



# DECARBONIZATION OF HEAVY DUTY TRANSPORT

## THE HERE AND NOW SOLUTIONS AND THE INNOVATIONS



**BIOFUELS AND  
WASTE TO FUEL**



**ELECTRIFICATION**



**PLATOONING , CONNECTED  
& AUTONOMOUS**

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# THE CARBON LAW: HALVING THE EMISSIONS EVERY DECADE FROM 2020



The #CarbonLaw - A roadmap for rapid decarbonisation



2020

2030

2040

<https://www.youtube.com/watch?v=UZ5nKGHMWC0>

# THE CHALLENGE FOR THE HEAVY DUTY TRANSPORT SECTOR



**-50% CO<sub>2</sub> in  
2030 to reach  
Paris goals**



**95% oil in  
transport**



**Average  
vehicle life  
13-20 years**

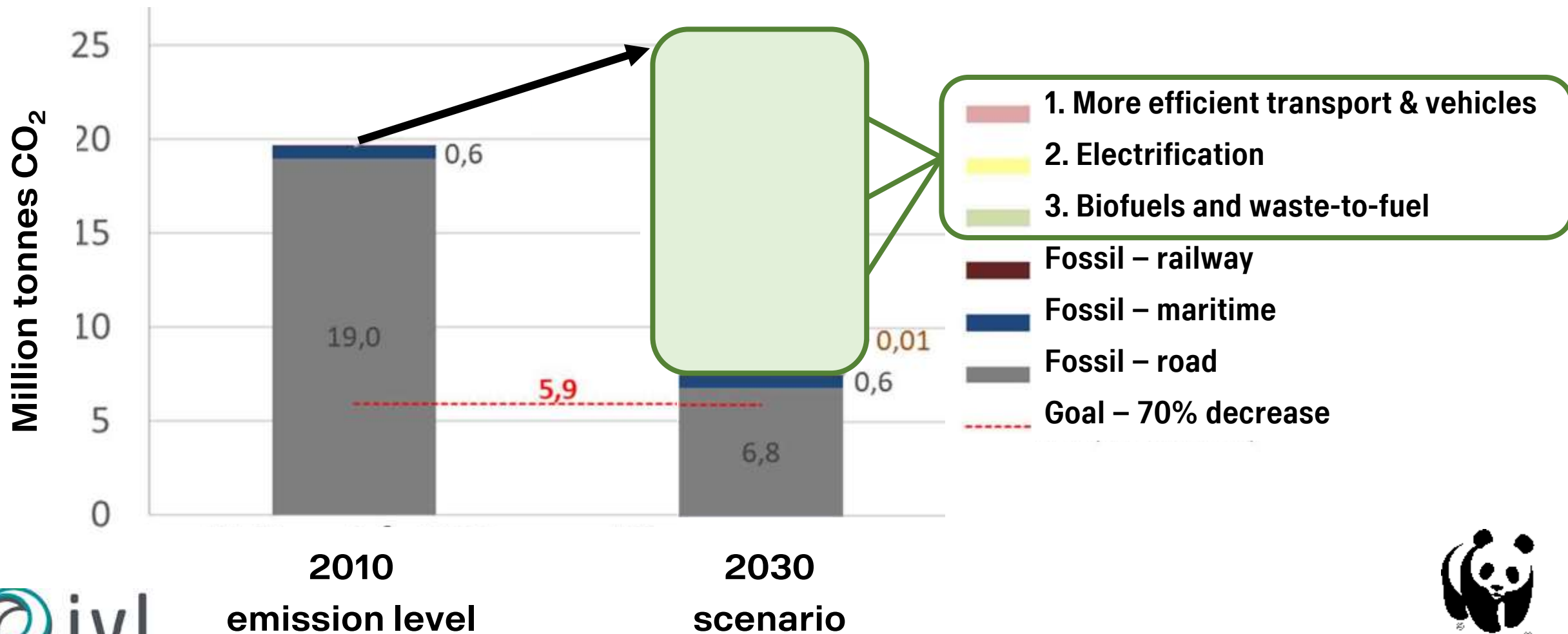


**> 1 % electric  
vehicles**

# EFFICIENCY + ELECTRIFICATION + BIOFUELS

## 3 KEY TOOLS ARE NECESSARY FOR DECARBONISATION OF TRANSPORT

WWF and IVL scenario for reaching the Swedish 2030 goal (-70% CO<sub>2</sub>) for decarbonisation of transport



