

Client:

Aluminij Industries Ltd.
Bačevići bb, 88000 Mostar,
Bosnia and Herzegovina

Strategy and action plan for reducing the carbon footprint of Aluminij Industries Ltd.

Author:

Željko Jurić, M.Sc.



NET ZERO Ltd.
Mirka Račkog 6
10290 Zaprešić
Croatia
OIB: 11333845032

December 2023.

Content

- 1. INTRODUCTION _____ 3
- 2. CARBON FOOTPRINT MANAGEMENT STRATEGY _____ 4
 - 2.1. SELECTION OF THE BASE YEAR4
 - 2.2. ANALYSIS OF SIGNIFICANT EMISSION SOURCES4
 - 2.3. DEFINING CARBON FOOTPRINT REDUCTION TARGETS.....6
- 3. ACTION PLAN FOR EMISSION REDUCTION _____ 8
 - 3.1. MEASURES TO REDUCE EMISSIONS FROM SCOPE 1 ACTIVITIES.....8
 - 3.2. MEASURES TO REDUCE EMISSIONS FROM SCOPE 2 ACTIVITIES.....9
 - 3.3. MEASURES TO REDUCE EMISSIONS FROM SCOPE 3 ACTIVITIES.....10
 - 3.4. ANALYSIS OF MEASURES TO REDUCE THE CARBON FOOTPRINT13
- 4. CONCLUSION _____ 15

1. INTRODUCTION

According to the World Meteorological Organization, the average global temperature in 2022 was 1.15 °C above the average temperatures in the period 1850-1900. The warmest year on record was 2016, while 2022 ranked as the fifth or sixth warmest year. The analyses also indicate a significant impact of anthropogenic greenhouse gas (GHG) emissions on global warming and climate change.

Under the Paris Agreement, the European Union (EU) has committed to reducing GHG emissions by at least 55 % by 2030 compared to the 1990 emissions. At the EU level, member countries collectively implement this commitment through an extensive legislative framework.

The European Commission has already announced its dedication to implementing a new European Green Deal with an even more ambitious goal of achieving climate neutrality by 2050. To achieve this, it will be necessary to intensify efforts to reduce emissions.

Organizations, or companies, play a crucial role in addressing climate change by first regularly and accurately calculating their carbon footprint and later implementing measures to reduce it. The long-term goal should be carbon neutrality.

This document presents the Strategy and Action plan for reducing GHG emissions, supporting the development of strategic programs and action plans to reduce the carbon footprint. The Carbon footprint management strategy (Chapter 2) selects a base year, defines significant emission sources, and sets goals for reducing GHG emissions. Within the Action plan (Chapter 3), selected measures are described that could contribute to reducing the carbon footprint.

2. CARBON FOOTPRINT MANAGEMENT STRATEGY

2.1. Selection of the base year

A consistent comparison of emissions over time requires companies to establish a base year against which they can compare current emissions. The base year is selected for which verified data on direct and indirect GHG emissions are available. Aluminij Industries Ltd. has **chosen the year 2022 as the base year**, as it is the first year for which the complete carbon footprint from all Scope 1 and Scope 2 activities, as well as all significant Scope 3 activities, has been calculated.

The company's emission reduction is calculated by comparing changes over time relative to the base year. Focusing on the overall organizational direct and indirect emissions has advantages as it helps companies effectively manage their risks and opportunities for reducing GHG emissions. It also helps in directing resources towards activities that result in the most cost-effective reduction of GHG emissions.

2.2. Analysis of significant emission sources

Key emission sources are those that, when aggregated in descending order, constitute over 95 % of total GHG emissions. In the case of Aluminij Industries Ltd., there is a dominant single source – primary aluminium, accounting for approximately 95 %. Therefore, the contribution of other emission sources in the overall carbon footprint (location-based method), excluding emissions related to primary aluminium (Figure 2-1.), has been considered, leading to the addition of six activities to the significant emission sources.

