Biogas and the sustainable development goals - how are they connected? What will be the "next wave"?

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Raw material focus
Diversified
100% product

Skoghallsverken vid Klarälvens utlopp i Vänern är en mönsteranläggning, där träindustriens snart sagt alla grenar, elektriskt sågverk, sulfitfabrik, sulfatfabrik, sulfitspritfabrik, elektrokemisk fabrik etc., finnas sammanförda, och där stora hamnanläggningar möjliggöra direkt utförsel med oceangående fartyg (efter Trollhätte kanals senaste utvidgning). Foto: Aero-Materiel (1049).

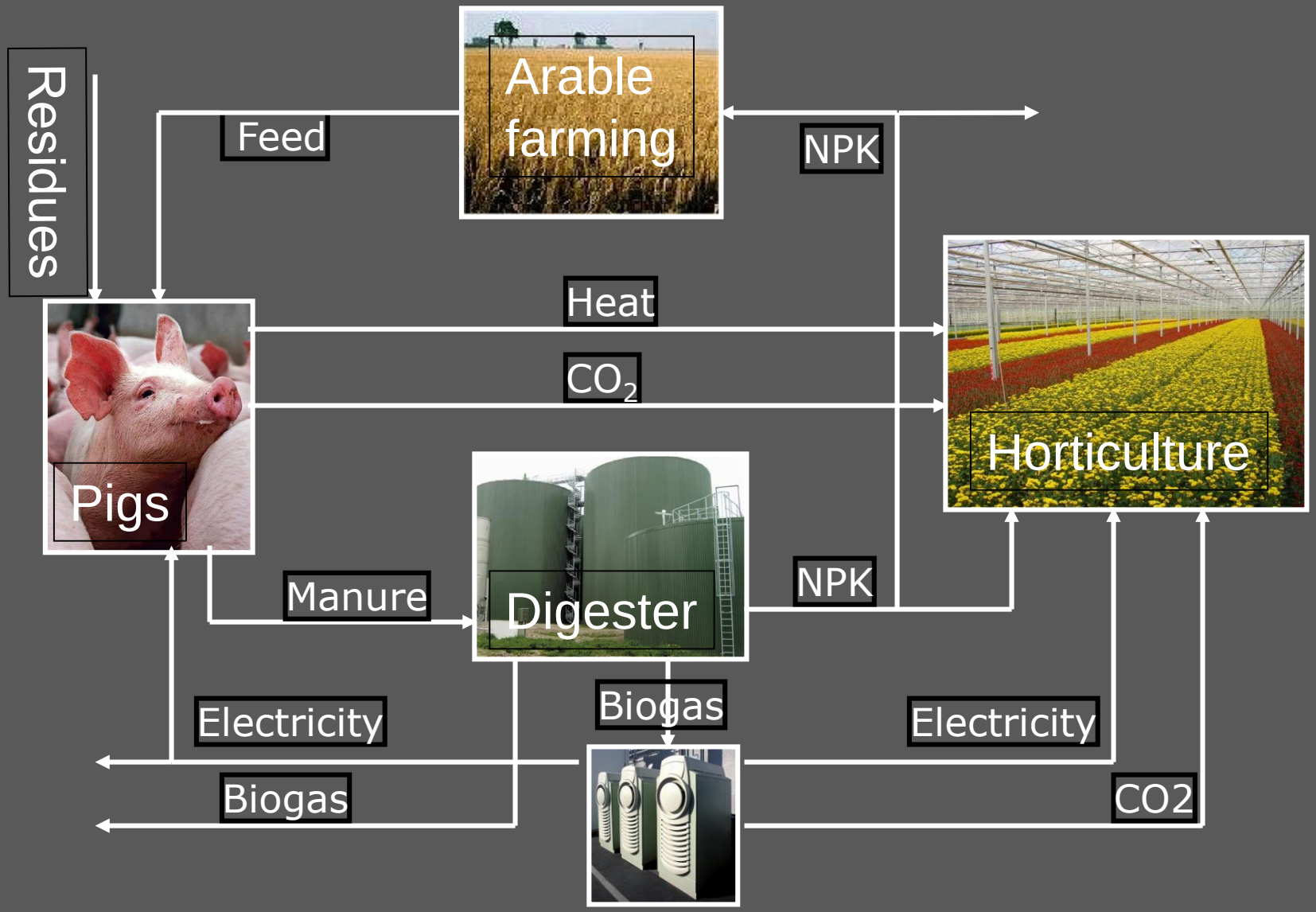
Demand focus
Core focus
Globalisation
Economy of scale

