, the responsibility for their protection is now clarified and fire risk is better managed, and opportunities for peatland rewetting are now easier to identify. A new area of more than 4,642,805 ha is managed as biodiversity friendly and forest areas subject to special protection were identified in six SFEs, contributing to improved public good provision.

35. **The project has successfully built capacity for detection, monitoring, and planning for climate- and radiation-sensitive forest management.** Carbon sequestration resulting from this project (PDO indicator 5) is 0.4 tCO_2eq per ha per year, within the range of projects in the region, for example, in Bosnia and Herzegovina (0.687).[43] Innovative methods were identified and applied for forest management through the use of (a) a remotely piloted aerial vehicle to enhance the efficiency of reporting on (and speed of response to) pest, disease, and fire damage; (a) a new software and web tool for nursery management, seed management, and so on; (c) a geoinformation service 'RadforInfo' and spatial tools for improved awareness and forest planning in radioactive zones; (d) a specialized forest survey (using GEF grant) including climate change adaptation, biodiversity conservation, and forestry and land use considerations; and (e) seed orchard and seed collection which has helped preserve biological and genetic diversity of trees species, ensure ecological security of Belarus and all of Europe, and support gains in forest productivity and biological sustainability.

36. **Enabling policy environment, outreach, and coordination capacity strengthened through legal and regulatory reform.** Development and implementation of the national institutional framework has increased provision of global public good by empowering the Ministry of Forestry to implement and embed new innovative approaches and ensure sustainability of project outcomes by shaping the 'state program for Belarusian Forests from 2021 to 2025', mainstreaming forest policy in 'green economy principles' including the Strategic Action Plan on Adaptation of Belarusian Forestry to Climate Change, and improving monitoring through regulation on use of monitoring data and so on. Recommendations for updating strategic documents of normative acts of the Ministry of Forestry were discussed at multi-stakeholder seminars and roundtables attended by over 1,700 people (see para 26).

[42] As reflected in PDO indicator 5 through the Food and Agriculture Organization EXACT modelling of carbon emissions.
[43] Source: ICR P129961 EX-ACT model estimates. ICR Review for P078301, Forestry in Kazakhstan reported 1.8 tCO_2e per hectare per year. Similar projects, such as P125021 in Hunan, show evidence that thinning practices led to 5 and 14 percent higher carbon sequestration than under comparison control forests.

37. **Improved skill development in best practices has shaped the next generation of forestry professionals and has improved their access to job opportunities.** Over 11 institutions were provided with capacity building on different aspects of SFM (target overachieved at 109 percent). The Ministry of Forestry and selected SFE representatives participated in the 12 exchange workshops in Poland, Romania, Kazakhstan, Switzerland, and Belgium. During the project, forestry specialists were trained in new methods and technologies with GEF grant financing, including training programs for harvester operators using new simulators. During the COVID-19 pandemic, the ministry moved the trainings online, increased the number of trainings, and reached 3,448 participants (versus the target of 3,000), including 157 women (target 150) and 63 forestry specialists who took part in study tours to the EU (training target was overachieved at 115 percent). The capacity building activities helped create 195 new jobs (72 in nurseries alone) in rural areas and helped support social inclusion by fostering equal opportunities for men and women. It is worth noting that the mechanization of harvesting is likely to have a positive effect on worker welfare and reduction in lost working time due to injury.

Justification of Overall Efficacy Rating

Rating: Substantial

38. The project overachieved its intended outcomes in target areas to its beneficiaries in terms of physical investments and soft skill investments toward enhanced silvicultural management, high-quality seedlings and felling residue for wood residues, and provision of public good. This is especially commendable given the range of unforeseen events (bark beetle infestation and the COVID-19 pandemic). While thinning removals are at par with best practice in the EU comparator countries, a lack of counterfactual evidence in some cases makes it difficult to fully attribute the outcomes to the project. For example, achieving 294 percent of the target for PDO indicator 2 (SFE profitability) is undoubtedly due in part to project activities, including enhanced thinning levels, nursery production, fire prevention, biomass recovery, processes, software, and capacity building of staff across a range of topics. However, due to the lack of data, the effect of price increases has been impossible to isolate from increased profitability and thus, while if based on achievement of PDO indicator targets alone the assessment would be High, a conservative approach is applied, which yields a rating for efficacy of Substantial.

C. EFFICIENCY

39. The ex post analysis confirms that the positive returns including both financial and broader economic benefits expected at appraisal are being realized through project investments. The results of the project financial analysis are positive, reflecting a balanced investment in nurseries for forest regeneration; machinery for thinning stands; and more effective recovery of value and carbon in harvesting residues through chipping and improved fire prevention, detection, and control. The estimations were based on the actual investments funded within this activity and on the ex ante estimates of costs and benefits received from the borrower, as well as suitably conservative assumptions where data were lacking (described further in annex 4).

40. Capacity building has also contributed to broader economic impact and reduced transaction costs beyond the project, by increasing the cost effectiveness of forest management, safety of forestry for radioactive areas, and the forest sector's readiness to adopt climate-resilient practices. The investment in capacity and governance for improved fire protection and from greatly improved nursery infrastructure will lead to significant benefits in the medium to long term. The standing capital value of forests will accelerate through thinning, which will distribute future growth increment on the best trees. The project work will also result in increased carbon sequestration.

41. **Overall project benefits and sensitivity analysis.** A net present value (NPV) and economic rate of return (ERR) were calculated for the project at appraisal and the anticipated rate of return was 20.3 percent with an economic net present value (ENPV) of US$25.8 million at 6% discount rate.[44]not including climate benefits. Ex post, the analysis shows a positive ENPV at a discount rate of 6 percent over 15 years of US$85.9 million on loan financing of US$57.41 million, equivalent to an ERR of 28.8 percent, higher than ex ante (see details in table 4.4). Models produced at appraisal for the investment categories of machinery, nurseries, chippers, and fire were amended and updated with data received from the borrower at project closing. While some useful data were received, some model inputs could not be updated and ex ante assumptions were used instead as well estimated made by the team. The main differences between ex ante and ex post analysis were (a) the higher level of investment in machinery (using AF) and in fewer larger nurseries, (b) the lower price for thinning revenues and higher price for improved nursery seedlings[45], and (c) a lower ratio of chainsaw men required to equal the production of harvesters when calculating the counterfactual regarding the mechanization of thinning. A sensitivity analysis was conducted for both ERR before and after carbon and the results showed positive NPVs and benefit-cost ratios higher than 1 even with high discount rates (see details in tables 4.5 and 4.6).

42. **Carbon balance accounting.** The estimated net carbon balance for completed project activities is 5,245,627 tCO_2eq of avoided emissions or increased carbon sequestration through additional forest seedlings, improved recovery of wood in thinnings, and replacement of fossil fuels for energy over a period of 30 years. This translates into a total monetary benefit of either US$98.49 million (World Bank lower bound), US$109.48 million (EU Emissions Trading Scheme (ETS)carbon price), and US$196.99 million (World Bank upper bound) over the 15-year analysis period, discounted at 6 percent. In the case of the ex post analysis, the EU ETS value was used as a mid-range estimate for the shadow price of carbon, based on daily trading volume-weighted average ETS transaction prices.

43. **Operational and administrative efficiency.** The PIU costs for GEF grant management were less than 1 percent of total project funding. Staff turnover was low. The PIU was a highly efficient implementer, gaining significant experience in international procurement and the large project management. The project was extended by one year due to scaling up of the activities under AF. No additional staff were hired, nor any additional budget sought for PIU implementation of the AF. Purchasing of additional nursery cassettes to greatly enhance the capacity of the new nurseries was an outstanding example of innovation by maximizing the effect of project finance by leveraging existing assets. Handling of project funds was efficient and US$63.14 of unspent funds under the parent project was returned to the World Bank.

44. **Rating of efficiency.** Efficiency is what would be expected in the sector and therefore is rated **as Substantial.**

[44] For purpose of comparison to ex-post analysis, 6% discount rate is used. Please note that at Appraisal stage, in the PAD, results were presented at 10% discount rate: the base case ERR at 20.1% and base case ENPV at US$ 14.7 million, not including carbon benefits. After AF, total project yielded an ERR of 40.4% with an ENPV of US$78.1 million including climate benefits with carbon price of US$66 per tonne on average.

[45] Seedling price at appraisal and as reported during ICR review by the PIU was 0.10-0.13 cents, with no time series available, counterintuitive in terms of high inflation, and lack of counterfactual evidence, given limited scope of 4 nurseries. As per data collected from ICR mission, the team estimated the price of seedlings sold to SFEs in the range of 0.61 cents, based on triangulation, which intuitively reflected the higher quality of seedlings over time. Further details in Annex 4, including table 4.7: sensitivity analysis showing positive NPV despite 70% reduction in price.

Assessment of Efficiency and Rating

45. Efficiency is rated as Substantial, given that economic viability is in line with what would be expected in the forestry sector and no issues occurred in the delivery timeline or procurement. Based on this economic evaluation, the project yielded significant positive development impacts. While retaining the structure of the original economic analysis, the design stage estimates were replaced with responses received from the borrower at project closing; however, some details on operating costs of harvesters, forwarders, and chippers were carried forward from the ex ante economic analysis due to lack of updated information. The main changes with respect to the ex ante estimates were in favor of higher returns: capital costs of machines being lower than planned, cost of fire measures being lower for the same level of outcome, and seedling prices and seedling volumes being higher. Changes that drove lower returns include thinning revenue per m^3 being lower, counterfactual thinning costs being lower than expected, higher chipping costs.

D. JUSTIFICATION OF OVERALL OUTCOME RATING

Table 1. Overall Outcome Rating

Relevance of PDOs	**High**
Efficacy	**Substantial**
PDO Outcome 1	Substantial
PDO Outcome 2	High
PDO Outcome 3	Substantial
Efficiency	**Substantial**
Overall outcome rating	**Satisfactory**

E. OTHER OUTCOMES AND IMPACTS (IF ANY)

Gender

46. Women are not well represented (approximately 15 percent of workforce) in the traditionally male-dominated forestry sector in Belarus due to its labor intensity and tough working conditions. The project design reflected social inclusion through empowering of women, monitoring, and reporting with the view to increase their employment (in skilled and semi-skilled jobs) in the forestry sector. The project (a) involved 17.7 percent female beneficiaries (6,812 women), surpassing the revised target post AF of 17 percent, in trainings, consultation, and other project-related activities; (b) provided opportunities for professional growth for female foresters by training over 157 women forestry specialists (surpassing revised target of 150); (c) created jobs with nurseries employing 70 percent women[46] of the 72 new jobs with equal rights and pay; (d) provided online mode of trainings, which provided flexibility and boosted participation of women with childcare commitments (as reported by the borrower); and (e) conducted communication and outreach through PIU stakeholder consultations at the national and oblast level to build awareness of opportunities for quality citizen engagement and address gender-specific constraints in the forestry sector, for example, the site-specific ESMPs for the proposed new nurseries considered gender aspects.

[46] Jobs as harvester and forwarder operators were explored but were not possible due to legal safety provisions for employing women as mandated by Belarusian Law.

Institutional Strengthening

47. The project facilitated development of the institutional framework for the forestry sector in the country through the entire third component of the project: (a) technical support for development of draft forest strategies and regulations; (b) support in identification of new and innovative methods, practices, and technologies to improve sector efficiency; and (c) training and educational modules/programs to build the next generation of forestry professionals. More than 11 institutions and 97 SFEs were regularly involved in workshops and capacity-building exercises. A total of 16 normative documents (11 of which were officially adopted) and supporting policy reforms were developed with project support, including strengthening the Forest Code framework,[47] the Forestry Development Strategic Plan for 2015–2030, and the state program 'Belarusian Forest' (2021–2025).[48] The project also supported identification of project sites that were to be protected for conserving biodiversity across 6 SFEs, which were formally recognized through regulation[49] and integrated into their forest management plans. Technical support, building readiness, and monitoring systems helped reflect the importance of Belarusian forests in achievement of global SDGs, 'green economy and green principles' strategy, United Nations Strategic Plan for Forests (2017–2030) and facilitated implementation of climate change commitments, mainstreaming forest concepts across sectors. It also improved country response to emergency situations with respect to snow, wind events, and especially forest fire, and enhanced the sector's capacity to store and use data and monitor, plan, and conduct inventory through digitalization and new software and innovative tools (details under Component 3). Forest sector manpower capacity was considerably strengthened through training on new methods and technologies developed within the project. Trainees included 405 workers (on operating new forest harvesting machinery); 3,448 government officials; and over 1,700 other stakeholders (forest enterprise staff, civil society, and researchers) trained and consulted during the project.

Mobilizing Private Sector Financing

48. In Belarus SFM is solely a function of the state and there are no large-scale forest nursery production facilities in the private sector (apart from a few small garden centers geared to produce ornamental plants for sale to the public), with many barriers to private sector investment.[50] Though the private sector was not a direct beneficiary of the project, and is not reflected in the results-based framework (RBF), the project supported the commercial sector (timber processing and board, for example, chipboard, plywood, medium density fiberboard, and pulp and paper production) by (a) helping SFEs sustainably produce raw materials for the downstream industry by increasing marketability through improved quality, competitiveness, and access to forestry produce for wood-based/forest processing industry and (b) improving economic viability of SFEs (see PDO indicator 2 for details), which implement thinning regimes (often at either break-even or even at a loss) to enhance the forest stock by

[47] Proposals cover issues such as forestry adaptation to the climate change, biodiversity conservation, creation of high productive forest stands, and effective usage of forest resources.
[48] Decree No. 52 of the Council of Ministers of the Republic of Belarus dated January 28, 2021.
[49] As per regulation 'Schedule of exploration of forest sites on conformity to the criteria related to nature protection territories, which was approved on 29.04.2016.
[50] In Western Europe, the control and supervision of seed collection, treatment, production, and storage is usually a function of the state (to ensure the purity of provenance, disease control, quality assurance, and so on). For private nurseries, they find that the investments required are large and with little guaranteed demand for forestry species and sizes, except from the forest enterprises themselves.

concentrating future increment on fewer and higher-quality trees.[51] This increased flow of higher quality timber is ideal to attract and sustain higher added value private sector industry. In the long run, the whole sector will benefit from strengthened value chains and increased ability to reinvest in reforestation and silvicultural services.

49. SFEs generally have limited downstream processing capacity, and this was not supported by the project. However, it supported establishment of a competitive market for SFEs and private sector services in the forestry sector through (a) analysis of private sector development in forestry management and (b) training to develop high-quality human capital. Notwithstanding some recent (self-funded) investment in pellet production by SFEs, the chip and sawdust co-products of increased sawn wood production will provide an appropriate (and energy efficient) raw material to sustain pellet manufacture but only as a secondary economic activity.

50. Also, over 20 construction companies, private sector contractors' suppliers of equipment and machinery for forest enterprises were involved in project implementation. This has built their experience to meet demand for new equipment from SFEs and access opportunities across other countries by operating with knowledge of international standards and other sub-sectors within forestry. The sale of modern machinery could be a viable private business in the sector of forestry harvesting services.