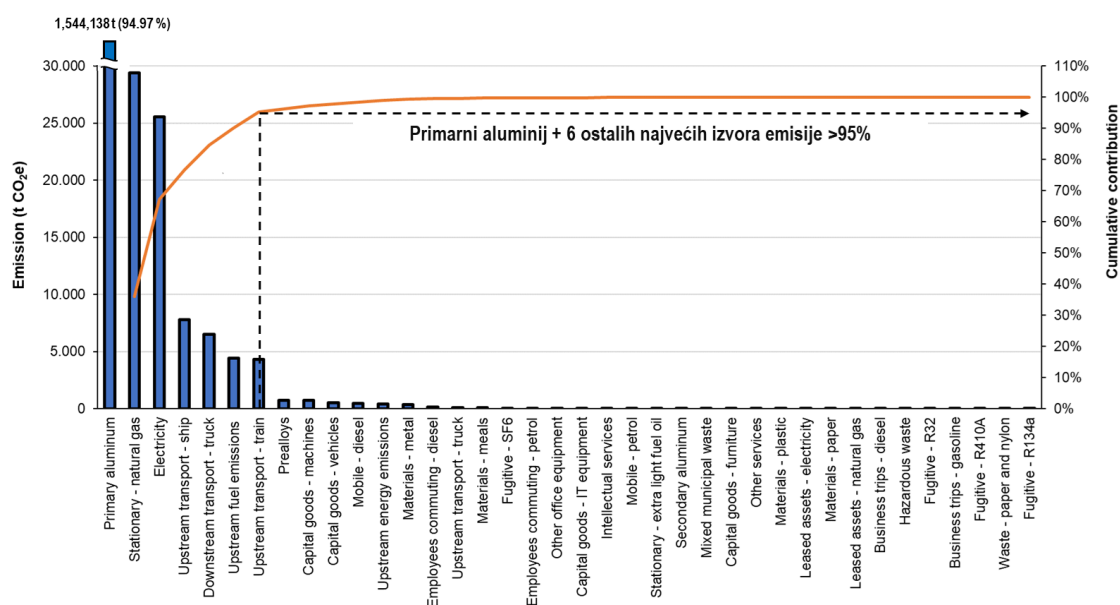


Figure 2-1. Key emission sources for 2022

Table 2-1. below shows the identified significant emission sources of Aluminij Industries Ltd. for the year 2022.

Table 2-1. Key GHG emission sources, 2022

Emission sources, 2022	CO ₂ e emission (t)	Share (%)	Cumulative (%)
Primary aluminium	1,544,138.1	94.968407	94.968407
Stationary - natural gas	29,412.0	1.808912	96.777318
Electricity	25,548.1	1.571275	98.348594
Upstream transport - ship	7.783.2	0.478684	98.827277
Downstream transport - truck	6.528.6	0.401523	99.228800
Upstream fuel emissions	4.422.3	0.271984	99.500784
Upstream transport - train	4.310.3	0.265095	99.765879
Prealloys	735.6	0.045240	99.811119
Capital goods - machines	720.7	0.044326	99.855445
Capital goods - vehicles	523.9	0.032221	99.887666
Mobile - diesel	485.6	0.029865	99.917532
Upstream energy emissions	430.6	0.026485	99.944017
Materials - metal	366.6	0.022546	99.966563
Employees commuting - diesel	136.3	0.008383	99.974946
Upstream transport - truck	89.3	0.005494	99.980440
Materials - meals	68.4	0.004204	99.984644
Fugitive - SF ₆	54.8	0.003371	99.988015
Employees commuting - petrol	29.1	0.001789	99.989804
Other office equipment	24.9	0.001529	99.991333
Capital goods - IT equipment	24.6	0.001514	99.992848
Intellectual services	22.7	0.001397	99.994245
Mobile - petrol	22.1	0.001357	99.995602
Stationary - extra light fuel oil	16.1	0.000991	99.996593
Secondary aluminium	15.9	0.000979	99.997572
Mixed municipal waste	11.4	0.000702	99.998274
Capital goods - furniture	9.06	0.000557	99.998831
Other services	5.41	0.000333	99.999163
Materials - plastic	4.37	0.000269	99.999432
Leased assets - electricity	2.48	0.000153	99.999585
Materials - paper	1.56	0.000096	99.999681
Leased assets - natural gas	1.53	0.000094	99.999774
Business trips - diesel	1.29	0.000080	99.999854
Hazardous waste	0.92	0.000056	99.999910
Fugitive - R32	0.83	0.000051	99.999961
Business trips - gasoline	0.28	0.000017	99.999978
Fugitive - R410A	0.19	0.000012	99.999990
Waste - paper and nylon	0.10	0.000006	99.999996
Fugitive - R134a	0.07	0.000004	100.000000
TOTAL	1,625,949.2		

Seven significant GHG emission sources were identified for the year 2022. The most substantial contribution to GHG emissions came from purchased primary aluminium (94.97 %), followed by natural gas combustion (1.81 %), electricity consumption (1.57 %), upstream transportation by ships (0.48 %), downstream transportation by trucks (0.41 %), upstream fuel

emissions (0.271 %), and upstream transportation by trains (0.265 %). The remaining 31 identified emission sources contributed less than 1 % to the total emissions.