# DIFFERENT LOW CARBON SOLUTIONS FOR DIFFERENT HEAVY DUTY TRANSPORT MISSIONS



<b>City</b>	Ethanol 	Biodiesel 	Biogas CNG 	Hybrid Electric 	Battery Electric 			
<b>Suburban</b>	Ethanol 	Biodiesel 	Biogas CNG 	Hybrid Electric 				
<b>Intercity/Regional</b>	Ethanol 	Biodiesel 	Biogas CNG 	Hybrid Electric 				
<b>Haulage</b>	Ethanol 	Biodiesel 	E-road 					

Most of fuel use is outside of city centres – in suburbs and regions

# WASTE TO FUEL SYSTEM SOLUTIONS

## FROM ALL KINDS OF ORGANIC WASTE TO CLEAN BIOGAS FLEETS



- 95% of all organic waste globally goes to landfill.
- In Sweden, 94% of vehicle gas is – biogas from waste!
- Landfills gone
- 90%+ of all procured transport is fossil free
- Great potential for all of EU



# DID YOU KNOW?

Waste from 1 000 citizens could power a biogas bus for a year!



...and that one biogas bus provides 1-3 additional jobs/year in the region!



# REGIONAL, FUNCTIONAL AND SYSTEM ORIENTED TRANSPORT PROCUREMENT IS KEY

## How to get there? ;

- Technology is not the problem – and should not be the focus;
- Cities and regions often lead the way with progressive green procurement;
- Financing, incentives and procurement for green transport should:
  - focus on real reductions of CO<sub>2</sub> emissions from a well-to-wheel approach;
  - not only look at vehicles – but rather whole system procurement, including vehicles, clean energy supply, waste-to-energy and infrastructure, in whole regions → scale and cost efficient low carbon transport systems.

→ Most CO<sub>2</sub> cuts for each € invested!



# STOCKHOLM REGION - 100% FOSSIL FREE TRANSPORT



BIOGAS, BIOETHANOL, BIODIESEL, HVO, BIOFUEL HYBRID-ELECTRIC  
FUNCTIONAL, LONG-TERM REGIONAL PROCUREMENT AND CO-OP  
2 300 FOSSIL FREE CITY, SUBURBAN AND REGIONAL BUSES – AND TRUCKS



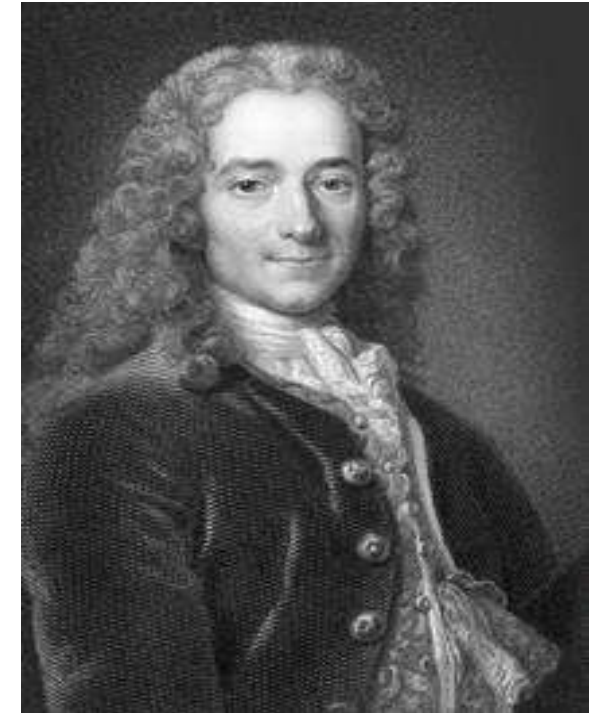
**CO-OPERATION IN THE REGION MADE IT POSSIBLE**



**WE NEED TO BOTH  
IMPLEMENT THE EXISTING COMMERCIAL LOW  
CARBON SOLUTIONS,  
AND SPEED UP DEVELOPMENT OF THE INNOVATIONS  
– AT THE SAME TIME.**

There is always an exciting new  
technology around the corner...

...but do not let perfect be the enemy of good!