Poverty Reduction and Shared Prosperity

51. **Poverty in Belarus is twice as high in rural areas and with people increasingly moving to urban areas, rural areas are becoming depopulated with some villages being completely abandoned.[52]** This project has contributed to a more prosperous and dynamic rural sector by creating more desirable skilled or semi-skilled employment opportunities for both men and women in rural areas; improving well-being; and facilitating growth of the forest industry through sustainable production: 267 new jobs were established due to the project, including 72 new jobs related to new forest nurseries (mainly for women) and 195 jobs for operators of harvesters and forwarders. Given the rising demand and surging prices of forest produce, working in SFEs is becoming more prestigious, and knowledgeable and capable forestry specialists can demand high paying jobs in rural areas and feel motivated to stay there. The increased profits of SFEs during the project and SFEs' reinvestment into scaling up forest management holds the potential for job creation, improved staff salaries, and well-being of the forestry workforce and private companies in the forestry sector. These results will be also sustainable due to the range of equal opportunity training programs offered annually to professionals (details in PDO Outcome 3) in the industry and growth of the industry. This growth may contribute to increased exports from Belarus. The results will also increase well-being and shared prosperity through provision of public good, while sequestering carbon and providing habitats for biodiversity and other environmental services.

Other Unintended Outcomes and Impacts

52. **Due to the COVID-19 pandemic, cost savings were used for efficiency gains toward project outcomes (see section B).** The project implementation for PDO Outcome 3 saw increased participation in training because trainings/workshops were delivered virtually, and innovative technologies were

[51] This means that volume which might otherwise be lost to death and decay can be harvested at each thinning, yielding a greater proportion of high-quality, straight, knot free timber at each successive thinning. Because the average tree now reaches the ideal merchantable size earlier, clear-cut can be scheduled earlier than heretofore (at the age of maximum mean annual financial increment) resulting in a higher utilization of the forest area.

[52] According to the Belarus Macro Poverty Outlooks, the national poverty rate, having risen during 2014–2017, fell by 0.3 percentage points in 2018, and continued its downward trend in 2019, to reach 4.7 percent in Q1 2020.

introduced to conduct forest monitoring using drones (including for tracking and reporting on the nursery construction in Mogilev) (see section on PDO Outcome 3). Use of remote communications proved effective in engaging a broad range of partners and stakeholders locally and from abroad, including for virtual World Bank supervision missions. As suggested by the Ministry of Forestry in their completion report, remote communications should continue to be used beyond the scope of pandemic limitations.

53. **Some of the project's outcomes are beneficial for the 'just transition' and 'green COVID-19'recovery in Belarus.** Energy switching/high-efficiency wood fuel as a transition fuel has already been highlighted in paragraph 33 and the potential for forestry to create sustainable high-skilled green jobs is highlighted in paragraph 29). The BFDP invested in two heavy duty woodchipper machines to Minsk Oblast in Smaliavichi and Uzda. Both towns are beneficiaries of the ongoing World Bank Sustainable Energy Scale-up Project (P170996), and biomass boilers are expected to be constructed there.

III. KEY FACTORS THAT AFFECTED IMPLEMENTATION AND OUTCOME

A. KEY FACTORS DURING PREPARATION

54. The objectives were relevant given the challenges faced by the forestry sector, rural poverty, and lack of opportunities in rural areas, as well as climate change objectives. The level of ambition was in line with best practices in the Scandinavian countries (see efficacy PDO Outcome 2 as an example of an indicator benchmarked against EU best practice).

55. **The project was a natural follow-on from previous World Bank engagement and reflected the lessons learned.** An extensive analysis was conducted as part of the production of the Forest Policy Note in 2013 (see also annex 8). It was also aligned with the Forest Code (development of which was supported by previous projects) (see 'quality at entry' section for details).

56. **The design of the project was logical with well-structured components, building on previous experience in the country and adding innovative elements based on latest technology and best practices in the sector.** The sequencing of activities and timing were properly planned. However, no disbursement took place for the first 15 months of the project due to the large and complex procurement contracts of harvesting machinery, which the Ministry of Forestry was keen to start with. To mitigate this, the World Bank brought its best technical expertise, including a project lead with 25+ years of forestry experience and provided the PIU with all required procurement trainings and continual World Bank support. On the other hand, this could have been addressed by having better clarity on the procurement process and having the specifications and other documentations ready at preparation, especially for big procurement packages for harvesters and forwarders. It was also important that training of forestry specialists and procurement of innovative equipment helped bolster the project's practical orientation with the introduction of new approaches and practices.

57. For M&E, an iterative process was followed by the PIU and supervised by the World Bank team in line with the Project Operational Manual and the Results Framework. The Results Framework included baselines and end targets, which were based on the best available estimates at the time. The main risks for implementation were captured[53] and adequate mitigation measures were put in place. One exception was the pest management risk, which did not fully capture the risk of bark beetle infestation; however, this risk could not be foreseen. The set of PDO and intermediate indicators was aligned with the

[53] The overall implementation risk rating was Moderate, with the implementation agency risk rated Substantial.

operational objectives of GEF and the World Bank's Core Sector Indicators.[54] However, indicators could have been better designed to capture counterfactual evidence (see other details in the M&E section).

58. The intended beneficiaries and stakeholders included women, and the project indicators and design integrated gender-progressive elements (see gender section). A wider variety of stakeholders were engaged through the Steering Committee platform. The Ministry of Forestry was appropriately chosen as a main counterpart as Belarusian forests are state-owned primarily under the jurisdiction of the Ministry of Forestry (88 percent) and responsible for forest policy and management, including, fire prevention, fighting, felling in drying stands, and handling radionuclide contaminated products (see annex 9). A number of specialized agencies of the Ministry of Forestry was also be involved for certain components, for example, the training center (RUTSLes) for implementing some of the training, Bellesozashita for the implementation of the monitoring of the radioactively contaminated forests, Belgosles for support for the forest management information systems, and the Republican Seed and Nursery Center . The Ministry of Environment and Natural Resources and its terrestrial bodies benefited from a number of GEF-funded activities.

B. KEY FACTORS DURING IMPLEMENTATION

Factors Subject to the Control Government and/or Implementing Entities

59. The project came about due to strong interest from the Government for continued cooperation in the development of the forestry sector and its contribution to the economy, supporting SFEs to flourish, and build the capacity of the next generation of forest professionals (see annex 8). The Government's commitment and ownership to the project remained strong throughout, as evidenced in the feedback from officials participating in the ICR mission. The project did not experience any delays or negative impacts on quality and adapted flexibly to high-level changes in the Ministry of Forestry (appointment of a new minister in 2018 and of a new first deputy minister in November 2018 and December 2021).

60. **The project was strongly aligned and contributed to strengthening the legislative and regulatory framework for forestry,** including the Forest Code, and contributed toward development of the Forest Development Strategic Action Plan (2021–2025), climate change commitments, SDGs, and the Strategy of the Energy Potential Development (as detailed in paragraph 26).

61. **Cooperation, coordination, and partnerships built with multiple stakeholders increased awareness, transparency, trust, and capacity and mainstreamed outcomes of the project** across the Ministry of Natural Resources and Environmental Protection, Ministry of Economy, National Academy of Sciences, Belarusian State Technological University, suppliers of equipment and private sector contractors, and SFEs through workshops, trainings, and setting up of a Steering Committee. The Steering Committee was created in 2015 to ensure coordination of the work within activities funded using GEF grant funds. In total, 15 meetings were organized and over 20 members representing eight organizations, including state government bodies, civil society organizations, and educational institutions, were part of these meetings.

62. As noted in paragraph 21, the AF, and the parent project, covered the financing gap that resulted from government budget constraints arising from the macroeconomic imbalances in 2016 and 2018. In 2016, the recession put additional pressure on fiscal accounts. Declining general government revenues (by 6.4 percent in real terms year-on-year) prompted the Government to tighten real spending (by 6.5

[54] At preparation, PDO indicators 'amount of carbon sequestered' and economic viability of SFEs, were aligned with the World Bank's Core Sector Indicators.

percent in real terms year-on-year) mainly cutting public capital expenditures (by 14.3 percent in real terms year-on-year). State support to enterprises fell from 1.5 percent of GDP in 2015 to 0.6 percent of GDP in 2016. Despite this, the SFEs allocated funding to cover costs of the PIU during the project and GEF grant lifetime.

63. The PIU capacity in Republican Unitary Enterprise (RUE) Bellesexport was built by providing trainings on development of terms of reference and GEF grant reporting and procurement and application of World Bank systems (Systematic Tracking of Exchanges in Procurement [STEP] and ClientConnection), which helped speed up effective implementation and timely disbursement of the project through four-way multilateral contracts (for example, between Ministry of Forestry, RUE Bellesexport, and supplier and buyer [SFE]). The Ministry of Forestry retained the majority of the PIU team on payroll even after project closure. This was a first-of-its-kind international project managed by the PIU that included complex procurement of machinery, investments in state-of-the-art nurseries, and GEF grant activities' implementation. The project also built expertise and capacity in the PIU through trainings and supervision support on environmental and social compliance and financial management (FM) arrangements.

Factors Subject to World Bank Control

64. **Throughout preparation and implementation, the World Bank team supported and effectively addressed the needs of the Government with agility.** There were two changes in the task team leaders (TTLs) from project identification to completion; however, having a co-TTL and TTL fluent in Russian was a considerable asset and helped improve communications and relationship with the Government. Regular implementation support missions provided technical advice, as well as fiduciary and environmental and social safeguard oversight. Aide Memoires and Implementation Status and Results Report (ISRs) were detailed with recommendations to address challenges and issues and agreed actions that were monitored. At the time of midterm review, all components were under implementation and on track. M&E reporting was reviewed regularly.

65. **The World Bank team was proactive** in arranging AF and scaling up activities, which prompted plans for three more new nurseries and extra harvesters and forwarders, and in the no-cost extension of the GEF grant closing date. Paragraph 16 describes why in 2019 the World Bank team chose not to pursue a change in the Results Framework despite a request from the Government. The World Bank team was always supportive in addressing the need for strengthening the PIU's capacity for procurement to ensure timely disbursement, GEF grant reporting, and environmental and social safeguards compliance and reporting.

Factors outside the Control of Government and/or Implementing Entities

66. **The project was agile and responsive to the external factors and events** described in paragraph 6 and section B and annex 6. Project activities and resources were reallocated to respond to the financing gaps and to manage these events (hurricane-strength windstorm in 2016, bark beetle infestation in 2018, and COVID-19 pandemic), mitigating any negative consequences and amplifying positive outcomes.

67. **In response to the COVID-19 pandemic**, all communication and knowledge exchange activities, meetings, and missions were conducted virtually. Cost savings were reallocated to provide protective and preventive equipment including masks and sanitizer at construction sites. It is commendable that there was no delay in completion of any activities under this project despite substantial disruption in the general environment. However, due to COVID-19, a final workshop to present the project results was not organized. Instead, the Ministry of Forestry with GEF funding prepared nine videos showcasing the project

and GEF grant results. COVID-19 travel restrictions also hampered the collection of project results evidence including for the ex post economic analysis. To compensate, during the final virtual supervision mission, the ministry invited representatives from SFEs so that the World Bank team could hear first-hand how the equipment is used and how the project helped them. The Ministry of Forestry and SFEs applied innovative approach as described in para 52 in applying drones to report on the nursery construction in Mogilev. Still for the ex post economic assessment, it would be recommended, for future project work, that the PIU team include an economist consultant at key project stages (preparation, midterm, and completion) to allow for smooth data collection and monitoring of economic and financial costs and benefits for the World Bank and the borrower.

IV. BANK PERFORMANCE, COMPLIANCE ISSUES, AND RISK TO DEVELOPMENT OUTCOME

A. QUALITY OF MONITORING AND EVALUATION (M&E)

M&E Design

68. While constructing the ToC at project completion (figure 1), it is evident that the RBF was well developed and allowed for measurable tracking of progress toward outcomes using effective M&E arrangements. The level of ambition of targets, difficulty, and scope were set in line with international best practices (see efficacy section for PDO Outcome 2) and remained unchanged for all indicators except for number of seedlings and emission reductions, which were revised upward at the AF stage in 2018 in line with construction of additional nurseries (see table 6.1). At design, apart from minor shortcomings of streamlining indicators,[55] the Results Framework and associated M&E system needed to improve design to build counterfactual evidence. For example, PDO indicator 2 on economic viability of SFEs and its target were not fully in the project's control because this indicator can be influenced by price changes (external factor) and counterfactual evidence was not possible because almost all SFEs in Belarus were under the scope of this project. Similarly, project indicators monitoring reduction in area under forest fires before and after project/or compared to areas not under the scope of the project or improvement in survival rates of seedlings could have been considered. Even though these were reported through data collected during ICR missions, building it within the M&E design would have helped capture counterfactual evidence through the Results Framework.

M&E Implementation

69. According to the PAD and Project Operational Manual, the PIU (Unitary Enterprise 'Bellesexport') was responsible for the collection of appropriate data from key partners and stakeholders, where it was relevant, to track progress of indicators toward targets in line with the RBF. The RBF was updated, and progress reports were generated for progress against each indicator biannually. All annual progress reports were submitted to the World Bank for review on time and comments were always considered. The project RBF status was regularly presented at the Belarus Country Portfolio Performance Review meetings. The World Bank also provided quality control and supervision with more than 10 missions conducted over the project implementation period and supervision of FM and procurement aspects once or twice a year, which delivered high ratings for M&E implementation. A Steering Committee monitored GEF grant activities and the effective monitoring process facilitated coordination of activities, building of partnerships, and achievement of project results. In addition, project activities financed exchange of

[55] The total number of indicators could have been reduced or some merged, for example, number of seedlings and number of nurseries.

international best practice in M&E of international environmental projects in accordance with requirement of the Belarusian legislation in 2016, 2018, and 2021 organized by the Ministry of Economy, Ministry of Taxation, Ministry of Natural Resources and Environmental Protection, Ministry of Forestry, and State Customs Committee. Given the high demand, expertise, and capacity for M&E at the national level and with indicators directly connected with the production activities of SFEs, the M&E process is likely to be sustainable post-project. However, the Ministry of Forestry is yet to define the organizational structure and designate roles and responsibilities to track, monitor, and report progress on SFEs or project outcomes such as carbon sequestration in the long run. During ICR mission meetings, the World Bank team was informed that M&E officials will remain on payroll to monitor project performance, and the website with documents will be maintained by the Ministry of Forestry, which will leverage funding from economically well-performing SFEs to sustain the project.

M&E Utilization

70. The RBF was used to monitor progress throughout project implementation and was especially useful during the virtual mission. M&E was used as a tool to support evidence-based learning or allow course correction, for example, in the case of the costs of nursery construction that would need to be financed by the project to achieve outcomes versus at appraisal stage where SFEs would self-finance nurseries. The RBF was revised during the AF preparations in April 2018. M&E helped monitor progress implementation after the AF loan was approved, and then another reallocation of funds took place in 2019 to respond to the emergency with the bark beetle infestation followed by an attempt to revise the Results Framework, which was not pursued (see paragraph 16). Despite this, it is truly commendable that the project was able to be responsive to external factors out of its control, adapt to timely project monitoring in virtual supervision in 2020 and 2021, and provide timely delivery and achievement of all outcomes (barring one intermediate one for nurseries, even though the PDO-level outcome was achieved).

Justification of Overall Rating of Quality of M&E

Rating: Substantial

71. There were some areas for improvement in the design such as indicators to capture counterfactual evidence. Despite it and according to the balanced assessment based on project performance on M&E implementation and utilization evidencing sufficient achievement toward outcomes, the project M&E has been rated Substantial.