2.3. Defining carbon footprint reduction targets

After selecting the base year, it is necessary to establish short-term and long-term emission reduction targets. Generally, there are two types of goals: absolute and relative. Absolute goals pertain to reducing total emissions in a given year compared to the emissions from the base year. Another option is setting a relative goal, such as reducing emissions per employee or per unit of product.

Achieving absolute goals results in a reduction in the emissions of the organisation, while relative goals can be achieved even with an increase in absolute emissions compared to the level in the base year. Accordingly, if relative goals are used, emissions need to be clearly expressed in absolute terms.

An absolute emission reduction targets have been set at 5-15 % by 2030 and 60-95 % by 2050, compared to the emission level from the base year 2022. Figure 2-2. illustrates the emission reduction targets for Aluminij Industries in relation to the base year 2022.

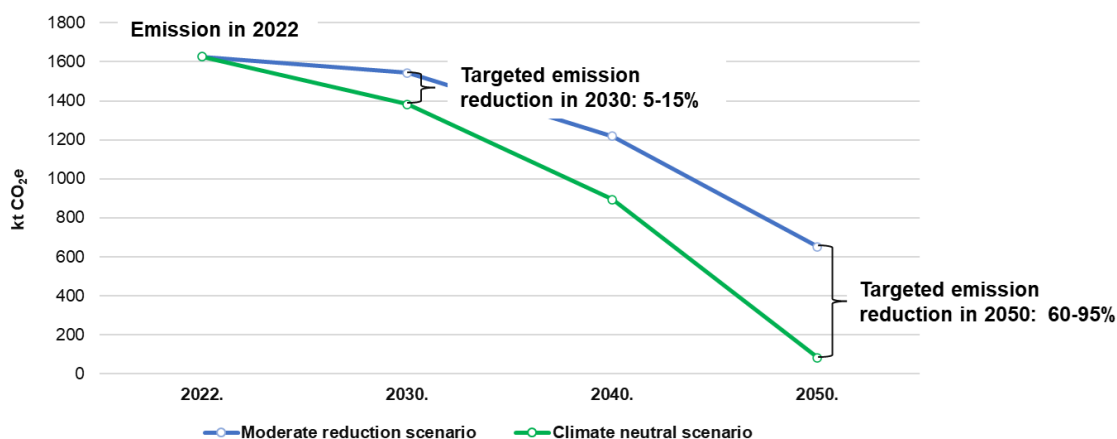


Figure 2-2. GHG emission reduction targets

The long-term target is to achieve carbon neutrality, primarily through the implementation of measures within the boundaries of the GHG emissions inventory, resulting in a significant reduction in GHG emissions (95 %). The science-based target by 2050 for the aluminium industry is to reduce the carbon intensity of direct emissions by at least 93 %, compared to the year 2018. Additionally, thermal energy emissions from alumina, aluminium casting and mining should be reduced by at least 94 %, and the carbon intensity of consumed electricity by 98 %, also relative to the year 2018. These targets are set to limit the increase in average global temperatures to a maximum of 1.5 °C.

Achieving a Climate neutral scenario would result in a 95 % reduction in emissions by 2050, compared to the base year 2022, in line with the aforementioned science-based target. Any remaining GHG emissions that cannot be avoided could be offset by purchasing emissions reduction units, known as carbon offset credits.

By purchasing carbon offset credits, it is possible to invest in projects that reduce GHG emissions outside the boundaries of Aluminij Industries Ltd. GHG inventory (carbon offset

projects). These projects typically involve emission reduction or increased removal of GHG in developing countries, often related to the use of renewable energy sources such as wind and solar energy or afforestation. These projects can be used to offset Aluminij Industries GHG emissions and achieve emission reduction targets, especially when the costs of internal measures are high, emission reduction opportunities are limited, or if targets cannot be met due to unexpected circumstances. In any case, it is essential to first use the potential of internal emission reduction measures before considering carbon offset credits.

