EPD®

Environmental product declaration

According to ISO 14025 for:

IRIZAR I4 COACH

Programme	*The International EPD® System* www.environdec.com
Programme operator	*EPD International AB*
Registration number	*S-P-01571*
Publication date	*2019-05-17*
Validity	*2024-05-17*
Scope	*Cradle-to-grave*
Geographical validity	*Global*
Product category rules	*PCR 2016:04 – UN CPC 49112* *Public and private buses and coaches. Ver 1.2*

Irizar

lighting the road

1. IRIZAR

Irizar is the parent company of a leading business group in the bus and coach sector and a benchmark in the sectors of electronics, communications (ITS solutions) and rotating machinery.

With over 3,300 employees, the Irizar Group operates through five coach and bus production plants (Spain, Morocco, Brazil, Mexico and South Africa) and six other companies involved in different sectors in Spain, as a result of its industrial diversification policy. It also has its own R&D Centre with a long-term focus on the applied research process and the technological development of proprietary products and systems.

The group's headquarters are located in the town of Ormaiztegi in Gipuzkoa (Spain), where Creatio, the Irizar Group Research and Development Centre, is also located.

Figure 1.- Irizar headquarters - Ormaiztegi

With a turnover exceeding 620 million euros a year, our group enjoys a commercial presence in over 90 countries on five continents.

Founded in 1889, stronger and younger than ever, nowadays Irizar is a solid, geographically and industrially diversified and continuously growing Group; it is firmly committed to the brand, technology and sustainability, to its own-brand products in both electric coaches and buses and to other products in the sectors in which it operates.

Irizar's business management system is certified according to the following international standards:

- ISO 9001:2008 – Quality management systems
- ISO 14001:2015 – Environmental management systems

2. IRIZAR I4 INTEGRAL

The product system analysed is the Irizar i4 integral coach. Irizar's versatility also extends to urban and intercity spaces and makes them the ideal environment for the Irizar i4 to showcase its features and personality. The result is a vehicle that is at home in the city, ideal as a metropolitan, commuter, school or business transport coach. It is now also available in a class II hybrid version with luggage compartment.

The different versions of this vehicle place an emphasis on accessibility. The doors, which come in a number of options, enable lifts to be installed that facilitate access for persons with reduced mobility. The floors, which can be flat or lowered, and the unobstructed aisles underline the concept of adaptability. The coach maintains all the standards of quality, comfort, reliability and safety that define the entire Irizar range, and complies with the R/66.01-02 regulations.

Figure 2.- Irizar i4

Its high degree of adaptability to the needs of customers and users is the main defining feature of the Irizar i4. Available in different lengths, ranging from 9.4 m to 15 m, and with a range of finishes and floor heights, the different versions of the Irizar i4 aim to meet the specific requirements of operators and passengers.

Avoiding problems on the road is a priority for every Irizar vehicle. Like the brand's other models, the Irizar i4 complies with the R/66.02 safety regulations and is equipped with the most advanced active safety systems in order to ensure stability and minimise risk in unforeseen circumstances.

At Irizar we know that fuel is the major cost component for operators, so we have made every effort to reduce consumption. The new generation of DAF EURO VI OBD-C engines with reduced internal friction, modified fuel injection system and other refinements, together with the software of the 6-speed automatic transmission.

The aerodynamic design of the unit is another thing that sets the brand apart. With a lower coefficient of air friction due to a narrower front with less air intake, the spare wheel cowling, reduced weight by using high-tensile steels, and the alloy wheels, all contribute to the fact that the Irizar i4 is the most efficient coach in the luxury sector when it comes to fuel consumption.

Another factor that affects maximum profitability are repair and maintenance costs. Service intervals have been extended and we have also made great strides in reducing the cost of serviceable parts and coachwork. Moreover, we can equip coaches with the most advanced technology for comprehensive monitoring and control of costs and efficiency, which helps transport companies to optimise the performance and profitability of each fleet.

