# CARBON INTENSITY METHODOLOGY

Galp approach

May 2021



## Carbon Intensity methodology May 2021



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## **Executive summary**

Galp (or the Company) is an integrated energy company with activities that span from exploration and production of oil and natural gas to refining and marketing of oil products and biofuels, natural gas marketing and electricity generation and sales.

Many companies, and specifically in the Oil&Gas sector, are using Carbon Intensity as a key metric to determine decarbonization performance. The definition of a carbon intensity metric allows us to respond to the responsibility of reducing carbon emissions from Galp's operations while simultaneously meeting increasing customer and social demands with a lower carbon footprint.

Galp has developed two different approaches for the calculation of its carbon intensity (CI):

1) All downstream sales-based approach: allows the quantification of CO<sub>2</sub> equivalent emissions per unit of all energy sold by Galp. This metric seeks an alignment with the boundaries and value chain integration included in the latest Science Based-Target Initiative (SBTi) guidance for Oil, Gas and Integrated Energy companies (version 10<sup>th</sup> August 2020) and IPIECA (Global Oil and Gas Industry Association) guidance.

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CI = \frac{Operational\ emissions\ (scope\ 1) + Indirect\ emissions\ (scope\ 2) + Other\ Indirect\ emissions\ (scope\ 3)}{Energy\ products\ sold\ by\ Galp\ (Oil\ and\ Gas\ Products, Biofuels, hydrogen\ and\ Electricity)}
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2) Production-based approach: allows the quantification of  $CO_2$  equivalent emissions per unit of primary energy produced by Galp ( $gCO_2e/MJ$ ).

 $CI = \frac{Operational\ emissions\ (scope\ 1) + Indirect\ emissions\ (scope\ 2) + Use\ of\ Sold\ Products\ (scope\ 3, category\ 11)}{Galp\ Energy\ Production\ (Oil\ and\ Gas\ Products, Biofuels, hydrogen\ and\ electricity)}$ 

The calculated all downstream sales carbon intensity for Galp's energy products was of  $76.3^{\circ}$  gCO<sub>2</sub>e/MJ in 2017, the year where Galp announced the diversification of its portfolio beyond Oil  $\delta$  Gas and that will be considered the base year for any analysis of carbon intensity evolution in the future. That same year, the production carbon intensity was of 93.4 gCO<sub>2</sub>e/MJ.

<sup>&</sup>lt;sup>1</sup> This value reflects the adjustments made in the adopted methodology based on "all downstream sales approach" which replaces the 78 gCO<sub>2</sub>/MJ based on "sales to end consumers approach" declared in previous report (Carbon intensity methodology – Galp approach / October 2020).

Carbon Intensity methodology May 2021



This document describes the fundamentals of the methodology for Galp's carbon intensity calculation, for the two accounting approaches. The methodology will be continuously updated in order to be as accurate was possible and reflect future updates of international guidance (e.g. SBTi, IPIECA).

#### 1. Introduction

The energy paradigm in the world is evolving and Galp aims to play an active role in this transformation, joining the efforts to address climate change and meet the goals set by the Paris Agreement. Galp is committed to ensure integrity and transparency in the reporting of its environmental performance, including in relation to Greenhouse Gases (GHG) emissions.

At Galp we have developed a methodology to calculate and assess our carbon intensity that allows us not only to aim reducing carbon emissions from Galp's operations and simultaneously to mee increasing customer and society demand regarding lower carbon footprint.

The carbon intensity methodology was developed with the purpose of calculating and assessing the evolution of the carbon emissions output from the energy products sold and produced by Galp. Two distinct approaches for the calculation of carbon intensity are considered: one where the intensity corresponds to the energy and life cycle emissions of all energy products sold downstream (all downstream sales) and another where the intensity is calculated from the point of view of the primary energy produced by Galp and associated emissions (production).

This methodology was defined and consolidated during 2021 and reflects the reality of the Company up to this date but might be updated in the future to incorporate changes in regulation, new methodological standards (e.g. SBTi updated guidance) and available technology.