Neglecting by-product valorisation

”Core focus” strategies have served humanity well

Serious resource and pollution problems grow because:

Sectors and supply chains are separated from each other



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Solving one problem at the time lead to problem shifting

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Wide system boundaries decrease the risk of problem shifting

Tail-pipe emissions have local relevance

Well to wheel emissions also add societal and global relevance

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Swedish environmental goals and UN sustainable development goals as frameworks for assessment

The broader the assessment – the better the result for biogas solutions

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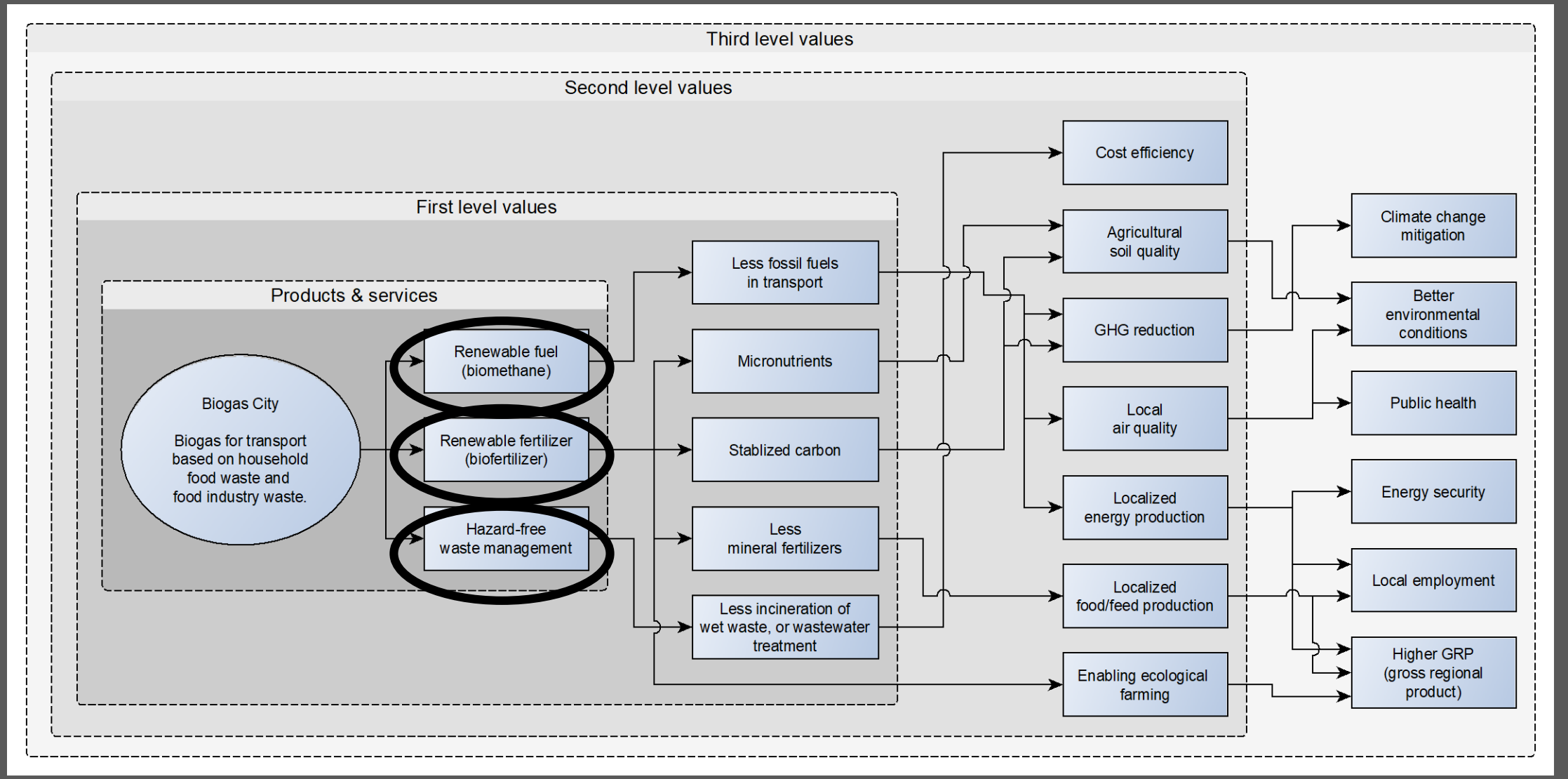
Values of biogas solutions: the biogas city