2.1. TECHNICAL DESCRIPTION OF THE VEHICLE

When making the life cycle assessment of the Irizar i4, a specific vehicle configuration was selected between the different available options within the i4 portfolio. The analysed coach is the integral i4 version, 12.92 meters long with single door and MX-11 EURO6 engine. This vehicle belongs to the M3 category, having more than 5 seats and weighting more than 5 tons.

GROUP	CONCEPT	VALUE
CHASIS	DENOMINATION	Irizar 2EJ. TR240KWIND.E6-CECOL
	LENGHT	12.92 m
	WIDTH	2.55 m
	CAPACITY	55 passengers
	DRIVER CABIN POSITION	Front
ENGINE	DENOMINATION	DAF MX11 E6
	FUEL	Diesel
	NOMINAL POWER	240 kW
	MAXIMUN TORQUE	1400Nm
	CYLINDERS	6
	EMISSION COMPLIANCE	EURO 6
	ENGINE POSITION	Rear
AXLES	AXLES	2
	WHEELS	4
	FRONT AXLE LOAD (MAX)	7500 Kg
	REAR AXLE LOAD (MAX)	12600 Kg
	DISTANCE BETWEEN AXLES	6820 mm
	FRONT LEDGE	2690 mm
	REAR LEDGE	3410 mm
STEERING CONTROL	DENOMINATION	BOSCH STEERING
	WHEEL LOCK	52.5º
	TURN DIAMETER	23.898 m
GEARBOX	DENOMINATION	ZF Ecolife
	SPEEDS	6
	TRANSMISSION	Automatic
BRAKE SYSTEM	DENOMINATION	Knorr SN7
SUSPENSION	DENOMINATION	Koni
	TYPE	ECAS – Electronically controlled air suspension
SECURITY	SYSTEMS	EBS, ABS, ASR, ESC, BFD
AIR CONDITIONER	DENOMINATION	IRIZAR HISPACOLD

Table 1.- Technical description of the vehicle

2.2. IRIZAR I4 CONTENT DECLARATION

GROUP	ANALYSED WEIGHT (KG)	THEORETICAL WEIGHT (KG)
POWERTRAIN	4.565,47	14.250,71
FRAME	3.071,30	
ROOF	1.342,61	
PLATINGS / INNER ZONES	1.886,08	
DOORS	92,30	
REFINEMENTS	3.219,04	
TOTAL	**14.176,79**	**ASSESSED % → 99,48%**

