



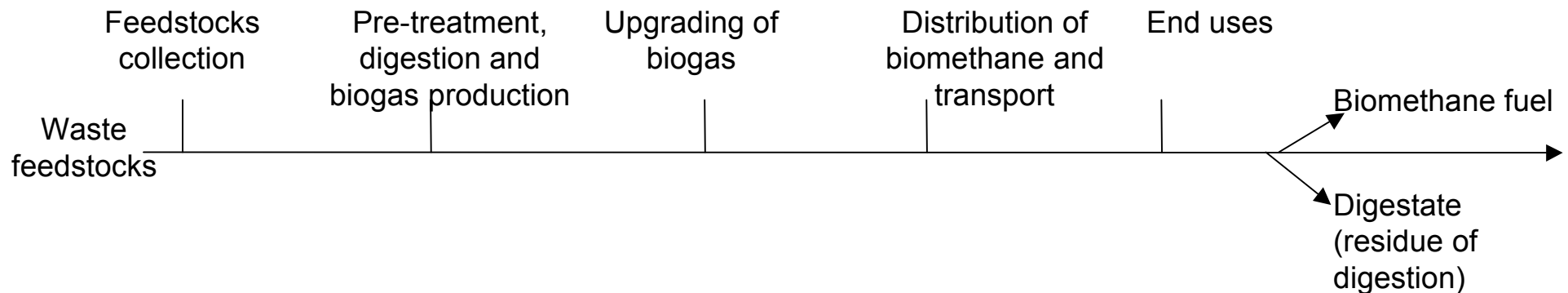
biogasmax
A DRIVING FORCE

European Conference on Biomethane Fuel - Göteborg

Best practices in Europe

■ From waste to biomethane (well-to-wheel):

>> ... how to ensure success at each stage of the biomethane chain ?

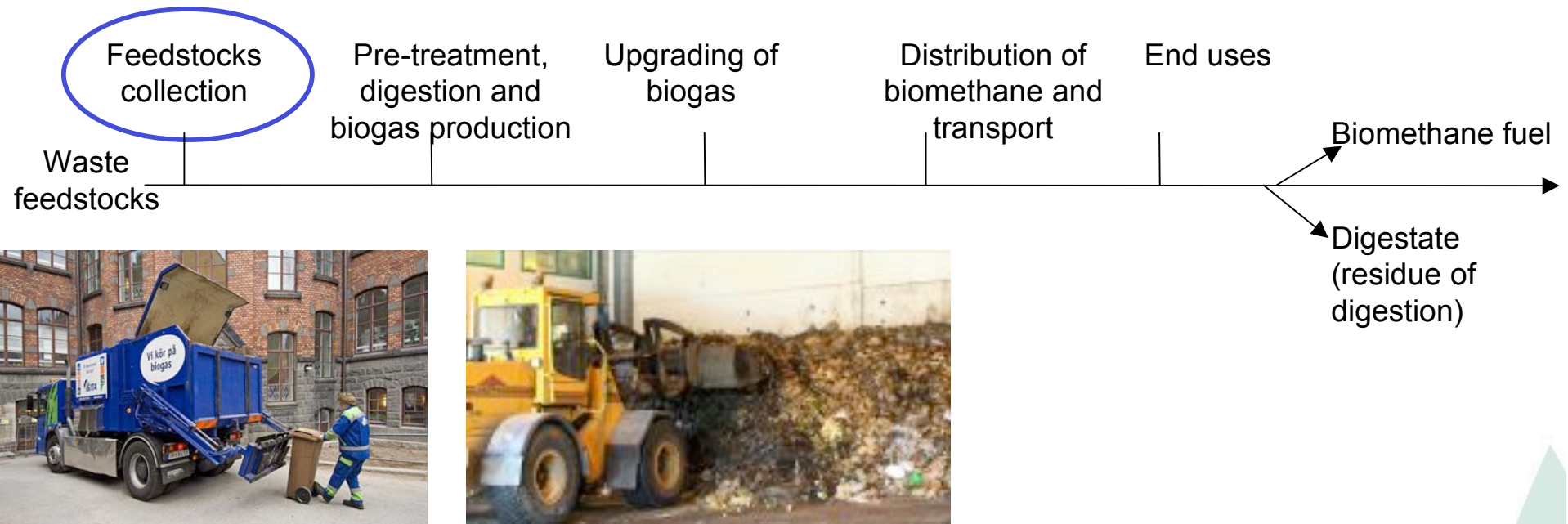


>> ... how to build an economically viable system ?

