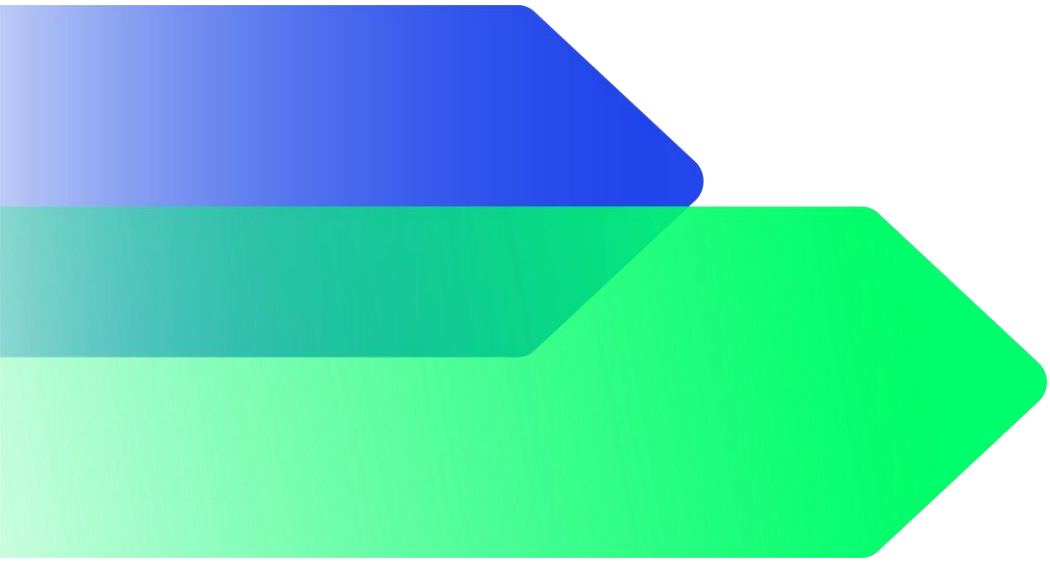
CARBON TRUST

REPORT

AIB Clean Transportation Impact Assessment

For eligible Clean Transportation projects

February 2022



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Abbreviations

BEV: battery electric vehicle

ICE: internal combustion engine

GHG: Greenhouse gases

1. Introduction

Aligned with its sustainability strategy, Allied Irish Banks ("**AIB**") is intending to issue green bonds to finance and / or refinance loans that meet the requirements as described in the AIB Green Bond Framework ("**Framework**")[1]. The objective of the Framework, and subsequent green bonds issued from it, is to fund projects or assets that mitigate climate change by reducing emissions, protect ecosystems or otherwise have a positive environmental impact. The Framework has been aligned to the ICMA Green Bond Principles, and has received a Second Party Opinion from Sustainalytics.

The ICMA Green Bond Principles are a set of voluntary guidelines that recommend transparency and disclosure and promote integrity in the development of the green bond market by clarifying the approach for issuing a green bond. The Framework therefore has four key components:

1. Use of Proceeds
2. Process for Project Evaluation and Selection
3. Management of Proceeds
4. Reporting

For each green bond issued, AIB asserts that it will adopt (1) Use of Proceeds, (2) Process for Project Evaluation and Selection, (3) Management of Proceeds, (4) Reporting, as set out in the Framework.

AIB, at its discretion but in accordance with the Green Bond Principles, will allocate the net proceeds of the Green Bonds to an eligible loan portfolio of new and existing green loans ("Eligible Green Project Portfolio"). The Eligible Green Project Portfolio are to be financed and/or refinanced in whole or in part by an allocation of the bond proceeds.

The Eligible Green Project Portfolio for "Clean transportation" includes loans to finance or refinance, establishment, acquisition, expansion, upgrades, maintenance and operation of low carbon vehicles and related infrastructures; the criteria for which are set out below, as per the AIB's Green Bond Framework[1]:

- Zero emissions vehicles and supporting infrastructure:
    - Fully electric, hydrogen or otherwise zero emissions vehicles for the transportation of passengers.
    - Infrastructure to support zero emissions vehicles including but not limited to EV charging and hydrogen fuelling stations.

The current eligible project portfolio of the AIB only covers the financing of battery electric vehicles (BEVs).

1.1. Who We Are

The Carbon Trust are a trusted, expert guide to Net Zero, bringing purpose led, vital expertise from the climate change frontline. We have been pioneering decarbonisation for more than 20 years for businesses, governments and organisations around the world.