3. ACTION PLAN FOR EMISSION REDUCTION

3.1. Measures to reduce emissions from Scope 1 activities

3.1.1. Measures to reduce emissions from stationary combustion sources

Reduction of natural gas consumption

The reduction in natural gas consumption can be achieved by minimizing the generation of scrap products and decreasing the amount of typical waste from the casting process, which is fully reintegrated into production. Increasing control and implementing additional procedures during production could help reduce the occurrence of batches with inappropriate chemical compositions that are poured and subsequently remelted. It is also necessary to consider potential investments to enhance furnace efficiency, improve furnace operations, and optimize work organization and planning to reduce idle time (inefficient energy consumption).

Assuming a 2 % reduction in natural gas consumption, it is assumed that GHG emissions will decrease by the same percentage (Table 3-1.).

Table 3-1. Emission reduction from stationary combustion sources, 2030

	Amount
Reduction of natural gas consumption (GJ)	10,475.0
GHG emission reduction (t CO₂e)	588.2

3.1.2. Measures to reduce emissions from mobile combustion sources

ECO driving training

The ECO driving training measure involves educating of drivers on efficient driving style. This measure is proposed for all drivers of company vehicles. The training, conducted in collaboration with a licensed company specializing in ECO driving education, needs to be tailored to the specific needs of Aluminij Industries. The training program takes into account the fleet structure, driver profiles, typical routes, and any special requirements of the company. The training includes both theoretical classroom sessions and practical on-road sessions with vehicles equipped to measure relevant parameters during driving. An instructor-moderator is present in the vehicle to record the driver's driving style and give advice. Practicing ECO driving can achieve approximately a 7.5 % reduction in diesel and petrol consumption in Aluminij Industries' company vehicles compared to the year 2022.

Regulation of tire pressure in company vehicles

This measure involves energy savings achieved through continuous tire pressure monitoring and adjustment to the optimal value for company vehicles. It is applicable to vehicles without an integrated tire pressure monitoring system. The potential fuel savings, resulting from tire pressure regulation, are calculated for the company vehicle fleet. The estimated reduction in fuel consumption is around 2 % compared to the year 2022.

Use of higher energy class tires for company vehicles

The calculation of savings is based on the reduction in fuel consumption due to the application of new, more energy-efficient tires on company vehicles. Tires with a higher energy class have a lower rolling resistance coefficient, requiring less energy for driving. The savings are calculated for the application of new tires with an energy class of A or B, replacing old tires with lower energy classes. The potential fuel savings, utilizing higher energy class tires, are based on Aluminij Industries' vehicle fleet. The estimated reduction in fuel consumption is around 4 % compared to the year 2022.

Total fuel consumption reduction in Aluminij Industries' company vehicles (13.5 %) and the reduction in GHG emissions are presented in Table 3-2. The calculation assumes that 100 % of petrol and 10 % of diesel fuel are used in company vehicles. The majority of diesel fuel (approximately 90 %) is used in off-road vehicles (e.g. forklifts).

Table 3-2. Emission reduction from mobile combustion sources, 2030

	Amount
Reduction of diesel consumption (Liter)	2,411.8
Reduction of petrol consumption (Liter)	1,281.2
GHG emission reduction (t CO₂e)	9.5

3.1.3. Measures to reduce fugitive emissions

It is essential to capitalize on every opportunity to reduce emissions of refrigerants in cooling systems and air conditioners (including vehicles) through frequent servicing and equipment checks, especially sealing systems, as well as to monitor and find the possibility of using refrigerants with lower Global Warming Potential (GWP). An analysis of the possibility of switching to more favourable refrigerants (with lower GWP) is proposed and, where possible, the replacement of the refrigerant is advised.

Consideration should be given to replacing existing cooling systems with more efficient ones that use refrigerants with low GWP. This approach not only aims to reduce emissions of hydrofluorocarbons (HFCs) by using refrigerants with lower GWP, but also contributes to the reduction of emissions from CO₂, CH₄, and N₂O due to decreased electricity consumption.

Table 3-3. shows the reduction of emissions by improving cooling systems and air conditioning.