B. ENVIRONMENTAL, SOCIAL, AND FIDUCIARY COMPLIANCE

72. **Environmental and social compliance was rated Satisfactory at project closure.** The project closed fully meeting the World Bank's safeguards' policies and national environmental, occupational health and safety, and labor requirements. The project was classified as an environmental category B-partial assessment as the potential environmental impact was moderate and social impact was low. This was mitigated by applying a set of measures specified in the site-specific ESMPs. The project triggered the following policies: OP/BP 4.01 on Environmental Assessment (as part of AF and parent project), OP/BP 4.36 on Forests (both AF and parent project), and OP/BP 4.09 on Pest Management (as part of AF). The latter was triggered due to the possibility that improving forest nurseries could stimulate increased use of pesticides, which offered an opportunity to promote Integrated Pest Management methods in the nurseries. To address potential environmental and social risks and impacts, for all nurseries to be constructed, site-specific ESMPs were developed and implemented. While during the project design stage, a Pest Management Plan was not required for new nurseries to address potential risks and impacts in this

regard, the PIU conducted a series of successful workshops with field demonstrations. The PIU was adequately staffed throughout project implementation and carried out monitoring of implementation of mitigation measures, including on occupational health/labor safety requirements. Reports summarizing compliance with the ESMPs were periodically submitted to the World Bank. The ESMPs were disclosed and publicly consulted upon before construction companies were selected, including by the participating forest enterprises and local environmental protection authorities. A project-level grievance redress mechanism (GRM) operated based on the Belarus domestic legislation with information on GRM publicly available on the project website.[56] At project closure, no grievances or compliances were registered by the GRM. During the construction of nurseries, there were no accidents or injuries, and no serious occupational health and safety noncompliance cases or large COVID-19 infections among staff were registered. As noted in paragraph 37, the mechanization of harvesting is likely to have a positive effect on reduction in lost working time due to injury. Based on the progress reports, newly constructed nurseries are functioning in compliance with the World Bank and national environmental and social requirements as specified in their ESMPs, and no outstanding or noncompliance environmental issues were found. A beneficiary feedback survey to capture project results as part of the preparation of the ICR was not considered due to time constraints and the evolving political situation in Belarus.

73. **Financial Management.** The project closed with a Satisfactory FM rating with no pending FM actions. Throughout project implementation, the PIU carried out the FM and disbursement functions in a satisfactory manner. The PIU was well staffed and had built its FM capacity through on-the-job learning and attending World Bank-organized learning events, especially on FM and disbursements. Interim unaudited financial reports were submitted on a quarterly basis, progress reports were submitted biannually, and audit reports were submitted annually for each—parent loan, AF loan, and GEF grant—and were of satisfactory quality. Planning and budgeting were done in accordance with the Procurement Plans, PAD, and decisions of the project Steering Committee. A Designated Account and transit account were set up in US dollars for the parent loan and Euros for AF, and a separate account, in US dollars, was set up for GEF grant funds. Annual audits of project financial statements were carried out on time by private auditors acceptable to the World Bank based on agreed terms of reference. The auditors issued clean (unmodified) audit opinions and did not note any significant internal control issues, including in the final audit report.

74. **Procurement.** The project was closed with procurement performance rating as Moderately Satisfactory. It was completed in line with the World Bank rules and procedures set within the Project Operational Manual and Procurement Plan (approved in 2015 and revised in 2016, 2017, 2018, and 2021). The procurement risk rating of the PIU was Substantial, especially when a new procurement policy framework came into force for implementation of the AF loan and when application of the new STEP tool started. This risk was mitigated through training on the new STEP tool organized by the World Bank in early 2018 for the procurement staff from the PIU. A draft Project Procurement Strategy for Development (PPSD) for the AF loan was prepared in line with the New Procurement Framework and approved by the World Bank. The PIU was well staffed and its capacity was built through training courses as described in para 56, 65, 63[57]. Some of the challenges encountered by the project were due to process bids being issued multiple times due to (a) noncompliance of bids and bidders with requirements of bidding

[56] https://bellesexport.by/ru/vidy-deyatelnosti/proekt-razvitiya-lesnogo-sektora-respubliki-belarus.html.
[57] Trainings in the International Training Center of the International Labour Organization (Turin, Italy) were arranged o selection of consultants, works procurement management, contracts management. Also PIU participated in procurement seminars arranged by the World Bank in the World Bank's Minsk country office and on-the-job training (virtual or face-to-face).

documents, (b) challenges to deliver equipment in the required time, (c) noncompliance of technical specifications of equipment, and (d) price being considerably higher than the planned budget. Issues related to longer time to get all the processes and documentation for the procurement of harvesting machines were touched upon in paragraph 56. However, once the machines were purchased, the rest of the procurement went much more smoothly, for example, having the engineering plans and specifications prepared in advance, for things such as the firefighting equipment, nurseries, and so on. All other challenges were overcome and cost savings were redistributed toward other project activities on time and in an efficient manner. All received complaints were resolved by the PIU in due time. The project was implemented without major delay, though the COVID-19 pandemic situation has negatively influenced the timely completion of some contracts. This was mitigated by close monitoring of the contract implementation by the World Bank and PIU to ensure that supply of some of the equipment went as planned.

C. BANK PERFORMANCE

Quality at Entry

75. The project is a natural follow-on, built on the success of previous engagements by the World Bank in Belarus (see annex 8 for more details). As a result, the project design benefited from rich experience and lessons learned from (a) within the country and proof of concept of SFEs adapting to the use of new technology and learning to maintain and operate the new machinery and equipment; (b) international best practices (Romania and Bulgaria) on capacity-building approach and institutional development through stakeholder involvement and sharing of international best practices and approaches (for example, by study tours for silvicultural systems in Finland and Poland); and (c) response to forest fires from Russian and Kazakhstan experience by introducing modern technology to improve detection and monitoring of fires. The project was extremely relevant and well positioned in both country context and government strategic priorities and responded to the needs of national priorities, local entities, and ongoing reforms within the sector. The project design was based on latest evidence and challenges to the forest sector, which were studied and analyzed as part of the Forest Policy Note (2013) and helped prepare and prioritize activities and outputs for the project. As a result, project components were balanced to reflect all aspects of SFM in a comprehensive manner and respond to challenges. However, M&E could have been strengthened as described in para 68 by improving the design to build counterfactual evidence. The World Bank team at the BFDP brought together leading experts with forestry and natural resource management expertise in the region and internationally. This was a first-of-its-kind international project for the Ministry of Forestry and included complex procurement of machinery: a powerful example of the type of sustainable intensification in forest management that is now of utmost importance in modern, climate-smart production forestry. Development by the World Bank, through training and supervision support, of capacity of the PIU in Bellesexport for project management, procurement, and environmental and social compliance is a positive long-term legacy of the project.

Quality of Supervision

76. The World Bank closely supervised project implementation through implementation support missions (at least two per year) to review progress and identify key issues that needed management attention. Extensive support was also provided between missions by technical experts in the World Bank team. Fiduciary and safeguards aspects received regular oversight. Performance reporting was candid and of high quality. Aide Memoires were detailed and captured milestones, critical decisions, and agreed next steps. Technical annexes in the Aide Memoires provided additional guidance and information on field

visits with photo reports. ISRs were candid and filed on time. The project benefited greatly from some World Bank team personnel based in Belarus and the region (TTL, safeguards, and FM) and continuity with some members participating from preparation to completion. TTLs were commended for their diplomacy, understanding of the government, team management, and accessibility. The task team was sufficiently staffed, to ensure technical supervision, majority of whom were located and available within the country/region, which helped develop deep relationships with the Government. There was smooth transition between TTLs, and the borrower was highly appreciative of the relationship that the World Bank team had developed based on responsiveness to changes needed and high level of agility in project supervision and implementation. The World Bank team had built strong relationship with the PIU and Government, marked by trust and respect and evident from mission meeting interactions and client satisfaction. During the pandemic, the World Bank team remained proactive and continued to extend support and assistance adapting to the new modes of operation through virtual communication. Since 2020, subsequent missions were held remotely, which ensured smooth project implementation and achievement of project outcomes despite the circumstances.

77. The task team followed an iterative process and design and was appreciated for being responsive to demands of Belarussian counterparts, which found solutions to proposed changes or challenges faced by the project, for example, during the bark beetle infestation (details in section 1 A). The World Bank team was quick to respond and reallocate resources while maintaining direction and progress toward achievement of project outcomes. Procurement and FM were timely and responsive to changes during project implementation resulting in contract issuance and smooth disbursement of payments.

Justification of Overall Rating of Bank Performance

78. The World Bank performance is rated Satisfactory.

D. RISK TO DEVELOPMENT OUTCOME

79. **Sustainability of consistently achieving development outcome is high, given the high relevance and institutional alignment of the project with enforcement of the Forest Code** and integration of green and circular economy principles, Forestry Development Strategic Plan for 2015—2030, and state program 'Belarusian Forest' for 2021–2025, among other government plans. In addition, the focus on meeting domestic energy needs through wood residues and the long-term benefits of thinning will sustain demand for project activities well beyond project completion. Beneficiaries built ownership with professionals having keen interest to be employed and be part of growth story of the forest sector economy, SFEs, and industrial growth. SFEs would be able to reinvest profits and repay loans from gains, which is viewed as a positive indicator for sustainability.

80. **The SFEs benefitting from the project have a good track record in maintaining and continuing financing of the forestry equipment procured.** For example, the equipment purchased under a previous World Bank loan (which closed in 2003) including a seed treatment plant, is still in use and is still well-maintained. The operation and maintenance costs are met from the forest enterprises' own budgets. Replanting, reforesting, and afforestation according to approved management plans is an obligation of all the forest enterprises and has to date always been undertaken. Moreover, the Government has announced plans to invest in 200 new VIMEK machines, using the SFE funds, and maintain thinning in future.[58]

[58] Source: ICR mission meetings.

81. **However, risk arises from the following:** (a) public financing toward sustainable forestry management, which has remained at the same levels and even decreased a bit compared to 2014: reducing from 33 percent in 2014 to 30 percent in 2020. The AF loan was mobilized to fund the budget financing gap in 2018. The World Bank outlook projections suggest that the real GDP is projected to decline by 2.8 percent year-on-year. [59] The existing state program 'Belarus Forest' is till 2025 and plans for total financing of BYR 7.06 billion; (b) major funding sources relying heavily on profits generated by SFEs from forestry commercial activities and credit sources. While this is a sign that SFEs gain more commercial sustainability, there is an increasing pressure on state funding support given the macroeconomic outlook in a post-COVID-19 fiscally constrained world. A stable funding of SFEs is vital to sustain outcomes of the project, while the role of the state funding is also important for the implementation of the planned state forest program till 2025 and to mitigate risks from price shocks and volatility in the timber market; and (c) ecological risks- an increased risk of forest fires and occurrence and frequency of natural disasters due to climate change. There is an increased risk of extreme weather events (windblows, heatwaves, and water scarcity)[60] and pest outbreaks affecting forests and swamps. This could be triggering force majeure and set back achievement of project outcomes in this project.

V. LESSONS AND RECOMMENDATIONS

82. **Sustainable Forest Management (SFM) helps advance climate change goals and promote circular economy in forest sector operations.** In countries where timber production is a significant contributor to the economy, adopting SFM practices can provide a significant economic boost, while increasing carbon sequestration and other ecosystem services. Intensified thinning regimes invigorate the forest stands, build climate resilience, increasing the volume of production (by recovering timber from removal through thinning of crowded-out trees that would otherwise die and decay) and increasing the proportion of high value logs from each successive thinning and at clearcut. This improved supply of high-quality raw material achieves high prices and allowed private processing industry to maximize value. The project's ERR increased significantly due to carbon sequestration and the enhanced sustainability of forest enterprises to drive economic development of the sector. The creation of wood chips with the residues from timber production also shows that forestry operations can promote a circular economy and reduce waste while increasing options for biomass based energy.

83. **Investment in new technologies is more effective when preceded by meticulous planning and skill development for the intended users:** Careful planning well before largescale equipment was procured, and training of new users were helped in reaping the benefits of new, more efficient, equipment in harvesting and nursery operations. The preparatory work before the delivery of the equipment ensured that very little time was lost in familiarizing technicians with the equipment, and, there was less idle time for the machines, resulting in better efficiency outcomes.

84. **Investments to enhance the performance of the private sector in wood processing could significantly amplify the benefits of improved public forest management.** Procuring modern machines made forest production more efficient, safe and sustainable. This increased the economic viability of SFEs and made them more self-reliant and prepared to transform into fully commercial state enterprises like in EU countries. The project was instrumental to support upstream (forest management) of the SFEs.

[59] Growth projections are preliminary and subject to revisions due to the environment of high uncertainty in which the economy operates and due to possible introduction of the fifth package of the EU sanction after a summer break. Source: World Bank Macro Poverty Outlook 48 October 2021.
[60] https://climateknowledgeportal.worldbank.org/country/belarus/climate-data-projections.

Investing in the improvement of the downstream processing capacity of the private sector could go a long way in increasing jobs and growth of the sector.

85. **Building partnerships with a cross-section of stakeholders increases coordination, transparency and trust.** Establishing the GEF Steering committee facilitated coordination, reporting and awareness about GEF Grant and project activities. This also allowed to make prompt decisions of the implementation strategy. During implementation the Ministry of Forestry and the PIU conducted stakeholder discussions of the analytical GEF grant activities which helped to improve uptake of the recommendations. For future projects, closer coordination and inclusion of the forest industry representatives, civil society and other Ministries (e.g., Ministry of Economy, Belhydromet) could be recommended, especially for discussions on impacts of climate change.

ANNEX 1. RESULTS FRAMEWORK AND KEY OUTPUTS

A. RESULTS INDICATORS

A.1 PDO Indicators

Objective/Outcome: To enhance silvicultural management and reforestation and afforestation

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Area of young and middle-aged production-forest thinned according to approved management plans	Hectare(Ha)	132,500.00 27-Mar-2015	165,000.00 27-Mar-2015		167,000.00 31-Aug-2021

Comments (achievements against targets):
The target was met (101%).

This indicator is linked to the PDO to enhance silvicultural management of forests. 183 harvesters and forwarders to forest enterprises in all the regions of the country were supplied and in use now for the young and middle-aged thinning according to the approved forest management plans. Such modernization and mechanization of thinning has raised forwarder productivity and harvesting is possible with one operator rather than 8-10 chainsaw workers laboring in hazardous conditions. In addition, the supply of new machinery helped to create new well-paid jobs (a harvester and forwarder operators) in the rural areas.

During the project implementation, starting 2018 till 2020 the actual indicator value was less than planned because there was a priority placed on sanitary clear cutting to remove dead and dying trees affected by pine bark beetle infestations before undertaking other types of harvesting in Belarus.

Now as reported by the Ministry, the problem has been resolved and the indicator value returned to its planned values and in the final year even exceeded the planned value of 165,000 hectares.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Amount of carbon (CO2) sequestered	Metric ton	4,643,384.00 27-Mar-2015	5,065,508.00 27-Mar-2015	5,245,627.00 12-Mar-2018	6,095,032.00 31-Aug-2021

Comments (achievements against targets):
This PDO and GEF indicator was met (118%).

The indicator was calculated using the EX-ACT tool. The final actual value of Year 6 includes the actual performance of the 4 seeding lines in the four new nurseries in Ivatsevichi, Glubokoe, Minsk and Mogilev. It also includes the seedlings planted in the growing fields of the state forest enterprises.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Economic performance of participating SFEs enhanced	Amount(USD)	0.00 27-Mar-2015	15,826,000.00 27-Mar-2015		46,600,000.00 31-Aug-2021

Comments (achievements against targets):
The achievement was exceeded (296%)

It measures the excess of revenue over expenditures inclusive of all financing sources for participating State Forest Enterprises (SFEs). Since 2020, the Belarus SFEs enjoy favorable internal and external price for wood materials, which caused such a spike in the net profits. For example, the price of lumber in 2020 has doubled. Prior to 2020, the SFEs demonstrated stable performance as the modernization of equipment for the silvicultural activities started to bear its fruits.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Capacity to produce high quality seedlings increased (number of container grown seedlings per year in project-financed nurseries)	Number	0.00 27-Mar-2015	4,000,000.00 27-Mar-2015	23,700,000.00 12-Mar-2018	25,100,000.00 31-Aug-2021

Comments (achievements against targets):
This PDO indicator was met (106%).

