Life Cycle Assessment The Kia EV3

Everything but ordinary

Movement that inspires

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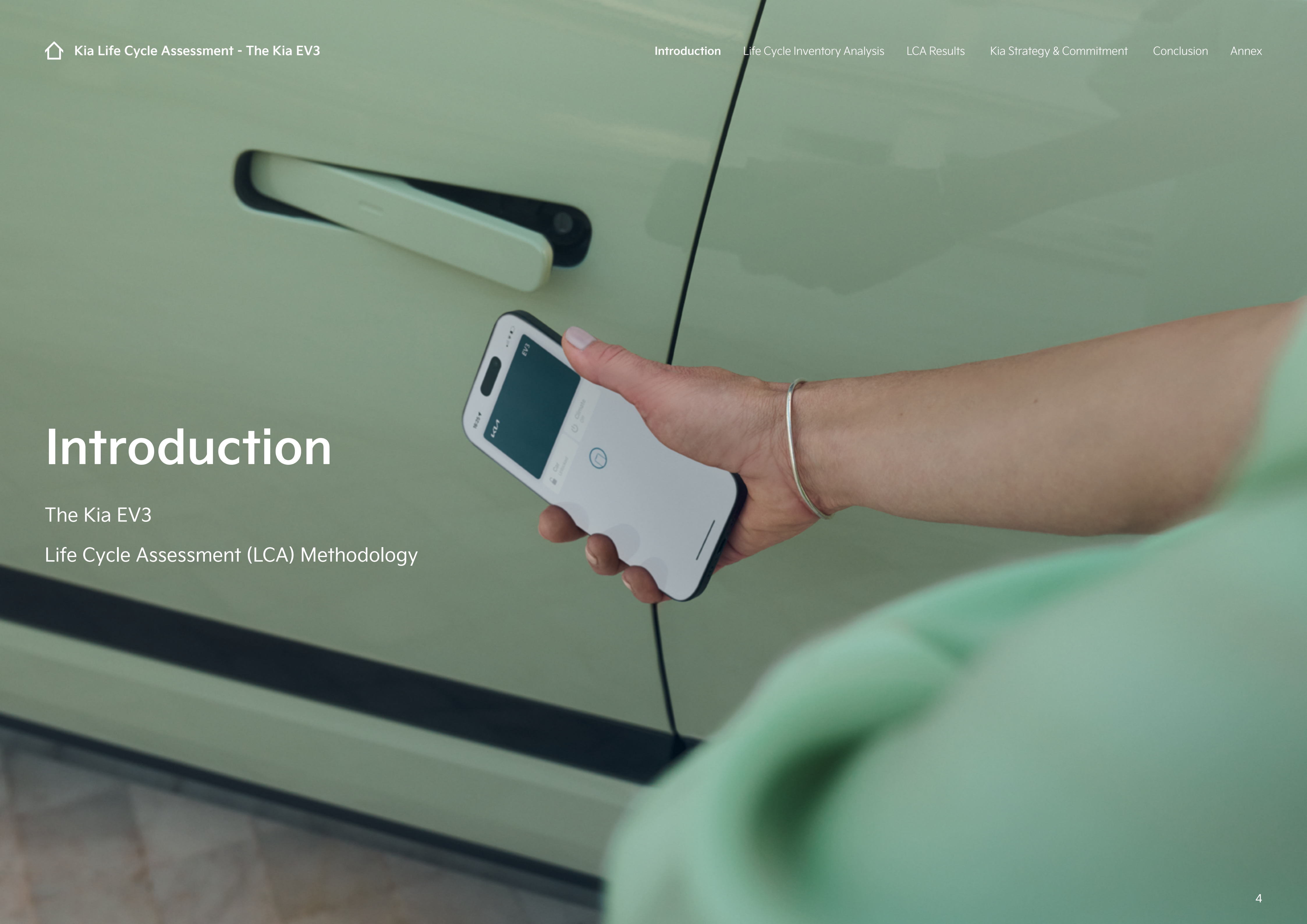
Movement that inspires



Introduction

The Kia EV3

Life Cycle Assessment (LCA) Methodology

The Kia EV3

The EV3 plays a transformative role in accelerating electrification by making zero-tailpipe-emission mobility more accessible.

Kia was determined to create an all-electric SUV that would raise the bar for what's expected of a compact electric model. Achieving this meant drawing up an entirely new set of parameters, such as intelligent regenerative braking and the ability to power or charge external devices. It features industry-leading technology, a WLTP driving range of up to 605km[1], and fast-charging capability.

The EV3's life cycle assessment quantifies environmental impacts at each stage, from material sourcing and manufacturing to use and end-of-life.

All results and methods are independently validated and detailed in this report.

[1] WLTP range depends on wheel size. The life-cycle assessment results presented in this report are based on the EV3 Long Range equipped with 19-inch wheels (WLTP range up to 563km).

Reference Configuration

For consistency and transparency, this Life Cycle Assessment is based on the Kia EV3 Earth equipped with an 81.4kWh battery, representing a widely available European configuration.

Production site	Korea (Autoland Gwangmyeong)
Market	Europe
Body	Wagon 5DR 5P
Wheel drive	FWD
Tire	19 inch
Fuel type	Electricity
Battery type	Lithium-ion NMC
Battery capacity	81.4kWh
Motor	150kW
CO_2 tailpipe emissions	0g/km
WLTP* combined consumption	16.2kWh/100km

All range figures are determined according to the standardised EU measurement procedure (WLTP).

Electricity consumption (kWh/100 km) combined is 16.2; CO_2-Emission (g/km) combined is 0. Electricity consumption combined: 16.2kWh/100km; CO_2-emissions combined: g/km; CO_2-class. The specified consumption and emission values were determined according to the legally prescribed measurement procedures (EU) 2017/1153. The above values have been tested in the Worldwide Harmonized Light vehicle Test Procedure (WLTP); however, they may not reflect real-world driving conditions. Actual energy consumption during driving may vary.

Life Cycle Assessment (LCA) Methodology

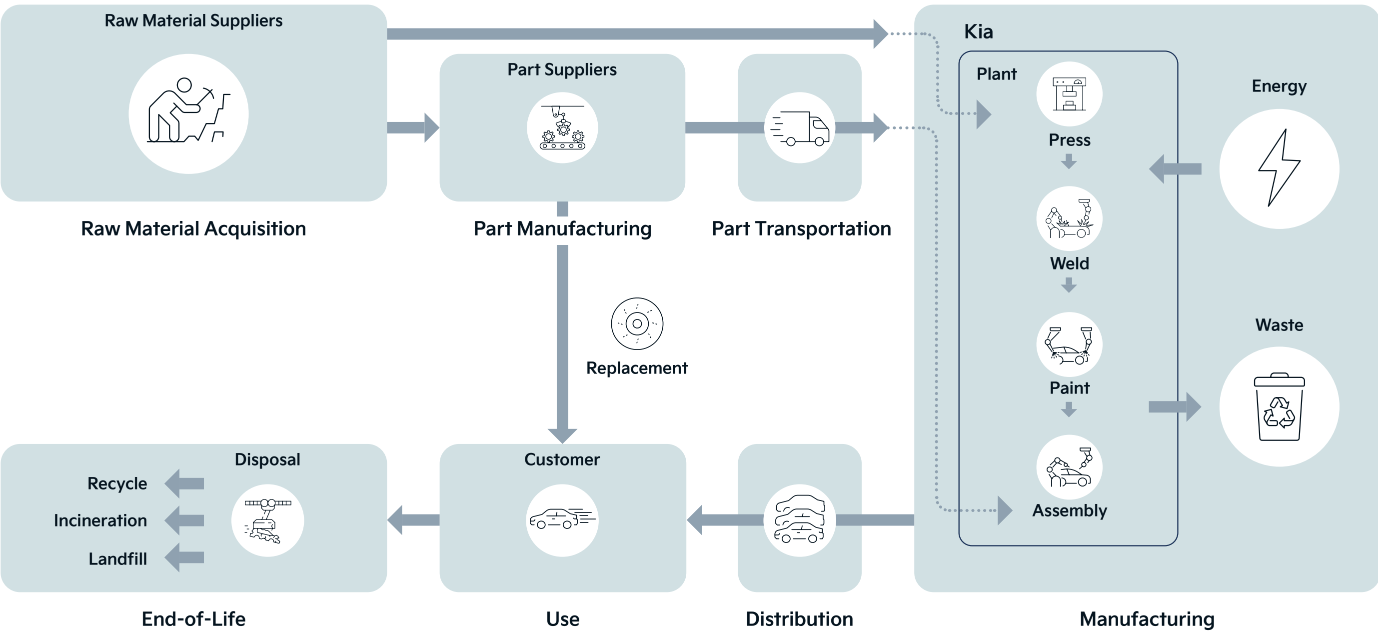
Goal

The goal of this Life Cycle Assessment (LCA) is to measure the environmental footprint and identify hotspots[1] of the Kia EV3 across its full life cycle. The results are intended to support Kia's research and development teams in guiding future product improvements, and to provide transparent information for customers and stakeholders.

Scope

The assessment covers all major stages: raw material extraction, manufacturing, distribution, use phase (200,000km), maintenance, and end-of-life. The system boundary for this assessment is illustrated in Figure 1.

Figure 1. System Boundary for Life Cycle Assessment



Data Sources

The analysis uses a combination of measured data, supplier declarations, and industry-standard databases (Sphera 2025.1, Ecoinvent 3.9-3.10). Environmental impacts are calculated using the Environmental Footprint (EF) 3.1 characterization method. Where direct data is unavailable, reasonable assumptions are applied and documented.

Limitations, Assumptions & Allocation

Cut-off criteria

Materials not clearly defined represent less than 1% of total mass, and packaging materials are not included.