Galp will apply this methodology when calculating the Company's carbon intensity with data based on the historical performance collected from its different activities, as well as inputs obtained using the best estimates for its evolution according to the Group's planned portfolio and business developments.



## 2. Scopes and boundaries of the methodology

#### 2.1 GHG emissions scopes

Greenhouse gases are gases present in the atmosphere that have the capacity to absorb thermal radiation from the earth's surface and thus can contribute to global warming. These gases are present in the atmosphere as part of natural processes and as a consequence of human activities. The greenhouse gases most commonly reported as a result of human activities are the ones covered by the Kyoto Protocol, namely: carbon dioxide ( $CO_2$ ), methane ( $CH_4$ ), nitrous Oxide ( $N_2O$ ) and fluorinated gases (HFCs, PFCs, SF6).

The most relevant GHG emissions in the oil and gas industry are  $CO_2$ ,  $CH_4$  and  $N_2O$ . Fluorinated gases may also be emitted but in much smaller quantities and therefore are not included in the scope of this methodology. The calculations on this metric are done on a  $CO_2$  equivalent basis, integrating the emissions of the most material GHG in the value chains ( $CO_2$ ,  $CH_4$  and  $N_2O$ ). The Global Warming Potential (GWP) values used correspond to the 100-year GWP from the IPCC  $4^{th}$  assessment report (2007).

GHG emissions can be divided in 3 types of scopes:

- Scope 1: Direct GHG emissions resulted from sources owned (partly or wholly) or controlled by the Company, namely: emissions from combustion of fuels in stationary equipment (e.g. turbines, generators, flares, incinerators) or mobile sources (e.g. vehicles, vessels, helicopters); emissions from the manufacture or processing of chemicals (e.g. hydrogen production); and, venting and fugitive emissions (intentional and non-intentional releases).
- Scope 2: Indirect GHG emissions from the generation of electricity, steam or heat purchased and used in the activities owned (partly or wholly) or controlled by the Company.
- Scope 3: All other indirect GHG emissions associated with the life cycle of the Company's products or processes, which result from sources not owned or controlled by the Company. Examples of scope 3 emissions used in this metric are: extraction and production of purchased materials; transportation of purchased materials and goods; use of sold products and services. Calculation of scope 3 emissions followed the guidelines of the GHG Protocol and sector specific IPIECA guidance for category 11 (see below).



#### Considerations on Scope 3 – Category 11 (use of sold products)

Use of sold products emissions in the oil and gas sector includes the direct end-use phase emissions of final products such as motor fuels and natural gas. This includes the end-use phase emissions of sold intermediate products such as crude oil. Category 11 includes the total expected lifetime use emissions for products sold during the accounting year, independent of when the actual use occurs. In some cases, such as for integrated oil and gas (IO&G) companies, companies may sell products at several points throughout their operations. The potential complexities of company operations can complicate defining and quantifying what constitutes 'sold products'. To avoid onerous accounting for IO&G companies, such as accounting for the movement of each molecule companies can use net volume accounting. In net volume accounting companies identify that point in the value chain where the largest total amount of potential sold products is transferred (e.g. crude produced, refinery throughput, retail and commercial operations).

**Source**: IPIECA, API, 2016. Estimating petroleum industry value chain (scope 3) greenhouse gas emissions

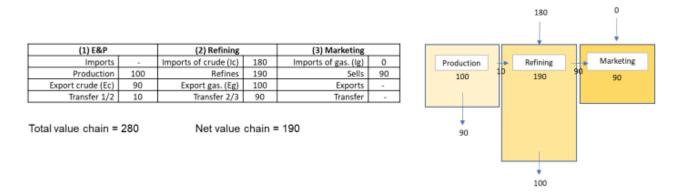


Figure 1 – Representative illustration of the net value chain application (Source: SBTi – Guidance on Setting Science-Based Targets for Oil, Gas and Integrated Companies)

## 2.2 Organisational boundaries

When accounting and reporting GHG emissions it is important to clearly establish the organisational boundaries that are used to consolidate the data. The methodology here proposed considers an **equity share approach** in which emissions are accounted proportionately to the Company's percentage share of equity in each operation, independently of the



Company's control / ownership over the operation. This approach reflects the percentage of economic interest, which is consistent with international financial accounting and reporting standards.