Actual capacity for two planting seasons of the forest nurseries in Ivatsevichy State Forestry Enterprise, Glubokoe State Experimental Forestry Enterprise and three rotations in the Republican Seed and Selection Center , and one rotation in Mogilev nursery is indicated in the final actual value. The Project also helped new nurseries to obtain new types of cassettes (100F) which could technologically help to significantly increase the seedling production capacity.

Overall, this new technology with the container-grown seedlings allows to increase the planting period which is important in the reforestation and afforestation. In the future the Ministry of Forestry plans to create more than 20% of forest crops using this technology. During the final mission, the 1st Deputy Minister highlighted that he considers the major result and breakthrough of the Project is the investment in these 4 new nurseries.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Average utilizable volume of commercial timber harvested during intermediate felling in targeted SFEs increased	Cubic Meter(m3)	28.50 27-Mar-2015	35.00 27-Mar-2015		35.00 31-Aug-2021

Comments (achievements against targets):
This PDO indicator was met as planned. It measures the intensity of the thinning operations and cannot exceed 35m3/ha per thinning operation. Finally achieved value remains optimal for keeping the productivity level on a sustainable level in Belarus.

A.2 Intermediate Results Indicators

Component: Improving silviculture and the sustainability of forest management

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Nursery lines for container grown seedlings of native tree species established	Number	0.00 27-Mar-2015	4.00 27-Mar-2015	6.00 12-Mar-2018	4.00 31-Aug-2021

Comments (achievements against targets):
This actual indicator in Year 6 includes all seed lines in the 4 established new forest nurseries - Ivatsevchi (opened in April 2018), Glubokoe (opened in October 2018), Minsk (opened in September 2019), and Mogilev (opened in September 2020). The construction of these new complexes went without any major delays and in compliance with the environmental and social safeguards.

The end target value was retracted as part of AF restructuring cancellation of 6 nursery lines, and the total number of financed nursery lines is 4 as per the Ministry of Forestry priorities and needs. However the capacity of these 4 seedlines (25.1 million seedlings) plus the volume of SFEs nursery fields paired with the new type of cassettes, provided the forestry sector of Belarus with sufficient growing materials to ensure sustainable forest management in Belarus. These 4 new nurseries provide the volume of seedlings as if it was for 6 nursery lines.

The 4 new nurseries created 72 new jobs, all new personnel received training including on pest management as supported by GEF grant. The seedlings produced at these 4 new nurseries will help to create forest cultures on an area of about 6 thousand hectares annually.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Improved thinning regime developed	Yes/No	No 27-Mar-2015	Yes 27-Mar-2015		Yes 31-Aug-2021

Comments (achievements against targets):

Indicator was met. Supplied units of machinery to participating 78 SFEs continue to contribute to the introduction of new technologies for forest thinning operations. In addition, adjustments to the Provision of the Ministry of Forestry No. 68 dated December 2019 were made, taking into account the existing forestry practice such as clarifying the grounds for felling. The version of this Provision remains valid as of August 2021.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
New areas outside protected areas managed as biodiversity-friendly (ha)	Number	1,226,700.00 27-Mar-2015	4,500,000.00 27-Mar-2015		4,642,805.00 31-Aug-2021

Comments (achievements against targets):
Taking into account the new requirements of the Forest Code of the Republic of Belarus, forest management throughout the territory is carried out with an emphasis on biodiversity conservation. This indicator is met (103%) and even exceeds the planned target of 4,500,000 hectares. The area of mixed stands under the authority of the Ministry of Forestry is indicated, with the exception of specially protected natural areas (forest reserves and natural monuments). Within the framework of the project, forest areas subject to special protection were identified in 6 leshozes, and forest management projects for these leshozes were approved, taking into account the norms of the Forest Code on biodiversity conservation. Through the GEF Grant an Electronic Reference Book of protected areas was developed to improve information support for forestry workers about the location and characteristics of protected areas located in the state forest Fund of the Republic of Belarus.

Component: Improving forest fire prevention, monitoring, detection and suppression, improving forest management information systems

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Reforms in forest policy, legislation or other regulations supported	Yes/No	No 27-Mar-2015	Yes 27-Mar-2015		Yes 31-Aug-2021

Comments (achievements against targets):
The Ministry of Forestry processed a number of by-laws and decrees to fulfill the provisions of the new Forestry Code since it was introduced in 2017. In the result of the project implementation, forest legislation of Belarus was actualized based on the international experience and to ensure harmonization with the international standards (16 normative documents were developed, of which 11 are officially approved, including standards, programs, strategies

on climate change and adaptation, etc.). New innovative practices of forestry management, with due regard to the biodiversity conservation in the process of forestry management planning, usage of all the ecosystem services provided by the forests, were introduced.

With support of the GEF Grant , a new forest fire zoning was developed and publicly discussed, this then was included in the respective decrees. This also included the clarifications of the forest management activities composition; detailing other types of logging. Procedure for measuring, marking and

accounting of harvested wood has been clarified. Similarly, the State Program "Belarusian Forest" for 2016-2020 has been reviewed and update for new planning period is being prepared. A draft of the State Program "Belarusian Forest" for 2021-2025 has been developed, widely discussed with the stakeholders , drawing up on the GEF Grant analytical support proposals to update the strategic plan for the development of the forestry sector in Belarus. This new Program was approved in the end of January 2021.

Component: Building the capacity for sustainable forest management (including GEF Project management)

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of people trained	Number	2,243.00 27-Mar-2015	2,380.00 27-Mar-2015	3,000.00 12-Mar-2018	3,448.00 31-Aug-2021
Number of people trained - female	Number	110.00 27-Mar-2015	145.00 27-Mar-2015	150.00 12-Mar-2018	157.00 31-Aug-2021

Comments (achievements against targets):
The target was exceeded (115%)

During the implementation of the Project, financed by the GEF grant, 3 448 forestry specialists were trained in new methods and technologies (including 157 women) . All recommendations for updating strategic documents of normative acts of the Ministry of Forestry were discussed at seminars, round tables with the participation of employees of forestry enterprises, representatives of scientific and civil society (1700). Thanks to the equipping of simulators on the basis of the Republican center for advanced training of forestry specialists, training was organized for all operators of harvesters (forwarders), 405 specialists were trained for the period 2018-2021.

Some of the face-to-face trainings were postponed or rescheduled due to the COVID19 measures of the Ministry of Forestry. However the Ministry intensified number of online trainings, which allowed to keep up the indicator value and even allowed to increase the outreach of the audience.

The number of female trained is also met, there is an increase in the number of female entering the sector and receiving the required training, despite the fact that the forestry sector in Belarus is male-dominated.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Govt institutions provided w/ capacity buildg to improve mgt of forest resources	Number	0.00 27-Mar-2015	11.00 27-Mar-2015		12.00 31-Aug-2021

Comments (achievements against targets):
The target was met (109%)

The delegates from the Ministry of Forestry and selected SFEs participated in total in the 12 study exchanges meetings/programs/ workshops in Poland, Romania, Kazakhstan, Switzerland and Belgium.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Project-supported organization(s) publish reports on inputs and effect of consultation and information dissemination activities on project/program/policies (Yes/No)	Yes/No	No 27-Mar-2015	Yes 27-Mar-2015		Yes 31-Aug-2021

Comments (achievements against targets):

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Direct project beneficiaries	Number	0.00 27-Mar-2015	35,000.00 27-Mar-2015	35,500.00 12-Mar-2018	38,487.00 31-Aug-2021
Female beneficiaries	Percentage	0.00	10.00	17.50	17.70

Comments (achievements against targets):

The target was met (108%). This indicator not only captures the employed staff of the 97 SFEs benefitted from the Project but also 10 organizations subordinated to the Ministry of Forestry. The Borrower ICR also reported that the 4 new nurseries in the 4 regions of Belarus have created 72 new jobs for local population. Thanks to the equipment in 78 forestry enterprises, 195 highly paid and safe workplaces for operators of harvesters and forwarders have been created.

B. KEY OUTPUTS BY COMPONENT

PDO Outcome 1: Enhanced silvicultural management and re/afforestation	
Outcome Indicators	1. Area of young and middle-aged production forest thinned according to approved management plans (167,000 ha) 2. Economic performance of participating SFEs enhanced (US$46.6 million) 3. Capacity to produce high-quality seedlings increased (containers grown seedlings 25,100,000)
Intermediate Results Indicators	Intermediate Indicator A: Nursery lines for container grown seedlings of native tree species established (4 nursery lines) Intermediate Indicator B: Improved thinning regime developed Intermediate Indicator C: 3 448 of people trained, including 157 women
Key Outputs by Component (linked to the achievement of the Objective/Outcome 1)	**Component 1: Improvement of Silviculture and the Sustainability of Forest Management Improving silviculture and forest management effectiveness** • 195 units of machinery (harvesters and forwarders) were procured within the project to ensure constitution of high productive forest stands, and for intermediate fellings in the young and middle-aged stands: 164 units of machinery under the parent loan and 31 under the AF loan. All the harvesters and forwarders were supplied in 2017-2021 to 78 forest enterprises, which are being used since 2017. The usage of new technologies of the intermediate fellings results in improvement of stability of the forest stands against climatic changes and hurricanes, reduction of timber losses, and ensuring of effective harvesting of trees and bushes preventing growth of the trees of the min species. The new machinery is more maneuverable, and its small size allows moving between the trees causing less damage to the forests in the process of work. The capacity of the new machinery is higher. One harvester can harvest about 28 m^3 of timber per day. Due to usage of the modern machinery, the share of the intermediate fellings increased by 26 percent until the end of 2021. The optimal volume of timber harvesting in the process of intermediate fellings to ensure productivity of the left stands, 35 m^3 per hectare, is also achieved due to usage of the new machinery. • Out of 195 units of machinery, procurement and usage of 12 harvesters and forwarders ensured prompt and effective response to the emergency in the forests of the Republic of Belarus resulting from hurricane speed winds in 2016. • 195 high-qualified safe working places were created due to the usage of new machinery. Productivity of the work is increased as well as labor protection and safety conditions of the staff of forestry sector. • Four simulators for training of machinists of harvesters and forwarders for the forest sector were

procured using GEF Grant funds.

- Four new forest nurseries for production of planting material with closed root system were financed (including the civil works) within the project in Brest, Vitebsk, Minsk, and Mogilev regions: forest nursery in the SFEs 'Ivatsevichskij forest enterprise, was launched in April 2018 (13 new jobs were created), forest nursery in the state experimental enterprise 'Glubokskij forest enterprise' was launched in October 2018 (14 new jobs were created), forest nursery in the Republican Selection and Seed Centre was launched in September 2019 (26 new jobs were created), and forest nursery in SFE 'Mogilevskij forest enterprise' was launched in September 2020 (19 new jobs were created).
- 25,1 million seedlings with closed root system were produced. The usage of planting material with closed root system will ensure creation of economically valuable forest stands in Belarus and export of the planting material in the midterm. It is planned that around 20 percent of forest cultures in Belarus will be created using high-quality planting material in future.
- New forest nurseries were equipped with all the necessary additional equipment to ensure their full operation during the planting season. It included 4 lines for filling up the cassettes with substratum and planting of seeds; 279,340 cassettes of types 64 FD 100 FD, F100, F64, F35, and 100F; 26,261 metal frame constructions for installation of the cassettes in the greenhouses and on the growing fields; 57,407 boxes, containers, and 1 set of racks for storage of the planting material; 5 loaders (multi-functional, diesel, telescopic, and fork-electric); and 1 elevator. The project supplied a new cabinet for cones drying and a de-winger in Minsk nursery.
- Ex situ collection of forms of forest plants resistant to climate stress and representing rare and economically valuable tree species was created. The collection was established on an area of 3.05 ha. 1,214 seedlings and saplings of more than 35 coniferous and deciduous wood species and their varieties were planted. The ex situ collection is a highly practical-oriented product ensuring production of biologically sustainable and economically valuable planting materials.
- Labor protection and safety conditions of the staff of forest nurseries were also improved. Using GEF Grant funds mechanical shovel for soil treatment, a root clearing saw, a digging machine, plow, Nizinskij harrow, Krokovskij rollers, and 2 devices for cleaning of felling sites from the felling wastes were purchased. Usage of this equipment resulted in improvement of productivity.

Component 2: Improvement of Forest Fire Prevention, Monitoring, Detection and Suppression Reducing the incidents of forest fire hazards

- 45 forest enterprises received and used 8 fire trucks, 31 off-road vehicles with cargo platform, 31 off-road vehicles for forest fire protection, and 2 forest fires extinguishing tank trucks. The machinery allowed for prompt delivery of the water and firefighting crews of forest enterprises to the fires in the forest stands and facilitated extinguishing of fires in the shortest time.

Additionally, for SFE 'Polesskij forest enterprise' equipment for forest fire extinguishing was procured using GEF Grant funds, including motor pumps, fire hoses, and a backpack fire extinguisher.

- The purchase of video surveillance systems (3 units) provided for permanent monitoring over the forest fund for timely detection of forest fires on the territory of 2 SFEs (Ushachskij forest enterprise and Novogrudskij forest enterprise).
- As a result of the inventory of dried peatlands, 6,679.2 ha of peatlands under agriculture and industrial exploitation were brought under protection to minimize fire risk through transfer to the forest fund, added to database 'Belarusian Peatlands', and reflected on map of Belarus.
- With GEF funding, 124 units of various forest fires suppression equipment were supplied including mud motor pumps, fire hoses, and combined manual barrels and sprayers.
- To ensure carrying out of new functions delegated by the Ministry of Forestry, equipment for testing and repair of fire hoses (6 units) and 1 utility vehicle for transportation of the workers were procured for enterprise 'Bellesozashchita' using GEF Grant funds. This ensures technical maintenance of fire hoses (drying and rolling to another edge) in the forest enterprises of the sector before the start of the top fire season and, consequently, improves preparedness of the forest protection service to fire fighting.
- Policy in the field of forest fire zoning was updated. Amendments to the technical code of common practice 'Rules of Firefighting Arrangement of Forests of the Republic of Belarus' were developed and approved by the Order of the Ministry of Forestry as of 28.04.2017 No. 9. Map of forest fire zoning of the territory of Belarus was actualized.
- Awareness-raising of civic society on prevention of forest fires arranged. A video was produced to draw attention to the problems of forest fires. During the fire dangerous seasons in 2019–2020, the video was broadcast on TV channels in prime time, on the internet, in the cinemas in all the regional centers, in the Minsk metro, and at the Minsk bus station 'Centralny'. About 2 million people were able to watch the video.