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Biogas Production

1. Improved resource recycling
2. Increased investments
3. Increased biodiversity
4. Less ecotoxicity
5. Less acidification
6. Less eutrophication
7. Increased regional employment
8. Increased regional sum of wages
9. Higher share of renewable energy
10. Increased nutrient recycling
11. Improved energy security

Biogas Use

1. Improved air quality
2. Lower accessibility
3. Less noise
4. Less acidification
5. Less eutrophication
6. Less climate impact

Swedish environmental goals and socio-economic factors from regional development area

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Increased biogas demand –more competitive and sustainable industries

Methane emissions from manure could stop and
3 TWh methane could be produced in Sweden

Biorefineries, slaughterhouses and dairies more competitive if biogas production is available for by-product valorization

Fish processing industry
Decrease emissions enable growth within permit
Provides heat and electricity

Swedish pulp and paper industry require 1 TWh electricity to treat waste water.

With an anerobic cleaning step 1 TWh of energy could be produced

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Biofertilizer enables ecological farming expansion

Biofertilizer also add soil organic carbon

0.4% annual increase enough to balance all CO_2-emissions

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Role of biogas in sustainable biorefineries- Lidköping

Sludge

Wastewater Treatment

Wastewater

Lidköping Municipality

Waste

Waste Mgt Department

Waste water

Heat

El.

Waste Derived Fuel

Lantmännen Lantbruk

Heat

Combined Heat & Power Plant

Steam

Lantmännen Reppe

Residues

Grain residues

Grain

Farmers

Fodder

Fertiliser

Gasum

Biogas

Biogas

Liquified Biogas

Fordons gas

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Framing of biogas solutions – alternative to the energy or waste sectors

Sustainable cities and regions

Integrated solution för wastewater treatment, waste management, public transport and nutrient recycling with global relevance

Sustainable bioeconomy

Future network based biorefineries contain a biogas solution for valorisation and diversification

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Biogas production at a Swedish paper mill?

	Existing system – without AD	Theoretical system – with AD
Final sewage discharges		
COD (t/d)	5.5	4.0
SS (t/d)	0.7	0.7
Total P (kg/d)	9.0	9.6
Total N (kg/d)	220	160
Biogas generation		
Energy content (GWh/year)	-	43
Sludge production		
Total sludge (TTS/year)	64.4	50.1
Sludge solids (%)	28	35
Estimated costs and revenues		
Net economic impact (million SEK/year)	-	2-11

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Biogas solutions in pulp and paper mills

Mill level

Better treatment capacity and decreased emissions

Reduction needs and costs for nutrients

Easier to comply with environmental permits

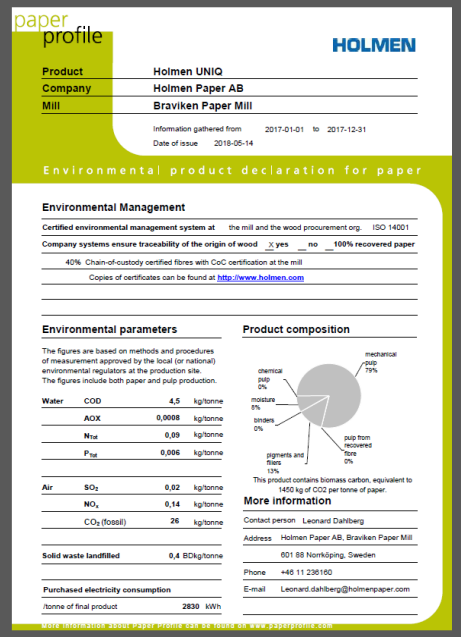
Sludge volume reduction

Economic diversification and can enable growth

Product level

Improved product performance

Environmental product declaration



paper profile

HOLMEN

Product	Holmen UNIQ
Company	Holmen Paper AB
Mill	Braviken Paper Mill

Information gathered from 2017-01-01 to 2017-12-31
Date of issue 2018-05-14

Environmental product declaration for paper

Environmental Management

Certified environmental management system at the mill and the wood procurement org. ISO 14001
Company systems ensure traceability of the origin of wood X yes no 100% recovered paper
40% Chain-of-custody certified fibres with CoC certification at the mill
Copies of certificates can be found at http://www.holmen.com