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[1] AIB (2020), Green Bond Framework, https://aib.ie/investorrelations/debt-investor/green-bonds/green-bond-framework

We draw on the experience of over 300 experts internationally, accelerating progress and providing solutions to this existential crisis. We have supported over 3,000 organisations in 50 countries with their climate action planning, collaborating with 150+ partners in setting science-based targets, and supporting cities across 5 continents on the journey to Net Zero.

The Carbon Trust's Green Finance team helps financial institutions navigate the risks and opportunities of climate change and the transition to a low carbon economy. We are independent experts who understand the environmental impacts, technologies and global markets that underpin green asset classes. We leverage this bottom-up understanding to create bespoke solutions and help financial institutions deliver genuinely green outcomes. We offer a comprehensive advisory and assurance service for green bonds and loans. We provide feasibility assessments, help identify eligible assets (Green Tagging), and build Green Bond and Loan Frameworks. For assuring green bonds and loans, we provide Second Party Opinions and certifications to recognised standards. We are approved verifiers to the Climate Bonds Initiative Standard and we are members of the ICMA Green Bond Principles, contributing in both cases as technical advisors. As impartial experts, we advise on methodologies and reporting on the environmental impacts of the use of proceeds, giving investors clarity and reassurance on the impact of their investment.

2. Methodology

2.1. Reporting Principles

Reporting of the environmental impacts of green bonds is evolving and is a relatively new concept. However, AIB is committed to reporting on the method used to calculate the avoided GHG emissions for its Green Bond Framework based on:

- PCAF's *The Global GHG Accounting and Reporting Standard for the Financial Industry*[2], chapter 5.6 Motor vehicle loans.
- The Green Bond Principles (GBP) Impact Reporting Working Group's *Suggested Impact Reporting Metrics (2018)*[3].
- ICMA Harmonized Framework for Impact Reporting (2020)[4]

In addition, AIB is committed to reporting greenhouse gas emissions in accordance with the five principles contained within the Greenhouse Gas Protocol, namely: relevance; completeness; consistency; transparency; and, accuracy. In accordance with the principles of reporting described above, AIB commits to transparent disclosure of any assumptions and estimations used in the calculation of its reporting framework.

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[2] Partnership for Carbon Accounting Financials (PCAF) (2020), The Global Accounting & Reporting Standard for the Financial industry, https://carbonaccountingfinancials.com/files/downloads/PCAF-Global-GHG-Standard.pdf

[3] ICMA (2018), Suggested Impact Reporting Metrics for Clean Transportation Projects https://www.icmagroup.org/assets/documents/Regulatory/Green-Bonds/Clean-Transportation-Reporting-Metrics-4-June-2018.pdf

[4] ICMA (2020), Harmonized Framework for Impact Reporting, https://www.icmagroup.org/assets/documents/Regulatory/Green-Bonds/Handbook-Harmonized-Framework-for-Impact-Reporting-December-2020-151220.pdf

2.2. Scope of Calculations and Reporting

2.2.1. General scope of green bond impact assessment

AIB intends to report the expected or actual quantitative environmental impact of the battery electric vehicles (BEVs) it finances or co-finances through its green bond issuance. The reporting includes the estimated reduction or avoidance in greenhouse gases ("GHGs") estimated to have occurred from its BEV loans. AIB also evaluates other indicators that are appropriate to report for environmental impact and performance, such as the number of electric vehicles deployed. At this stage, social and other economic indicators are noted within the scope of the green bonds in question. Governance indicators are also not in scope.

AIB undertakes to report the environmental impact of projects it finances or co-finances through its green bonds based, where possible, on the actual environmental performance of the asset. Where this is not possible, expected performance is used. The reporting includes both green indicators and resulting emissions reductions or avoidance, both of which require assumptions and calculations. The reporting is be based on the net-benefit resulting from the asset in a given period of operation, rather than the gross emissions change before or after the life of the asset or project.

Calculations include project-by-project impacts, as well as aggregated results across the portfolio of assets financed or co-financed with the proceeds of AIB's green bonds. Environmental indicators are attributed to AIB on a project-by-project basis, based on the current percentage share financed (where applicable) and disbursed by the bank. The reporting is undertaken on an annual basis, covering the previous 12-month period and considers any dynamic changes in the assets financed or co-financed that occur from one reporting period to another.