# THANK YOU FOR YOUR ATTENTION!



**BIOFUELS AND  
WASTE TO FUEL**



**ELECTRIFICATION**



**PLATOONING , CONNECTED  
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**SCANIA**



# EXTRA MATERIAL



**SCANIA**



# CLEAN AND LOW CARBON AROUND THE WORLD



Nottingham and Reading, United Kingdom

Stockholm, Sweden



Kalmar region, Sweden



Bordeaux, France



Madrid, Spain



Melbourne, Australia



Bogota and Cartagena, Colombia

Jakarta, Indonesia



Virginia, South Africa



# STOCKHOLM REGION - 100% FOSSIL FREE TRANSPORT



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## KALMAR – A REGION POWERED BY WASTE

130 GWH REGIONAL BIOGAS, POWERING BUSES AND TRUCKS  
LOCAL CO-OP CITIES – AUTHORITIES – BIOGAS PRODUCERS – FARMERS  
LOCAL ENERGY, JOBS AND PROFITS FOR THE REGION

# FUNCTIONAL DEMANDS IN TENDERS IS KEY

## VALUE FOR MONEY? AN EXAMPLE FROM THE UK



	FUNDING	BUSES	CO <sub>2</sub> REDUCTION	PM REDUCTION	
<b>CITY 1</b>	3,3	24	559	1,1	Electric
<b>CITY 2</b>	4,7	110	5059	5,16	Biogas
	<i>£ million</i>	<i>Number of</i>	<i>Tonnes</i>	<i>Factor of</i>	



28 August 2017 — News story  
**Cleaner journeys as government commits £11 million to greener buses**

Bus users will benefit from cleaner and greener journeys with roll out of low emission buses in major cities across England and Wales.

- 86 more Euro III-IV diesel buses replaced by clean Euro VI biogas buses in city 2 for a similar investment.
- 10x more CO<sub>2</sub> and 4x more PM reduced in City 2!
- Value the taxpayer's money and prioritise what is best for the people and the planet! Focus on real reductions of both local emissions and CO<sub>2</sub>