Component 3: Capacity Building for Sustainable Forest Management

- 78 forest enterprises received 81 units of individual protective sets (including respirators) and 82 manual sprinklers for treatment with chemical compounds against weeds, for spraying compounds protecting the plants against pests, and for feeding of the plants and granulated fertilizers. This helped improve labor safety conditions for the forest staff working in forest nurseries.
- A remotely piloted aerial vehicle was procured and is aimed to allow monitoring of the conditions of the forest fund, organization of forest protective measures, and the fires and is enabled to receive real-time data. Proposals on improvement of the forest monitoring system in the

	Republic of Belarus to ensure minimization of negative impact of the changing climatic conditions and economic activities at the forests were prepared. A vehicle was also procured to transport staff and new equipment for the monitoring of remote sites. Also 5 tablets and 10 pieces of rangefinders were supplied. • Regular practical trainings on timber harvesting simulators of multi-operational machinery were held at the Republican Center for Improvement of Skills of the Managers and Specialists of the Forestry Sector of the Ministry of Forestry. During 2018–2021, 405 specialists of the forest sector were trained. • Training materials were developed and saved for online use, and in 2020–2021, several seminars were conducted on 'modern environmentally-oriented technologies for the use of plant protection products and fertilizers in tree nurseries'.
Objective/Outcome 2 **PDO2: Increase in the use of felling and residues**	
Outcome Indicators	1. **Average utilizable volume of commercial timber harvested during intermediate felling in targeted SFEs increased (cubic meter per hectare [m^3/ha])**
Intermediate Results Indicators	NA
Key Outputs by Component (linked to the achievement of the Objective/Outcome 2)	**Component 1: Improvement of Silviculture and the Sustainability of Forest Management Improving silviculture and forest management effectiveness** • Two chopping portable machines for processing timber into the chips were procured and handed over to SFE 'Smolevichskij forest enterprise' and SFE 'Uzdenskij forest enterprise'. **Component 3: Capacity Building for Sustainable Forest Management.** • Improvement of institutional framework on treatment with felling wastes. International experience of Canada, Finland, Sweden, Germany, and Russia on treatment of felling wastes after commercial feelings was studied. Methodologies of assessment of carbon sequestration by the felling wastes in the process of commercial cuts (clear and non-clear) and intermediate cuts were prepared. • Recommendations and complex of actions on biodiversity protection, optimum content of nutrients and minimization of carbon dioxide emissions at the sites after clear and non-clear commercial cuts, and treatment of felling wastes upon results of monitoring, with due regard to the balance of social, ecological, and consumption interests of forest use were also developed. • Amendments and additions to the State Standard STB 1360-2002 'Sustainable Forest Management and Forest Use. Commercial Fellings. Requirements to the Technologies' were prepared and are related to the treatment of felling wastes. • Proposals with justification of social and ecological and economic factors for removal/non-

	removal of felling wastes in the process of thinnings and clear-cut fellings were developed. The proposals were elaborated to ensure that absorption of carbon dioxide by the forest stands of Republic of Belarus in the forests of the main tree species is not reduced.
Objective/Outcome 3 **PDO3: Improve the public good contribution from forests in targeted forest areas.**	
Outcome Indicators	1. **Amount of carbon sequestered (6,178,052 Metric ton)**
Intermediate Results Indicators	**Intermediate Indicator D:** Reforms in forest policy, legislation, or other regulations supported **Intermediate Indicator E:** 12 government institutions provided w/capacity building to improve management of forest resources **Intermediate Indicator F:** New areas outside protected areas managed as biodiversity friendly (4,642,805 ha) **Intermediate Indicator G:** Support for dissemination, communications, publishing (yes/no)
Key Outputs by Component (linked to the achievement of the Objective/Outcome 2)	**Component 3: Capacity Building for Sustainable Forest Management.** • Inventory of dried peatlands and those inefficiently used in agriculture and for industry purposes, which were transferred to the forest fund, was done. Analysis of fire preventive measures for each peatland was conducted. Schemes of organization of territory to minimize risk of fires for each peatland were developed. • Improvement of institutional capacity in the field of selection. This was done due to creation of ex situ collection of forms of forest plants resistant to climate stress and representing rare and economically valuable tree species. The collection was established on the area of 3.05 ha. 1,214 seedlings and saplings of more than 35 coniferous and deciduous wood species and their varieties were planted. The ex situ collection is a highly practical-oriented product ensuring production of biologically sustainable and economically valuable planting materials. It is also of high scientific importance as it ensures production of initial material for experimental selection and genetic works. • Actualization and development of national institutional forest framework. A number of technical, normative, legislation, and other regulatory documents were developed and approved stipulating introduction of new practices and approached with due regard to necessity of biological and landscape conservation, estimation of forest ecosystem services, introduction of 'green economy' principles, and so on: (a) New version of the regulations on organization of forest monitoring and usage of monitoring data was developed and approved by the Resolution of the Government as of 04.11.2016 No. 907. (b) State program 'Belarusian Forest' for 2021–2025 was developed and approved by

	Resolution No. 52 of the Government as of January 28, 2021. (c) Rules for the control of radioactive contamination in the system of the Ministry of Forestry were amended and approved by the Order No. 36 of the Ministry of Forestry as of February 3, 2017. Rules for forestry organization at the territories contaminated because of the Chernobyl accident were developed and approved by Resolution No. 86 of the Ministry of Forestry as of December 27, 2016. Amendment No. 1 to the Technical code of common practice 240-2010 'Exploration of lands of forest fund' was developed and approved by Resolution No. 24 of the Ministry of Forestry as of October 24,2016, and is valid from April 1, 2017. Amendment No. 2 to the Technical code of common practice 239-2010 'Exploration of forest felling sites' was developed and approved by Resolution No. 29 of the Ministry of Forestry as of November 4, 2016, and is valid from April 1, 2017. The latter two mentioned technical normative documents stipulate requirements for forestry management in the radioactive contaminated zones. (d) New versions of the following state standards of Belarus (hereinafter- STB) were developed: STB 1708 'Sustainable Forest Management and Forest Use. Basic Requirements', STB 'Group Certification of Forest Management and Forest Use Systems Requirements'; STB 2157–2016 (PEFC ST 2002:2013) 'Identification of Timber and Non-Timber Forest Products upon origin. Basic requirements'. (e) Strategy and Action Plan on adaptation of Belarusian forestry to the climate change, increase of greenhouse gases (GHGs) absorption, and introduction of 'green economy' principles were developed and approved at the session of the Scientific and Technical Council of the Ministry of Forestry as of June 28, 2019, No. 4. (f) The following methodical documents were also developed envisaging introduction of new innovative practices: methodical document on reconstruction of low-value forest stands to increase share of broad-leaved forests and recommendations on reforestation of felling sites of dried spruce and pine forest stands. • Capacity building of the forest sector staff: 63 specialists of the forestry sector, environmental sector, and other stakeholders learned best practices of forestry management at 6 study tours to European countries; 3,448 specialists of forest sector were trained on new approaches, practices, and technologies on the basis of the Republican Center for Improvement of Skills of the Manager and Specialists of Forestry Sector (including those trained to work with new harvesters and forwarders). This number of trained specialists includes 157 women. Another 1,700 people were trained through participating in the workshops, trainings, and other events held in the process of research, development of new

	legislative documents, and so on. • 72 new 'green' jobs were established in relation to creation of new forest nurseries, and 195 new jobs were created due to delivery and usage of new forest harvesting equipment. • Improvement of forestry education: 11 new educational programs were developed covering new practices and approaches. Since 2021, the programs are included into the educational process of the Republican Center for Improvement of Skills of the Managers and Specialists of the Forestry Sector of the Ministry of Forestry. This ensures project sustainability in long run through training of 'new generation' forestry staff on a permanent basis. • Improvement of the forest management planning system. A lot was done within the project to change current forest management planning system and introduce new modern approaches. Analysis of effectiveness of the current system of forest management planning in the Republic of Belarus and analysis of possibilities of development of market for forest management and planning services were done. New approaches on assessment of climatic changes influencing the structure and conditions of forests in the course of forest management to create sustainable and productive forests with conservation of biodiversity were developed. Testing of usage of the remotely piloted aerial vehicles in the process of forest inventory and development of technology of processing of data received from the remotely piloted aerial vehicles was ensured. Usage of a new approach to the development of forest management plans taking into consideration biodiversity conservation function of the forests was piloted. • Automation and computerizing to enhance forestry management and access to the data: (a) Two new software, 'Nursery management' and 'Seed management of forest stands', were developed. Due to the new software, all the documents are filled in electronically, and all the aggregated documents and reports are generated electronically with further transformation in MS Word format and printing on paper. (b) New software (information management system) 'Reforestation' was developed to ensure improvement of effectiveness of reforestation and afforestation, automation of planning process, and exclusion of errors in the process of integration of reporting documentation. (c) Geoinformation service 'RadForInfo' (software) was developed. Usage of 'RadForInfo' facilitates prompt decision-making on forest use (forest fellings) in radioactive contaminated zones, and first, with high density of soil contamination with 137 Cs (hereinafter contamination density) from 15 till 40 Ci/km^2 (III zone).

	(d) Software 'LesInfo' consisting of the sub-systems of input, storage, and provision of forest management information; spatial analysis of data with possibility of demonstration of graphical pictures (public maps OSM, Google Maps and own maps); and creation of own information layers related to the forest fund is developed. • Awareness-raising of public and stakeholders on forestry-related topics. A film with the project results and 8 social videos were produced. The videos cover the following topics: main achievements in reforestation and forest production, function of new forest seed centers, forest contamination management, forest fire management, people working in the forests, professional orientation of children, and school forestry units. These videos are planned to be broadcast on the TV channels and the internet.

ANNEX 2. BANK LENDING AND IMPLEMENTATION SUPPORT/SUPERVISION

A. TASK TEAM MEMBERS

Name	Role
Preparation	
Andrew Michael Mitchell, Elena Klochan	Task Team Leader(s)
Barbara Ziolkowska	Procurement Specialist(s)
Alexei Slenzak	Social Specialist
Sydnella E. Kpundeh	Team Member
Elena Segura Labadia	Team Member
Jennifer Shkabatur	Social Specialist
Klavdiya Maksymenko	Social Specialist
Nina Rinnerberger	Team Member
Hanna Shvanok	Team Member
Supervision/ICR	
Vladislava I. Nemova, Madhavi M. Pillai	Task Team Leader(s) after November 2018
Andrew Michael Mitchell, Elena Klochan	Task Team Leaders till November 2018
Alexander Balakov	Procurement Specialist(s)
Irina Babich	Financial Management Specialist
Anastasiia Zakharova	Team Member
Tatiana Bender	Team Member
Leela Raina	Team Member
Myles Mac Donncadha	Team Member
Warren Paul Mayes	Social Specialist
Rajesh Koirala	Team Member
Maya Abi Karam	Counsel
Luz Meza-Bartrina	Counsel

Arcadii Capcelea	Environmental Specialist
Rahmoune Essalhi	Team Member
Luis M. Schwarz	Team Member
Olga A. Gubareva	Team Member

B. STAFF TIME AND COST

Stage of Project Cycle	Staff Time and Cost	
	No. of staff weeks	US$ (including travel and consultant costs)
Preparation		
FY14	17.138	80,031.50
FY15	30.565	127,383.78
FY16	0	0.00
FY18	7.242	82,401.41
FY19	.400	33,184.56
Total	**55.35**	**323,001.25**
Supervision/ICR		
FY15	0	0.00
FY16	17.813	80,545.33
FY17	8.527	28,245.18
FY18	14.175	78,158.83
FY19	34.839	194,885.37
FY20	23.738	129,836.51
FY21	18.426	76,865.55
FY22	17.152	80,121.44
Total	**134.67**	**668,658.21**

ANNEX 3. PROJECT COST BY COMPONENT

Components	Amount at Approval (US$, millions)	Actual at Project Closing (US$, millions)	Percentage of Approval
Improving silviculture and the sustainability of forest management (Component 1)	50.87	52.07	104.0 %
Improving forest fire prevention, monitoring, detection and suppression, improving forest management information systems (Component 2)	4.88	3.09	63.0 %
Building the capacity for sustainable forest management (Component 3, including GEF Project management)	2.10	2.10	100.0 %
Total	**57.85**	**57.26**	**98.9 %**

Note:

a. The amounts at approval for Components 1 and 2 include the two IBRD Loans (8474 approved in 2015 and 8821 approved in 2018), while Component 3 was fully financed from the GEF Grant TF0A1173.

b. AF Loan 8821 was approved in euros (EUR 12.0 million). For this table it was transferred from EUR to US$ amounts using the exchange rates at approval and closing as in the datasheet, respectively. This creates a discrepancy in total costs at approval and closing.

c. Actual amounts by component at project closing are based on data provided by the PIU in US$ for IBRD Loan 8474 and IBRD Loan 8821 and in euros for the AF loan, accordingly.

d. IBRD Loan 8474 had an undisbursed balance of US$63.14, which was returned to the World Bank during the grace period. The GEF grant and the AF loan in euros are fully disbursed.

ANNEX 4. EFFICIENCY ANALYSIS

1. The financial benefits of the project estimated at appraisal included (a) increasing the intensity of thinning operations; (b) increasing the utilization of forest production by using felling arisings, which are currently wasted; (c) reducing costs and increasing survival rates for forestry planting stocks; and (d) reducing the losses from forest fires. Economic benefits were also estimated for increased carbon sequestration through increased forest growth, reduced emissions by substituting use of fossil fuels, and reduced carbon released through forest fires. The following analysis includes (a) a narrative of benefits due to improved governance and capacity and (b) analysis of the financial and technical efficiency of the above investments. Investment costs are equivalent to the total project value.

2. Some long-term project benefits (for example, thinning interventions or uplift in forest productivity due to genetically improved growing stock) were not modelled due to uncertainty and the required extension of time over many decades. Further challenges were encountered in obtaining detailed data in support of the expected technical efficiencies due to the lack of in-person missions. Where detailed data were unavailable, supporting literature sources are provided for the expected improved efficiencies, and conservative assumptions are made where needed.

3. While retaining the structure of the original economic analysis, the design stage estimates were replaced with responses received from the borrower at project closing; however, some details on operating costs of harvesters, forwarders, and chippers were carried forward from the ex ante economic analysis due to lack of updated information. The main changes with respect to the ex ante estimates were in favor of higher returns: capital costs of machines being lower than planned, cost of fire measures being lower for same level of outcome, and seedling prices and seedling volumes being higher[61]. Changes that drove lower returns were thinning revenue per cubic meter being lower, counterfactual thinning costs being lower than expected, and higher chipping costs.

4. **Improved governance and capacity** strengthened forest management by updating technical standards and procedures to align with international and national norms in climate change adaptation, conservation of biological diversity, higher intensity silviculture and reforestation, recovery of wood wastes for energy, control of exploitation of radioactive forest areas, use of remotely piloted aerial vehicles, and sustainable forest management and certification. These activities reflect many of the recommendations identified in the World Bank Belarus Forest Policy Note of 2013. Significant new software was developed in support of existing and updated forest inventory, planning, and management and to underpin the enhanced standards and procedures. Eleven new educational programs were also developed. Approximately 1,700 people participated in workshops or training related to the above improvements. While these advances have significant economic benefits, generating new knowledge, efficiency, and experience, monetization of such benefits is difficult and rarely done for practical purposes. As an example of the type of returns achieved on this type of investment, evidence suggests that the annual rate of return of public investments for research and innovation ranges between 20 percent and

[61] Seedling price at appraisal and as reported during ICR review by the PIU was 0.10-0.13 cents, with no time series available, counterintuitive in terms of high inflation, and lack of counterfactual evidence, given limited scope of 4 nurseries. As per data collected from ICR mission, the team estimated the price of seedlings sold to SFEs in the range of 0.61 cents, based on triangulation, which intuitively reflected the higher quality of seedlings over time. Further details in table 4.7 which include a sensitivity analysis, showing positive NPV despite 70% reduction in price.

37 percent,[62] and the benefit-cost ratio for agricultural research has positive values, with an average value of 4 for low- and middle-income countries.