=> What can be learnt from Biogasmax best practices in Europe ?



Best practices in Europe



First step: the political will

- Biomethane fuel production units can be developed thanks to a strong political support
 - biofuels and a better quality of air
 - organic recovery of biowaste (to match with the European Directive on landfilling objectives and to avoid the incineration of this type of moist waste which is – in terms of net energy production - not really interesting)
 - the production of quality organic fertiliser

- The political support is a strong and necessary way for biomethane expansion:
 - financial supports (incentives) for investments (plants, vehicles, distribution facilities...)
 - tax system on fuels and other energies
 - legislation on safety issues, waste management, green procurement...
 - grid injection



The political will: some experiences

- **Stockholm** has decided to treat 35% of the municipal organic waste in a biological way by 2010
- **Lille** aims to feed the Organic Recovery Centre with the source-sorted household organic waste issued from 50 % of the metropolis area
- **Linköping** (Stockholm) has set up a “pay as you through” fee for household waste collection proportional to weight: this measure encourages source separation and thus the relevance and the effectiveness of a biogas production plant
- **Rome** decided to develop the source-sorted biowaste collection in various types of housing.
- **Göteborg** has developed the Biogas Väst cooperation project. Purpose : to develop a new industry. Vision for 2020 : Biomethane could replace 20 % of fossil fuel in the road transport sector.



The political will:

■ The role of European legislation:

- New impulsion towards a sustainable management of organic waste has been expected by the progressive implementation of the EC Directive 199/31 on Landfill asking for gradual reduction of organic waste received by landfills. This has been addressed by the **Biogasmax case studies**.
- It might be pointed out that the former project of EC Directive on biowaste in 2001, which was finally given up, could have supported strongly the biogas development in cities. To this regard, it should be highlighted that a **Green Book for Biowaste** (which is a pre-study for legislation) was published by the EC's DG Environment at the end of year 2008 (EU [COM(2008)811ENDG]).



Door-stop selective biowaste collection (1)

■ in Rome

ON STREETS:

Big containers have been removed from the streets



BUILDINGS, SCHOOLS, OFFICES, COMMERCIAL ACTIVITIES:

Small bins have been located in internal rooms/areas of buildings



Organic waste

Plastic, Glass,
Metal

Paper,
Cardboard

Dry, non recyclable
waste



■ in Rome

AT HOME:

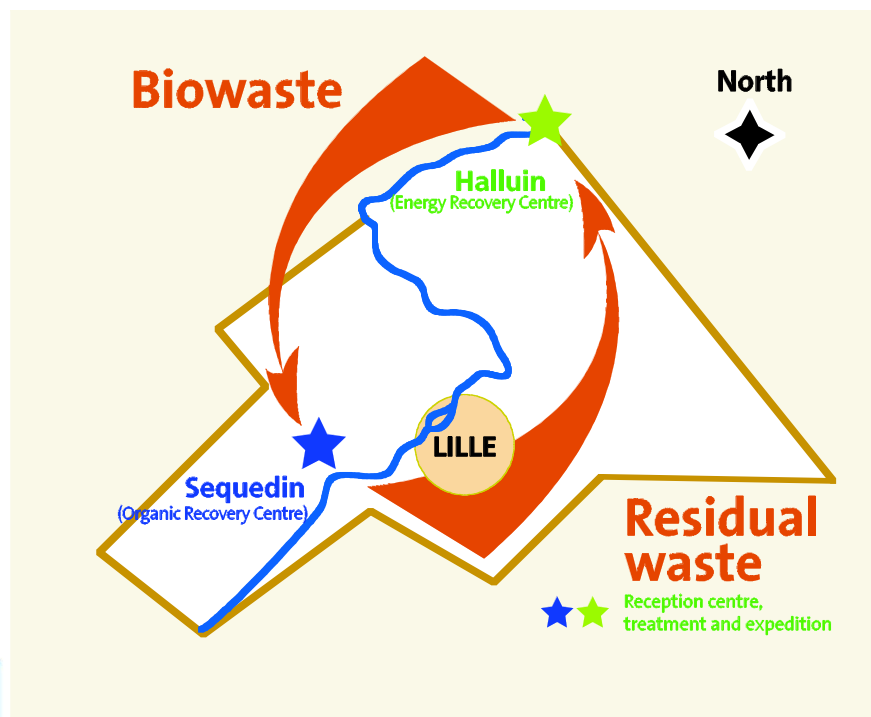
Each household will receive a Kit for facilitating organic/humid wasted separated collection that consists in:

- n.1 **BIO-BIN** (PVC bin with holes for odour prevention or reduction)
- n. **180** recyclable paper bags for indoor use;
- User separated collection guide
- Service calendar

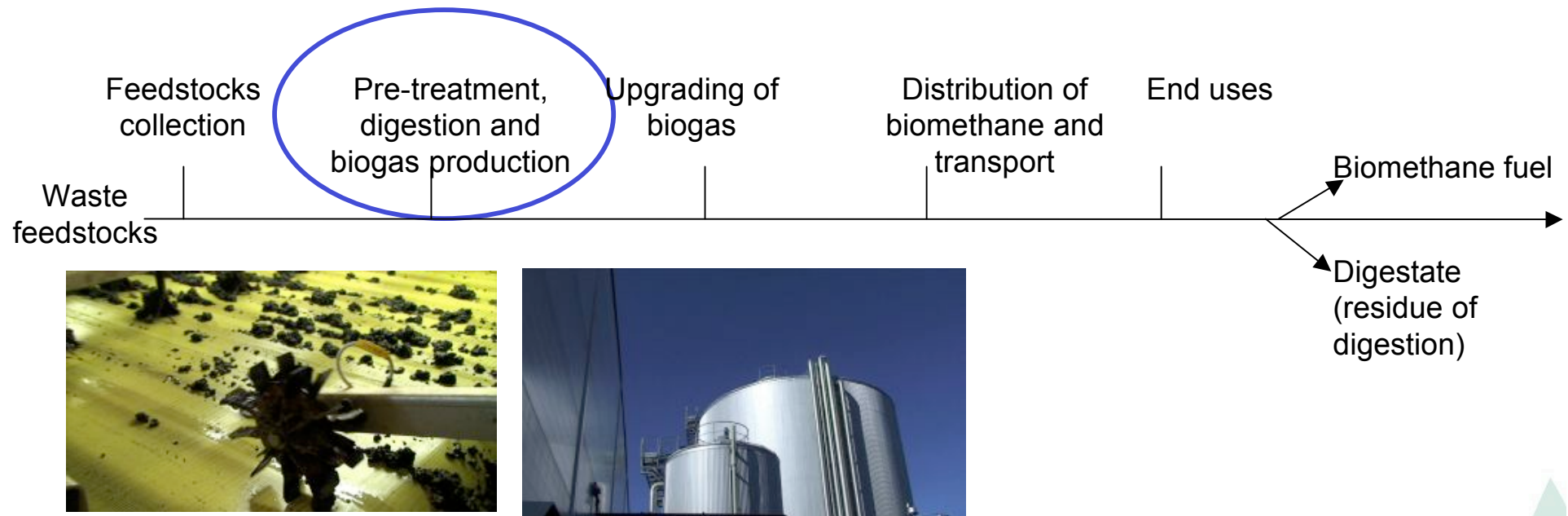


Optimisation of transport flows

- **in Lille**, the organic recovery centre is located close to the waterway and directly linked with the other main transfer centre. Thus, a major part of substrate is easily transported to the biogas plant.



Best practices in Europe



Pre-treatment of feedstock (1)

- Use of co-substrates to increase biogas production:
 - **in Bern**, biogas production increased by 21%, through adding co-substrates rich in energy (alcohols, fat, restaurant waste and plant oils...)