Environmental parameters

The figures are based on methods and procedures of measurement approved by the local (or national) environmental regulators at the production site. The figures include both paper and pulp production.

Water	COD	4,5	kg/tonne
	AOX	0,0008	kg/tonne
	N_{tot}	0,09	kg/tonne
	P_{tot}	0,006	kg/tonne
Air	SO_2	0,02	kg/tonne
	NO_x	0,14	kg/tonne
	CO_2 (fossil)	26	kg/tonne
Solid waste landfilled		0,4	BDkg/tonne
Purchased electricity consumption			
/tonne of final product		2830	kWh

Product composition

This product contains biomass carbon, equivalent to 1450 kg of CO2 per tonne of paper.

More information

Contact person	Leonard Dahlberg
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	601 88 Norrköping, Sweden
Phone	+46 11 236160
E-mail	Leonard.dahlberg@holmenpaper.com

More information about paper profile can be found on www.paperprofile.com

Corporate level

Fossil-free goals

Climate positive

Contributing to sustainable development goals

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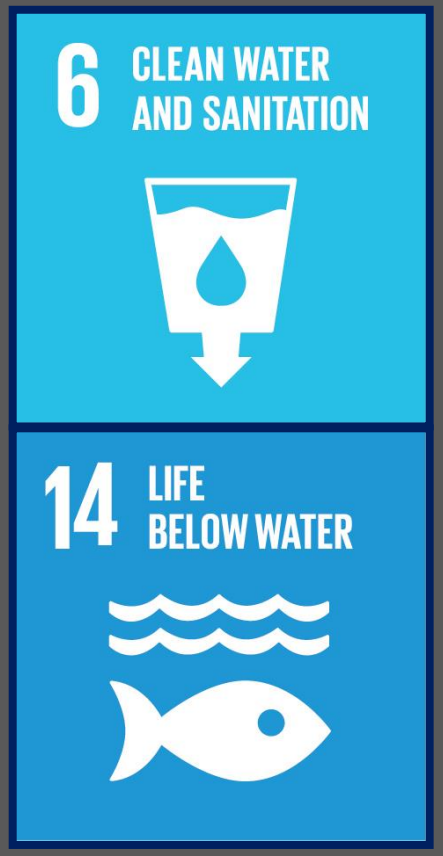
Biogas in pulp and paper industry sustainability strategic work



Water cleaning and recycling

Less emissions

Higher value creation from forest resources

Biofertilizer

New production line

Biorefinery development

Innovation

Biogas solutions in the pulp and paper industry

- The framing of biogas as an ”energy” and “waste treatment” solution impacts the perception of this technology

- Anaerobic digestion systems are linked to larger environmental and sustainability performance of relevance on the mill, the product and the corporate level

- “**The way issues are discussed matters** in the political debate about business and sustainability… because **such discourse may have a performative function in producing the effects that it names**” (Ihlen and Roper 2014)

