

BIO METANO NOW

CNG LNG

SUSTAINABILITY
ON THE MOVE

WHAT IS BIOMETHANE?

The pillar of sustainable mobility

Bio Methane is a sustainable fuel from renewable sources obtained from agricultural waste, agrifood company waste, and the organic fraction of waste.

Its performance levels are identical to those of traditional methane obtained from fossil fuels. In addition to being a **green fuel** it is produced in terms of circular economy and environmental sustainability. Its production is virtuous and **its combustion generates considerably lower values compared to oil derivatives**

in terms of CO₂ and nitrogen oxide (**NO_x**) and are altogether null for particulates (**PM**). These characteristics make it the undisputed protagonist of decarbonisation, sometimes even more so that electric motors when the latter use energy generated by fossil fuel powered plants, polluting at the source. Biomethane protects the environment every step of its life: from production to use, which is why it is and always will be a great resource in the fight against pollution.

Biomethane can be used in two forms for transport:

BIO-CNG (the **gaseous form**) is recommended for cars or regional transport services for goods and people, such as BUSES.

BIO-LNG (in **liquid form**), ideal for ships and trucks which cover long-distance routes, with autonomies close to traditional DIESEL engines.

The heavy goods sector is the most interesting one for Liquid Bio Methane. To date, electric motors are not compatible with long distance routes due to autonomies, battery weight and recharging times, which is why today **Liquid Bio**

Methane can be an optimal solution in terms of sustainability. Bio Methane is an ally in the fight against climate change: it can be used without releasing carbon from fossil sources. **This way for the future of road haulage.**



Bio Methane LNG
is in liquid form resulting in a significant reduction of volume.

Bio Methane CNG
Is a compressed gas which remains in a gaseous state

CH₄ a molecule that unites

Same chemical composition, different environmental impact

An analysis of chemical composition shows that **Bio Methane is very similar to fossil methane.** Both gases are made up of **98% CH₄**, meaning they are both simple hydrocarbons formed by one carbon atom and four hydrogen atoms. This means that when used as a fuel, both are entirely similar in terms of performance levels. **The main difference lies in the emission of CO₂** in the **well to wheel** cycle. On site emissions generated by the vehicle in use, determined by fuel combustion, are the same for fossil Methane and Bio Methane (**tank to wheel**).

The substantial difference lies in **lower CO₂ emissions due to the biomass purification process** during **Bio Methane production, which lowers emissions, even achieving CARBON NEGATIVITY in some specific cases**, for example with biomass from animal husbandry waste if combined with CO₂ recovery as a by-product. **This "refinement" generally results in drastic cuts to greenhouse gas emissions.**



A SHARED VALUE

Choosing Bio Methane for a winning circular economy

The production of Bio Methane enables the recovery of resources and the reintegration of biological materials within the production process which would otherwise be lost or become waste. The production and use of Bio Methane is a winning process every step of the way, for everyone.

Farmers and agrifood companies **turn waste and scraps into a resource**, boosting profitability. **The transformation process creates jobs.**