Table 3-3. Emission reduction by improving cooling systems and air conditioning, 2030

	Amount
Replacement of the refrigerant and increase in efficiency (%)	30
GHG emission reduction (t CO₂e)	0.3

3.2. Measures to reduce emissions from Scope 2 activities

3.2.1. Emission reduction measures due to reduction in electricity consumption

Lighting replacement with LED lamps and adjustment of office equipment

The majority of lighting lamps have already been replaced with LED lights. It is suggested to replace the remaining lighting lamps with efficient LED lights, including the replacement of fluorescent lighting and incandescent bulbs. LED lighting offers advantages in terms of lifespan, maintenance costs, and electricity consumption. The proposal is to gradually replace existing lighting lamps as they reach the end of their life cycle. By using energy-efficient lighting solutions, electrical energy consumption can be significantly reduced, and investing in lighting is one of the most effective ways to cut costs.

Optimization of office equipment operation is recommended. Although individual pieces of office equipment may not represent significant energy consumers, due to their large amount there are significant potentials for reducing electricity consumption. It is suggested that, at the level of Aluminij Industries, all computers be configured so that monitors automatically enter stand-by or sleep mode 15 minutes after inactivity. Hard drives should be set to enter sleep mode after 30 minutes of inactivity, and entire computers after 60 minutes. Copy machines should be set to enter stand-by mode after 15 minutes of inactivity. The potential savings resulting from these adjustments depend on how office equipment is used. Importantly, this type of measure does not require any additional costs.

It is anticipated that these measures can lead to an overall 5 % reduction in electricity consumption, resulting in a decrease in GHG emissions (Table 3-4.).

Table 3-4. Emission reduction due to reduction in electricity consumption, 2030

	Amount
Reduction of electricity consumption (MWh)	1,728.6
GHG emission reduction (t CO₂e)	1,277.4

Decarbonisation of the Power sector in Bosnia and Herzegovina

The expected reduction in the emission factor for electricity could be around 16 % by the year 2030 (620.8 g CO₂e/kWh) compared to the year 2022 (739.0 g CO₂e/kWh). The decrease in the specific emission factor is a consequence of the anticipated increase in the share of renewable energy sources in electricity production in Bosnia and Herzegovina.

Decarbonising the Power sector will lead to a reduction in GHG emissions (Table 3-5.).

Table 3-5. Emission reduction due to decarbonisation of the Power sector, 2030

	Amount
Reduction of emission factor for electricity (%)	16
GHG emission reduction (t CO₂e)	2,554.8

3.3. Measures to reduce emissions from Scope 3 activities

3.3.1. Replacement of primary with secondary aluminum (old scrap)

Aluminij Industries Ltd. has developed its own plan to reduce GHG emissions, aligning with a long-term strategy for the observed period until 2050. The plan aims to increase the quantity and percentage of recycled aluminium in aluminium products. Significant progress has already

been made in the previous period, and the company will strive to transform this effort into a continuous process of improvement. It is estimated that 10 % of primary aluminium used in 2022 will be replaced by secondary aluminium (old scrap) by 2030 (Table 3-6.). Achieving the same effect of reducing GHG emissions is possible by increasing the proportion of primary aluminium purchased from a producer with a lower GHG emission factor during production and in their upstream supply chain (the so-called cradle-to-gate factor for primary aluminium producer), instead of using more secondary aluminium.

Table 3-6. Emission reduction by replacement of primary with secondary aluminium, 2030

	Amount
Replacement of primary with secondary aluminium (%)	10
GHG emission reduction (t CO₂e)	153,894.8

3.3.2. Reduction of upstream emissions related to fuels and energy

The described measures within Scopes 1 and 2 activities would lead to a reduction in the consumption of natural gas, diesel, petrol, and electricity. Consequently, indirect emissions caused by the consumption of these fuels and energy would also decrease. Indirect emissions arise from the production processes of oil and natural gas, energy transformations (e.g. refineries), as well as fuel transportation and the transmission and distribution of electricity from production sites to consumers. It is assumed that these measures could result in a reduction of upstream emissions of natural gas by 2 %, diesel by 1.35 % (due to the application of measures only on company road vehicles), petrol by 13.5 %, and electricity by 5 % compared to the year 2022 (Table 3-7.).

Table 3-7. Reduction of upstream emissions related to fuels and energy, 2030

	Amount
Reduction of natural gas consumption (t CO ₂ e)	87.1
Reduction of diesel consumption (t CO ₂ e)	0.8
Reduction of petrol consumption (t CO ₂ e)	0.4
Reduction of electricity consumption (t CO ₂ e)	21.5
GHG emission reduction (t CO₂e)	109.9

3.3.3. Reduction of upstream transport emissions

Aluminij Industries plans to carefully select more favourable/proximate countries for sourcing necessary raw materials (e.g. primary aluminium) to reduce transport distances, thereby decreasing GHG emissions. It is assumed that by reducing the use of primary aluminium and choosing raw materials from closer locations, upstream transport emissions could be reduced by 10 % compared to the year 2022 (Table 3-8.).