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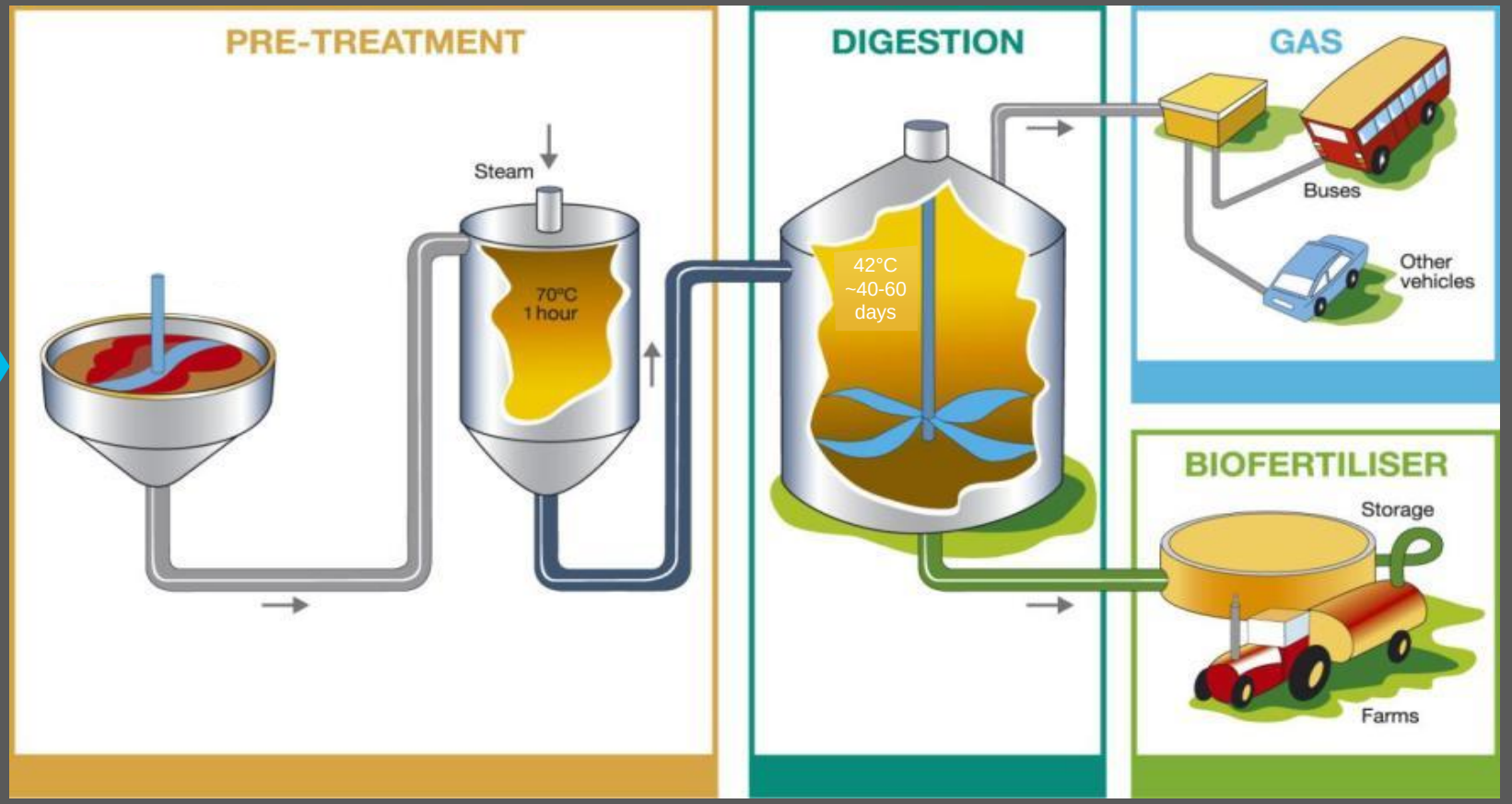
Biogas solutions – a Nordic model of global relevance

Sewage
Organic wastes
Landfills



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Grand challenges for cities and their surroundings

70% population	80% energy use	80% CO_2	86% GDP

Urbanisation and congestion
Air pollution
Climate change
Energy security
Not enough jobs
Amount of waste grows
Nutrient flows between city and surroundings
Water pollution
Soil fertility in agriculture