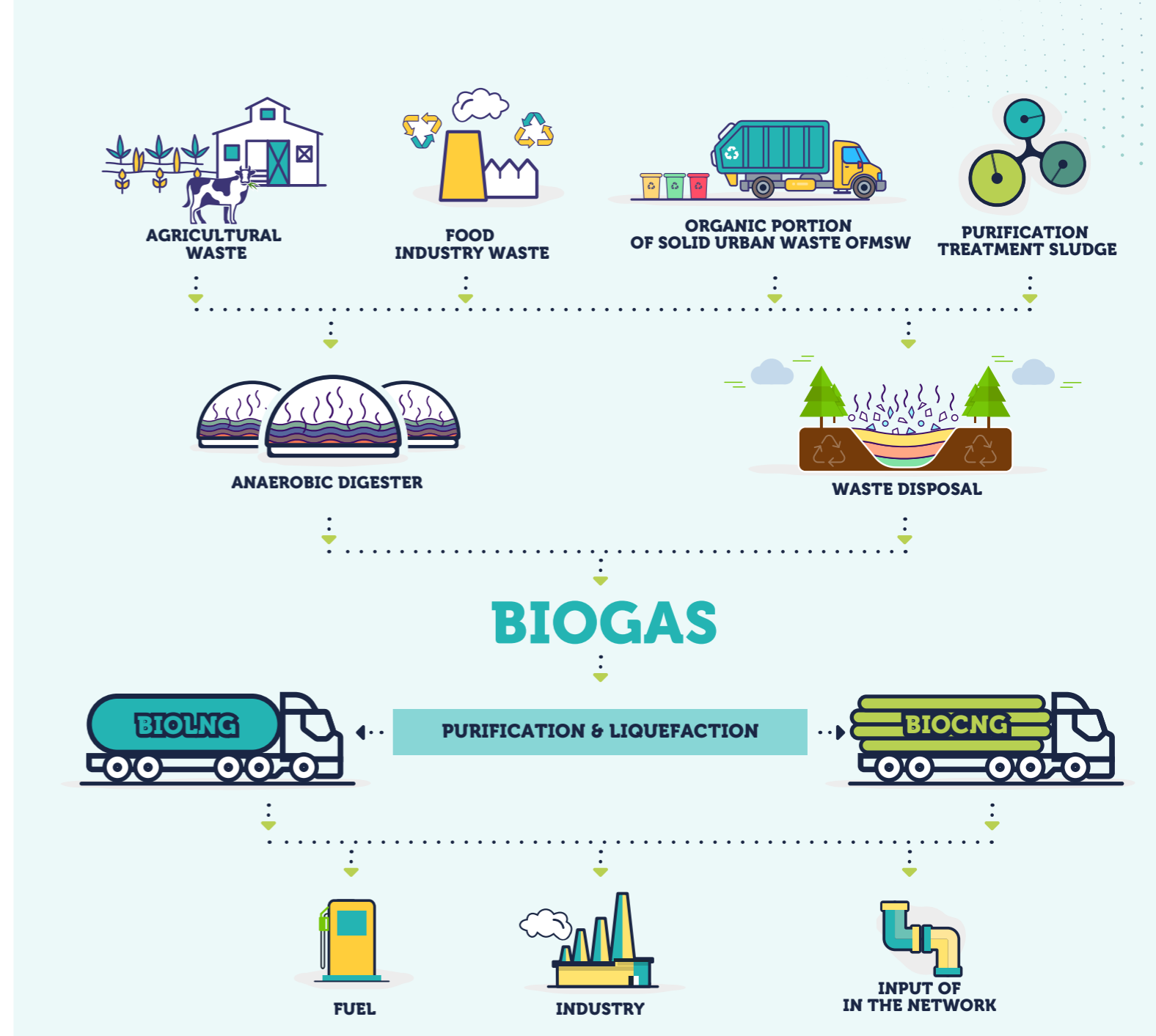
The use of this **fuel lowers the pollution threshold compared to traditional fossil fuels**, improving the environment and preserving it for future generations.

Bio Methane is made from renewable sources, which means that the resources used to extract it are regenerated over time and so it can always be produced as part of a circular economy, free from limits linked to extraction.

The result is a 100% sustainable product from renewable sources.

The aim of circular

economy is an increasingly sustainable and inclusive business model. A better future for the next generation starts here.



COMPETITIVE SUSTAINABILITY

A comparison with Diesel

Factors to take into consideration when purchasing a new truck for road haulage are manifold. A brief comparison of the environmental advantages of diesel or Bio Methane fuelled vehicles can be helpful when making this decision. The use of Bio Methane as a fuel for transport can **significantly reduce greenhouse gas emissions: on average even by up to 78%* compared to diesel**, without forgetting the near zeroing of fine particles.

Thanks to these properties, Bio Methane fuelled vehicles can circulate freely in residential and suburban areas even during vehicle blocks imposed whenever atmospheric pollution thresholds are exceeded, resulting in an operative advantage of the vehicle compared to standard ones. **Making a sustainable and competitive choice is possible today and can contribute towards improving the future of the planet.**

*source: www.sciencedirect.com

Environmental performance levels

are the same as those of fossil LNG if we consider the tank to wheel process, in addition to an even greater lowering of CO2 levels in the case of the BIO product, analysed in the entire well to wheel process. Therefore at this level of analysis, the result of the lowering of CO2 can be:

UP TO
-95%
SOURCE: IVECO

TRUCK BIO-LNG

CO₂ <= -95%
Well to wheel calculation

NO_x -70%

PM -95%

dB(A) -5 (-75%)