Table 3-8. Emission reduction from upstream transport, 2030

	Amount
Reduction of upstream transport emissions (%)	10

GHG emission reduction (t CO₂e)	1,218.3
---	----------------

3.3.4. Reduction in the number of business trips

Whenever possible, it is preferable to hold virtual meetings and online conferences instead of traveling on business trips for Aluminij Industries employees. It is assumed that by adopting this practice, the number of business trips could be reduced by 25 % compared to the year 2022. The contribution of reducing the number of business trips to emission reduction is shown in Table 3-9.

Table 3-9. Emission reduction due to the reduction of business trip numbers, 2030

	Amount
Reduction in the number of business trips (%)	25
GHG emission reduction (t CO₂e)	0.4

3.3.5. Reduction of employee commuting emissions

Aluminij Industries employees mainly commute to work using their own diesel or petrol personal vehicles. It is proposed to motivate employees to use bicycles more frequently for commuting. Additionally, the possibility of introducing an official bus that would transport a significant number of employees and the option of implementing car-sharing initiatives should be considered. It is assumed that by encouraging these sustainable commuting practices, GHG emissions could be reduced by 20 % by the year 2030 compared to the year 2022 (Table 3-10.).

Table 3-10. Emission reduction from employee commuting, 2030

	Amount
Reduction of employee commuting emissions (%)	20
GHG emission reduction (t CO₂e)	33.1

3.3.6. Reduction of downstream transport emissions

In addition to reducing emissions from upstream transportation of raw materials, there is an expectation of a 5 % reduction in emissions from downstream transportation of aluminium products by the year 2030 compared to 2022 (Table 3-11.). This reduction in downstream transportation emissions is achievable through the use of newer and more efficient trucks (lower fuel consumption per 100 km), an increased share of biodiesel in diesel fuel, and a potential shift to using trucks powered by hydrogen or electricity by the year 2030.

Table 3-11. Emission reduction from downstream transport, 2030

	Amount
Reduction of downstream transport emissions (%)	5
GHG emission reduction (t CO₂e)	326.4

3.4. Analysis of measures to reduce the carbon footprint

By implementing the analysed measures, it is possible to achieve a **reduction in GHG emissions from Aluminij Industries by 9.9 % until 2030, compared to emissions of the base year 2022** (location-based method). The contribution of these analysed measures to the expected emission reductions by 2030 is presented in Table 3-12.

Table 3-12. Contribution of analysed measures to the reduction of GHG emissions, 2030

Activities	CO ₂ e emission in 2022 (t)	Measures	CO ₂ e emissions reductions in 2030 (t)	CO ₂ e emissions reductions in 2030 (%)
Stationary combustion sources	29,428.1	Reduction of natural gas consumption	588.2	2.0
Mobile combustion sources	507.7	ECO driving training; Regulation of tire pressure in company vehicles; Use of higher energy class tires for company vehicles	9.5	1.9
Fugitive emissions	55.9	Improvement of the cooling systems and air conditioning	0.3	0.6
Scope 1 activities	29,991.7	Scope 1 measures	598.1	2.0
Electricity consumption (location-based method)	25,548.1	Lighting replacement with LED lamps and adjustment of office equipment; Decarbonisation of the Power sector	5,160.7	20.2
Scope 2 activities	25,548.1	Scope 2 measures	5,160.7	20.2
Purchased goods and services	1,545,383.4	Replacement of primary with secondary aluminium	153,894.8	10.0
Capital goods	1,278.3	No measures are foreseen	0.0	0.0
Fuel- and energy-related activities (not included in Scope 1 or Scope 2)	4,779.6	Reduction of fuel (natural gas, diesel and petrol) and energy (electricity) consumption	109.9	2.3
Upstream transportation and distribution	12,182.8	Reduction of upstream transport emissions	1,218.3	10.0
Waste generated in operations	12.4	No measures are foreseen	0.0	0.0
Business travel	1.6	Reduction in the number of business trips	0.4	25.0
Employee commuting	165.4	Reduction of employee commuting emissions	33.1	20.0
Downstream transportation and distribution	6,528.6	Reduction of downstream transport emissions	326.4	5.0
Downstream leased assets	4.0	No measures are foreseen	0.0	0.0
Scope 3 activities	1,570,409.4	Scope 3 measures	155,582.8	9.9
Total emissions	1,625,949.2	Emission reduction by measures	161,341.7	9.9