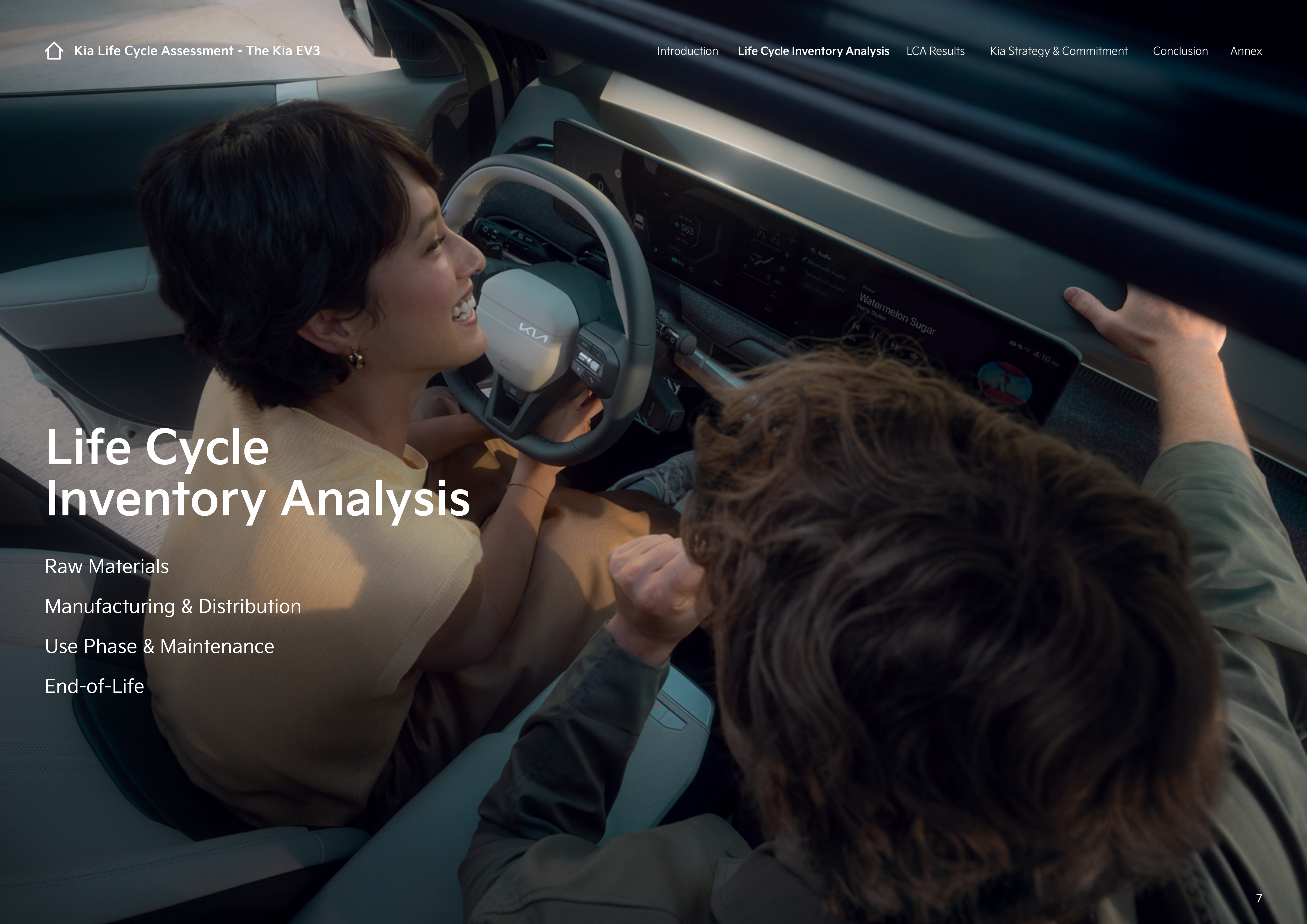
Allocation

Because the manufacturing site produces multiple vehicle models, energy and emissions data are allocated to the EV3 proportionally, based on the vehicle's share of total production volume and weight. (See Figure 2 for a visual representation of the allocation approach).

Figure 2. Allocation Approach

$$\text{Vehicle data} = \frac{\text{Site manufacturing data}}{\Sigma_{site}(\text{Production of vehicle X weight of vehicle})} \times \text{Weight of target vehicle}$$

[1] A "hotspot" is a material or component that has a significant impact on the total footprint.



Life Cycle Inventory Analysis

Raw Materials

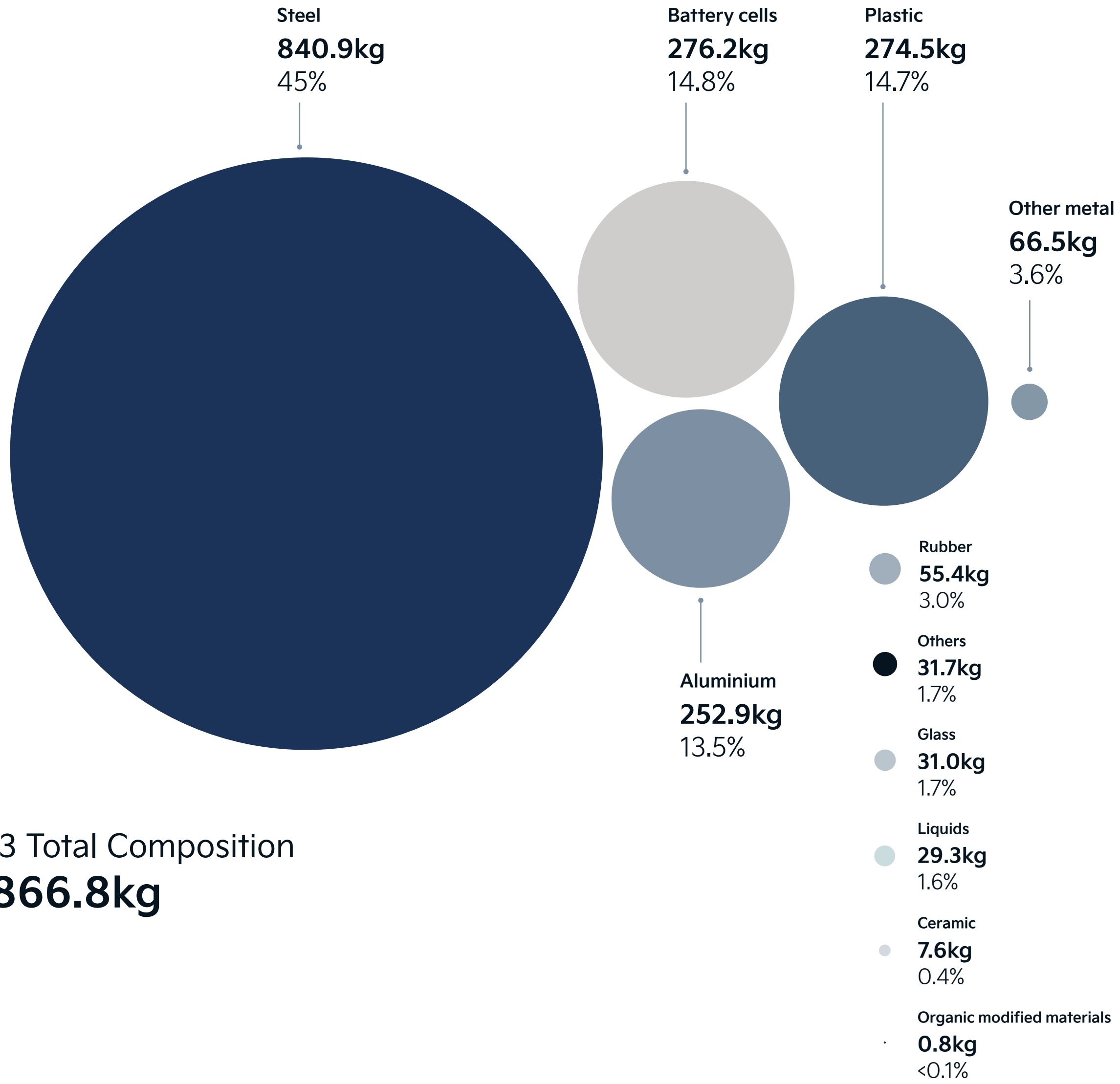
The EV3 Long Range (81.4kWh) consists of approximately 1,866.8kg of materials, determined through our internal system and verified via the International Material Data System (IMDS).

This ensures that the material inventory reflects actual production specifications and supplier declarations. The EV3's material composition includes metals, plastics, glass, battery cells, and other components, as shown in the chart. The battery cells category in the chart includes the high-voltage battery, which—while not the largest by mass—is one of the most significant contributors to the vehicle's overall environmental impact due to its resource and energy intensity.

Understanding EV3's Material Profile

As shown in the chart, steel dominates the composition at **45%**, followed by the battery cells at **14.8%**, plastic at **14.7%**, and aluminium at **13.5%**. Together, steel and aluminium account for 58.5% of the vehicle's total mass, forming the structural backbone of the EV3. The battery cells (276.2kg) are the primary functional core that enables the vehicle's zero tailpipe emission range. Their mass is a direct reflection of the energy density required to replace fossil fuel combustion. Minor categories such as plastics, glass, rubber, ceramics, liquids, and organically modified materials make up the remainder, each serving specialised roles in design and performance. This breakdown provides a clear baseline for understanding material allocation. In the following sections, we will examine how these proportions influence lifecycle emissions, where weight alone does not always determine impact.

Raw Material Composition



EV3 Total Composition
1,866.8kg

Manufacturing & Distribution

The EV3 is assembled at Kia's Autoland Gwangmyeong in Korea, a facility designed to combine precision manufacturing with environmental responsibility.

The assembly stage includes three key processes

1) stamping and welding for the body; **2)** painting; **3)** general assembly.

Each step is optimised to reduce waste and energy consumption, supporting Kia's commitment to sustainable mobility. For the LCA, we collected the following data for the manufacturing and distribution of the vehicle:

Parts Manufacturing & Transportation

To assess the environmental impact of parts, it is necessary to consider both manufacturing and transportation stages.

Before parts are transported, they undergo production processes that consume energy and generate emissions. In our approach, manufacturing impacts are estimated using standardised process data rather than modelling each part individually. This ensures consistency and efficiency in calculations while providing a representative view of typical automotive manufacturing operations.

After manufacturing, parts are delivered to assembly plants. Transportation impacts are calculated based on:

- Volume of transportation, multiplied by the weight of the cargo and the transport distance of the parts.
- Weight of parts, confirmed through analysis in the raw material acquisition stage.
- Transport distance, determined by the average distance between the supplier's location and Kia's factory, using data managed by VAATZ (Value Advanced Automotive Trade Zone).

Vehicle Manufacturing

To quantify the impacts of vehicle manufacturing, the assessment covers the energy consumed during assembly and the treatment of water and solid waste attributable to EV3 production.

The EV3's production requires 292.5kWh of electricity and 63.4Nm^3 of gas per vehicle, calculated using Korea's grid carbon intensity of 557gCO/kWh (Sphera). These values reflect the actual energy needed during assembly and provide a realistic picture of the vehicle's manufacturing footprint.

The assessment also includes the impacts from treating water and solid waste generated during production. All process water undergoes proper treatment before discharge, and around 10.5kg of solid materials such as scrap and packaging are managed through recycling or disposal.

Including these steps ensures that the model captures the emissions associated with handling real by-products of the assembly process.

By combining energy use with water and waste treatment impacts, the EV3's LCA presents a complete and accurate view of assembly-stage emissions. This approach makes sure the results stay closely aligned with the conditions and processes that occur during actual vehicle production.

Vehicle Distribution

To evaluate the environmental impact of parts transportation, it is necessary to collect information on the volume of transportation.

The volume of transportation in the distribution stage is based on the weight of the vehicle and the transport distance that the vehicle travels from the production plant to the European market, which represents the customer region in the modelling boundary.

For this calculation, that includes:

- Land transportation within Korea: from the Gwangmyeong plant to the Korean port.
- Sea transportation: from the Korean port to the European port.

The weight of the vehicle can be comprehensively confirmed from the raw material acquisition stage, and the transport distance that is delivered to the market can be obtained by applying the specified standard distance.

Use Phase & Maintenance

The Use Phase

The Use Phase models the EV3 over a lifetime of 200,000km under WLTP conditions. It accounts for the energy required to charge the vehicle based on average European grid mixes.

Well-to-Tank

Well-to-Tank (WtT) refers to the energy consumed and greenhouse gases emitted before the energy reaches the vehicle.

In this methodology, only electricity is considered, since the assessment focuses on EVs. WtT therefore represents the impact of producing electricity in the European grid mix and supplying it to the charging station, where the vehicle is charged.

Tank-to-Wheel

Tank-to-Wheel (TtW) emissions measure pollutants (NO_x, CO, CH_4, N_2O, and CO_2), generated directly from a vehicle's tailpipe during operation, excluding fuel production or transportation.

Tank-to-Wheel (TtW) emissions are zero for a battery electric vehicle, as there is no combustion process.

Maintenance

In addition to charging, the model includes maintenance activities and replacement parts such as tires, brakes, and fluids, based on standard service intervals from the owner's manual.

Detailed analysis of future scenarios, including the effects of renewable energy adoption and optimised maintenance strategies, will be presented in the following sections.

End-of-Life

End-of-life modelling reflects current European statistics for dismantling, recycling, and recovery.

Metals such as steel and aluminium are modelled with near-complete recycling rates, meaning they largely return to material cycles.