Table 2.- Weight breakdown – i4 coach

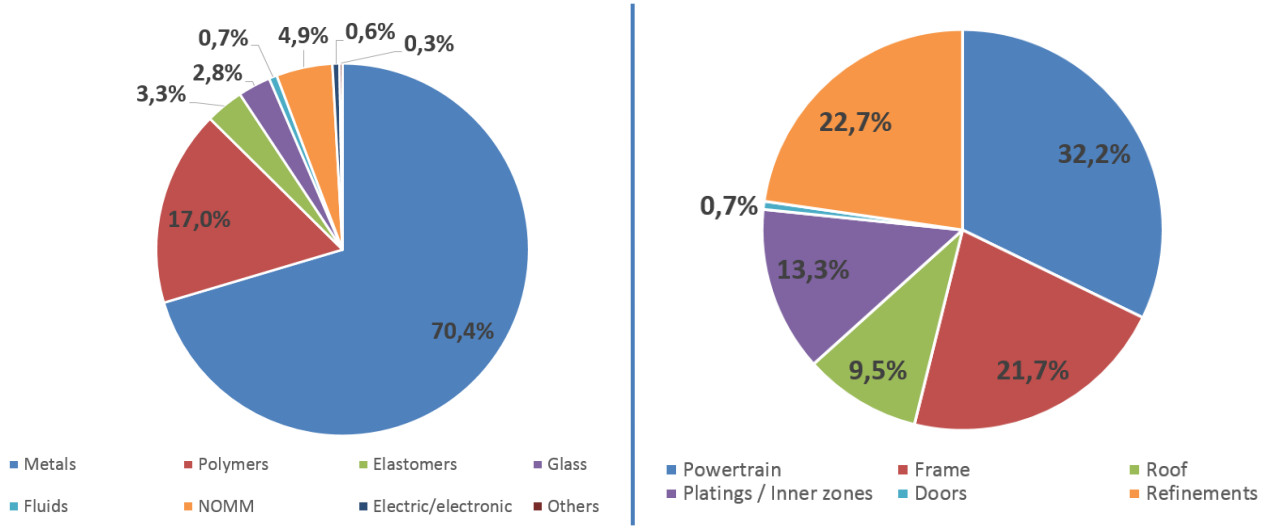

Figure 3.- Content declaration and weight breakdown

3. ANALYSED SYSTEM SCOPE

3.1. FUNCTIONAL UNIT

"Transport 1 passenger along 1 Km in the Irizar i4 integral coach"

Given that the Irizar i4 coach is designed for interurban routes, the annual intensity of use for the product was calculated considering that specific scenario.

SCENARIO	PASSENGER CAPACITY	KM / YEAR	SERVICE LIFE	PASSENGERS*KM
INTERURBAN	55	110.000	12 years	72.600.000

Table 3.- Reference flow

3.2. SYSTEM BOUNDARIES

The following diagram, shows a summary of the different life cycle aspects included in the analysis of the Irizar i4 coach. The life cycle stages, have been divided in 3 different phases known as upstream, core and downstream, as required by the specific requirements set in PCR 2016:04 – UN CPC 49112 - Public and private buses and coaches. Ver 1.2.