The largest contribution to emission reduction by 2030, compared to the year 2022, is expected to come from replacing primary with secondary aluminium (153,894.8 t CO₂e). Additionally, the implementation of measures to reduce electricity consumption and the expected reduction of the emission factor for electricity (5,160.7 t CO₂e) are significant contributors. A notable reduction in emissions is also achievable by decreasing emissions from upstream transportation (1,218.3 t CO₂e). The analysed measures would contribute to a 2.0 % reduction in Scope 1 emissions, a 20.2 % reduction in Scope 2 emissions, and a 9.9 % reduction in Scope 3 emissions by 2030, compared to the year 2022.

Aluminij Industries has set targets to reduce emissions by 5-15 % by 2030 and 60-95 % by 2050, relative to the emission levels in the base year 2022. The implementation of the analysed measures would achieve a 9.9 % reduction by 2030, aligning with the set emission reduction target (Figure 3-1.).

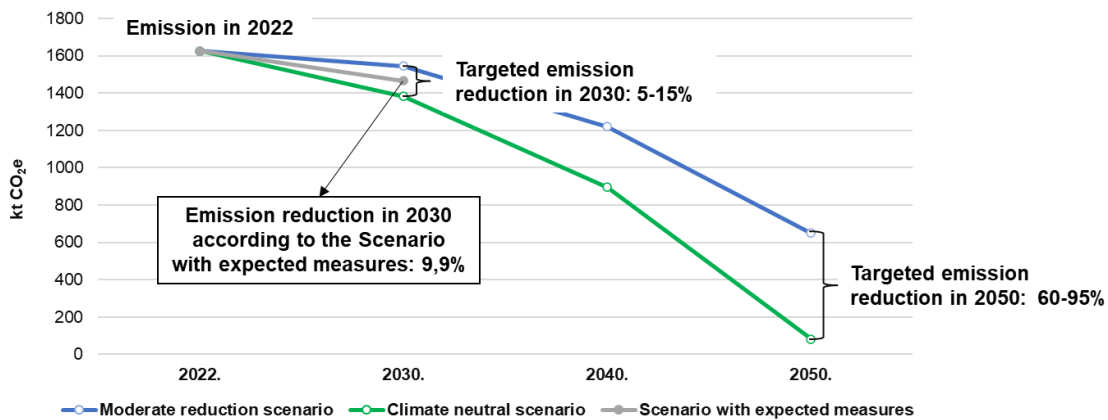


Figure 3-1. Emissions reduction scenarios for Aluminij Industries

With the provided assumptions, the carbon footprint of Aluminij Industries in 2030 would amount to 1,464,607.5 t CO₂e (compared to 1,625,949.2 t CO₂e in 2022). In addition to the absolute carbon footprint decrease, significant reductions are expected in the specific GHG emissions per employee (assuming the same number of employees in 2030 as in 2022 – 321 employees) from 5.07 kt CO₂e/employee (2022) to 4.56 t CO₂e/employee (2030) and per product mass (assuming equal mass of aluminium products in 2030 as in 2022 - 137,692.6 t) from 11.81 t CO₂e/t product (2022) to 10.64 t CO₂e/t product (2030).

The long-term target is to achieve carbon neutrality by 2050. This can be primarily accomplished by implementing the aforementioned and additional measures at the Aluminij Industries location. Any remaining GHG emissions that cannot be avoided may be offset through the purchase of so-called carbon offset credits.

4. CONCLUSION

For Aluminij Industries, emission reduction targets of 5-15 % by 2030 and 60-95 % by 2050 have been set, compared to the emission levels in the base year 2022. The implementation of the analysed measures would result in a reduction of emissions by 9.9 % by 2030, aligning with the set emission reduction target.

The long-term target is to achieve carbon neutrality by 2050. To attain this long-term target, the following steps are required:

- extend the emission calculation to include all Scope 3 activities, covering all GHG emissions associated with Aluminij Industries,
- implement emission reduction measures at the Aluminij Industries site to achieve a significant reduction in the carbon footprint, while any remaining emissions can be compensated through the purchase of carbon offset credits.