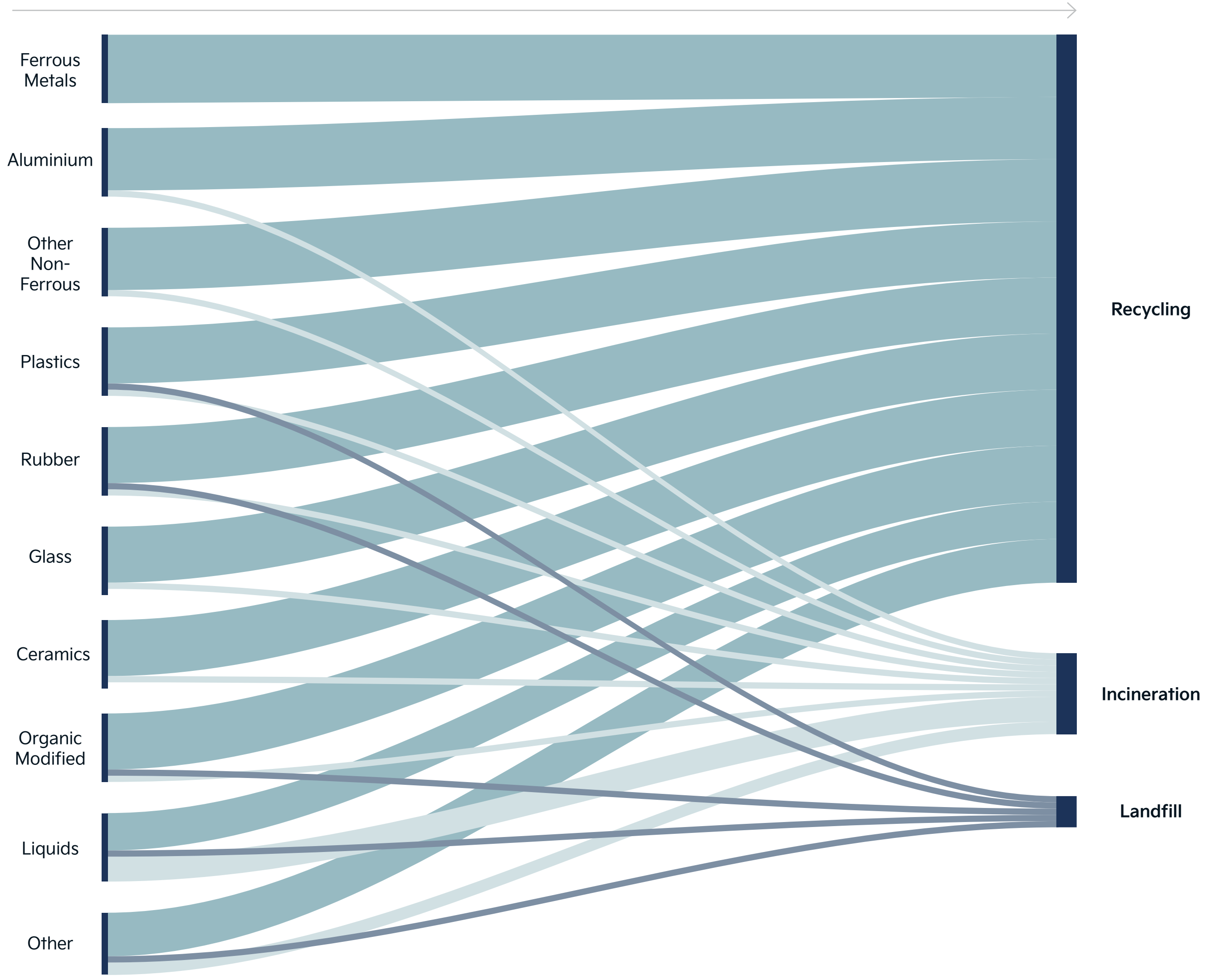
In contrast, plastics, rubber and glass have lower recovery potential due to mixed compositions, contamination, and limited recycling pathways. As a result, some landfill use remains in the model to reflect realistic waste-management practices.

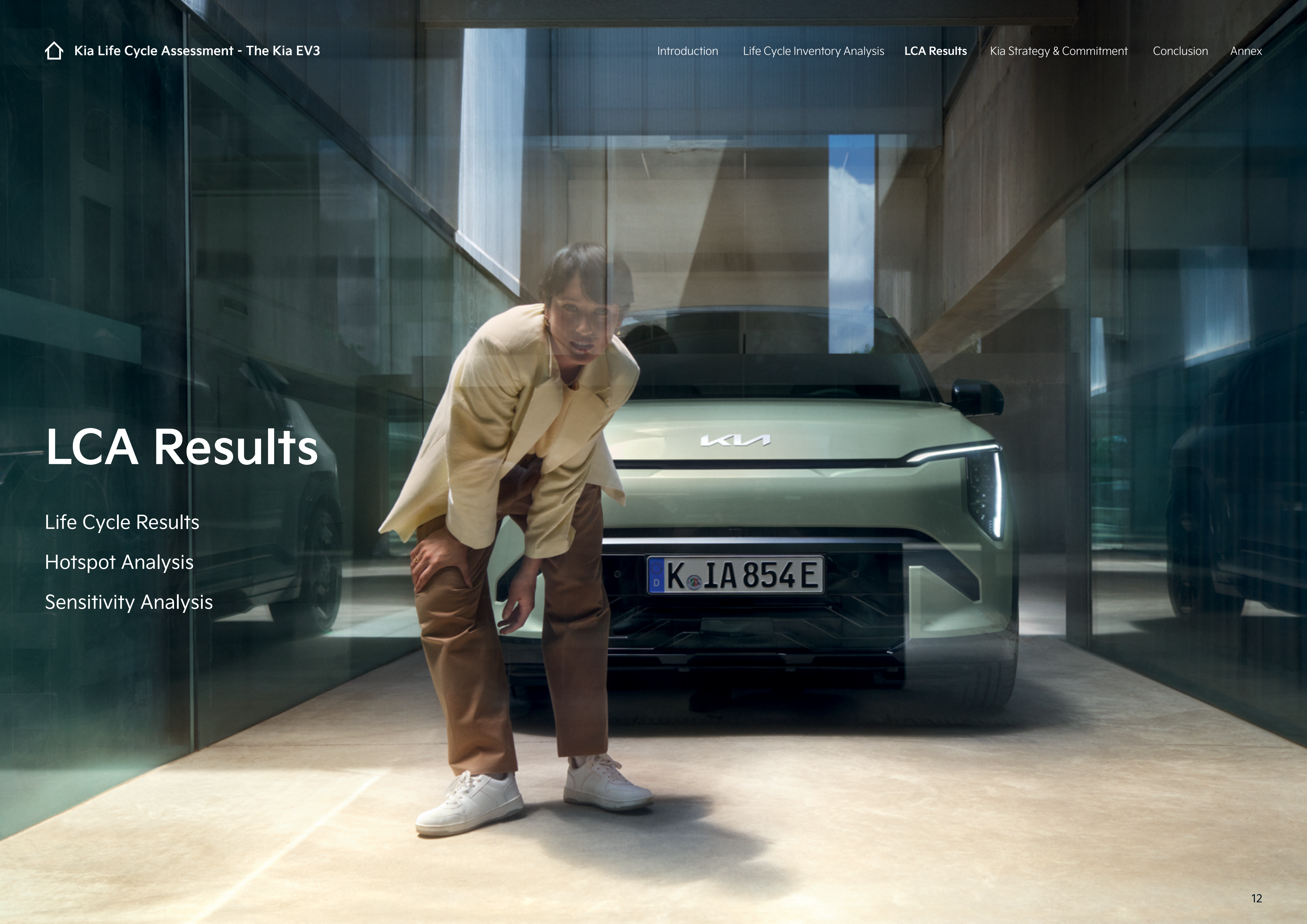
Circularity

This stage points to clear opportunities for improving circularity. Increasing the use of mono-material components, selecting metals and high-value polymers with proven recycling routes, and designing parts for easier disassembly can significantly reduce reliance on landfill in the future.

Kia complements this modelling with initiatives that extend vehicle life—such as battery repair and remanufacturing programs—because keeping vehicles on the road longer delays end-of-life processing and conserves resources.

End-of-Life Modelling
(For reference only)





LCA Results

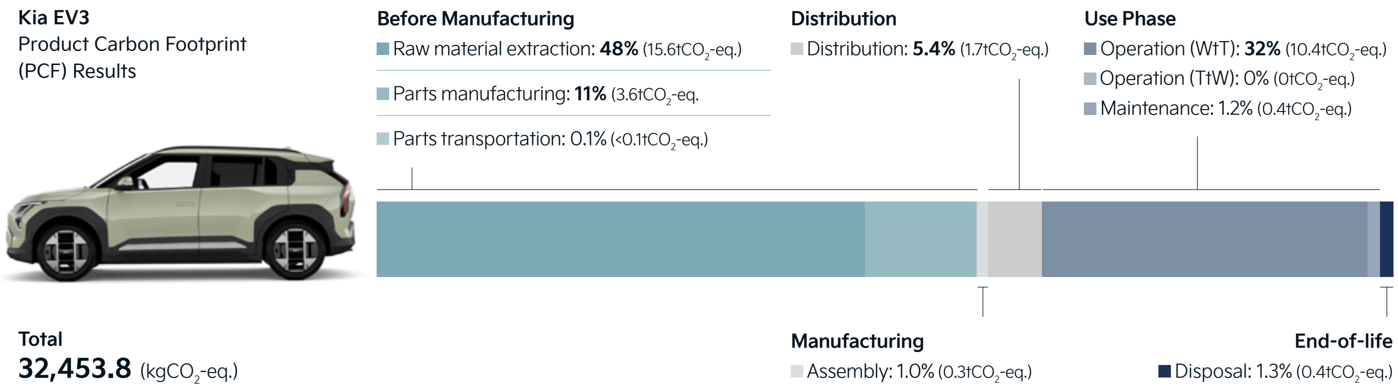
Life Cycle Results

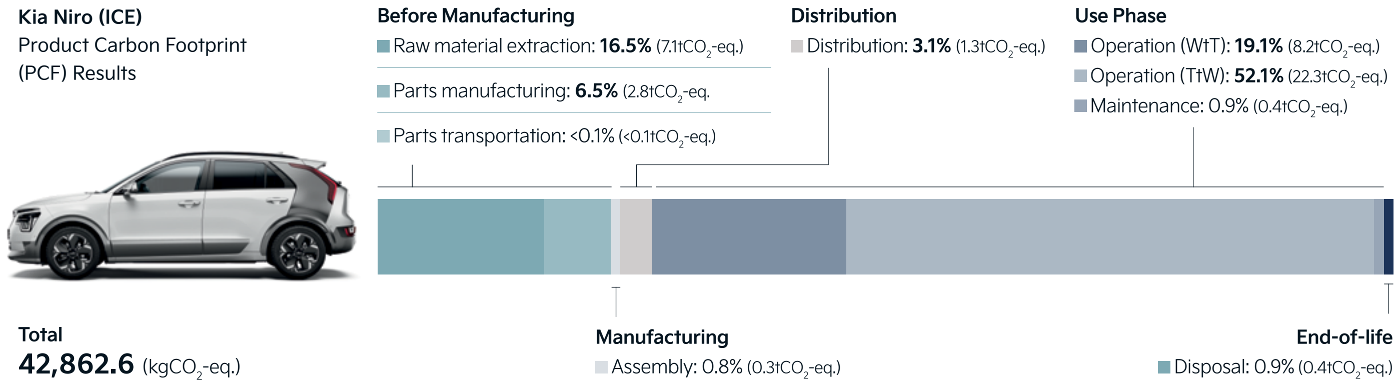
This section presents the Product Carbon footprint (PCF) results for the EV3 across its life cycle stages. Other impact categories result are provided in the Annex.