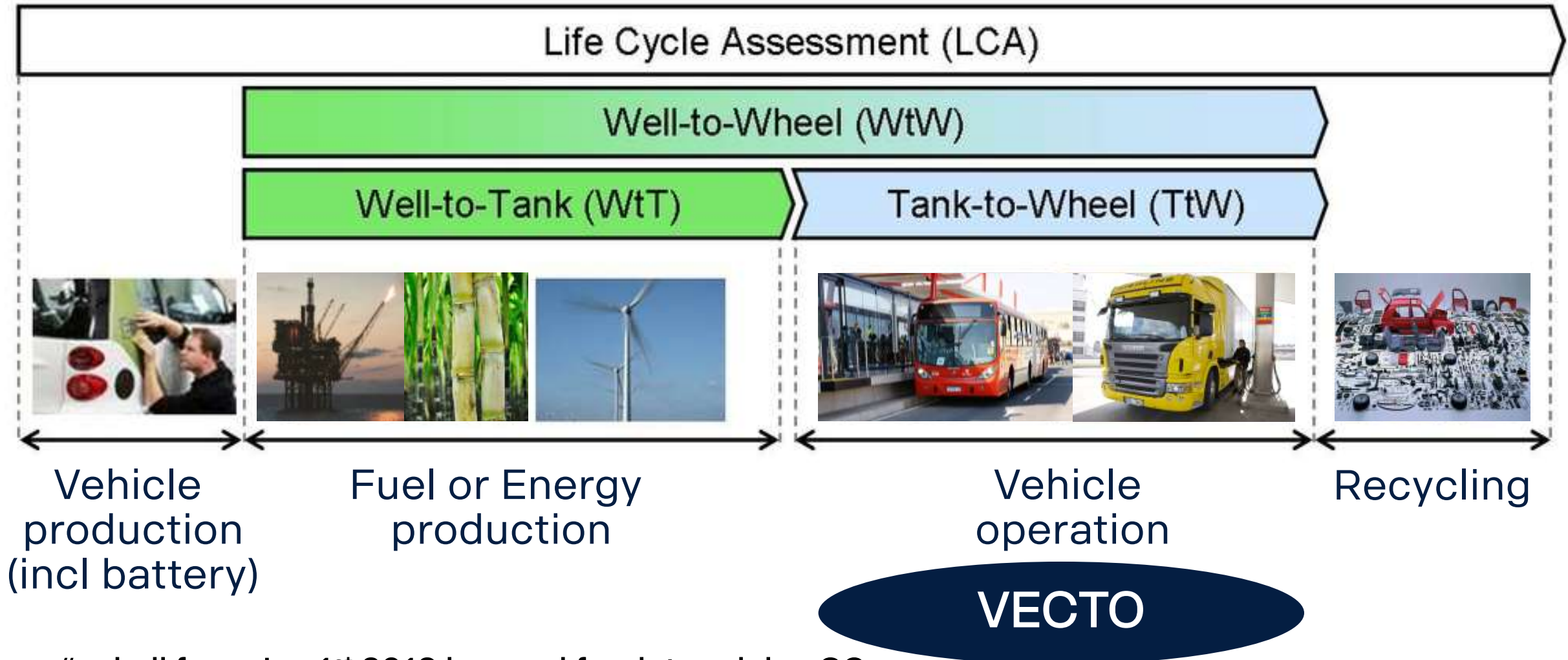
**10X**  
CO<sub>2</sub> cuts

**4X**  
PM cuts

# REGARDLESS OF TECHNOLOGY – IT'S REAL CUTS OF CO<sub>2</sub> THAT MATTERS



WTF IS WTW, TTW AND WTT?



“...shall from Jan 1<sup>st</sup> 2019 be used for determining CO<sub>2</sub> emissions and Fuel Consumption from Heavy Duty Vehicles..”





# THERE ARE NO SILVER BULLETS FOR SUSTAINABLE TRANSPORT

A BROAD GREEN TOOLBOX



Energy  
efficiency



Smarter  
transport



Alternative fuels  
and electrification

**CLEAN  
LOW CARBON  
COMMERCIAL  
OUTCOMPETE DIESEL**

# HERE AND NOW - CLEAN AND LOW CARBON

NO SILVER BULLETS – DIFFERENT SOLUTIONS NECESSARY FOR DIFFERENT TRANSPORT MISSIONS AND MARKETS



## BIODIESEL & HVO

Low blends to B100  
Diesel engine

**Up to 85 %  
CO<sub>2</sub> reduction**

*All types of applications, including long-haulage and coaches.*



## ETHANOL ED95

World's No. 1 biofuel  
Diesel engine

**Up to 90 %  
CO<sub>2</sub> reduction**

*Buses, coaches waste collectors, distribution trucks.*



## BIOGAS & NATURAL GAS

Compressed or liquid  
Otto engine

**Up to 90 %  
CO<sub>2</sub> reduction**

*City/Intercity buses, waste collectors, distribution trucks.*



## HYBRIDS & ELECTRIFICATION

Diesel hybrids  
Biofuel hybrids  
BEV Demo tests

**Up to 98 %  
CO<sub>2</sub> reduction**

*City buses, waste collectors, distribution trucks.*



## BUS SYSTEMS

Bus System packages

Buses  
Service and R&M  
Workshops  
Financing  
ITS and FMS systems  
Ticketing systems  
Alternative Fuels

# GLOBAL CO<sub>2</sub> REDUCTIONS FROM ALTERNATIVE FUELS AND POWERTRAINS



## Biodiesel

Produced from sources like rapeseed, soy and other oil plants – as well as waste cooking oil.



Optimal CO<sub>2</sub> reduction of up to 83%\*



## Bioethanol / ED95

Can be produced comparatively easy – even on a small scale – from sources like sugar cane, wheat, cellulose and organic waste.



Optimal CO<sub>2</sub> reduction of up to 90%\*



## HVO – Hydrogenated Vegetable Oil

Produced from sources such as waste oil, rapeseed oil and animal fat.



Optimal CO<sub>2</sub> reduction of up to 90%\*



## Hybrid

A combination of electrical driveline and traditional engine reduces the fuel consumption which leads to lower emissions and noise levels.

The estimate refers to a hybrid and HVO combination.



Optimal CO<sub>2</sub> reduction of up to 92%\*



## Biogas

Produced from a number of sources, but the most cost efficient and sustainable source is local sewage or waste.



Optimal CO<sub>2</sub> reduction of up to 90%\*



## Full electric

A fully electric driveline with either conductive or inductive charging infrastructure can ensure continuous operation without local emissions.

Assuming renewable electricity production from wind and sun, 37% using average global electricity production, 31% using fossil electricity production from coal.

Renewable electricity



Optimal CO<sub>2</sub> reduction of up to 98%\*

Global grid-mix



Optimal CO<sub>2</sub> reduction of up to 37%\*



## Natural gas

Natural gas is a fossil fuel, but since the methane molecule contains only one carbon atom the emitted amount of CO<sub>2</sub> during combustion is smaller compared to diesel.