One solution contributes to them all

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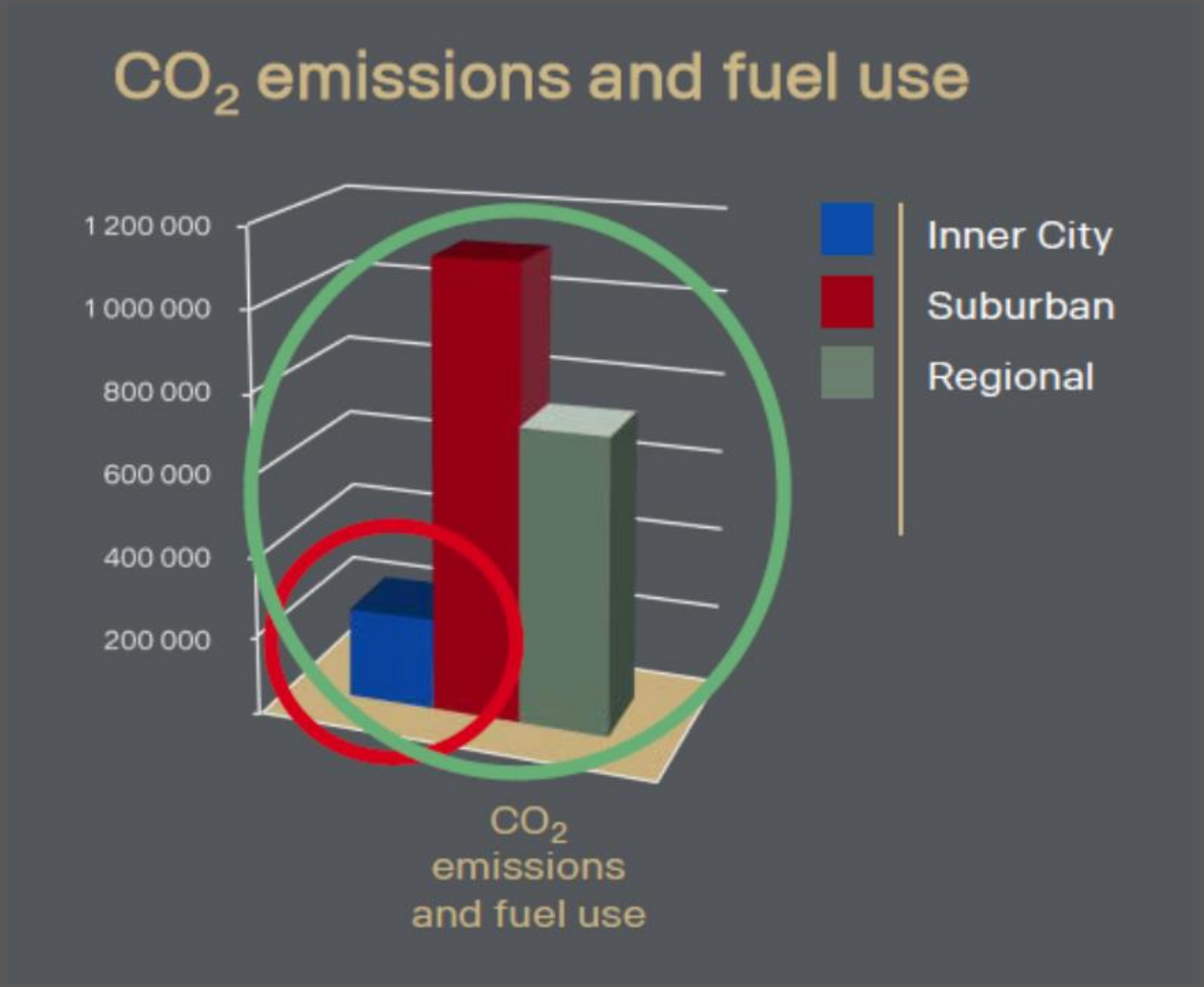
Transport in cities is mainly suburban and regional