5. **During project preparation, models were prepared to reflect the impact of investments.** At appraisal, price estimates for tradable commodities were based on the World Bank's Global Commodity Price Projections and all local costs were converted into their approximate economic values using a Standard Conversion Factor (SCF) of 0.8. The ex post analysis adjusted the models used at appraisal to reflect updated investment, productivity, cost, and revenue estimates. Costs and benefits are calculated as incremental to the ones that would occur without the project. Conservative assumptions and estimates are used for the inputs and outputs of activities undertaken following implementation of the project components and activities, or that can be attributed to the project's implementation. The analysis does not include VAT on sales or purchases. The economic internal rate of return (ERR) is used in this analysis to assess the viability and robustness of investments.

Benefits from Increased Intensity of Thinning Operations

6. **Financial efficiency.** A total of 195 harvesters and forwarders were purchased at a cost of over US$34 million. The AF and a redistribution of investments resulted in 69 more machines being purchased than planned at appraisal. A life-span of 10 years is indicated for these investments with zero salvage value. At appraisal, one harvesting machine was paired with one forwarder. In practice, except for extreme haul distances, the productivity of the forwarder will exceed that of the harvester, often by a factor of 2. The labor costs of running a double shift per machine was used although they were assumed to operate 1.5 shifts per day. Productive machine hours therefore equate to 75 percent of scheduled machine hours, which is a reasonable industry norm (Brinker et al. 2002).

7. At appraisal, the assumption was made that the volume which could be thinned by the acquired machinery would be thinned in any event, according to the forest management plans already in place. The 'without project' scenario sees motor-manual (chainsaw harvesting) used instead. The ratio of chainsaw operators to machine operators was 8:1 and so 32 chainsaw operators were calculated as being needed to equal the output of one harvester/forwarder team. Given the harvester productivity of 10,500 m^3, 32 chainsaw operators would have an extremely low annual production of 296 m^3 per operator (roughly equivalent to 1,500 small trees) to match it. The low productivity (and resulting high unit cost) of chainsaw thinning in the ex ante analysis caused a large disparity in price between chainsaw thinning (the 'without project' option) and the proposed mechanization. Ex post, this assumption has been revised downward to 13 using up-to-date sources (Pedolin et al. 2021) and the PIU information that approximately 10 chainsaw operators would do the work of one mechanized harvesting team so the disparity has reduced.

8. The thinning yield per hectare was improved by 20 percent through mechanization from 28 m^3 per ha to 35 m^3 ha^{-1} (PDO indicator). Ex post this, the benefits of the counterfactual (chainsaw harvesting and primitive forwarding) were adjusted by reducing the revenues achieved by the chainsaw team by 20 percent while retaining the production costs of the output level of the mechanized harvesting team.

9. Given that the procurement did not comprise neat multiples of teams comprising one harvester and one forwarder, the machines have been analyzed separately ex post. One forwarder normally has the productive capacity to serve two harvesters, so the productivity of the forwarder model has been set to

[62] Hines, Phillip. 2017. *Why Fund Research? A Guide to Why EU-Funded Research and Innovation Matters*. The rate of return was calculated as the average amount gained per year as a percentage of the original investment. https://sciencebusiness.net/why-fund-research.

double that of the harvester (Kofman and Kent 2009). In addition, given the nature of the forwarding task, it has been assumed that some of this work will be accomplished by tractor or horse in the 'without project' scenario and the labor balance has been shifted slightly (on a 60:40 ratio) toward the chainsaw harvesting tasks under this scenario. The changes made in the ex post analysis are outlined in table 4.1

Table 4.1. Changed Assumptions in Thinning Machine Analysis

Item	Ex Ante	Ex Post
Revenue per m^3	US$12 (estimated commodity prices)	US$6.79 (5-year average of prices achieved reported by the borrower, split 50:50 between harvester and forwarder)
Harvester productivity (m^3 per year)	9,488 (253 days x 1.5 shifts per day x 25 m^3 per shift)	10,500 (average productivity of VIMEK harvester reported by the borrower)
Chainsaw productivity equivalent to harvester productivity above (used to calculate incremental benefits, m^3 per person year)	296 (ratio of 1:8 between machine operators and chainsaw persons)	810 (based on estimated productivity of 0.6 m^3 per scheduled person hour and according to the PIU data)[63]
Thinning production per hectare (m^3 per ha)	28.1	35 (as per PDO indicator)
Chainsaw operators required to harvest the stated machine production above	32	12 (as per PIU data and productivity literature)
Forwarder productivity (m^3 per year)	9,488 (253 days × 1.5 shifts per day × 25 m^3 per shift)	21,000 (× 2 harvester productivity)
Ratio of labor allocated to replace forwarder under 'without project' scenario	50% (that is, 16 of 32 chainsaw operators for harvesting task, 16 for forwarding task)	40% (5 forwarding, 7 harvesting; to reflect the fact that transport of logs to forest road is never a completely manual task)
Ratio of forwarder to harvester	1	0.5 (to reflect normal practice)
Fuel cost (US$ per L)	1.18	0.821[64]
Harvester capital cost (US$, thousands)	220	203 (average price paid by borrower)
Forwarder capital cost (US$, thousands)	150	155 (average price paid by borrower)

10. At appraisal, the internal rate of return (IRR) calculated for the machine team was 41 percent, while under the revised assumptions the equivalent IRR is now calculated as –0.1 percent. The main source of difference is the reduction in number of chainsaw operators and reduction in expected unit price.

11. **Technical efficiency.** Silviculture is the purposeful management of forests toward the achievement of management objectives. Thinning, especially at the early stages of a forest rotation, is a silvicultural intervention that may be loss making. Losses are knowingly incurred so that future stand increment will be distributed among trees with the best vigor, growth form, or timber quality. The remaining trees will also reach the optimum desired size more quickly while not sacrificing timber quality due to excessive branching (causing knots). In addition, trees that would otherwise be crowded out and

[63] Pedolin et al. 2021.
[64] https://www.globalpetrolprices.com/Belarus/diesel_prices/.

die can be harvested before this occurs and put to good use (including capturing the carbon and energy they have already sequestered). Thinning can yield immediate revenues, but the emphasis is usually on the improved status of the forest stand in the future. A low or even negative IRR would not be uncommon in the purchase of thinning machinery, especially if the machines are small and of lower productivity, as is the case here. Using such small, highly maneuverable, and low-impact machines (VIMEK and AMKADOR) can be more expensive because of lower productivity but is highly desirable that the remaining trees can be individually selected for retention and are not injured in the process of harvesting the thinning trees. Skidding using tractors or by horse can cause considerable damage to standing trees, reducing their value and making them more prone to drought, disease, and pest attack.

12. Thinning also reduces the fuel load in terms of fire risk and can also raise the resilience of the remaining trees to drought and attack from pests or disease. The evaluation of the financial benefits of thinning is a complex task, which has not been undertaken here, and the analysis would be subject to considerable uncertainties and extend over many decades. Studies in thinning of conifer plantations elsewhere have shown that thinning can increase NPV by 5–10 percent at a discount rate of 5 percent (Farrelly and Hynes 2007; Ryan et al. 2016).

13. Using harvesters and forwarders in forestry also brings added safety and professionalism. The workplace is more comfortable and can attract and retain workers more easily. High technology is applied, and ongoing training keeps operators motivated and their skills in demand. Chainsaw injuries are usually severe, causing significant productivity losses and even death. Medical costs for chainsaw-related injuries in the United States in 1999 surpassed US$350 million, but this does not account for lost productivity and pain, disability, and suffering. A switch to mechanized harvesting makes significant improvements in worker safety and marks a substantial contribution to the technical efficiency of these investments.

14. Implementation efficiency was high resulting in lower-than-budgeted unit costs for equipment and 69 additional machines purchased at minimal extra administrative cost. Considerable experience was gained by the PIU and ministry in best practice international procurement of sophisticated forest machinery.

Benefits from Increased Utilization of Harvest Waste

15. The benefits are achieved by deploying site-cleaning machines and chippers to chip the waste wood for energy.

16. **Financial efficiency.** Two chippers and 12 site-cleaning machines were purchased at a total cost of US$0.856 million. For the ex post analysis, six site-cleaning machines have been assigned in support of each of the two purchased chippers. At appraisal, the IRR was 25.8 percent with an NPV of US$377,000 before carbon benefits. Ex post, the operation is calculated as having a negative return (IRR of –15.8 percent) before carbon benefits over the same 10-year period. The reduction in IRR is due to increased capital outlay (more expensive chipper and site-clearing machine attachments) and five additional site-cleaning machines assigned per chipper, with a lower production level of chips. If only 1 of the 12 site-clearing attachments is assigned to each chipper and the production held constant (as in ex ante), the ex-post IRR rises to 6 percent.

17. **Technical efficiency.** Utilization of wood wastes for energy or incorporation into long-lived wood products that would otherwise rot and release their sequestered carbon clearly has an economic benefit (see para 23 or analysis). It also reduces fuel loading so that fire outbreaks are more easily contained. In addition, the site-clearing activity can have a positive effect on reduced reforestation costs. Rather than clearing and planting through harvest wastes and branches, a clean site allows easier planting and weed

control. In Ireland, the cost of reforestation by planting is reduced by 30 percent where sites have had their harvest residues removed; however, no such savings are calculated ex post due to lack of local data.

Benefits from Improved Forest Nursery Capacity and Survival Rates

18. **Financial efficiency.** The project financed additional annual production capacity of 25.1 million 'closed root' seedlings with the construction or rehabilitation of four nurseries, which now meet the highest international standards. At appraisal, 10 nurseries were expected, and the overall IRR was –17.3 percent. Ex post, the analysis reflects the actual capital outlay on the four nurseries, cost and revenue adjustments to reflect the actual employment levels in the built nurseries, the increased capacity of each nursery (five times the production of the nurseries envisaged at the ex ante stage). higher seedling prices, and a 15 percent reduction in seedling costs due to improved survival rates. See table 4.2. **Error! Reference source not found.** for amendments to financial analysis in the nursery investments.

19. An increase in capacity of some 25.1 million seedlings allows for an additional 6,000 ha to be planted in a purposeful manner rather than attempting to use natural regeneration (which can often result in lower-value aspen and birch forests). Species can also be better matched to the site and this improves climate adaptation and resilience using high-quality seed from selected sources and processed at the national seed center (supported by the project). Up to 20 percent improvement in timber production is possible by using planting stock improved through breeding programs (Lee and Matthews 2004). No estimate was made of the financial benefits accruing from these improvements as uncertainties are significant and the appropriate period would extend many decades into the future. However, the weighted average price per seedling sold to SFEs as per data collected during ICR mission has increased to between US$0.45 and US$0.97 in the first five years (with a five-year average of US$0.61 thereafter) to reflect the increased price attained due to the improved genetic quality, consistency, lengthened planting season, convenience, and resilience of the closed root seedlings. The price increase, assisted by a 15 percent reduction in seedling losses due to improved survival (of these more expensive seedlings), is the main driver behind improved financial performance.

Table 4.2. Changed Assumptions in Nursery Analysis

Item	Ex Ante	Ex Post
Seedling price	US$0.10	US$0.61 (triangulated based on 5-year average, data collected from ICR mission)
Nursery productivity (seedlings per nursery)	1,280,000	6,275,000
Number of nurseries	10	4
Average annual employment per nursery at full production (full-time equivalent)	5	22
Average construction cost (US$)	683,015	3,955,000
Cost savings expected due to 15% improved survival rate (95% versus 80% previously)	—	Reduction in cost equivalent to 15% of revenues from sales to SFEs

20. **Technical efficiency.** At appraisal, the costs per nursery were based on a capacity of 1.28 million seedlings per nursery per year. In the nurseries built, with an average capacity of 6.275 million seedlings (a fivefold increase in size), economies of scale would be expected to bring additional savings. In the interest of adhering to conservative assumptions and in the absence of data from the borrower, no such savings were modelled in the ex post analysis, and the same unit production costs per seedling were applied.

21. **Implementation efficiency.** In addition to improving survival, closed root seedlings extend the planting season, leading to greater efficiency in logistics and deployment of labor. Additional cassettes were purchased to leverage the capacity of smaller nurseries at the forest enterprise level to grow the seedlings for 12 months, getting them ready for planting in the field. This practice frees up more capacity in the high-capacity nurseries to raise more high-quality seedlings from carefully selected seed sources and maximizes the utility of older nurseries which have adequate technology (and space) to host the seedlings for finishing off and is an efficient use of resources. Equipment levels of the national seed center were also enhanced, and a new arboretum was centrally established to act as a repository for genetic forest resources (in the financial analysis these central costs are spread equally across all four nurseries).

Benefits from Improved Fire Prevention and Control

22. The average annual volume of timber lost through fire damage between 2000 and 2012 is recorded as 38,811 m^3. The ex ante estimate was that the project would result in a 30 percent reduction in damage. Comparing the average annual area damaged by fire where canopy was greater than 30 percent (using MODIS) in 2011–2015 with the average annual area damaged during the project (2016–2020) from the same source shows a 27 percent reduction (Global Forest Watch 2014). At appraisal, the IRR was calculated at –13.3 percent but ex post, a return of 1.0 percent is indicated on the US$2.8 million investment. The difference is due to approximately 56 percent lower investment achieving similar benefits over the same 15-year period.

Benefits from Improved Carbon Balances

23. All benefits described above also generate carbon benefits, either by increasing carbon sequestration through increased forest growth or reducing emissions by substituting use of fossil fuels or reducing carbon released through forest fires. GHG accounting was undertaken to both estimate the amount of carbon benefits and assess the carbon footprint of the project, which is expected to be positive. Based on the GHG emissions accounting, the project net carbon balance is estimated at 5,245,627 tCO_2eq of avoided emissions or increased carbon sequestration over the full analysis period (30 years). Taking the estimated incremental net carbon benefits over the six-year life of the project, and assuming (a) the lower estimate from the Report of the High-Level Commission on Carbon Prices (Stiglitz and Stern 2017), (b) the upper bound estimate (Stiglitz and Stern 2017), and (c) the annual average of volume-weighted daily EU ETS trades the carbon benefits are presented in table 4.3. Assuming the actual rates for Years 1 to 6 and the 2021 rates thereafter until 2030 lowest average annual average (EU ETS) at US$6.51 million, this would translate into a net benefit of the project of around US$109.48 million(discounted at 6 percent) over the 15 years covered under the economic analysis.

Table 4.3. Carbon Benefits

	2016	2017	2018	2019	2020	2021–2030	Total
Net annual CO_2 reductions (Million tCO_2eq)[a]	0.26	0.26	0.26	0.26	0.26	0.26	
Lower bound (US$/$tCO_2eq$)[b]	36.00	37.00	38.00	39.00	40.00	41.00	
Upper bound (US$/$tCO_2$ eq)	72.00	74.00	76.00	78.00	80.00	82.00	
EU ETS price in US$ (US$/$tCO_2eq$)[c]	5.50	7.91	16.03	28.65	29.55	65.01	
Net Carbon Benefits (US$, millions)							**Total @ 6% discount rate**
Lower-bound value	9.21	9.46	9.72	9.98	10.23	10.49	98.49
Upper-bound value	18.42	18.93	19.44	19.95	20.46	20.97	196.99

	2016	2017	2018	2019	2020	2021–2030	Total
Net annual CO_2 reductions (Million tCO_2eq)[a]	0.26	0.26	0.26	0.26	0.26	0.26	
Lower bound (US$/$tCO_2eq$)[b]	36.00	37.00	38.00	39.00	40.00	41.00	
Upper bound (US$/$tCO_2$ eq)	72.00	74.00	76.00	78.00	80.00	82.00	
EU ETS price in US$ (US$/$tCO_2eq$)[c]	5.50	7.91	16.03	28.65	29.55	65.01	
EU ETS value	1.41	2.02	4.10	7.33	7.56	16.63	109.48

Note: a. Based on EX-ACT calculations and presented in the project Results Framework.
b. Lower and upper bounds are taken from shadow pricing guidance for carbon contained in the Report of the High-Level Commission on Carbon Prices.
c. The annual average of EU ETS carbon futures daily price data, weighted by daily trading volumes[65] and converted to US dollars (using mid-market rates on June 1 of each year from xe.com[66]).