Optimal CO<sub>2</sub> reduction of up to 15%\*

\*Compared to standard diesel

Fossil

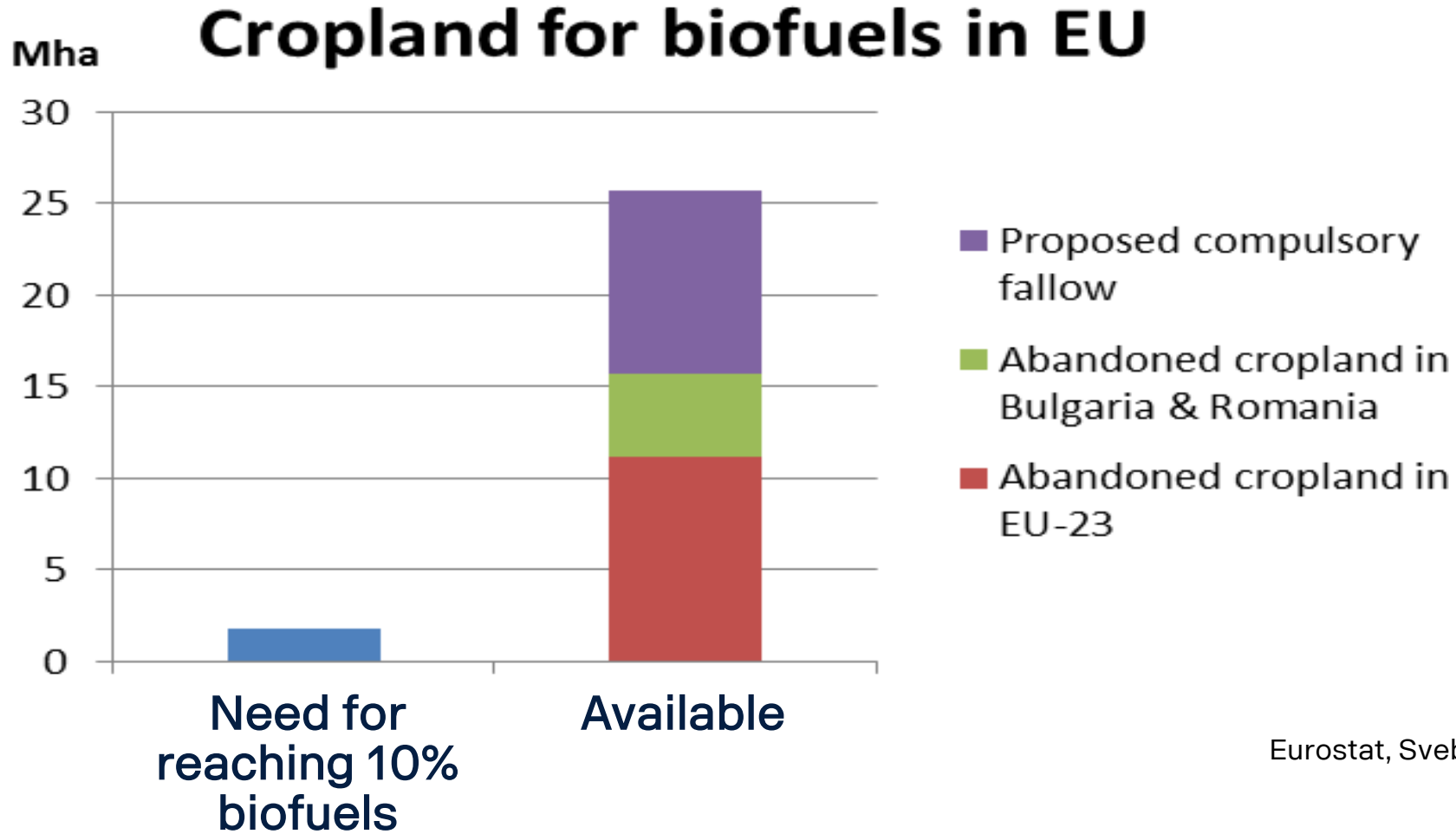


Up to +31% increase of CO<sub>2</sub> emissions



# THERE IS A LOT OF IDLE LAND – ALSO IN EUROPE

FALLOW AND ABANDONED LAND ALONE COULD MAKE EUROPE FOSSIL FUEL FREE AND OIL INDEPENDENT