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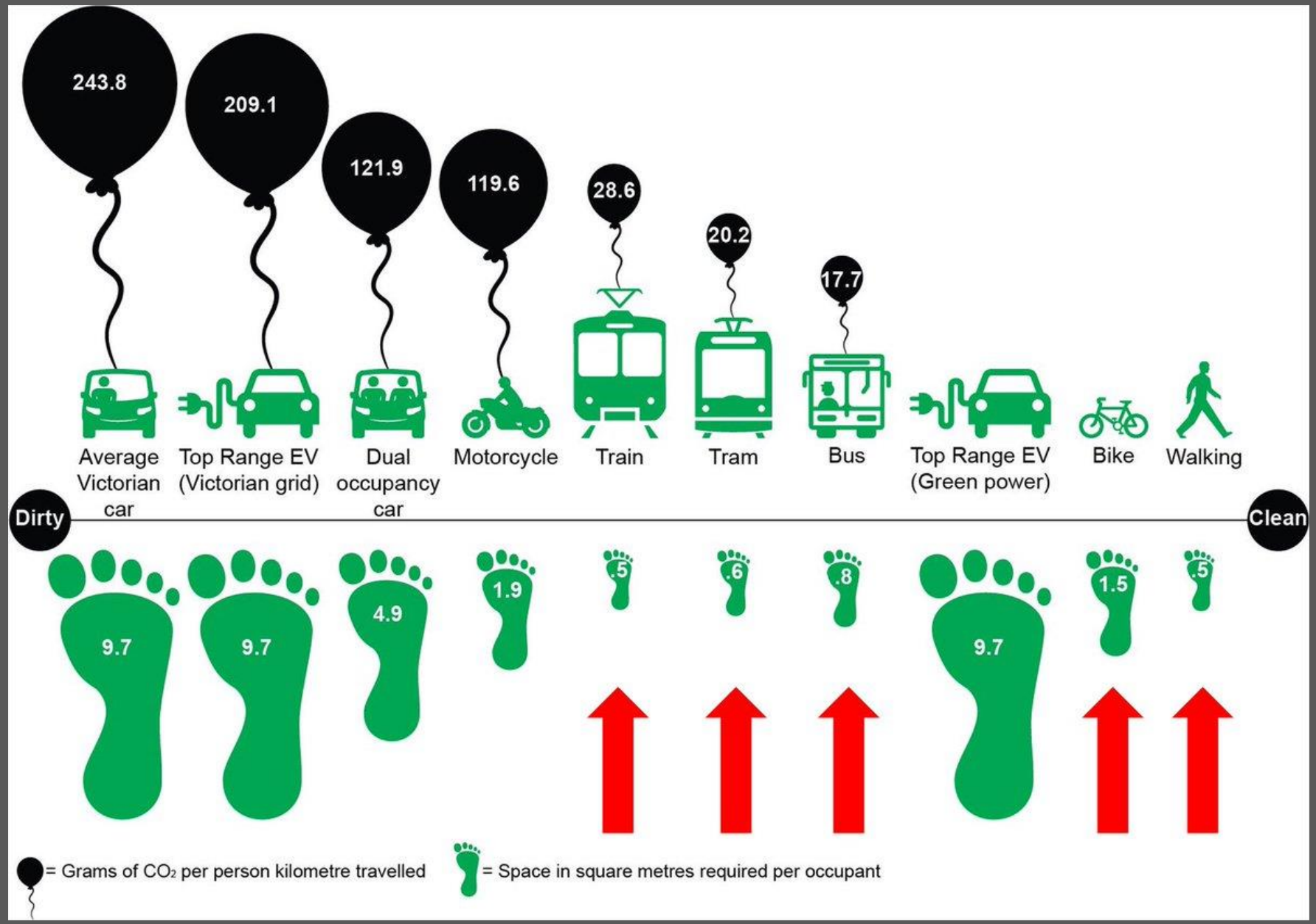

Biogas fuelled
Bus Rapid Transit Systems

Climate neutral
98% particle reduction
95% NOx-reduction
50% noise reduction

Cost-efficient
- 10-50 times bigger transport network than rail solutions

Capacity as Metro (24 m bus, 120-150 passengers, 5 min intervals)

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Nordic countries can make a global difference!

”Sweden – a fossil free world fair” DI 20180409

Technology
Vehicles
Knowledge
Collaborative governance

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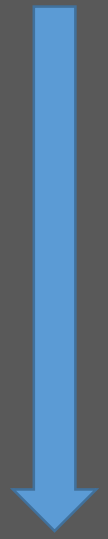
The framing and identity of biogas solutions



- Waste treatment – hygienic focus
- Energy and climate – carbon focus
- Circular and biobased economy - local nutrient flows
- Sustainability strategies – direct and indirect effects in a larger system

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Conclusion

Biogas and the sustainable development goals - how are they connected?

- Closely and widely but almost never acknowledged.

What will be the "next wave"?

- Companies and societies will start “framing” biogas solutions as tools for sustainability and tell;
- the narrative of biogas solutions as modern smart systems

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