NITROGEN SEMITRAILER

CO₂ ZERO

NO_x ZERO

PM ZERO

dB(A) ZERO



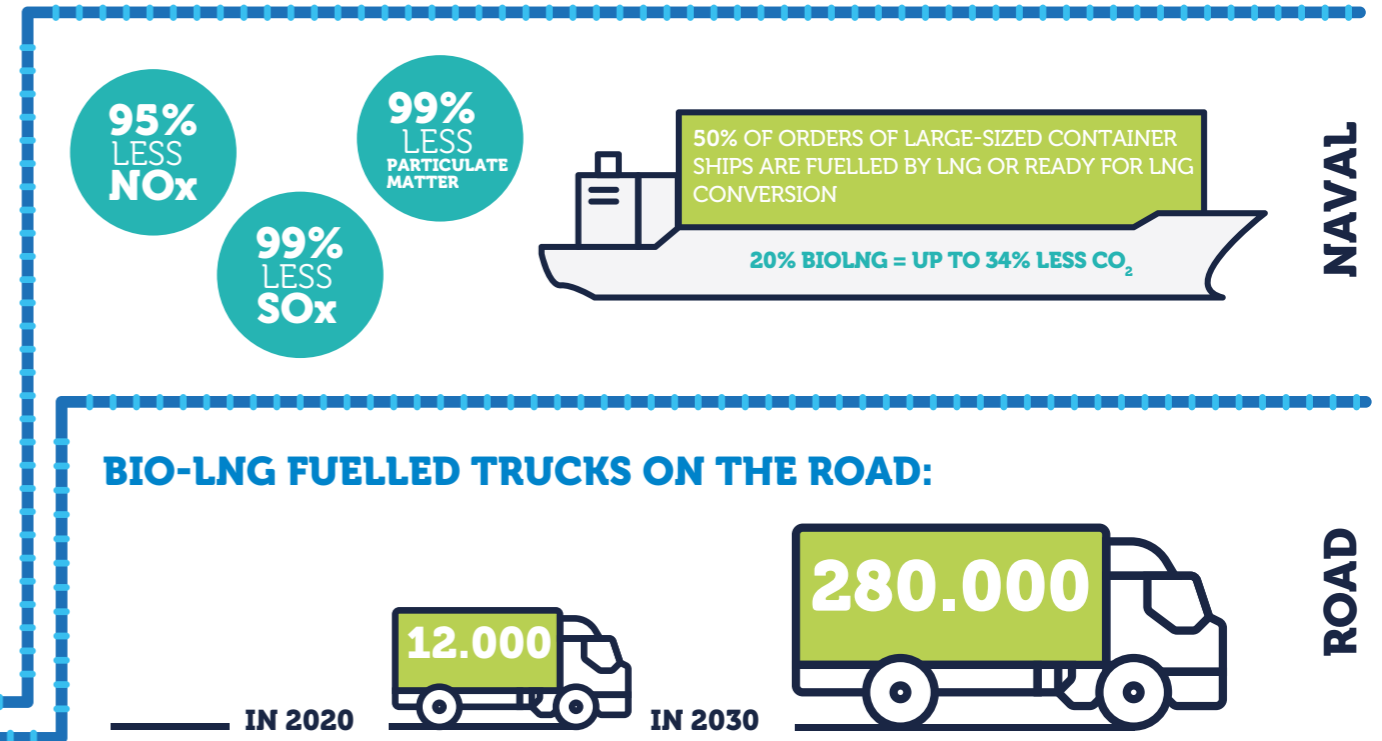
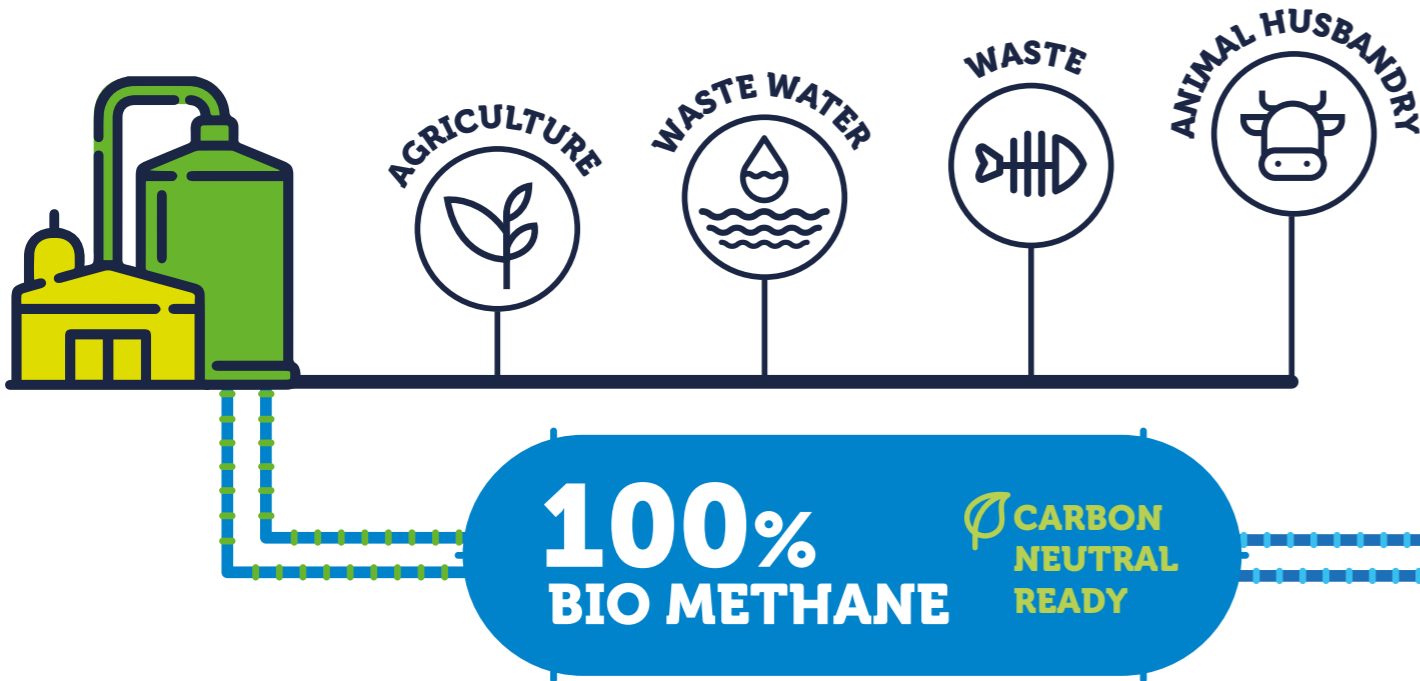
ONE OF **THE MOST SUSTAINABLE** SOLUTIONS EVER ON THE MARKET
AND **EXCLUSIVE TO LC3 TRASPORTI**