Assumptions Used

This assessment covers the full life cycle of one EV3 vehicle over a 200,000km lifespan, using the current European electricity mix for both manufacturing and charging. The primary impact category analysed is Global Warming Potential (CO_2eq.), while other impacts are detailed in the Annex. Results are based on the best available data at the time of the study, and only include 1 significant digit to reflect inherent uncertainties.

Comparison





Results

The cradle-to-grave carbon footprint of the EV3 is estimated at 32.5tCO_2eq. over its lifetime.

- Emissions are distributed across life cycle stages, with raw material extraction and refining contributing the largest share at **48%** (around 15.6tCO_2eq.), mainly due to the energy-intensive processes involved in lithium-ion NMC battery cells, BIW (body in white), wheels, and tires.
- Parts manufacturing contributes **11%** of the total emissions, with part transportation only adding marginal contributions, while distribution represents **5.4%** (about 1.7tCO_2eq).
- The use phase accounts for **33.2%** (approximately 10.7tCO_2eq.), driven by electricity generation for vehicle operation (WtT).
- Like part transportation, end-of-life processes only contribute minimal amounts.

For Comparison

A conventional gasoline SUV from Kia lineup (Niro) emits 42.9tCO_2eq over the same lifetime, meaning the EV3 achieves **24%** reduction in emissions under the baseline scenario. It is important to note that these results depend heavily on the electricity mix and assumptions used; increasing renewable energy in manufacturing and charging phases would further lower the footprint.

Analysis

The results indicate that the largest contributors to the EV3's carbon footprint are raw material extraction (including battery cells), followed by emissions from electricity generation during the use phase.

	Kia EV3	Kia Niro (ICE)
Process	**Value (kgCO_2-eq.)**	
Raw material extraction	15,570.9	7,068.1
Parts manufacturing	3,569.5	2,769.1
Parts transportation	41.8	17.3
Vehicle manufacturing	333.2	344.2
Distribution	1,739.1	1,346.6
Operation (WtT)	10,371.1	8,178.2
Operation (TtW)	0.0	22,347.3
Maintenance	394.5	406.3
End-of-life	433.6	385.4
Total	**32,453.8**	**42,862.6**

Hotspot Analysis

A "hotspot" is a material or component that has a significant impact on the total footprint. Identifying hotspots helps prioritise areas for future improvement.

The Kia EV3's environmental impact is driven by a few key materials and processes.

The battery cells alone account for approximately **46.7%** of the total footprint, reflecting the energy-intensive processes involved in cell manufacturing and raw material extraction.

Aluminium contributes about **26.0%**, largely because its production process is highly energy-intensive, requiring significant electricity for electrolysis and forming structural components.

Steel represents around **14.5%**, driven by its extensive use in the chassis and safety-critical structures. The high emission profile in steel production is driven by the primary smelting and refining processes. However, because steel is a permanent material, it serves as a valuable resource for closed-loop recycling at the end of the vehicle's life.

It is important to note that even though the life cycle inventory analysis shows steel has a higher physical weight in the vehicle, aluminium has a greater carbon impact because its production process consumes more energy per unit of material. These materials matter because they are fundamental to vehicle strength, durability, and crash safety, yet their production processes remain energy-intensive contributors to the life-cycle footprint.

Identifying these hotspots helps guide where material optimisation can deliver the most effective carbon-reduction opportunities.

Mitigation Action for Key Hotspots

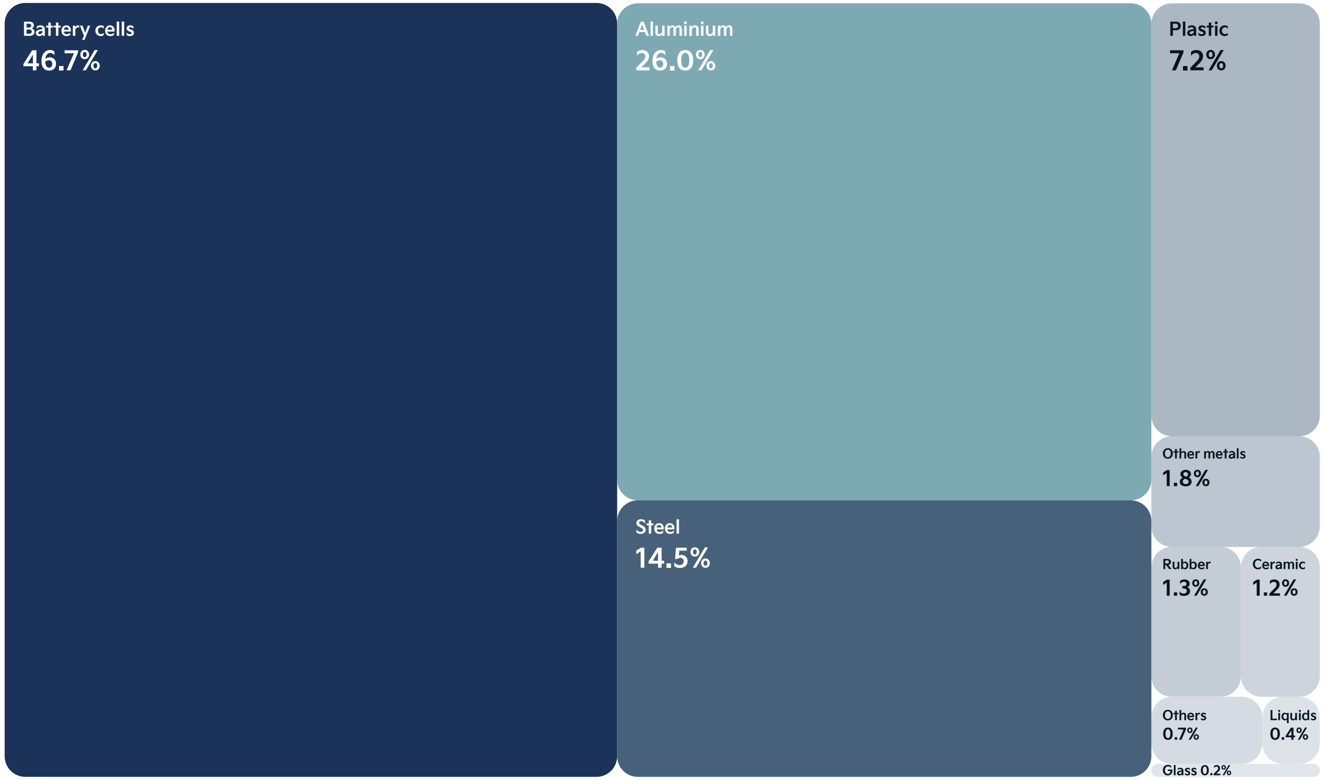
To address these impacts, Kia plans to use steel that emits approximately **20% less carbon** than conventional blast-furnace-produced steel by 2030, reflecting ongoing collaboration with suppliers developing lower-carbon production methods.

For aluminium, Kia is conducting material research and parts development to **expand the use of recycled content** where technically feasible, supported by partnerships with suppliers operating renewable-powered smelting processes.

Battery-related improvements focus on enhancing **energy efficiency** in cell manufacturing and expanding **closed-loop recycling** systems to recover critical materials such as lithium, nickel, and cobalt.

By targeting these hotspots Kia aims to **reduce upstream emissions** and accelerate the transition toward lower-carbon supply chains, ensuring that material choices align with **long-term climate objectives** and regulatory requirements.

Share of Climate Change Impact by Material (%)



Sensitivity Analysis

Grid Carbon Intensity

The carbon footprint of the EV3 during its use phase is directly influenced by the carbon intensity of the electricity used for charging.

Our analysis demonstrates that, depending on the local energy mix, use-phase emissions can vary significantly. For instance, charging the EV3 in regions with a high share of renewable energy (such as Norway) results in substantially lower emissions compared to regions where electricity generation is more carbon-intensive (such as Poland). Depending on the local grid mix, this can lead to differences of up to fourfold[1] in use-phase CO_2 emissions.

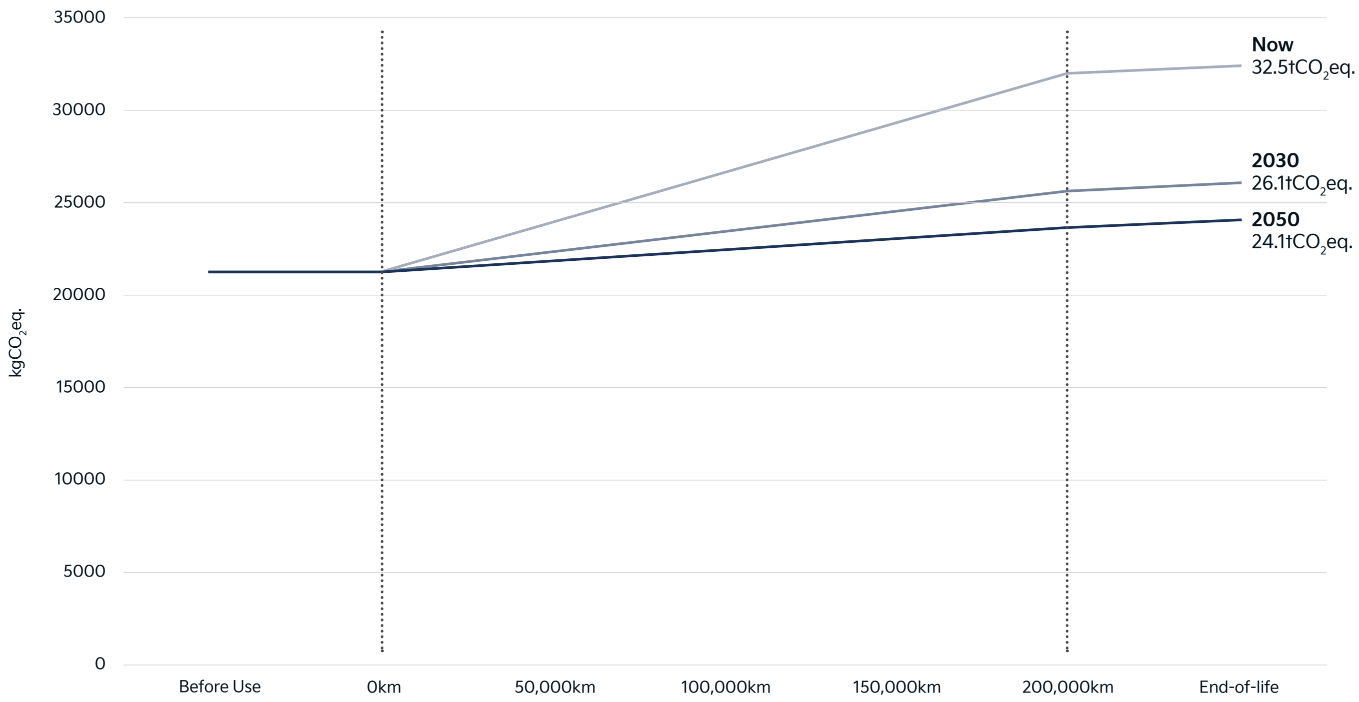
This sensitivity analysis underscores the importance of clean energy access in maximizing the climate benefits of electric vehicles.

To support this, Kia is actively investing in renewable energy procurement for manufacturing and is committed to expanding renewable energy charging solutions[2] for customers across Europe.

Analysis of the Use Phase under Different Grid Scenarios

Projected changes in the European electricity grid will significantly affect the EV3's total carbon footprint. As the grid transitions to higher shares of renewable energy, the emissions associated with vehicle use decrease accordingly.

Lifetime EV3 Carbon Footprint under different EU Electricty-mix Scenarios



Scenario derived from the policies already in place and those officially announced.
Source: Electricity grid mix future, Sphera.