24. **Overall project benefits and sensitivity analysis.** Given the above benefit streams, the base case ERR of the combined operations (original project + AF) is estimated at 28.8 percent (see table 4.4) compared to the ex ante estimate of 20.3 percent. If carbon benefits are included, the returns rise to 44.1 percent.

Table 4.4. Summary Ex Ante and Ex Post Economic Analysis

Indicator	At Appraisal	Ex Post Estimation (excluding carbon)	Ex Post Estimation (including carbon)
ENPV @ 6% discount rate (US$, millions)	25.8	85.9	195.4
ERR (%)	20.3	28.8	44.1

25. The ENPV of the net benefit stream, discounted at 6 percent, is estimated at US$85.9 million, while ex ante this was US$25.8 million. While the improved return is driving the difference, the quantum of additional funding would also be a factor, all else being equal. When carbon benefits are included the ENPV rises to US$195.4 million. Benefit-cost ratios are greater than 1 except when carbon is excluded, and the discount rate raised to 9 percent or above. Table 4.5 presents a sensitivity analysis showing returns excluding carbon and shows returns including carbon benefits. This validates the analysis conducted at AF stage[67].

Table 4.5. Sensitivity Analysis Excluding Carbon

Discount rate (%)	3.00	6.00	9.00	12.00
Benefit-cost ratio	2.21	1.98	1.79	1.61
ENPV (US$, millions)	117.70	85.90	62.50	45.00

Table 4.6. Sensitivity Analysis Including Carbon

Discount rate (%)	3.00	6.00	9.00	12.00
Benefit-cost ratio	3.67	3.24	2.86	7.90
ENPV (US$, millions)	260.10	195.40	148.10	113.00

[65] https://www.investing.com/commodities/carbon-emissions-historical-data.
[66] For example, https://www.xe.com/currencytables/?from=USD&date=2016-06-01#table-section for 2016.
[67] As per Report No: PAD2612 on AF: If a low estimate of the carbon social price is taken into account, then ERR would be 35.8% with NPV equal to USD 57.3 million for the combined (original +AF) project; if a high estimate of the carbon social price is taken into account, then ERR would be 44.4% with NPV equal to USD 99.0 million. The project is economically viable without accounting for carbon benefits.

26. Additional sensitivity analysis is shown in table 4.7. This reveals that returns are most sensitive to changes in unit price of thinning and seedling revenues. The carbon benefits in the base case were based on actual prices in the EU ETS market. If shadow carbon prices were used from the Report of the High-Level Commission on Carbon Prices, these would also have a significant effect.

Table 4.7. Additional Sensitivity Analysis

Scenario	NPV @ 5% (US$, millions)	IRR With Carbon (%)	IRR Without Carbon (%)
Base case	$ 195.36	44.1%	28.8%
Operating costs increase by 15%	$ 189.99	43.0%	27.5%
Operating costs decrease by 15%	$ 195.60	44.2%	28.9%
Thinning revenues rise by 15%	$ 124.49	42.8%	26.8%
Thinning revenues fall by 15%	$ 121.64	41.8%	25.7%
Seedling survival improves by 10%	$ 181.51	41.4%	25.5%
Seedling survival improves by 20%	$ 223.06	49.8%	35.3%
Seedling price change by 20%	$ 223.06	49.8%	35.3%
Seedling price change by -20%	$ 167.66	38.7%	22.1%
Seedling price change by -30%	$ 153.81	36.0%	18.7%
Seedling price change by -50%	$ 126.12	30.7%	11.2%
Seedling price change by -70%	$ 98.42	25.4%	2.0%
Carbon price Lower WB	$ 184.37	58.6%	N/A
Carbon Price Upper WB	$ 282.87	104.1%	N/A

27. Table 4.8 summarizes the overall calculations for the analysis. Each item on the cost and benefit side has a specific source of information. Costs and revenues were held constant to the ex ante levels where these could not be updated due to a lack of data. The detailed physical and financial parameters are part of the calculation in a separate Excel file in case it is needed.

Table 4.8. Summary Table Ex Post

Project Economic Analysis (Million USD)								
Item	Fiscal Year							
	1	2	3	4	5	6	7...	...15
Project costs (A)	56.85	2.40	3.39	4.25	5.34	3.96	3.96	3.74
Investment costs	54.43	0.03	0.03	0.03	0.03	-	-	-
Thinning	34.43							
Chipping	1.29	-	-	-	-	-	-	
Nurseries	15.82	-	-	-	-	-	-	-
Fire prevention	2.87							
Supporting Project Implementation	0.03	0.03	0.03	0.03	0.03			
Incremental operating cost increases	2.42	2.37	3.36	4.22	5.31	3.96	3.96	3.74
Chipping	0.23	0.22	0.22	0.22	0.22	0.22	0.22	
Nurseries	2.10	2.07	3.06	3.92	5.01	3.65	3.65	3.65
Fire prevention	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Project incremental benefits (B)	9.76	13.47	18.94	28.67	37.39	36.14	36.14	34.48
Incremental operating cost benefits	1.88	2.62	3.05	3.89	4.98	3.63	3.63	2.29
Thinning	0.95	1.34	1.34	1.34	1.34	1.34	1.34	-
Improved seedling survival	0.93	1.28	1.70	2.55	3.64	2.29	2.29	2.29
Incremental financial benefits	6.18	8.54	11.50	17.16	24.56	15.58	15.58	15.26
Chipping	-	0.03	0.14	0.14	0.32	0.32	0.32	-
Nurseries	6.18	8.51	11.36	17.01	24.23	15.26	15.26	15.26
Incremental economic benefits	1.70	2.31	4.39	7.62	7.85	16.92	16.92	16.92
Fire prevention	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29
Net carbon sequestration (C)	1.41	2.02	4.10	7.33	7.56	16.63	16.63	16.63
Project net benefit (B-A)	*(47.09)*	*11.07*	*15.55*	*24.42*	*32.04*	*32.18*	*32.18*	*30.74*
Project net benefit excluding carbon (B-A-C)	*(48.49)*	*9.05*	*11.45*	*17.10*	*24.48*	*15.55*	*15.55*	*14.11*

28. **GEF incremental cost review.** At the time of appraisal, a separate incremental cost assessment was not required. However, the project financial analysis does cover aspects of GEF financing including the benefits of carbon sequestration. GEF investments included investments in equipment enhancing the nursery infrastructure and staff safety under Component 1; specialized equipment for forest fire detection, prevention, and suppression under Component 2; four simulators for training harvester and forwarder operators; a drone; and several important technical assignments to improve forest management capacity under Component 3. GEF funding brought to the project a focus on key environmental dimensions, particularly sustainable forest and biodiversity.

29. Investments in equipment such as the purchase of two VIMEK simulators and two AMKODOR simulators as well as investments in the remotely piloted aerial vehicle could be regarded as incremental as they were purchased for the first time and there was no available state funding for such training needs and innovative monitoring equipment for Belarussian foresters. Training courses arranged using four simulators enabled the capacity building of forest harvester workers. The newly purchased drone allowed to test monitoring of the conditions of the forest fund, organization of forest protective measures, and forest fires situation. It also provided the supply of the real-time data.

30. Furthermore, under Components 1 and 2, GEF financing helped with several key analytical activities:

- **Component 1.** An ex situ collection of forest woody plants resistant to climate stress and rare and economically viable wood species was created on a territory of 3.05 ha. It included 1,214 seedlings and samplings of more than 35 coniferous and deciduous wood species. This collection will increase the productivity and biological stability of Belarussian forests and

preserve biological and genetic diversity. GEF funding also helped update the in situ database of selected populations, climate types, species, forms, and genotypes. To promote the results of this activity, a video was developed and posted on the Ministry of Forestry's website.

- **Component 2.** GEF funding financed a targeted inventory of depleted peatlands dried for agriculture purposes and were transferred to the forest enterprises. A total of 36 sites of peatlands with an area of more than 10 hectares were transferred to 24 forest enterprises and now are included and accounted for in the databases of 'Belarus Peatlands' and mapped. Proposals to minimize forest fires risks were developed.
- **Component 3.** With the help of GEF funding, forest management plans of four SFEs were amended upon results of field research and rare and key biotopes were identified. A total of 256 passports and protective obligations for rare and typical biotopes, habitats of wild animals, and location of wild plants included in the Red Book were prepared. Proposals on limitation of different types of fellings or prohibition of fellings on the territories of allocated biotopes and habitats were developed. Dynamics of ecosystems due to climate change were assessed. A software to collect and analyze monitoring data in forest ecosystems was developed and is in use now. GEF funding also enabled the development of software and a mobile app for processing, storage, and provision of forest management information (LesInfo and RadForInfo). This allowed to automatize the inputting and processing of forest data and integrate individual software products and reports by different management levels.

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ANNEX 5. BORROWER, CO-FINANCIER AND OTHER PARTNER/STAKEHOLDER COMMENTS

The ICR draft was officially shared for review with the following counterparts in Belarus: Ministry of Forestry; RUE Bellesexport; Ministry of Natural Resources and Environmental Protection , Ministry of Economy, Ministry of Finance. All received letters of responses are provided below in Russian and English translation.

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_____ № _____
№ 16/02-2022 dated as of February 8, 2022

February 21, 2022
Minsk

Your Excellency,

On behalf of the Ministry of Forestry of the Republic of Belarus I would like to thank you for the support and fruitful collaboration World Bank has provided for the implementation of the Belarus Forestry Development Project as part of increase the efficiency of the Forestry.

The Belarus Forestry Development Project made an invaluable contribution to the achievement of important objectives to strengthen forestry both at the central and local levels. Enhancing silvicultural management and reforestation and afforestation, increasing the use of felling residues and improving the public good contribution from the forest areas of the Ministry of Forestry of the Republic of Belarus became the main stages of the Project worth mentioning.

The Ministry of Forestry of the Republic of Belarus agrees with the findings, assessment presented in the Implementation Completion and Results Report for the Forestry Development Project (the World Bank letter № 16/02-2022 dated as of February 8, 2022).

Taking this opportunity, Mr. Sargsyan, please, accept my assurances of highest respect for you.

Sincerely,

Mr. Vitaly A. Drozhzha
Minister
Ministry of Forestry
Republic of Belarus

H.E. Gevorg Sargsyan
Country Manager for Belarus
The World Bank

Minsk

МІНІСТЭРСТВА ЛЯСНОЙ ГАСПАДАРКІ
РЭСПУБЛІКІ БЕЛАРУСЬ

ЭКСПАРТНА-ВЫТВОРЧАЕ РЭСПУБЛІКАНСКАЕ
УНІТАРНАЕ ПРАДПРЫЕМСТВА
БЕЛЛЕСЭКСПАРТ
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р/с BY58BPSB30121077510189330000
у ААТ «Сбер Банк» бульвар імя Мулявіна,6, г. Мінск,
BIC BPSBBY2X УНП 100994804

МИНИСТЕРСТВО ЛЕСНОГО ХОЗЯЙСТВА
РЕСПУБЛИКИ БЕЛАРУСЬ

ЭКСПОРТНО-ПРОИЗВОДСТВЕННОЕ
РЕСПУБЛИКАНСКОЕ
УНИТАРНОЕ ПРЕДПРИЯТИЕ
БЕЛЛЕСЭКСПОРТ
ул. Скрыганова 6, 403 220073, г. Минск, Республика Беларусь
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р/с BY58BPSB30121077510189330000
в ОАО «Сбер Банк» бульвар им. Мулявина,6,г.Минск,
BIC BPSBBY2X УНП 100994804

18.02.2022 № 08/799
на № _____ ад _____

Минск, 18 февраля 2022 г.

Уважаемый господин Саркисян,

От имени УП «БЕЛЛЕСЭКСПОРТ» я хотел бы поблагодарить Вас за поддержку и плодотворное сотрудничество, оказанные Всемирным банком, в целях повышения эффективности развития лесного сектора Республики Беларусь.

Проект «Развитие лесного сектора Республики Беларусь» внес неоценимый вклад в достижение важных целей по укреплению лесного хозяйства как на центральном, так и на местных уровнях. Повышение эффективности лесоразведения, лесовозобновления и лесовосстановления, увеличение использования порубочных остатков, а также обеспечение общественных благ за счет лесных ресурсов на территории реализации проекта стали основными этапами проекта, заслуживающими упоминания.

УП «БЕЛЛЕСЭКСПОРТ» согласно с выводами и оценкой, представленными в проекте Отчете о завершении реализации и результатах Проекта «Развитие лесного сектора Республики Беларусь» (письмо Представительства Всемирного банка в Республике Беларусь от 8 февраля 2022 года № 16/02-2022).

Пользуясь случаем, примите, уважаемый господин Саркисян, мои уверения в высоком к Вам уважении.

С уважением,

А.В.Минчук
Заместитель директора-
руководитель филиала
УП «БЕЛЛЕСЭЕСПОРТ»

ГОСПОДИНУ
ГЕВОРГУ САРКИСЯНУ
ГЛАВЕ ПРЕДСТАВИТЕЛЬСТВА
ВСЕМИРНОГО БАНКА В
РЕСПУБЛИКИ БЕЛАРУСЬ
г.Минск

MINISTRY OF FORESTRY OF THE REPUBLIC OF BELARUS
EXPORT AND PRODUCTION REPUBLICAN UNITARY ENTERPRISE
BELLESEXPORT

Letter No. 08/749 dated February 18, 2022

Mr. Gevorg Sargsyan
World Bank Country Manager for Belarus
City of Minsk

Dear Mr. Sargsyan,

On behalf of the UE "Bellesexport", I would like to thank you for the support provided by the World Bank and the productive cooperation to improve the development effectiveness of the forestry sector in the Republic of Belarus.

The Belarus Forestry Development Project contributed invaluably to achieving the important goals of strengthening the forestry sector both centrally and at the local level. Enhancement of silvicultural management and reforestation and afforestation, increased use of felling residues and improvement the public good contribution from forests in targeted forest areas were the key stages of the Project worthy of note.

UE "Bellesexport" concurs with the conclusions and assessments presented in the draft Implementation Completion and Results Report for the Belarus Forestry Development Project (Letter from the World Bank Country Office in Belarus No. 16/02-2022 dated February 8, 2022).

Please accept, dear Mr. Sargsyan, the assurances of my highest consideration.