MADE FROM RENEWABLE SOURCES;

A 100% SUSTAINABLE PRODUCT

In logistical terms, BIO fuel can be managed in the same way as the fossil product, and this guarantees immediate distribution as soon as it will be available, in sufficient quantities to satisfy market demand.

This emerging fuel is approaching the market, however strong demand is already present and is expected to grow rapidly in the near future. This will undoubtedly make it an important actor on the road towards decarbonisation in Europe.



53 IN 2020 PORTS (EU27 & UK) EQUIPPED WITH BIO-LMNG REFUELLING FACILITIES

37+ IN 2030 PORTS EQUIPPED WITH BIO-LMNG REFUELLING FACILITIES

330+ IN 2020 LNG/BIO-LNG STATIONS

2.000+ IN 2030 LNG/BIO-LNG STATIONS

BIO LNG AND DIESEL COMPARED

BIO LNG

VS

DIESEL

AUTOIGNITION TEMPERATURE

537°C ——— 210°C

IN CASE OF FIRE

Under the action of fire, the tank can dissipate gas without exceeding maximum design pressures.

The liquid starts to boil, pressure rises and in the worst case scenario, the tank may explode.

IN CASE OF LEAKAGE

Small leaks evaporate rapidly into the atmosphere whereas bigger leaks remain on the ground and vaporise.

The fuel forms a puddle on the group which does not evaporate immediately.

FLASH POINT

5-15% ——— 0.6-6.5%

SUSTAINABLE PRODUCT

YES ——— NO

AUTONOMY

1,500 KM WITH A FULL TANK ——— +2,000 KM WITH A FULL TANK

REFUELLING TIMES

10 min APPROX. ——— 15 min APPROX.



2030 goal

With the B.E.S.T. project launched in 2015, we set ourselves the goal of achieving **40% of the LNG fleet fuelled with BIO METHANE**, at the end of 2021, as an intermediate step towards **decarbonisation by 2030**.

HOW TO USE BIO LNG

Try to think of the **cryogenic tank** in vehicles which run on bio methane as an astronaut's suit. The outer layer (visible) **protects from shocks and reflections** of sun rays. The inner layer, thanks to its insulating material cover and total absence of air between both layers, **maintains bio methane at input temperature** and at a pressure of no more than 8 atmospheres.

STEP A

The tank is wrapped in several layers of insulating material.



STEP B

The tank is placed inside another tank.



STEP C

a vacuum is created between the walls of both tanks, resulting in **super cryogenic insulation**.



TEST PROOF SAFETY

Are bio methane tanks sensitive to collisions?

NO! As proven by the **DROP TEST**: a full LNG tank is dropped from a height of 9 metres onto its most critical part and from 3 metres on the part with tubes and valves. No liquid must leak within an hour from impact.



Does biomethane explode easily?

NO! As proven by the **BONFIRE TEST**: a full LNG tank connected to all devices is subjected to fire (590°C) and must withstand this condition for longer than 5 minutes, without exploding and without the opening of any safe valves.

Can pressure easily compromise a BIO LNG tank?

NO! Safety is determined by the **PRESSURE TEST**: every single tank is subjected to 1.3 times the maximum design pressure and must not show any leaks, damage or defects.





LC3TRASPORTI.COM



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