In accordance with the principles of reporting described above, AIB has, and continues to commit to transparent disclosure of any assumptions and estimations used in the calculation of its reporting framework.

2.2.2. Scope of clean transportation impact assessment

The impact of clean transportation financing is calculated by estimating the avoided emissions arising from the deployment of battery electric vehicles (BEVs). Avoided emissions refer to the incremental difference in emissions that internal combustion engine or ICE vehicles (e.g., petrol, diesel, etc.) would have generated when driving a given distance (i.e., "the baseline" or Direct emissions, Scope 1), compared with the carbon emissions associated with generating electricity to charge BEVs to drive the same given distance (Indirect emissions, Scope 2). In other words, the estimated annual emissions avoided because of driving a fully electrical vehicle instead of a vehicle with an internal combustion engine (ICE) over a given distance.

Both Direct and Indirect emissions originate from the use phase of the vehicle and do not include upstream (e.g., well-to-wheel emissions, battery manufacturing, etc.) or downstream (e.g., end of life treatment) emissions (Scope 3). Details around the calculations and justifications for all emission scopes are explained below.

2.3. Environmental impact methodology

2.3.1. Scope 1: Direct emissions from fuel combustion in vehicles

The Direct emissions, or ICE emissions, are the tailpipe CO_2 emissions from fossil fuel combustion when driving ICE vehicles.

A baseline was calculated to estimate the avoided direct emissions. The baseline can be considered as a hypothetical scenario in which BEVs financed by AIB were replaced with ICE vehicles. In other words, the baseline refers to what would have happened if AIB had not, in recent years, increased the share of BEVs in its total financed fleet, assuming that each BEV would otherwise be replaced by an ICE vehicle. It calculates the emissions that would have occurred if the average private car distance covered in Ireland was driven by ICE vehicles instead of BEVs, using an emission factor derived from the carbon intensity of the average new ICE vehicle in Ireland.

The calculation for the baseline emissions is:

$$\boldsymbol{Direct\ (Scope\ 1)\ emissions}\ =$$

$$Count\ of\ BEV\ in\ \ project\ portfolio\ \times Average\ private\ car\ distance\ covered\ in\ Ireland\ per\ year \times average\ CO_2\ emissions\ of\ new\ cars\ in\ Ireland, excluding\ BEVs\ for\ year\ of\ loan$$

Table 1 Summary of inputs to calculate the Baseline Scope 1 emissions

Description	Unit	Input	Source(s)
Number of BEVs in the Eligible Project Portfolio	#	783	Provided by AIB
Average private car distance covered in Ireland, per year, km, 2019	km	16,352	Department of Transport, 2021, Transport Trends 2020: An Overview of Ireland's Transport Sector, p.9
Weighted average specific CO_2 emissions of new cars in Ireland, excluding BEVs for year of loan[5]	$kgCO_2/km$	Differs by loan year	Sustainable Energy Authority of Ireland (SEAI), 2021, Energy in Ireland: 2021 Report, p.80 SEAI, Transport Statistics
Direct (Scope 1) emissions	**1,421,201 kg CO_2**		

[5] The weighted average is based on a standardised testing procedure, which since 2018 has been the Worldwide Harmonised Light Vehicle Test Procedure (WLTP). The standardised testing procedures are known to underestimate the fuel use and CO_2 emissions of cars, compared to typical real world driving conditions. The SEAI highlights the concern over the potential for very large performance gaps between the test results and the real-world operation of plug-in-hybrid vehicles in particular. Therefore, it is possible that this emission factor for new vehicles underestimates the true emissions of all non-BEV ICE vehicles.

The CO_2 emission factor for the baseline ICE vehicle was the average CO_2 emission factor for new non-BEV vehicles in Ireland for the year that the loan was taken out, e.g., for 2020 it was $0.111kgCO_2/km$. The figure for 2021 was the same as for 2020 as that was the most recent data available from the SEAI.