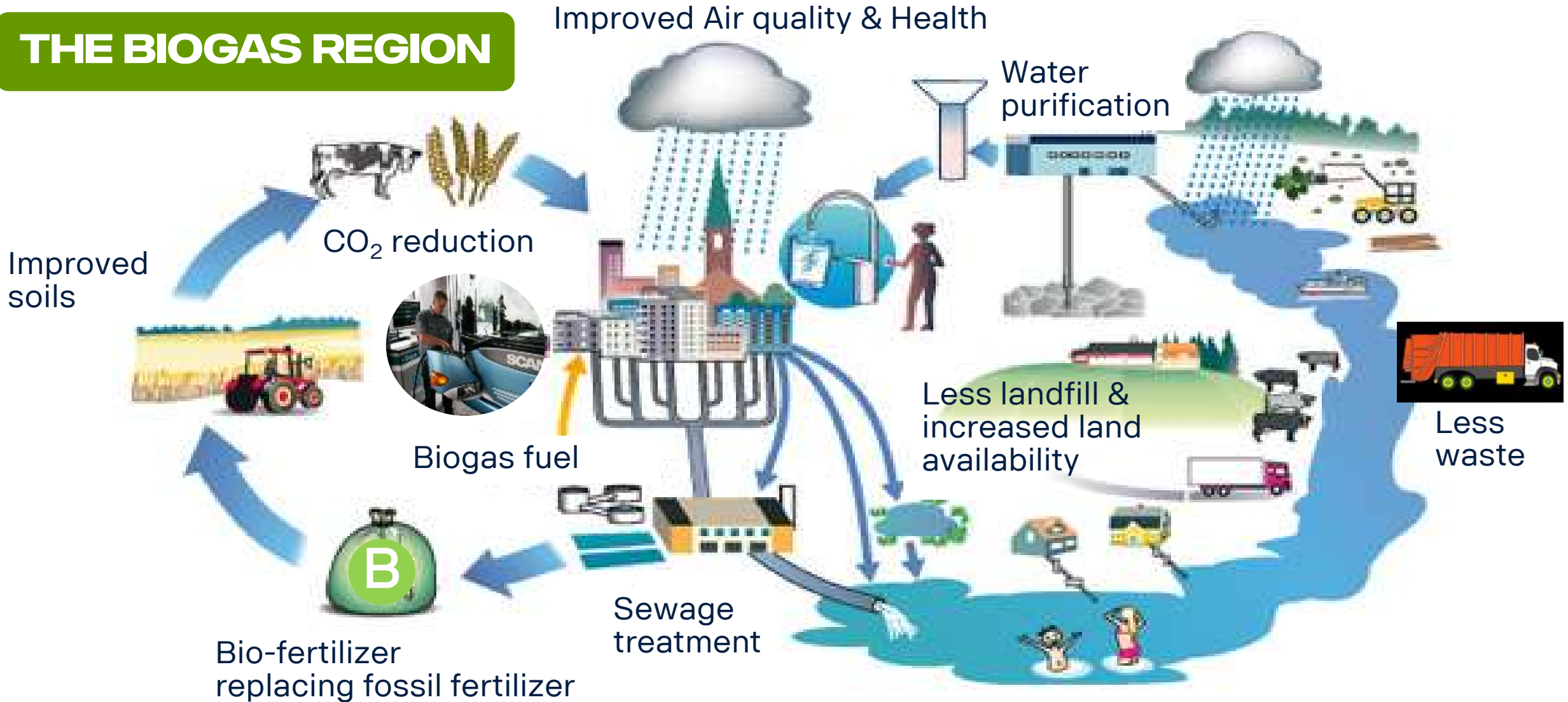
Eurostat, Svebio

# A PRE-REQUISITE FOR A CIRCULAR ECONOMY

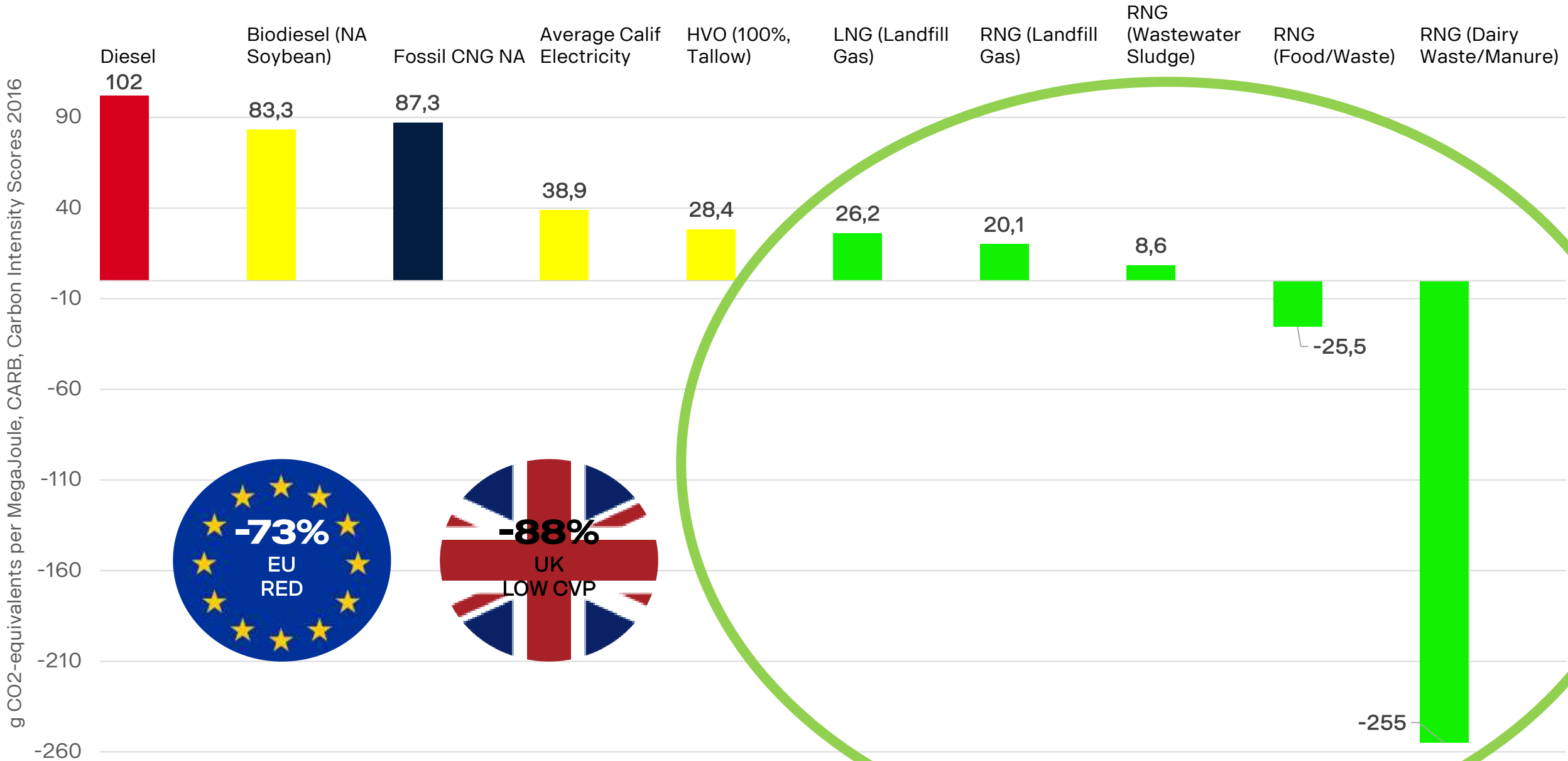
WASTE-TO-BIOGAS SYSTEMS HAS MANY BENEFITS FOR THE REGION



## THE BIOGAS REGION



# BIOGAS – AS GREEN AS IT GETS



g CO2-equivalents per MegaJoule, CARB, Carbon Intensity Scores 2016

# WASTE-TO-FUEL BUS SYSTEMS ADDRESSES ALL THE KEY PROBLEMS FOR GROWING CITIES



**DO YOUR MAYOR  
A FAVOUR!**

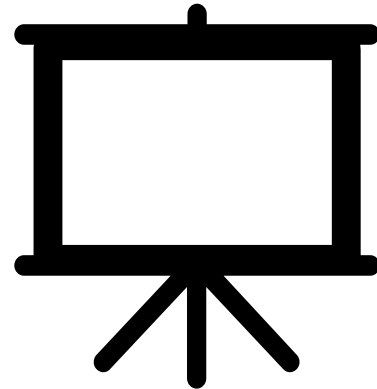
ENERGY SECURITY,  
PUBLIC TRANSPORT, WASTE,  
AIR QUALITY AND  
CLIMATE CHANGE MITIGATION  
ARE THE TOP 5 PRIORITIES OF  
ALL MAJOR CITIES