2030 Scenario

With the EU grid expected to have at least 38% [3] lower CO_2 intensity due to increased renewables, the EV3's total life cycle footprint is projected to fall to approximately 26.1tCO_2eq.

2050 Scenario

Under a near-zero-carbon grid, the footprint could be reduced further to around 24.1tCO_2eq.

Each step toward grid decarbonisation leads to a proportional reduction in use-phase emissions, highlighting the importance of clean energy in reducing the carbon emissions of electric vehicles.

[1] ICCT,2023; EEA 2022

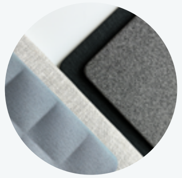
[2] By purchasing Guarantees of Origin (GoOs)

[3] Sphera

Kia Strategy & Commitment

Kia Strategy & Commitment

Materials & Circularity



Kia is integrating 10 material solutions across future vehicles.

Supplier Decarbonisation

Kia collaborates with Tier-1 suppliers to encourage increased use of renewable energy and improved efficiency.

Kia aims for key suppliers to commit to science-based targets (SBTs).

Manufacturing

Kia is committed to transitioning all manufacturing sites to 100% renewable energy by 2040.

Kia aims to reduce production site energy use by 20% by 2040.

Kia is increasing internal water reuse at AutoLand Slovakia by integrating part of the reverse-osmosis reject water into suitable production processes, reducing freshwater demand in the Paint Shop.

Use Phase & End-of-Life

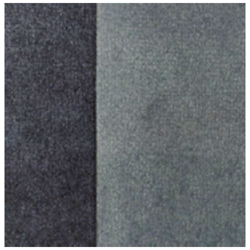
Kia purchases a renewable energy certificate for every charging session within the Kia Charge network in Europe.

Kia is expanding charging solutions with bi-directional capability for smarter energy use.

Kia is implementing battery repair*, remanufacturing, and second-life programs to extend life and reduce waste.

*Currently available in Europe as of report publication date.

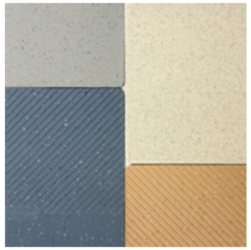
Kia has identified **10 material solutions.**

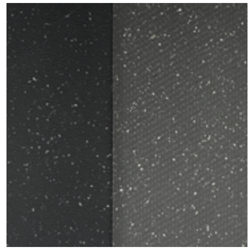

Recycled PET or fishing net carpet

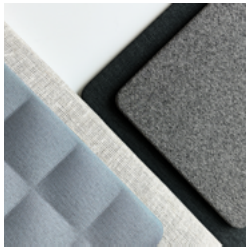

Bio PU foam


Bio paint

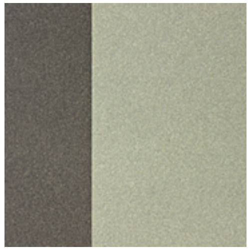

BTX free paint


Bio plastic


PCM™ plastic


Recycled PET fabric


Recycled PET yarns


Recycled PET felt


Bio PU

Kia's goal is to completely stop using leather and replace it with Bio PU (Bio Polyurethane). Bio PU has a similar feeling to leather and is highly durable.

Embedding Recycled Content into EV3 Design

Approximately 9.3kg of recycled plastics are used in interior components of the EV3.

For example, the non-woven PET in the floor carpet is made by at least 95% of recycled material.

In addition to recycled plastics, the EV3 incorporates about 2.8kg of bio-based materials, mainly derived from sugar cane and corn. These bio-based materials are used in selected interior components, including seat foams and trim parts. These materials are durable, but at end-of-life can be industrially composted or recycled again.

Continuous Improvement and Supplier Engagement

We are actively sourcing low-carbon materials and engaging with suppliers to accelerate adoption of advanced solutions like bio-polymers and bio-based coatings. Our strategy includes increasing recycled content and collaborating on innovations that reduce upstream emissions. These efforts will evolve as new technologies and materials become available, ensuring Kia remains aligned with long-term sustainability goals.

Material Solutions

EV3 Exterior

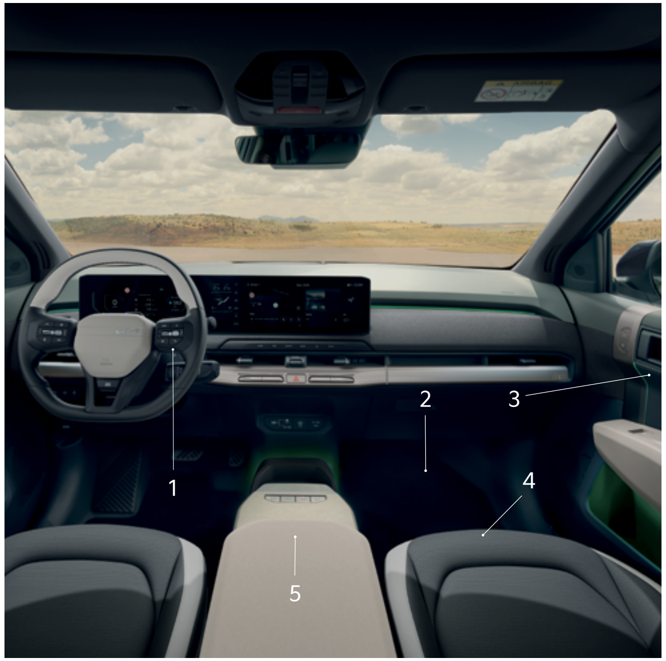
1 **Bumper Cover: 20%**
Recycled plastic from automotive waste

2 **Fender: 20%**
Recycled plastic from automotive waste

3 **Side Sill Moulding: 20%**
Recycled plastic from automotive waste

4 **Wheel Guard: 18%**
Recycled PET plastic from post -industrial waste

EV3 Interior



1 **Steering Wheel and Buttons: 10%**
Bio paint

2 **Floor Mats: 95%**
Recycled PET carpet

3 **Door Trim: 20%**
Bio TPO (Thermoplastic Olefins)

4 **Seat Covering: 20%**
Recycled PET fabric

5 **Center Console: 16%**
PCM™ plastic

The Ocean Cleanup

Together, Kia and The Ocean Cleanup have explored new ways of transforming what has been extracted from The Great Pacific Garbage Patch (GPGP) in the North Pacific Ocean into durable plastic products.

40% of the EV3 Trunk Liner is made of recycled plastics from The Ocean Cleanup.[1]

Disclaimer. The following % are based on the standard model. GT-Line and optional accessories might affect %. Recycled content refers to the mass of recycled material contained within plastic components. Component weights may include both recycled and virgin material. Bio-based content refers to the proportion of material derived from biological sources within within a component.

[1] This is a limited edition trunk liner. The product is composed of 40% recycled ocean plastic, 35% TPV and 25% inorganics/other additives.

Chemical Avoidance

Kia ensures compliance with hazardous-substance regulations through structured chemical management and development-stage audits.

Kia has implemented a policy to identify, manage, and reduce the use of dangerous or hazardous chemicals and substances in its products and manufacturing processes. The company is committed to complying with all relevant legislation, such as the EU's REACH directive, protecting human health and the environment from hazardous substances.

Kia undertakes the following efforts to ensure the EV3 complies with all hazardous substance regulations:

Management During the Development Stage

Chemical Audit Stage

Kia collects chemical information from all suppliers for every component and manages it in a database.

Development Stage

During the early development stages (prototype/pilot), key components are physically collected and analysed to verify the presence of hazardous substances.

Safety Compliance Stage

If a non-compliant component is identified, it is replaced with a safe, compliant alternative before mass production begins.

Future Plans

Going forward, Kia is strengthening its internal chemical management approach.

As part of this work, starting in 2027, POPs (Persistent Organic Pollutants) will be phased out from all Kia vehicles globally, regardless of whether a specific country has implemented the regulation in its domestic law.

EV Charging

The EV3 brings technology traditionally found in upper-segment vehicles to a broader audience. This includes features like advanced driver assistance systems, bi-directional charging capabilities (V2G, V2H, V2L), and state-of-the-art connectivity options.

Bi-directional Charging

This feature allows energy to flow both to and from an electric car's battery (EVs). This is unlike standard charging, known as unidirectional charging, which only draws electricity from the grid to charge the car. Bi-directional charging enables your EV to return electricity to your home, devices, and even the grid itself.

With the right equipment, an EV battery becomes a versatile energy storage system capable of storing energy when it's cheapest or cleanest and using it when it's most needed.

A bi-directional EV charger alternates between two primary functions

Charging

This is when the charger draws power from the grid or renewable energy sources, such as solar panels, to charge the EV battery.

Discharging

The charger sends stored energy from the vehicle back into a connected load, like your home, an appliance, or the electricity grid.

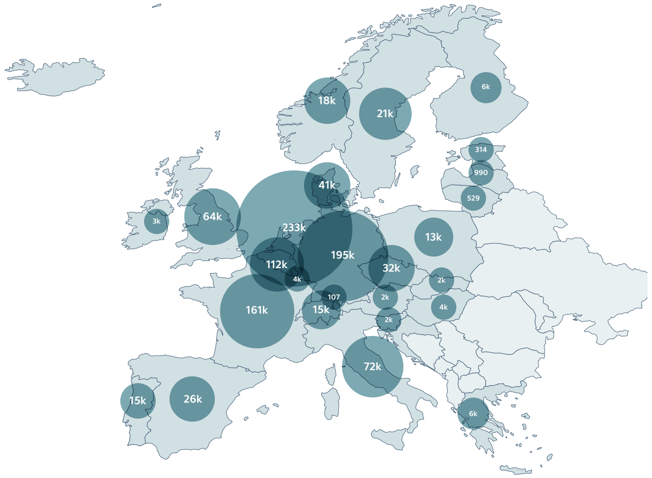
Specialised Hardware & Software

This functionality is made possible by specialised hardware and software, including an inverter for AC and DC (EVs) currents, which converts AC (used by homes) to DC (used by EV batteries), and vice versa. The technology provides the user with more freedom to use renewable energy where and when it is needed. However, it's worth noting that not all EVs or chargers support bi-directional charging, although the infrastructure is continuing to evolve and advance.

EV Charging

Charge Anywhere. Drive Everywhere.

Kia Charge and Kia Charge Business provide access to one of Europe's **largest charging networks**, supported by intuitive digital tools and advanced charging technology. With over 1,000,000 charging points, the system ensures a seamless charging experience through one app, one account, and effortless payment.



The Kia EV3 Long Range supports **ultra-fast DC charging**, achieving 10% to 80% in approximately 31 minutes[1] at high-power stations (up to 127kW effective speed). This enables quick stops and minimal downtime, whether for daily commutes or long-distance travel.

Charging Sessions with Kia Charge are supported by **renewable energy** through the purchase of Guarantees of origins (GoOs). For every kilowatt-hour charged, an equivalent amount of renewable electricity is credited to the grid.