2.3.2. Scope 2: Indirect emissions from electricity generation consumed in EVs

Indirect emissions, or BEV emissions, are the CO_2 emissions from generating electricity used to charge the BEVs to travel the same calculated distance as the ICE vehicles in the baseline. This is based on the average carbon intensity of Ireland's electricity grid, and the specific energy consumption of the financed BEVs. The calculation for the Scope 2 emissions is:

$$\boldsymbol{Indirect\ (Scope\ 2)\ emissions\ =}$$

$$\sum_{v} CO_2\ emission\ factor\ of each\ \ BEV_v\ \times Average\ private\ car\ distance\ covered\ in\ Ireland\ per\ year$$

$$\boldsymbol{CO_2\ emission\ factor\ of\ each\ BEV\ =}$$

$$Energy\ consumption\ of\ each\ BEV\ per\ km_v\ \times Electricity\ emission\ factor\ in\ Ireland$$

v = vehicle

Table 2 Summary of inputs to calculate Scope 2 emissions

Description	Unit	Input	Source(s)
Energy consumption of BEV per km	kWh/km	Differs by BEV model[6]	Sustainable Energy Authority of Ireland (SEAI), Compare Cars (accessed Feb. 22) Electric vehicle database, Energy consumption of full electric vehicles
Electricity emission factor, Ireland, 2020	$kgCO_2/kWh$	0.296	Sustainable Energy Authority of Ireland (SEAI), Conversion factors
Indirect (Scope 2) emissions	**651,260 kg CO_2**		

Note: only includes the inputs not already outlined in Table 1

[6] The energy consumption of the BEV was derived from the SEAI's car comparison tool. As the energy consumption of Tesla's were not available, these were sourced from the publicly available electric vehicle database (EVDB), where their 'EVDB real range' figures may be slightly above the vehicle maker's official rated energy consumption.

The data available for the BEV financed was limited to the high-level make and the model. However, the energy consumption of a BEV may vary even within the same vehicle model, e.g., based on vehicle size, travel range, or type. Therefore, the average energy consumption of the different model types was used for a given vehicle model. For example, the energy consumption figure used for the Tesla Model 3 was the average energy consumption of the Model 3, the Model 3 Long Range Dual Motor, and the Model 3 Performance.

2.3.3. Scope 3: Upstream and Downstream emissions

General approach

PCAF's guidance[7] on reporting emissions from motor vehicle loans clarifies that Scope 3 emissions related to the production of vehicles, delivery of vehicles to buyers, or decommissioning of vehicles after use do not need to be covered; as these emissions are difficult to obtain, and they can be considered marginal in terms of lifecycle emissions of a vehicle.

Also, PCAF recommends that if Scope 3 emissions were to be reported, they should only be accounted as a lump sum in the initial financing year, and that this approach only holds for new vehicles, not used vehicles. Given that at the time of reporting data was not available on which of the financed projects were for new vehicles and which were for used vehicles, this would complicate the accounting of the production emissions.

Depending on data availability, the inclusion of Scope 3 emissions, particularly that of production emissions, may be revisited in future impact reports. Below, we set out how we are taking a conservative approach with the avoided emissions calculations, and that if all Scope 3 emissions were calculated, the avoided emissions of BEVs would likely be even higher.

Production and maintenance emissions

According to the latest literature[8], the difference in the combined lifecycle emissions of production and maintenance between ICE vehicles and BEVs is marginal. As BEVs have, in general, lower lifecycle GHG emissions associated with the production of the glider and powertrain, as well as with maintenance, but higher emissions associated with battery production, the combined lifecycle emissions from production and maintenance in only slightly higher for BEVs than for ICE vehicles.

The latest literature on the lifecycle emissions from vehicles cover the following Scope 3 emissions:

- **Production emissions**:
    - **Glider and powertrain** (including raw material extraction, processing, component manufacture, assembly, and recycling): The lifetime GHG emissions associated with the production and recycling of the glider and powertrain for BEVs in Europe (6.5 tCO_2e/km) is around 9.7% less than for gasoline ICE vehicles (7.2 tCO_2e/km).
    - **Battery**: The estimated GHG emissions from producing the batteries for BEVs are only about a third of the total production emissions of BEVs. This is less than previous estimates, for which battery production makes up a larger share of a BEV's production (and therefore lifecycle) emissions. The new estimates are due to the use of more up-to-date data on battery production, accounting for carbon intensities of state-of-the-art battery chemistry, and accounting for regional battery production and import shares.

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[7] Partnership for Carbon Accounting Financials (PCAF) (2020), The Global Accounting & Reporting Standard for the Financial industry, https://carbonaccountingfinancials.com/files/downloads/PCAF-Global-GHG-Standard.pdf, chapter 5.6 Motor vehicle loans.