# THE WASTE TO FUEL FILM

FROM ALL KINDS OF ORGANIC WASTE TO CLEAN BIOGAS FLEETS



**THE WASTE  
TO FUEL FILM**

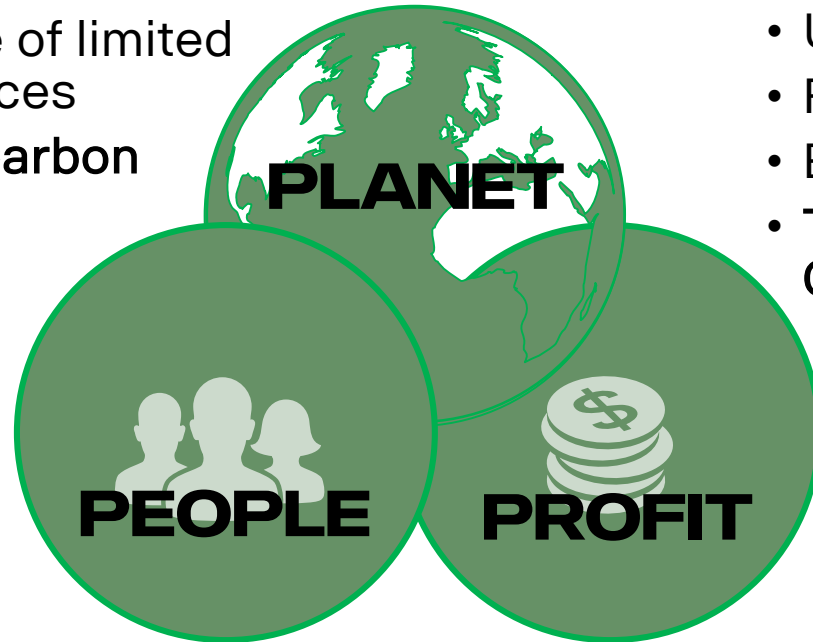




# WHAT IS SUSTAINABILITY?

## AND WHAT IS SUSTAINABLE TRANSPORT?

- GHG emissions
- Usage of limited resources
- Low Carbon



- Attractive
- Uptime
- Flexibility
- Economy
- Total Cost of Operations



- Safety (driver & surrounding)
- NOx, PM, Noise, Ozone
- Supply chain responsibility
- Clean

**CLEAN  
LOW CARBON  
COMMERCIAL  
OUTCOMPETE DIESEL**

# LEADING THE SHIFT

*“I’m committed to lead Scania on a way where we will take the leadership in creating the shift towards a more sustainable transport system.”*

*Scania is the first global vehicle OEM got approved the Science Based Targets.*

**Henrik Henriksson,  
President and CEO of Scania.**



- 50% CO<sub>2</sub> cuts in our own operations by 2025

- 50% CO<sub>2</sub> in our own purchased transport by 2025

100% fossil free electricity by 2020

-20% CO<sub>2</sub> in customer operations by 2025



# MORE ON SCANIA'S SUSTAINABILITY WORK AND OTHER GOOD EXAMPLES

CTRL + CLICK ON THE LINKS TO OPEN THE YOUTUBE CLIPS!

[THIS IS A BUS >>](#)

[WASTE TO FUEL >>](#)

[ELECTRIFICATION >>](#)

[BIOGAS BUSES ON ICELAND >>](#)

[NOTTINGHAM BIOGAS I >>](#)

[NOTTINGHAM BIOGAS II >>](#)

[DANISH BIOGAS INTERCITY >>](#)

[THE POO BUS >>](#)

[NORWEGIAN BIOGAS BUSES >>](#)

[GAS TRUCKS IN SPAIN >>](#)

[BBC ON BIOGAS >>](#)

[IVL BIOGAS FILM >>](#)



[ALTERNATIVE FUELS >>](#)

[DIVERSITY >>](#)

[CONNECTIVITY >>](#)

[AUTOMATION >>](#)

[AUTONOMOUS TRUCKS >>](#)

[THE NXT CITY VEHICLE >>](#)

[PARTNERSHIPS >>](#)

[BUS SYSTEMS >>](#)

[JOHANNESBURG BRT >>](#)

[CARTAGENA GAS BRT >>](#)

[FISHY BUS-INNESS >>](#)

[ETHANOL BUSES IN FRANCE >>](#)

[BONUS: WORLD'S FASTEST BUS – COW POWERED...](#)