The methodology considers Galp's operations in the Refining and Midstream segments in Portugal, Commercial segment in Iberia and Africa, participation interests in Upstream projects in Brazil, Angola, Mozambique, São Tomé e Principe and Namibia and Renewable and New Business projects worldwide.

#### 2.3 Exclusions

For the purpose of carbon intensity calculations, the following exclusions were considered:

- Emissions related to the use of non-energy products;
- Emissions related to trading activities;
- Emissions related with equipment manufacturing (were considered outside of the scope of the energy supply value chain of the Company);
- Emissions from the production and transport of fuels used in the generation of thirdparties electricity;
- Avoided emissions or emission offsets.

## 3. GHG accounting and reporting principles

GHG accounting and reporting is based on the following principles:

- Materiality and Relevance: The information reported and boundaries defined properly reflects the performance of all significant Galp activities. Materiality and relevance of the information reported is assessed in line with legal requirements and stakeholders' interest and needs.
- Comparability/Consistency: Data is collected and emissions calculated according to systematic and controlled processes. The reporting scope and limitations are clearly defined, to ensure that the data is reported in a consistent manner to allow comparisons over time.



- Accuracy: Detailed and precise information is provided and uncertainties are reduced
  as far as practicable. Information sources and methods used to collect and estimate
  data, as well as limitations, are specified to allow stakeholders to make informed decisions.
- Clarity and Transparency: All relevant information is made available to stakeholders, in a factual, accessible, understandable and coherent manner. Assumptions and references used are clearly explained and disclosed.
- Traceability: All data is collected, recorded, analysed and disclosed, so that it may be reviewed, verified and audited.

In the development of this methodology the following GHG reporting frameworks and guidances were used as key references and guidelines: GHG Protocol, Petroleum Industry Guidelines (IPIECA, API and IOGP), SBTi consultation guidance documents. A comprehensive list of all the references and guidelines used and consulted to develop this standard are identified in the References. Data input for the calculation of GHG emissions include the volumes related to the activity of each segment of the value chain. These volumes are multiplied by emission factors that materialize the emissions in CO<sub>2</sub> equivalent per unit of product. Key emission and conversion factors can be found in the Annex.

## 4. Carbon Intensity calculation

In this section we provide detailed information on the carbon intensity calculation for the two distinct metrics considered: downstream sales and production.

## 4.1 All downstream sales-based approach

#### Definition

The metric applies to all energy products sold by Galp (oil-based liquid fuels, gas, electricity, biofuels and hydrogen) or any subsidiary (here after Galp) and includes emissions from the full life cycle of these products integrating greenhouse gases (GHG) released during their production, transport, transformation, distribution and consumption. The same emissions are calculated for products purchased from third parties and sold or transformed by Galp. This implies that this metric includes scope 1, 2 and 3 emissions released during the life cycle of these products. It also includes emissions of all the new business to be developed within



Galp's energy strategy. Scope 3, category 11 emissions (use of sold products) were calculated according with SBTi and IPIECA guidelines (see 2.1).

#### Integration of business segments

One key feature for the carbon intensity calculation (downstream sales) is the integration between business segments within a value chain (see 2.1). Energy and emissions data is collected from Galp's activities which are included in the Upstream, Refining & Midstream, Commercial, Renewables and New Businesses segments, always considering Galp's equity in the corresponding operations.

All business segments are integrated and purchases of oil, gas, biofuels and electricity are netted with the Company's production, with the emissions corresponding to the remaining purchased volumes from third parties being calculated. Integration in the oil value chain is done from upstream to refining segment, natural gas from upstream to commercial and electricity from generation to commercial.