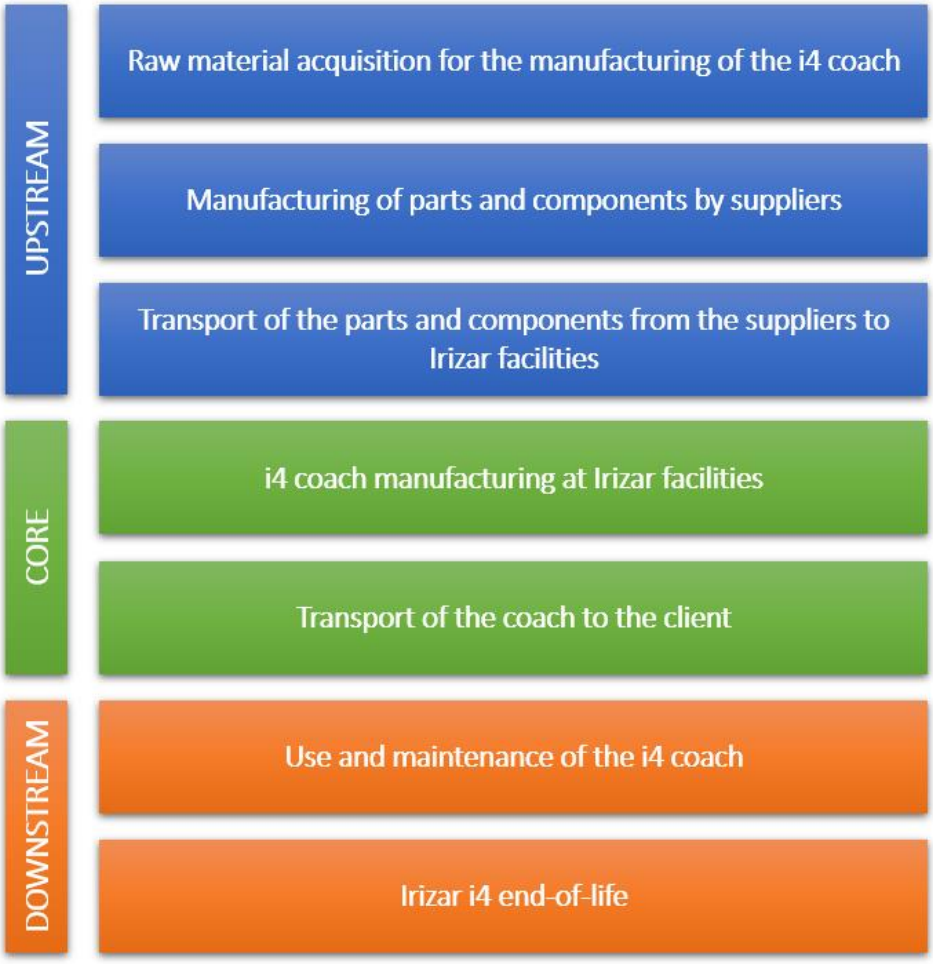

Figure 4.- Life cycle stages

4. ECO-PROFILE

USE OF RESOURCES		1 P*KM TRANSPORTED			
CONCEPT	UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
PRIMARY ENERGY RESOURCES - RENEWABLE					
USED AS ENERGY CARRIER	MJ, net calorific value	8,61E-04	1,93E-04	1,32E-03	**2,37E-03**
USED AS RAW MATERIAL	MJ, net calorific value	3,23E-04	4,69E-05	5,13E-04	**8,82E-04**
TOTAL	MJ, net calorific value	1,18E-03	2,40E-04	1,83E-03	**3,25E-03**
PRIMARY ENERGY RESOURCES - NON-RENEWABLE					
USED AS ENERGY CARRIER	MJ, net calorific value	9,30E-03	3,01E-03	3,40E-01	**3,53E-01**
USED AS RAW MATERIAL	MJ, net calorific value	1,33E-03	8,02E-05	-	**1,41E-03**
TOTAL	MJ, net calorific value	1,06E-02	3,09E-03	3,40E-01	**3,54E-01**
OTHER RESOURCES					
SECONDARY MATERIALS	Kg	6,56E-05	-	-	**6,56E-05**
USE OF NET FRESHWATER	m^3	5,58E-06	1,14E-06	2,39E-05	**3,06E-05**

Table 7.- Use of resources

OUTPUT FLOWS		1 P*KM TRANSPORTADO			
CONCEPT	UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
Materials for recycling	Kg	-	2,94E-07	1,87E-04	**1,87E-04**
Materials for energy recovery	Kg	-	1,55E-06	4,34E-06	**5,89E-06**

Table 8.- Output flows

WASTE MANAGEMENT		1 P*KM TRANSPORTADO			
CONCEPT	UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
Hazardous waste disposed	Kg	1,60E-07	2,72E-08	9,23E-08	**2,79E-07**
Non-hazardous waste disposed	Kg	1,61E-04	3,93E-05	1,43E-04	**3,43E-04**
Radioactive waste disposed	Kg	1,97E-08	1,13E-08	2,31E-06	**2,34E-06**

Table 9.- Waste management

POTENTIAL ENVIRONMENTAL IMPACTS			1 P*KM TRANSPORTADO			
CONCEPT		UNIT	UPSTREAM	CORE	DOWNSTREAM	TOTAL
Global warming potential	Fossil	Kg CO_2 eq	6,21E-04	1,62E-04	2,20E-02	**2,28E-02**
	Biogenic	Kg CO_2 eq	1,95E-05	1,11E-05	4,75E-05	**7,81E-05**
	Land use / Land transformation	Kg CO_2 eq	1,56E-06	5,57E-07	1,81E-06	**3,92E-06**
	TOTAL	Kg CO_2 eq	6,42E-04	1,74E-04	2,21E-02	**2,29E-02**
Acidification potential		Kg SO_2 eq	3,75E-06	7,62E-07	1,83E-04	**1,88E-04**
Eutrophication potential		Kg PO_4^{3-} eq	2,38E-06	1,58E-07	3,26E-05	**3,51E-05**
Formation potential of tropospheric ozone		Kg NMVOC eq	2,55E-06	4,78E-07	2,53E-04	**2,56E-04**
Abiotic depletion potential – Elements		Kg Sb eq	4,02E-08	3,08E-10	5,10E-09	**4,56E-08**
Abiotic depletion potential – Fossil resources		MJ, net calorific value	8,41E-03	2,58E-03	3,38E-01	**3,49E-01**
Ozone layer depletion		Kg CFC-11 eq	5,05E-11	2,16E-11	4,08E-09	**4,16E-09**