[8] Bieker (2021), A global comparison of the life-cycle greenhouse gas emissions of combustion engine and electric passenger vehicles, International Council on Clean Transportation (ICCT), https://theicct.org/sites/default/files/publications/Global-LCA-passenger-cars-jul2021_0.pdf

- **Maintenance**: Because BEVs use fewer consumables, they have lower maintenance GHG emissions than comparable gasoline or diesel-powered ICE vehicles. The lifecycle emissions associated with maintenance for BEVs (4 g CO_2e/km) is 20% less than that for gasoline ICE vehicles (5 g CO_2e/ km).

Upstream energy emissions

The Scope 3 upstream emissions associated with the fuel/electricity of the vehicle is also not accounted for. In the case of the baseline ICE vehicles, this would entail the well-to-tank (WTT) emissions associated with extraction, refining and transportation of the raw fuel sources to the vehicles, prior to combustion. In the case of BEVs, this would entail the transmission and distribution (T&D) losses associated with getting the electricity from the power plant to the BEVs.

Overall, the avoided emissions from upstream fuel production would outweigh both the emissions associated with T&D losses, as well as the marginal increase in production emissions for BEVs from the battery manufacturing process. Essentially, if all Scope 3 emissions were calculated, the benefits of BEVs would likely be even higher. Therefore, by not accounting Scope 3 emissions, we are taking a conservative approach to the avoided emissions figures.

2.3.4. Annual avoided emissions

Once the total Direct emissions from ICE vehicles (the baseline) and Indirect emissions from BEVs were obtained, the avoided emissions were calculated by subtracting Indirect emissions from Direct emissions, as per the below formula:

$$\boldsymbol{Annual\ avoided\ emissions} = \sum_{v} Direct\ emissions_v - Inidrect\ emissions_v$$

$v = vehicle$

Table 3 Annual avoided emissions

Annual avoided emissions	**779,274 kg CO_2**

2.3.5. Attributed impact to AIB

An attribution factor has not been applied to the total avoided emissions amount. In other words, the entirety of the impact from the BEV's estimated avoided emissions has been attributed to AIB. For the purposes of this impact assessment, no distinction has been made whether the entire vehicle, or only a portion of it, has been financed by AIB. AIB could expect to consider the annual impact from the avoided emissions for at least 8 years, as the average age of a vehicle in Ireland was 8.4 years in 2019[9].

Attribution of the total avoided emissions is recognised market practice for impact assessments. It is possible that in future annual impact assessments, an attribution factor deriving from the portion of the vehicle's total cost which was financed by AIB is considered.

If an attribution factor were to have been considered, the calculation for the attributed impact of the avoided emissions would be:

$$\boldsymbol{AIB\ annual\ attributed\ avoided\ emissions} = \sum_{v} Annual\ avoided\ emissions_v \times Attribution\ factor_v$$

$$\boldsymbol{Attribution\ factor} = \frac{Total\ amount\ of\ the\ loan_v}{Cost\ of\ the\ asset_v}$$

v = vehicle

Table 4 Summary of inputs to calculate attribution factor

Description	Unit	Input	Source(s)
Outstanding loan per project	€	Differs by project	Provided by AIB
Retail price per BEV (including SEAI grant)[10]	€	Differs by BEV[11]	Sustainable Energy Authority of Ireland (SEAI), Compare Cars (accessed Feb. 22)
AIB annual attributed avoided emissions	**419,502 kg CO_2**		

[9] The European Automobile Manufacturers' Association (ACEA), 2021, Average age of the EU vehicle fleet, by country, https://www.acea.auto/figure/average-age-of-eu-vehicle-fleet-by-country/

[10] In the absence of the value of origination of the loan (as recommended by PCAF), the retail value of the vehicle was used as a proxy. This is however an imperfect measure, as some of the vehicles were bought second-hand at a different price to the retail price. In instances where the outstanding loan amount exceeded the retail price of the vehicle, the loan amount was used as the retail price. In two instances, the loan amount was ~300% and ~10,000% of the retail price, in which case the loan was assumed to finance a fleet, and the total loan was divided by the retail price to give an estimation of the number of BEVs financed.

[11] The retail price per BEV was sourced from the SEAI's car comparison tool. The price is only visible when multiple cars are selected and are compared. As vehicle models have various types, the average price across all types was used for the price of a vehicle model (e.g., price used for Nissan Leaf was the average of the price of the Leaf SV 62 kWh, the Leaf XE 40 kWh, the Leaf SVE Premium 62 kWh etc.). As all of the BEVs financed in the portfolio were eligible for an SEAI BEV grant of €5,000 (because they cost more than €20,000), this grant amount was deducted from each average vehicle model price.

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Published in the UK: 2022