Sincerely,

A. V. Minchuk
Deputy Director
Head of Branch Office
UE "Bellesexport"

МІНІСТЭРСТВА
ПРЫРОДНЫХ РЭСУРСАЎ І АХОВЫ
НАВАКОЛЬНАГА АСЯРОДДЗЯ
РЭСПУБЛІКІ БЕЛАРУСЬ
МІНПРЫРОДЫ

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E-mail: mail@minpriroda.gov.by
р/р BY29 AKBB 3604 9000 0011 1000 0000
ААТ «ААБ Беларусбанк»
г. Мінск, код AKBBBY2X, УНП 100519825,
АКПА 00012782

18.02.2022 № 10-2-35/36-исх

На № _____ ад _____

МИНИСТЕРСТВО
ПРИРОДНЫХ РЕСУРСОВ И ОХРАНЫ
ОКРУЖАЮЩЕЙ СРЕДЫ
РЕСПУБЛИКИ БЕЛАРУСЬ
МИНПРИРОДЫ

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ОАО «АСБ Беларусбанк»
г. Минск, код AKBBBY2X, УНП 100519825,
ОКПО 00012782

Представительство Всемирного
банка в Республике Беларусь

О согласовании

Министерство природных ресурсов и охраны окружающей среды Республики Беларусь рассмотрело в пределах компетенции проект Отчета о завершении реализации и результатах Проекта «Развитие лесного сектора» и согласовывает его без замечаний и предложений.

Министр А.П.Худык

10 Гринчик 200 52 63
3 Карсека 200 63 29

MINISTRY OF NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION OF THE REPUBLIC OF BELARUS

Letter No. 10-2-35/36 dated February 18, 2022

World Bank Country Office in Belarus

Re: Approval of the Draft Report

The Ministry of Natural Resources and Environmental Protection of the Republic of Belarus has reviewed the draft Implementation Completion and Results Report for the Belarus Forestry Development Project within its competence and approves it without any conceptual comments and proposals.

Sincerely,

A. P. Khudyk
Minister

МІНІСТЭРСТВА ЭКАНОМІКІ РЭСПУБЛІКІ БЕЛАРУСЬ

Мінэканомікі

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тэл. 222 60 48, факс 200 37 77
e-mail: minec@economy.gov.by

МИНИСТЕРСТВО ЭКОНОМИКИ РЕСПУБЛИКИ БЕЛАРУСЬ

Минэкономики

ул.Берсона, 14, 220030 г.Минск
тел. 222 60 48, факс 200 37 77
e-mail: minec@economy.gov.by

15.02.2022 № 15-02-10/1599
На № _____ ад _____

Минск, 15 февраля 2022 г.

Уважаемый господин Саркисян,

От имени Министерства экономики Республики Беларусь свидетельствую Вам свое глубокое почтение и благодарю Вас за проводимую Всемирным банком работу в Республике Беларусь.

Министерство экономики Республики Беларусь рассмотрело направленный письмом Всемирного банка от 8 февраля 2022 г. № 16/02-2022 окончательный проект Отчета о завершении реализации и результатах Проекта «Развитие лесного сектора» и полагает возможным его согласовать.

Надеемся на дальнейшее плодотворное сотрудничество.

Пользуясь случаем, примите, уважаемый господин Саркисян, мои уверения в высоком к Вам уважении.

С уважением,

Д.В.Ярошевич
Заместитель Министра экономики Республики Беларусь

ГОСПОДИНУ
ГЕВОРГУ САРКИСЯНУ
ГЛАВЕ ПРЕДСТАВИТЕЛЬСТВА
ВСЕМИРНОГО БАНКА В
РЕСПУБЛИКЕ БЕЛАРУСЬ

г. Минск

MINISTRY OF ECONOMY OF THE REPUBLIC OF BELARUS

Letter No. 15-02-10/1599 dated February 15, 2022

City of Minsk, February 15, 2022

Mr. Gevorg Sargsyan
World Bank Country Manager for Belarus
City of Minsk

Dear Mr. Sargsyan,

On behalf of the Ministry of Economy of the Republic of Belarus, I am pleased to present my compliments to you and thank you for the work carried out by the World Bank in the Republic of Belarus.

The Ministry of Economy of the Republic of Belarus has reviewed the final draft of the Implementation Completion and Results Report for the Belarus Forestry Development Project sent with the World Bank's Letter No. 16/02-2022 dated February 8, 2022 and considers it possible to endorse it.

We look forward to our further productive cooperation.

Please accept, dear Mr. Sargsyan, the assurances of my highest consideration.

Sincerely,

Dmitri V. Yaroshevich
Deputy Minister
Ministry of Economy
Republic of Belarus

МІНІСТЭРСТВА ФІНАНСАЎ РЭСПУБЛІКІ БЕЛАРУСЬ
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ОАО «АСБ Беларусбанк», БИК AKBB BY 2X

18.02.2022 № 9-1-4/4540
На № _____ от _____

Представительство Всемирного банка
в Республике Беларусь
Электронный адрес:
tbender@worldbank.org

копия: Министерство лесного
хозяйства Республики Беларусь

Электронный адрес:
mlh@mlh.gov.by

О рассмотрении проекта

Министерство финансов рассмотрело проект Отчета о завершении реализации и результатах Проекта «Развитие лесного сектора Республики Беларусь», представленный письмом от 8 февраля 2022 года № 16/02-2022, и в пределах своей компетенции концептуальных замечаний и предложений по данному проекту не имеет.

Одновременно обращаем внимание на необходимость отредактировать данные пункта 3 Примечания Приложения 3 «Затраты по проекту в разбивке по компонентам» (стр. 62 отчета) путем замены цифры «71» на цифру «63,14». По данным системы Client Connection Международного банка реконструкции и развития неизрасходованный остаток займа составляет 63,14 долл. США.

Заместитель Министра В.В.Татаринович

9 Екименко 309 42 09
12 Плещенко 309 43 80

MINISTRY OF FINANCE OF THE REPUBLIC OF BELARUS

Letter No. 9-1-4/4540 dated February 18, 2022

World Bank Country Office in Belarus
E-mail: *tbender@worldbank.org*

Copied to:
Ministry of Forestry of the Republic of Belarus
E-mail: mlh@mlh.gov.by

Re: Review of the Draft Report

The Ministry of Finance has reviewed the draft Implementation Completion and Results Report for the Belarus Forestry Development Project sent with Letter No. 16/02-2022 dated February 8, 2022, and has no conceptual comments and proposals to make on this draft report within its competence.

At the same time, we call attention to the need to edit the data in p. 3 of the Notes in Annex 3 “Project cost by component” (p. 62 of the ICR) by replacing the number “71” with the number “63.14”. According to the International Bank for Reconstruction and Development's Client Connection system, the undisbursed loan balance is USD 63.14.

Sincerely,

V. V. Tatarinovich
Deputy Minister

ANNEX 6. SUPPORTING DOCUMENTS

Key Challenges in Forestry Sector According to the Forest Policy Note (2013)

1. The following challenges were identified and helped shape the problem statement and rationale for the project:

- **Limited forest productivity from thinning (silvicultural management practice) of young and middle-aged forest.** Forest management, particularly 'silvicultural practices' studied during the appraisal,[68] was resulting in high stocking densities, deadwood, and little light reaching the forest floor due to thinning on long cycles and high initial stocking densities in young and middle-aged forests stands, which comprised 66.6 percent of the total forested area. There was a need to even out the age-class distribution to ensure a more consistent supply, by undertaking regeneration fellings both earlier and later than the optimum age; optimization of species structure of forests, to include more mixed species stands and ensure that species are correctly chosen to match the site conditions; optimization of ages and intervals of the cuts; optimization of forest distribution by groups and categories; and optimization of forest areas removed from utilization.
- **Climate change and damages from fire, windblow, snow events, and loss of biodiversity further limited the regenerative capacity and sustainability of the forest sector**. Windblow, fires, and drying of spruce stands and ash trees (about 6,000 ha annually) lead to significant damage. A focus on efforts toward fire prevention, detection, and forest monitoring through technology and awareness campaigns would help strengthen outdated forest fire monitoring and management systems. Introduction of diversity and climate resilience to species of forest culture would further strengthen sustainability of the forest sector by replenishing forest sites and supplementing natural reforestation. Afforestation/reforestation practices would benefit from good-quality planting material through sustained production from modern climate-resilient technologies with closed root system from the selected trees of known origin.
- **Insufficient government capacity (technical, technological, and human capital) and need to collaborate to address the threats to the forestry sector economy, including SFEs and the people dependent on the sector for jobs.** The ministry needed to be equipped with technical know-how, best practices, and technological advances for interventions in green economy, climate change, and biodiversity to develop the Forest Strategic Action Plan 2030. Supplementary legal and regulatory frameworks also needed to be developed to accelerate growth of the forestry sector economy. The centralized management of forestry enterprises and planning of forestry activities resulted in their limited economic independence. Collaborate and engagement with all stakeholders was needed to boost maximize gains in the forestry sector.

2. A more detailed discussion on the changes and their implication is presented in table 6.1.

[68] Outlined and supported by evidence collected during analytical exercise 'Forest Policy Note'.

Table 6.1. Summary and Timeline of Changes during Project Implementation

Year(s)	External Factors and Rationale	C1	C2	C3	Key Changes
2015–2017	Shortage of government funds, increase of costs, and implementation arrangements for establishing nurseries	✓	✓		• Initially, according to the 2015 Procurement Plan, the funds of the main loan should be used for the construction of state-of-the-art nursery complexes comprising greenhouses; lines for cassette planting; refrigerators; and irrigation systems to produce container-grown seedlings in 6 regions, one per each region, in Brest, Vitebsk, Gomel, Grodno, and Mogilev regions and for the Republican Forest Selection and Seed Centre in Minsk region, for the total amount of US$6.6 million. The costs of construction and installation works were included in the Procurement Plan (totaling US$16.67 million) for the planned new nurseries in Brest and Vitebsk regions and for the Republican Forest Selection and Seed Centre in Minsk region. • **2016 redistribution of funds.** Procurement of chipper machines reduced from 11 to 2 units; savings used to finance the construction works of 6 nurseries.
2016	Emergency declared in response to windstorm in Minsk Oblast	✓			• Procurement of 12 additional units of harvesters and forwarders was arranged by direct contracting. These machines were required to clear dieback of forests on forest floor, improve health and recovery of forests, and avoid forest fire hazard from waste/forest damage rotting on forest floor.
2018	AF IBRD loan (EUR 12 million, US$14.4 million)	✓			• **2018.** AF IBRD loan mobilized to scale up planned investments under Component 1 including a plan to procure two multipurpose forest loading and transportation machines intended for extraction (forwarders); construct the remaining three nurseries in Mogilev, Grodno, and Gomel; and procure extra reusable cartridges for finishing of container-grown seedlings in satellite nurseries. The main loan funds were used to invest in three new nurseries in Brest, Vitebsk, and Republican Forest Selection and Seed Centre in Minsk region. • **2018.** Closing date of the GEF grant postponed by one year to August 31, 2021, as in the parent loan and AF.
2019	Bark beetle infestation	✓	✓		• **Redistribution of funds under AF loan.** Instead of the planned 3 nurseries, only 1 in Mogilev was constructed and fully equipped. The savings were used to purchase 31 additional multipurpose harvesting machines and procure additional nursery equipment and machinery . Hence, as of 2019, the main loan funds invested in three new nurseries in Brest, Vitebsk, and the Republican Forest Selection and Seed Centre in Minsk region and the AF loan were used to invest in a new nursery in Mogilev oblast. • Official restructuring request made linked with the Results Framework but not pursued by the World Bank and restructuring recalled in the portal.
2019–2021	Cost savings and COVID-19 pandemic			✓	• **Redistribution of GEF activities.** Cancellation of 3 GEF grant activities: evaluation of forest fund objects and their carbon

Year(s)	External Factors and Rationale	C1	C2	C3	Key Changes
					absorption potential and 2 training activities and some activities costing less than initially estimated, resulted in the redistribution of funds for a new set of activities under Component 3. As a result, kits (masks, personal protective equipment, and so on), 82 sprinklers for nurseries, a vehicle for transportation of equipment to allow in-field testing of hydraulic and water hoses for fire equipment, and remotely piloted aerial vehicle for real-time monitoring of forests were procured and informational and promotional videos to increase awareness were made. All these activities were implemented on time. • Cost savings from the switch to virtual mode for in-person study tours in the EU were used to procure a vehicle and additional equipment for forest pathologists for analysis of forest stands.

Table 6.2. Achievement of Outcomes at a Glance

PDO		Original PAD Target (baseline)	Revised Targets (AF)	Outcome
The PDO is to enhance silvicultural management and re/afforestation, increase the use of felling residues and improve the public good contribution from forests in targeted forest areas.				
Efficacy (PDO)		**Substantial**		
PDO1: Enhance silvicultural management and re/afforestation 1. Area of young and middle-aged production forest thinned according to approved management plans (ha) 2. Economic performance of participating SFEs enhanced (Amount in US$) 3. Capacity to produce high quality seedlings increased (number of container-grown seedlings per year in project nurseries) (Number) **Intermediate Indicator A:** Nursery lines for container-grown seedlings of native tree species established **Intermediate Indicator B:** Improved thinning regime developed (yes/no) **Intermediate Indicator C:** Number of people trained, women/men	Indicators	**1. 165,000 (132,500)** **2. 15,826,000 (0)** **3. 4,000,000 (0)** **4 - Nurseries (0)** **Yes (no)** **2,380 (2,243)** **145 (110)**	**23,700,000** **6 - Nurseries** **3,000** **150**	**1. 167,000** **2. 46 600 000** **3. 25,100,000** **4 nurseries** **Yes** **3,448** **157**
	Efficacy	**Substantial**		
PDO2: Increase in the use of felling and residues 4. Average utilizable volume of commercial timber harvested during intermediate felling in targeted SFEs increased (cubic meter per hectare [m^3/ha])	Indicators	**4. 35 (28.50)**		**35**
	Efficacy	**High**		
PDO3: Improve the public good contribution	Indicators	**5. 5,065,508**		

PDO		Original PAD Target (baseline)	Revised Targets (AF)	Outcome
from forests in targeted forest areas. **5. Amount of carbon sequestered (Metric ton)** **Intermediate Indicator D:** Reforms in forest policy, legislation or other regulations supported **Intermediate Indicator E:** Government institutions provided w/capacity building to improve management of forest resources **Intermediate Indicator F:** New areas outside protected areas managed as biodiversity friendly (ha) **Intermediate Indicator G:** Support for dissemination, communications, publishing (yes/no)		**(4,643,384)** **No** **0** 4,500,000 (1,226,700)	**5,245,627**	**6,178,052** **Yes** **12** **4,642,805**
	Efficacy	**Substantial**		
Beneficiaries who benefited from this project **Total** **Women**		25,000 10%	35,000 17.5%	38,487 17.7%

ANNEX 7. GEOGRAPHICAL DISTRIBUTION OF PROJECT INTERVENTIONS

ANNEX 8. ENGAGEMENT IN FORESTRY SECTOR DIALOGUE SECTOR IN BELARUS

1994-2002

- **First Forestry Project** (P008302, US$33.4 million). Investment of US$4.7 million in the state-of-the-art seed center (RFSSC), which included, among other activities, the construction of the main office building (photo 1), the greenhouse complex and new technology for cone and seed processing, and treatment and storage of conifer seeds. In addition, a modern biotech laboratory was created to test seed germination and viability.

2008-2016

- Policy dialogue with the Belarus forestry authorities mainatained through the regional program on **Forest Law Enforcement and Governance** (FLEG I from 2008 to 2012 and FLEG II from 2013 to 2016), funded by the EU and implemented in seen countries. www.enpi-fleg.org

2015-2021

- **Belarus Forestry Development Project** (P147760, US$40.71 million, EUR 12 million, GEF Grant US$2.74 million) to support Belarus strengthen its forestry sector by modernizing some forestry operations, improving the public goods function of forests, and increasing its contribution toward a more prosperous and dynamic rural sector by creating desirable skilled or semi-skilled employment opportunities.

ANNEX 9. Organization Chart of the Ministry of Forestry and Subsidiary Institutions in Belarus