For more information access kiacharge.com

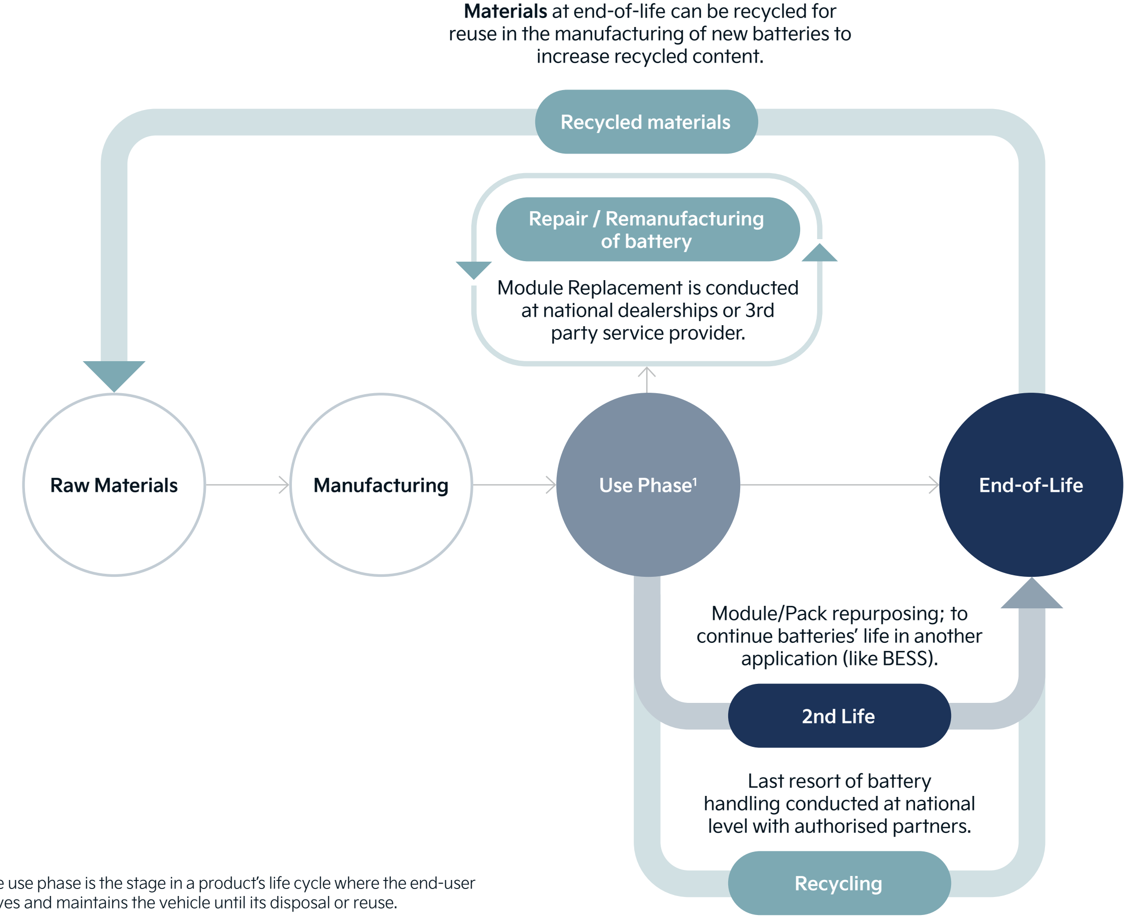
[1] Charging time is indicative. Real-life charging times may vary depending on conditions such as temperature, charger type, and battery state.

Circularity & End-of-Life Initiatives

To maximise the lifespan of vehicles, we prioritise battery repair and remanufacturing. This process allows us to refresh the battery's health at a modular level, securing the vehicle to stay on the road longer.

This 'life extension' approach ensures that we only move to repurposing or recycling once all options for maintaining the vehicles primary performance have been exhausted.

Circularity Initiatives



[1] The use phase is the stage in a product's life cycle where the end-user drives and maintains the vehicle until its disposal or reuse.

Partial Repair & Battery Remanufacturing Process

To maximise the value and utility of the materials within the vehicles, we employ a maintenance strategy centered on partial repair and re-manufacturing. Rather than viewing the battery as a single, consumable part, we treat a Battery System Assembly (BSA) as a modular asset that can be restored.

By replacing only a defective Battery Module Assembly (BMA) instead of the entire pack, the vehicle owner can reduce the cost and complexity of the maintenance while keeping a sustainable supply of high quality components.

This modular approach optimises the lifespan of the battery's raw materials. By extending the primary life of the battery through repair, the environmental impact associated with the battery's production is spread over a greater total kilometers driven, improving the overall lifecycle efficiency of the vehicle before it reaches the final repurposing/recycling stage.

Partial repair focuses on replacing only the defective module, restoring functionality quickly and efficiently when replacing the entire pack isn't necessary. This approach reduces unnecessary material waste because most of the battery remains in use, and it lowers repair costs by avoiding the expense of a full pack replacement. For drivers, that means a practical solution that keeps the vehicle on the road longer without compromising quality.

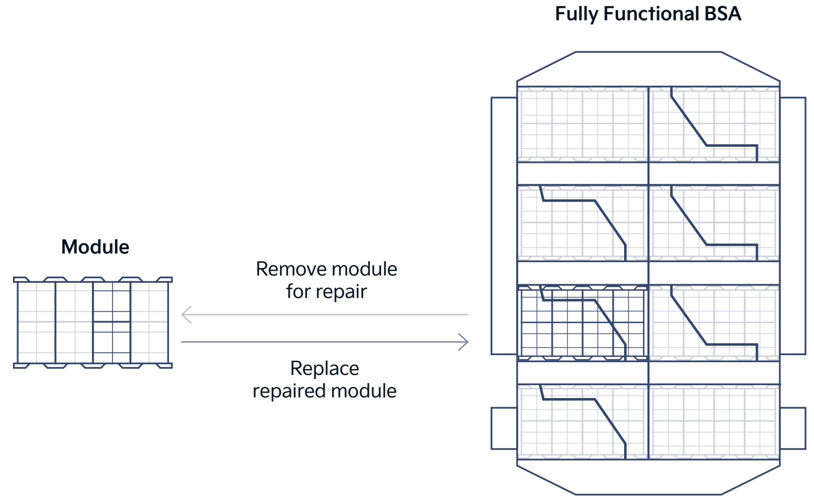
Remanufacturing takes this concept further. Instead of discarding used batteries, Kia analyses modules with remaining capacity and combines them to create a fully functional system. This process gives batteries a second life, prevents valuable components from being thrown away, and offers a more affordable alternative to new packs. For drivers, it is a way to extend vehicle life while supporting responsible resource use—delivering real value without unnecessary waste.

BSA - Battery System Assembly. The complete, integrated unit that includes the battery pack, the battery management system (BMS), and other related components for safe and efficient operation of the high-voltage battery system.

BMA - A component within a larger Battery System Assembly (BSA).

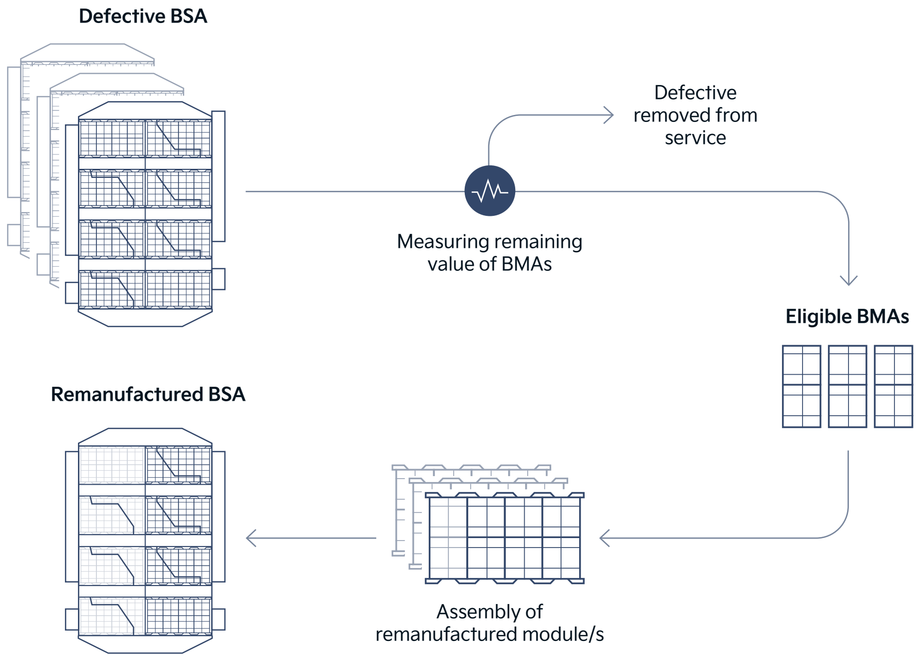
Partial Repair

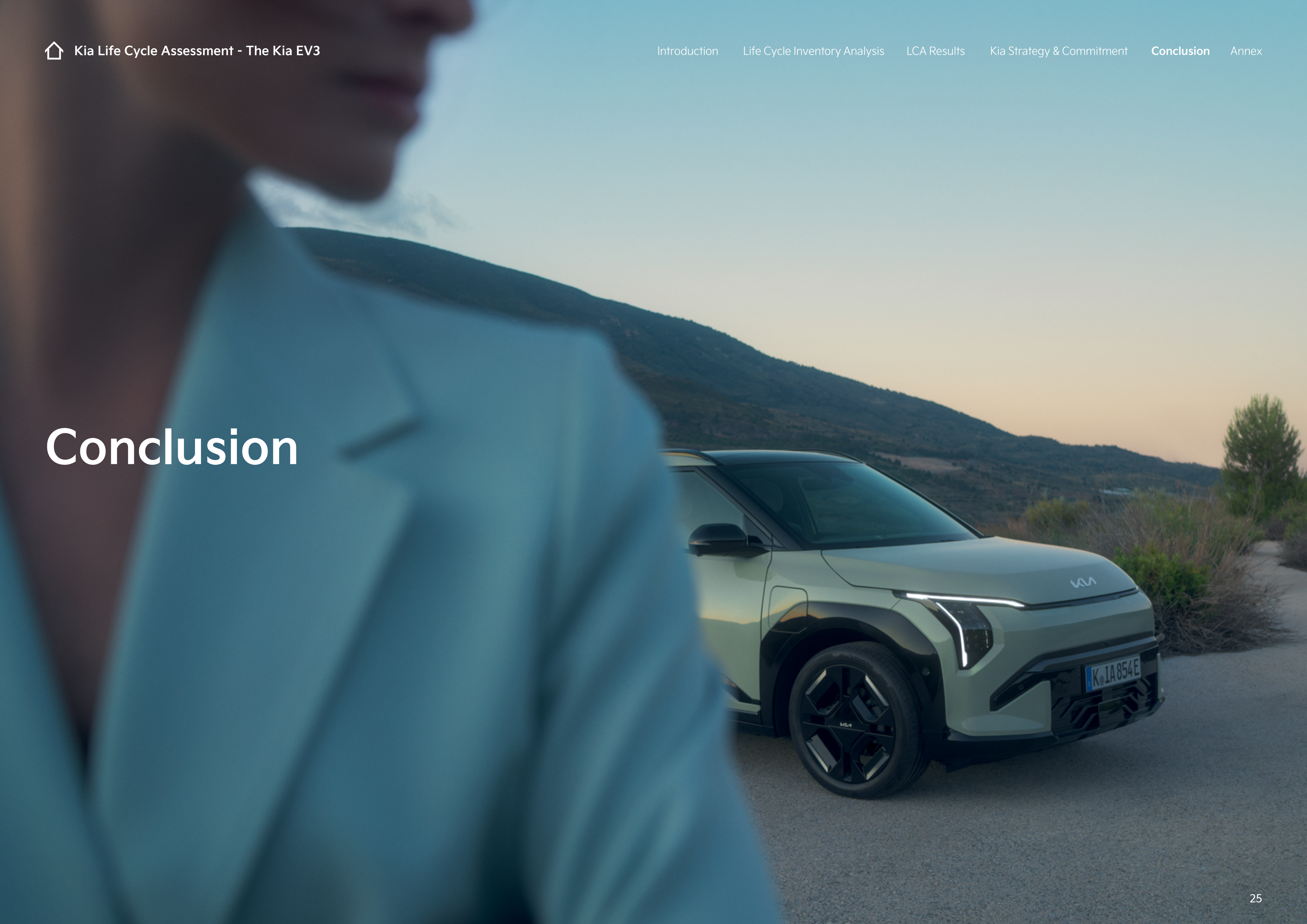
Replace defective BMA with new BMA to repair BSA.