A short description of each business segment and how their activities are taken into account in this metric is provided below:

Upstream	Upstream operations contribute currently with oil and gas produced in all geographies
	where Galp has operations. Net entitlement oil and gas production from assets oper-
	ated or partly owned by Galp is taken into consideration as are emissions related to
	the working interest in these projects.
Refining & Midstream	The Refining & Midstream segment includes activities related to shipping and refining
	of oil products, as well as logistics and biofuels production. Emissions related to elec-
	tricity purchase for the operations and electricity produced in co-generation plants are
	also being considered. Activities are located mostly in mainland Portugal, although lo-
	gistics operations include locations in Spain and Africa. Scope 3 use of sold product
	emissions and associated energy for oil products are calculated for all refinery
	throughput since according to the net volume accounting principle (see 2.1) this is the
	point in the oil value chain where the largest volume of oil products is traded.
Commercial	Commercial activities include supply, distribution and sales of oil, gas and electricity
	products in Iberia (Oil, Gas, Power) and Africa (Oil) to Galp's end consumer. Electricity
	sales include supply from the grid, Power Purchase Agreements (PPA) of renewable
	energy from third parties and Galp's own generation. The emissions related to the sup-
	ply and distribution of all the above-mentioned products are considered. Energy and
	emissions related to the use of sold gas are calculated and integrated in the metric.



	Biofuels incorporated into oil products are accounted in terms of energy and life cycle
	emissions. In gas and biofuels value chains, the largest volumes traded occur on the
	Commercial side.
Renewables	Renewable energy produced by the Company's in projects in Portugal, Spain and else-
and New	where in the world is accounted for. Renewable energy is assumed to have no associ-
Businesses	ated GHG emissions.
Others	Emissions related to losses in the gas distribution network in Portugal.

Therefore, oil, gas and electricity production are integrated within Galp's value chain, netting internal changes of products, in order to provide a representative well-to-wheel intensity, capitalize on efficiency and avoid double counting related with purchases of energy commodities (oil, gas, electricity).

A schematic representation of the balances and integrations performed in Galp's energy products value chain is provided in the figure below.

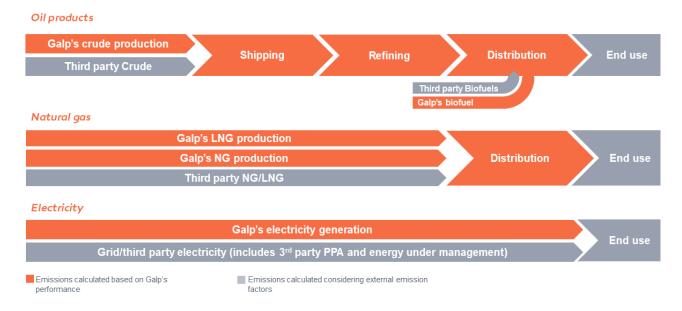


Figure 2 - Schematic representation of the balances and integrations performed in Galp's energy products value chain. <u>Orange</u>: emissions calculated based on Galp's performance; <u>Grey</u>: emissions calculated considering external emission factors and use of sold product emissions.



#### Carbon Intensity Calculation

The all downstream sales carbon intensity metric reflects the weighted average  $CO_2e$  released during the lifecycle of the energy products in Galp's portfolio per unit of energy delivered to society, expressed in  $gCO_2e/MJ$ , as per the formula below:

 $CI = \frac{Operational\ emissions\ (scope\ 1) + Indirect\ emissions\ (scope\ 2) + Other\ Indirect\ emissions\ (scope\ 3)}{Energy\ products\ sold\ by\ Galp\ (Oil\ and\ Gas\ Products, Biofuels, hydrogen\ and\ Electricity)}$ 

The metric includes all the emissions associated with Galp's operations (scope1+2) as well as indirect emissions (scope 3) occurring in the value chain of all sold products, including use of sold product (Galp's clients + other operators + exports) and 3<sup>rd</sup> parties purchases.

Concerning operational emissions (scope 1 + 2) Galp has also a commitment to an absolute emission reduction target.