Table 10.- Potential environmental impacts

5. OTHER ENVIRONMENTAL INFORMATION

SOURCE	INDICATOR	VALUE	UNIT
WHSC TEST	FUEL CONSUMPTION	198,0	g / kWh
	CO_2 EMISSIONS	623,0	g / kWh
	PM EMISSIONS	0,82	mg / kWh
	NO_X EMISSIONS	21,79	mg / kWh
	CO EMISSIONS	0,94	mg / kWh
WHTC TEST	FUEL CONSUMPTION	210,1	g / kWh
	CO_2 EMISSIONS	644,0	g / kWh
	PM EMISSIONS	1,39	mg / kWh
	NO_X EMISSIONS	133,44	mg / kWh
	CO EMISSIONS	66,49	mg / kWh
ECE REGULATION N°51	MOVING SOND LEVEL	78	dB(A)
	STATIONARY SOUND LEVEL	88	dB(A)
ISO 22628	RECICLABILITY RATIO	96,03	%
	RECOVERABILITY RATIO	98,26	%

Table 12.- Other environmental indicators

6. INFORMATION ON THE VERIFICATION SYSTEM

The company declaring the EPD is the unique responsible for the content of this EPD.
EPDs of the same product category but from different programmes may not be comparable.

Programme	The International EPD® System EPD International AB Box 210 60 SE-100 31 Stockholm (Sweden) www.environdec.com info@environdec.com
Registration number	S-P-01571
Publication date	2019-05-17
Validity	2024-05-17
Geographical scope	Global
Reference year for the data used	2017
Scope	Cradle-to-grave
Product Category Rules (PCR)	PCR 2016:04 Public and private buses and coaches. Ver 1.2
Review of the Product Category Rules (PCR) conducted by	The Technical Committee of the International EPD® System Chair: Massimo Marino Contact via: info@environdec.com
Product Category Rules (PCR) prepared by	The Technical Committee of the International EPD® System PCR Moderator: Gorka Benito Alonso – IK INGENIERIA. Contact via: g.benito@ik-ingenieria.com
Product group code	UN CPC 49112 Public-transport type passenger motor vehicles
Independent verification of the data and declaration, as per ISO 14025:2006	☐ EPD process verification ☒ EPD verification
The procedure for monitoring the EPD during its validity period requires external verification	☐ Yes ☒ No
Verifying entity	Tecnalia R&I Certificación, S.L. Verifier: Elisabet Amat eli.amat@tecnaliacertificacion.com ENAC. Accred. number 125/C-PR283
LCA study conducted by	IK-Ingeniería www.ik-ingenieria.com
Name of the company and contact	Irízar S.Coop. Zumarraga Bidea, 8, 20216 Ormaiztegi, Gipuzkoa (SPAIN) +34 943 80 91 00 www.irizar.com

Table 13.- Information on the verification system

7. EXTERNAL REFERENCES

Irizar group
www.irizar.com

Irizar i4 catalogue
www.irizar.com/descargas/catalogos/irizar-i4-catalogo

Additional information on the International EPD® System
www.environdec.com

The International EPD® System is based on a hierarchical approach using the following international standards:

- ISO 9001, Quality management systems
- ISO 14001, Environmental management systems
- ISO 14040, LCA - Principles and procedures
- ISO 14044, LCA - Requirements and guidelines
- ISO 14025, Type III environmental declarations

www.iso.org

Database used for the LCA:
EcoInvent 3.3 Database, published by the Swiss Centre for Life Cycle Inventories

www.ecoinvent.org

Leiden University / Environmental science institute
www.cml.leiden.edu

Intergovernmental panel on Climate Change (IPCC)
www.ipcc.ch/report/ar5/wg1/

ReCiPe LCIA model
www.rivm.nl/en/Topics/L/Life_Cycle_Assessment_LCA/ReCiPe