Remanufacturing

Measure the remaining value in the BSA to work out what used BMAs are eligible to create a fully functional BSA.





Conclusion

Conclusion

The EV3 delivers a significant reduction in life-cycle carbon emissions compared to conventional combustion vehicles, especially when charged on renewable energy.

Its total carbon footprint (32.5tCO_2eq.) is dominated by use-phase electricity production and by the carbon-intensive processes of making its advanced materials such as the battery.

Life cycle analysis shows that, even when accounting for battery production, the EV3 has a lower overall carbon footprint than comparable internal combustion engine (ICE) vehicles.

These are the areas Kia is particularly tackling through its sustainability initiatives.

The use of fossil-free electricity is pivotal

It can cut the EV3's footprint by more than a quarter, based on LCA scenarios comparing average grid mix to renewable sources. This highlights the importance of clean energy in reducing the carbon emissions of electric vehicles.

Material Production

The battery is the main contributor in the raw material phase of the vehicle's lifecycle. However, with bold moves to decarbonise the supply chain (renewable energy in manufacturing of cells, steel, aluminium), battery recycling programs, and increase recycled content, these efforts are expected to reduce upstream emissions in future vehicle iterations.

Beyond Climate Impact

Kia is taking practical steps to deliver added value for customers. These include expanding Kia Charge and introducing bi-directional charging to enable smarter, more flexible energy use. Additionally Kia is:

- extending battery life through partial repair and remanufacturing to reduce waste and offer cost-effective solutions;
- minimising hazardous chemicals in the cabin while ensuring responsible end-of-life management for all vehicles;
- and strengthening end-of-life processes to support responsible handling and recovery of vehicle components.

Together, these initiatives reflect Kia's commitment to advancing sustainability through measurable actions that support both people and planet.

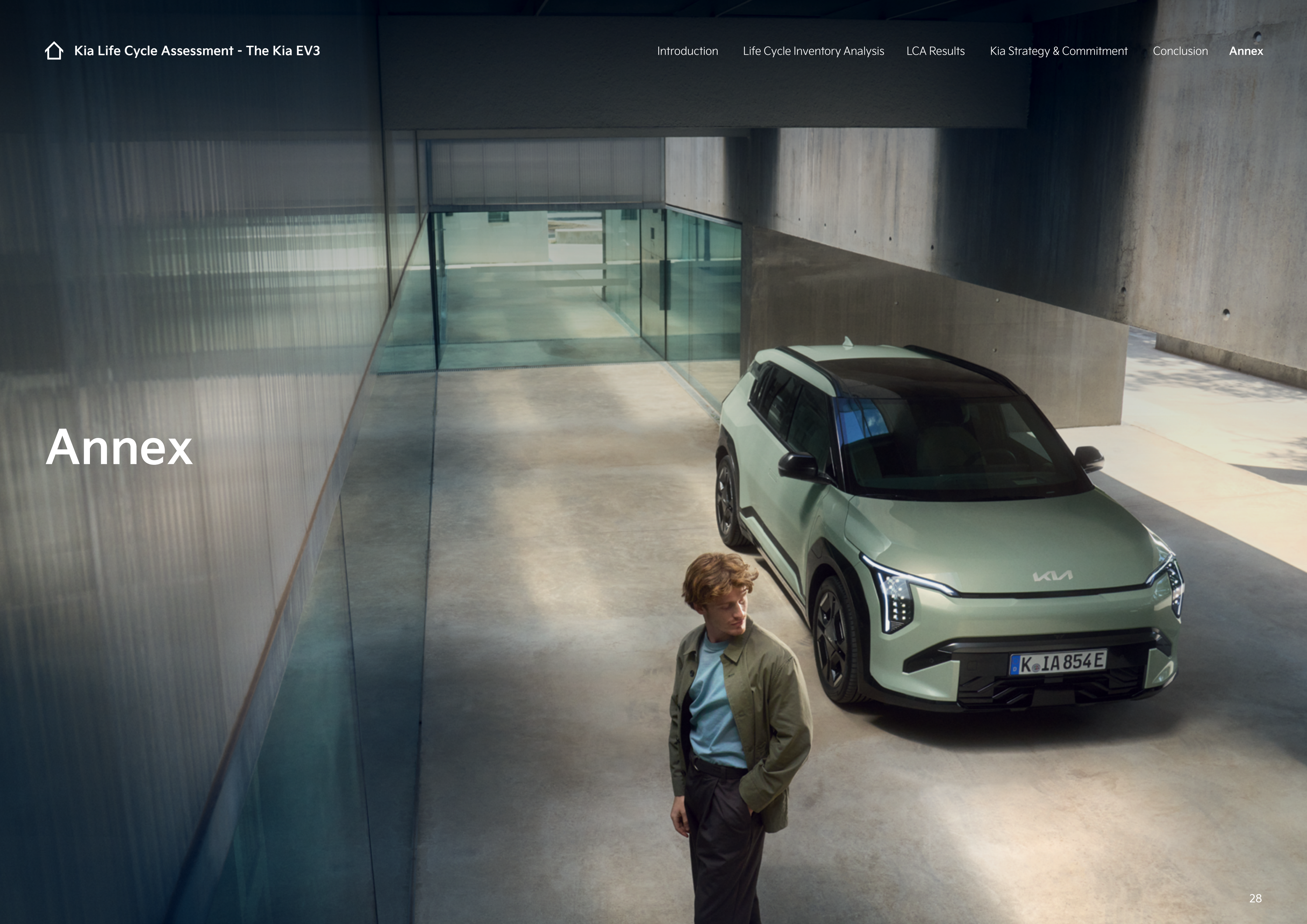
The EV3 represents Kia's ethos of "progress with responsibility."

The EV3's LCA will serve as a baseline and benchmark for future models: it has helped identify clear paths for improvement such as in extending battery life and increasing the use of bio-based and recycled materials.

Looking Forward

Kia will continue to make life cycle information available, ensuring transparency and supporting informed decision making. This ongoing commitment helps guide each subsequent model, aiming for an even lower carbon footprint and steering us toward our 2045 carbon-neutral pledge.

Annex



LCA Result Summary

Carbon Footprint

Process	kg CO_2-eq.	%
Raw material extraction	15,570.94	47.98
Parts manufacturing	3,569.53	11
Parts transportation	41.79	0.13
Assembly	333.17	1.03
Distribution	1,739.06	5.36
Operation (WtT)	10,371.14	32
Operation (TtW)	0.00	0.00
Maintenance	394.54	1.22
Disposal	433.57	1.34
Total	**32,453.783**	

Ozone Depletion

Process	kg CFC-11 eq.	%
Raw material extraction	4.50×10^{-5}	94.92
Parts manufacturing	1.26×10^{-8}	0.03
Parts transportation	5.75×10^{-12}	0.00
Assembly	1.25×10^{-9}	0.00
Distribution	2.70×10^{-10}	0.00
Operation (WtT)	2.33×10^{-7}	0.49
Operation (TtW)	0.00×10^{0}	0.00
Maintenance	4.59×10^{-7}	0.97
Disposal	1.70×10^{-6}	3.59
Total	**4.74×10^{-05}**	

Particulate Matter

Process	Disease incidences	%
Raw material extraction	1.47×10^{-3}	64.81
Parts manufacturing	4.01×10^{-5}	1.77
Parts transportation	7.91×10^{-6}	0.35
Assembly	3.65×10^{-6}	0.16
Distribution	5.14×10^{-4}	22.68
Operation (WtT)	1.85×10^{-4}	8.18
Operation (TtW)	0.00×10^{0}	0.00
Maintenance	1.74×10^{-5}	0.77
Disposal	2.90×10^{-5}	1.28
Total	**2.27×10^{-03}**	

Ionizing Radiation

Process	kBq U235 eq.	%
Raw material extraction	225.5	3.79
Parts manufacturing	254.4	4.27
Parts transportation	0.0	0.00
Assembly	25.4	0.43
Distribution	1.5	0.02
Operation (WtT)	5,441.1	91.33
Operation (TtW)	0.0	0.00
Maintenance	4.5	0.08
Disposal	5.0	0.08
Total	**5957.4**	

Photochemical Ozone Formation Human Health

Process	kg NMVOC eq.	%
Raw material extraction	43.81	40.43
Parts manufacturing	4.48	4.13
Parts transportation	0.48	0.44
Assembly	0.38	0.35
Distribution	43.92	40.53
Operation (WtT)	13.34	12.31
Operation (TtW)	0.00	0.00
Maintenance	0.98	0.90
Disposal	0.97	0.90
Total	**108.36**	

Acidification

Process	Mole of H+ eq.	%
Raw material extraction	142.30	69.82
Parts manufacturing	4.03	1.98
Parts transportation	0.44	0.22
Assembly	0.36	0.18
Distribution	32.13	15.76
Operation (WtT)	22.42	11.00
Operation (TtW)	0.00	0.00
Maintenance	1.15	0.57
Disposal	1.00	0.49
Total	**203.82**	

Eutrophication Terrestrial

Process	Mole of H+ eq.	%
Raw material extraction	138.29	34.11
Parts manufacturing	17.60	4.34
Parts transportation	2.20	0.54
Assembly	1.50	0.37
Distribution	179.50	44.28
Operation (WtT)	60.25	14.86
Operation (TtW)	0.00	0.00
Maintenance	2.98	0.74
Disposal	3.05	0.75
Total	**405.4**	

Eutrophication Freshwater

Process	kg P eq.	%
Raw material extraction	0.21	72.78
Parts manufacturing	0.00	0.29
Parts transportation	0.00	0.01
Assembly	0.00	1.42
Distribution	0.00	0.13
Operation (WtT)	0.02	7.54
Operation (TtW)	0.00	0.00
Maintenance	0.01	2.05
Disposal	0.05	15.79
Total	**0.29**	

LCA Result Summary

Eutrophication Marine

Process	kg N eq.	%
Raw material extraction	15.67	39.19
Parts manufacturing	1.60	4.00
Parts transportation	0.20	0.50
Assembly	0.15	0.37
Distribution	16.39	40.99
Operation (WtT)	5.38	13.44
Operation (TtW)	0.00	0.00
Maintenance	0.28	0.70
Disposal	0.32	0.81
Total	**39.99**	

Land Use

Process	Pt	%
Raw material extraction	19,535.35	17.91
Parts manufacturing	2,635.02	2.42
Parts transportation	114.21	0.10
Assembly	254.18	0.23
Distribution	196.40	0.18
Operation (WtT)	83,639.40	76.67
Operation (TtW)	0.00	0.0
Maintenance	424.71	0.39
Disposal	2,292.14	2.10
Total	**109,091.41**	

Water Use

Process	m^3 world eq.	%
Raw material extraction	5,007.97	64.95
Parts manufacturing	29.25	0.38
Parts transportation	0.08	0.00
Assembly	4.71	0.06
Distribution	1.55	0.02
Operation (WtT)	2,565.59	33.28
Operation (TtW)	0.00	0.00
Maintenance	49.91	0.65
Disposal	50.87	0.66
Total	**7,709.93**	

Resource Fossils

Process	MJ	%
Raw material extraction	201,912.72	39.56
Parts manufacturing	60,914.26	11.93
Parts transportation	541.28	0.11
Assembly	5,545.11	1.09
Distribution	22,883.33	4.48
Operation (WtT)	208,834.72	40.91
Operation (TtW)	0.00	0.00
Maintenance	7,727.11	1.51
Disposal	2,082.78	0.41
Total	**510,441.31**	