Numerator	Numerator (emissions component – $gCO_2e$ )		
Oil	Activity emissions from exploration & production, shipping, refining, logistics, supply		
	and distribution and scope 3 emissions from the use of sold products (from the combus-		
	tion of all refined fuels). <u>Note</u> : integration of the value chain is done from upstream to		
	refining; scope 3 emissions for $3^{rd}$ parties purchases are also calculated.		
Gas	Activity emissions from exploration & production, from losses in gas distribution		
	network and the use of sold products (scope 3 – category 11). <u>Note</u> : integration of the		
	value chain is done from upstream to commercial; scope 3 emissions for $3^{rd}$ parties		
	purchases are also calculated.		
	Direct emissions from the activities of Galp's biofuel production units as well as all		
Biofuels	lifecycle emissions from biofuels incorporated in oil products sold; scope 3 emissions		
	for 3 <sup>rd</sup> parties purchases are also calculated.		
Electricity	Please see 'electricity accounting' section above. <u>Note</u> : due integration of the electricity		
	value chain in Iberia, it was considered in the carbon intensity calculation a weighted		
	average electricity emission factor for the electricity grid in Portugal and Spain and used		
	to determine 3 <sup>rd</sup> parties purchased electricity emissions.		
New Energy	Emissions from Galp's new energy business (e.g. storage).		
Business			
Denominat	or details (energy component - MJ)		
Oil	Energy contained in refined oil fuels.		
Gas	Energy from natural gas sold to end-users		
Biofuels	Energy from biofuels share in oil products sold (diesel, gasoline, fueloil, jet fuel)		



Electricity <sup>2</sup>	Energy from electricity sales in Iberia and the rest of the world. Please see 'electricity
	accounting' section above for more details.

**Hydrogen** Energy contained in the green hydrogen produced.

Source: data sources include internal measurements (e.g. EU-ETS audited values), Galp's internal data and the Company's estimates. Information regarding emission and conversion factors is explained in chapter 4.3.

For the determination of the denominator of the carbon intensity metrics, all energy products are converted to an energy basis. Crude oil, liquid fuels and gas are converted from their original volumes into a common unit of energy (Joules), calculated through their respective low heating values. Electricity is converted to Joules and later to a fossil equivalent using a Primary Energy Factor (PEF) that reflects the efficiency of thermoelectric production. This factor changes with time, reflecting the decarbonisation of electric grids in the locations where the Company has commercial electricity businesses (see Annex). Renewable Electricity sold for electric mobility is multiplied by a factor of 4 to reflect the higher efficiency of electrical engines when compared to Internal Combustion Engines (ICE), as predicted in the European Directive RED II.

## 4.2 Production-based approach

#### Definition

The calculation of the carbon intensity from production reflects the average carbon emissions from Galp energy production and accounts for scope 1 (direct) and 2 (indirect) emissions from the Company's business activities. Regarding scope 3 emissions, this metric includes category 11 from the GHG Protocol (Use of sold products) considering the GHG emissions associated to the use (combustion) of all oil and gas production from Galp, excluding a share of hydrocarbons which are thought to have non energy use (chemicals, plastics, asphalt, etc) according to SBTi guidance. The metric is expressed in g CO<sub>2</sub>e/MJ, as per the formula below:

 $CI = \frac{Operational\ emissions\ (scope\ 1) + Indirect\ emissions\ (scope\ 2) + Use\ of\ Sold\ Products\ (scope\ 3, category\ 11)}{Galp\ Energy\ Production\ (Oil\ and\ Gas\ Products, Biofuels, hydrogen\ and\ electricity)}$ 

<sup>&</sup>lt;sup>2</sup> Note: the calculation presented seeks the alignment with SBTi guidance (Annex D) where it is stated that eletricity shall be accounted by the volumes of own production or [production + net purchases] (whichever is largest)