Resource Mineral/Metal

Process	kg Sb eq.	%
Raw material extraction	0.98	99.49
Parts manufacturing	0.97	0.02
Parts transportation	0.00	0.00
Assembly	0.00	0.00
Distribution	0.00	0.00
Operation (WtT)	0.00	0.22
Operation (TtW)	0.00	0.00
Maintenance	394.54	0.02
Disposal	433.57	0.25
Total	**0.98**	

Life Cycle References

Life Cycle Inventory Data

Life Cycle Stage	Source	Region	Database Name
Raw Material Acquisition	worldsteel	Asia	Steel cold rolled coil
	worldsteel	Asia	Steel wire rod
	worldsteel	Asia	Steel plate
	Sphera	RNA	Zinc ingot (electrolysis, 99,9%)
	Sphera	IN	Polyamide 6.6 granulate (PA 6.6) (HMDA from butadiene)
	Sphera	DE	Primer solvent-based
	worldsteel	Asia	Steel hot dip galvanised
	worldsteel	Asia	Steel hot rolled coil
	Ecoinvent 3.11	RoW	Cast iron production
	Sphera	IN	Polypropylene granulate (PP)
	Sphera	US	Thermoplastic polyurethane (TPU, TPE-U) adhesive
	IAI/Sphera	GLO	Aluminium ingot mix IAI 2019
	Sphera	IN	Polyoxymethylene granulate (POM)
	Sphera	DE	Ethylene Propylene Diene Elastomer (EPDM)
	Sphera	RER	Wood pellets (6.2% moisture; 5.8% H2O content) (EN15804 B6)
	Sphera	RER	Asphalt binder (EN15804 A1-A3)
	Sphera	DE	Seam sealing (PVC)
	Sphera	IN	Nitrile butadiene rubber (NBR, 33% acrylonitrile)
	Sphera	US	Carbon black (furnace black; general purpose) - thermal energy credit
	Ecoinvent 3.11	RoW	Steel production, electric, chromium steel 18/8
	Sphera	GLO	Copper mix (99,999% from electrolysis)
	Sphera	GLO	Silver mix
	Nickel Institute	GLO	Nickel (Class 1, >99.8% Nickel)
	Sphera	IN	Polyethylene high density granulate (HDPE/PE-HD)
	Sphera	IN	Polybutylene terephthalate granulate (PBT)
	Sphera	IN	Polyethylene terephthalate bottle grade granulate (PET) via PTA
	Sphera	DE	Silicone rubber (RTV-2, condensation)
	Sphera	IN	Styrene-butadiene rubber (S-SBR) mix
	Sphera	ES	Ferrite (MnZn ferrite)
	Sphera	CN	Iron oxide (ferrite) (Fe2O3), from iron ore in acid
	Sphera	JP	Lubricants at refinery
	Sphera	IN	Polyvinyl chloride granulate (S-PVC)
	Sphera	IN	Float glass
	Sphera	GLO	Gold mix (primary, copper and recycling route) <p-agg>

Life Cycle References

Life Cycle Inventory Data

Life Cycle Stage	Source	Region	Database Name
Raw Material Acquisition	Sphera	RNA	Lead (99,995%)
	Sphera	DE	Polyetherimide granulate (PEI)
	Euro-graph/ELCD	EU-25	Graphic Paper
	Sphera	IN	Polycarbonate granulate (PC)
	Sphera	US	Polyphenylene sulfide granulate (PPS)
	Sphera	IN	Acrylonitrile-butadiene-styrene granulate (ABS) mix
	Ecoinvent 3.11	GLO	Market for polyurethane, flexible foam, flame retardant
	Sphera	DE	PC 50% + PBT 50%
	Sphera	RER	Phenolic resin adhesive modified with nitrile rubber (approximation)
	Sphera	IN	Epoxy Resin (EP) Mix
	Sphera	US	Glass fibres
	Sphera	US	Ethylene Vinylacetate Copolymer (E/VA) (72% Ethylene, 28% Vinylacetate)
	Sphera	DE	PC 50% + ABS 50%
	Sphera	IN	Alumina
	worldsteel	Asia	Steel electrogalvanized
	Sphera	US	Polypropylene / ethylene propylene diene elastomer granulate (PP/EPDM, TPO, TPE-O)
	Sphera	GLO	Printed Wiring Board 4-layer rigid FR4 with chem-elec AuNi finish (Subtractive method)
	Sphera	IN	Polymethyl methacrylate granulate (PMMA)
	Sphera	IN	Natural rubber (NR) (incl. LUC emissions)
	Sphera	US	Sulphuric acid (37%)
	Sphera	IN	Polystyrene granulate (PS)
	Sphera	IN	Aluminium ingot (secondary)
	worldsteel	GLO	Steel seamless pipe
	Sphera	GLO	Titanium
	Sphera	DE	Deionised water 50% + EG 50%
	Sphera	IN	Polyester Resin (unsaturated) (UP)
	Sphera	DE	Grain leather seat cover (10 sqm/9.5 kg)
	Sphera	CN	Magnet Nd-Fe-Dy-B (high energy demand)
	CottonInc	GLO	Cotton fiber (bales after ginning)
	Sphera	CN	Lithium-ion NMC 622 battery cell, 220 Wh/kg energy density, 1kg
	Sphera	RER	Refrigerant 1234 ze production from Vinyl chloride monomer and carbon chloride via 240fa and 245fa
	Sphera	RER	Magnesium oxide (MgO, fine, filler)
	Sphera	DE	Deionised water 70% + Ethanol 30%
	IPA	GLO	Platinum, primary route

Life Cycle References

Life Cycle Inventory Data

Life Cycle Stage	Source	Region	Database Name
Parts Transportation	Sphera	GLO	Truck, Euro 4, more than 32t gross weight
	Sphera	GLO	Container ship, 5,000 to 200,000 dwt payload capacity, deep sea
Manufacturing	Sphera	KR	Electricity grid mix (2025)
	Sphera	JP	Thermal energy from natural gas
	Sphera	US	Process water from ground water
	Sphera	RER	Hazardous waste (high net calorific value) treatment mix (incineration and landfill)
	Sphera	US	Municipal wastewater treatment (mix)
Distribution	Sphera	GLO	Truck, Euro 4, more than 32t gross weight
	Sphera	GLO	Ro-ro-ship, 1,200 to 10,000 dwt payload capacity
Use	Sphera	RER	Electricity grid mix (2025)
	Sphera	RER	Electricity grid mix (2030)
	Sphera	RER	Electricity grid mix (2050)
EoL	Ecoinvent 3.11	RoW	Treatment of metal scrap, mixed, for recycling, unsorted, sorting
	Sphera	RER	Ferrous metals in waste incineration plant
	Sphera	RER	Ferrous metals on landfill
	Ecoinvent 3.11	RoW	Treatment of aluminium scrap, post-consumer, by collecting, sorting, cleaning, pressing
	Sphera	DE	Non-ferrous metals, aluminium, more than 50μm in waste incineration plant
	Sphera	RER	Inert matter (Aluminium) on landfill
	Sphera	DE	Non-ferrous metals (others) in waste incineration plant
	Ecoinvent 3.11	RoW	Treatment of waste polyethylene terephthalate, for recycling, unsorted, sorting
	Sphera	DE	Plastics (unspecified) in waste incineration plant
	Sphera	RER	Plastic waste on landfill
	Ecoinvent 3.11	RoW	Treatment of waste glass sheet, collection for final disposal
	Sphera	RER	Inert waste in waste incineration plant
	Sphera	RER	Inert matter (Glass) on landfill
	Ecoinvent 3.11	RoW	Treatment of waste paperboard, unsorted, sorting
	Sphera	RER	Paper and board (water 0%) in waste incineration plant
	Sphera	RER	Paper waste on landfill
	Ecoinvent 3.11	RoW	Treatment of waste brick, recycling
	Sphera	RER	Commercial waste in municipal waste incineration plant
	Sphera	RER	Commercial waste (AT, DE, IT, LU, NL, SE, CH) on landfill
	Sphera	US	Populated printed wiring board (after ROHS) in waste incineration plant (0% H_2O content)

CERTIFICATE

HYUNDAI KIA

Certificate-ID:	C01-2025-10-21273583
Certificate for:	**Life Cycle Assessment Methodology of Hyundai Motor Company / KIA Corporation**
Certificate Holder:	Hyundai Motor Company / KIA Corporation 37, Cheoldobangmulgwan-ro, Uiwang-si, Gyeonggi-do, 16082, Korea
Applied Standards / Guides / Criteria:	• ISO 14040:2006 + A1:2020 • ISO 14044:2006 + A1:2018 + A2:2020
Accounting Scope:	Life Cycle Assessment (LCA) method of products Hyundai Motor Company / KIA Corporation
System Boundary:	Cradle-to-Grave
Review Report:	CF-2025-10-21273583
Valid until:	2026-09-30

TÜV Rheinland hereby certifies that Life Cycle Assessment Methodology, developed by Hyundai Motor Company / KIA Corporation, is scientifically based and reflects the state of arts, and complies with the requirements of ISO 14040:2006 + A1:2020 and ISO 14044:2006 + A1:2018 + A2:2020.The approach and principles behind the methodology are generally appropriate for the assessment of potential environmental impacts of the products considered. Furthermore, the data used is appropriate for the goal and scope of the method. Necessary recommendations for the documentation and the methods were discussed and were implemented by Hyundai Motor Company / KIA Corporation. From this point onward, TÜV Rheinland recommends the continuous enhancements of the methodology in line with advancements in science, technology and industry-specific developments, and its adaptation as necessary to ensure ongoing relevance and robustness. Specifications and assessment limits can be found in the review report. The validity of this certificate can be viewed by scanning the QR code or entering the test mark ID at www.certipedia.com.

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Cologne, 21 October 2025

S. Kammerer | Ran Tao

Simon Kammerer
TÜV Rheinland Energy & Environment GmbH
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Abbreviations

AC	Alternating Current
BEV	Battery Electric Vehicle
BESS	Battery Energy Storage System
PU	Polyurethane
BMA	Battery Module Assembly
BMS	Battery Management System
BSA	Battery System Assembly
CFC-11eq.	Chlorofluorocarbon-11 equivalent
CO_2	Carbon Dioxide
CO_2eq.	Carbon Dioxide equivalent
DC	Direct Current
EoL	End-of-Life
GHG	Greenhouse Gas
GoOs	Guarantees of Origin
GWP	Global Warming Potential
HVB	High-voltage Batteries
ICCT	International Council on Clean Transportation
ICE	Internal Combustion Engine
IMDS	International Material Data System
kBq	U235 eq. Kilobecquerel Uranium-235 equivalent
KwH	Kilo-watt Hour
LCA	Life Cycle Assessment
LCIA	Life Cycle Impact Assessment
NM3	Normal Cubic Meter
NMVOCeq.	Non-methane Volatile Organic Compounds equivalent
PCF	Product Carbon Footprint
PCM	Post Consumer Material
PET	Polyethylene Terephthalate
POPs	Persistent Organic Pollutants
Pt	Points (unit for land use)
RE100	Renewable Energy 100 (global initiative for 100% renewable electricity)
REACH	The Regulation on the registration, evaluation, authorisation and restriction of chemicals
RED	Renewable Energy Directive
SBT	Science-based Target
Sb eq.	Antimony equivalent
SUV	Sport Utility Vehicle
TPO	Thermoplastic Olefin
TtW	Tank-to-Wheel
VAATZ	Value Advanced Automotive Trade Zone
VAT	Value added tax
V2X	Vehicle-to-everything
WLTP	Worldwide Harmonized Light Vehicles Test Procedure
WtT	Well-to-Tank
WtW	Well-to-Wheel

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