Numerator (emissions component – gCO₂e):		
Oil	Scope 1 and 2 activity emissions from Exploration & Production, refining, logistics and	
	distribution; scope 3 emissions from the use of product (considered the emissions	
	from combustion of all oil produced minus a share assumed to have a non-energy	
	use).	
Gas	Scope 1 and 2 activity emissions from Exploration & Production; scope 3 emissions	
	from the use of product (considered the emissions from all gas production minus a	
	share assumed to have a non-energy use).	
Biofuels	Scope 1 and 2 direct emissions from the activities of Galp's biofuel production units	
	Emissions from electricity production from Refining & Midstream (co-generation	
Electricity	plants)	
New Energy	Emissions from Galp's new energy business.	
Business	(apage) company A/I)	
Denominator	(energy component - MJ):	
0:1	Energy contained in Galp's oil production minus a share assumed to have a non-en-	
Oil	ergy use.	
	Energy contained in Galp' natural gas production minus a share assumed to have a	
Gas	non-energy use.	
Biofuels	Energy contained in biofuels produced by Galp.	
Electricity	Includes Galp's eletricity production from co-generation units and renewable energy	
	(solar and wind) production on an equity basis.	
Hydrogen	Energy contained in all green hydrogen production.	
Source: data so	urces include internal measurements (e.g. EU-ETS audited values), Galp's internal	
data and the Co	ompany's estimates. Information regarding emission and conversion factors is	

Source: data sources include internal measurements (e.g. EU-ETS audited values), Galp's interna data and the Company's estimates. Information regarding emission and conversion factors is explained in chapter 4.3.

## 4.3 Energy/Emission factors and conversions

The emission factors applied in this methodology fall into two broad categories – specific emission factors for Galp products and generic emission factors applied to third parties products and activities. Galp has proprietary emission factors for the combustion of its own products as well as the corresponding Low Heating Values that allow for the calculation of their energy content. When the Company's own emission factors are not available, values from the literature (e.g. biofuels, third parties purchased oil and gas) or from suppliers are used. Some of the most relevant energy/emission factors include:

• Emissions related to the production of third-parties oil (crude oil purchased by Galp): calculated using the emission factor for upstream oil production corresponding to the



average value reported by IOGP members (IOGP, 2020. Environmental performance indicators):

- Emission factor related with crude oil combustion: from IPCC data;
- Emissions related to the production of third parties gas (purchased gas): calculated according to the WTT emission factors supplied by DEFRA for gas purchases in the EU;
- Emission factors for stationary and mobile combustion: from the Portuguese National Inventory Report (APA inventory);
- Low Heating Values (LHV) and oxidation factors for fuels: from the APA inventory to be considered for EU-ETS accounting (APA, 2013);
- LHV for biofuels were taken from Aatola et al., 2008;
- WTW emissions factors for biofuels were estimated from the values in European Directive RED II;
- Emission factors for electricity purchased from the grid in Portugal: calculated or obtained by official data concerning the energy mix of a given year (data from DGEG, ERSE and APREN) taking into consideration the most recent emission factor available;
- Emission factors for electricity purchased from the grid in Spain: from the most recent national energy data (data from REE);
- Primary Energy Factor (PEF) was taken into consideration using the information made available by the Fraunhofer Institute in 2016.
- Multiplier for renewable electricity used in electric mobility that reflects higher efficiency of electrical engines when compared to ICE from the RED II directive.

The global warming potential (GWP) for greenhouse gases was taken from the IPCC AR4 (2007) and corresponds to the 100-year GWP.

Unit conversions were calculated using information taken from the International Energy Agency and Society of Petroleum Engineers.



Whenever more detailed emission factors or other types of data become available the methodology will also be updated. Please check Annex for more detailed information on energy/emissions factors and conversions.

#### 5. Assurance

An independent external expert, PwC, verified the methodology adopted in the Carbon Intensity Model (All downstream sales-based approach and Production-based approach). PwC verified that the methodology is adequate, properly identified and referenced and that the assumptions and input data used in the calculations performed are acceptable, reasonable and are duly substantiated. It was also verified that the input values and assumptions were inserted in an appropriate and precise manner in the Carbon Intensity Model, considering the orientations and references of the present document.

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