	Biogas Mio Nm³/a	Increase since 2006 [%]	Biomethan e Mio Nm³/a
2006	4,702,728	-	-
2007	5,239,398	11.4	-
2008	5,700,510	21.2	ca. 1.8

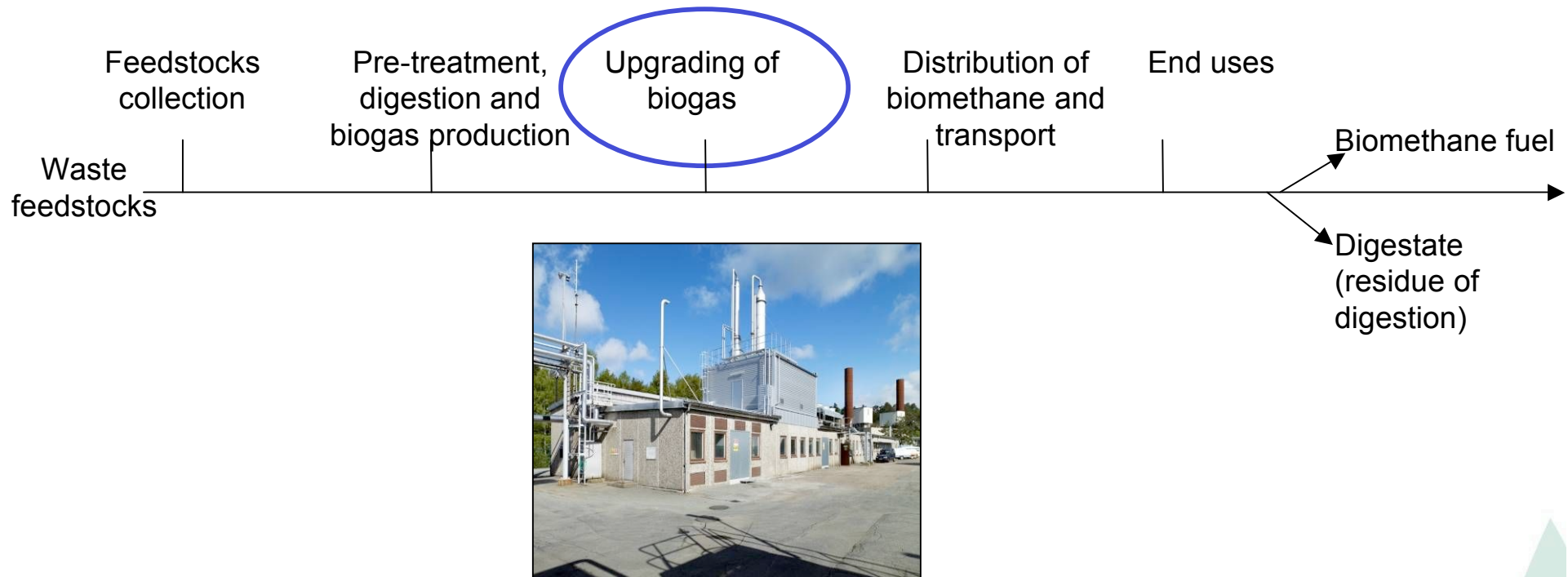


Pre-treatment of feedstock (2)

- Increasing biodegradability studied in BiogasMax research activities:
 - **ISET** in Germany is currently working on the effect of ultrasonic disintegration on feedstock in order to increase the rate of biogas production,
 - methane content is increased up to 15 %
 - biogas production rate is increased up to 20 %
 - **INRA** in France is testing for **Lille** different pre-treatment of feedstock in order to increase the biodegradability and the biogas production
 - chemical pre-treatment (basic hydrolysis) can increase up to 50 % the biodegradability of sewage sludge
 - addition of co-substrates like greasy waste water can boost the biogas production without any side-effect



Best practices in Europe



Upgrading of biogas

■ Objectives:

- remove pollutants like H₂S
- remove CO₂ to increase the methane content of the gas

■ Many techniques are available on the market

■ Three techniques have been monitored within BiogasMax:

- water scrubbing
- pressure swing adsorption
- chemical absorption

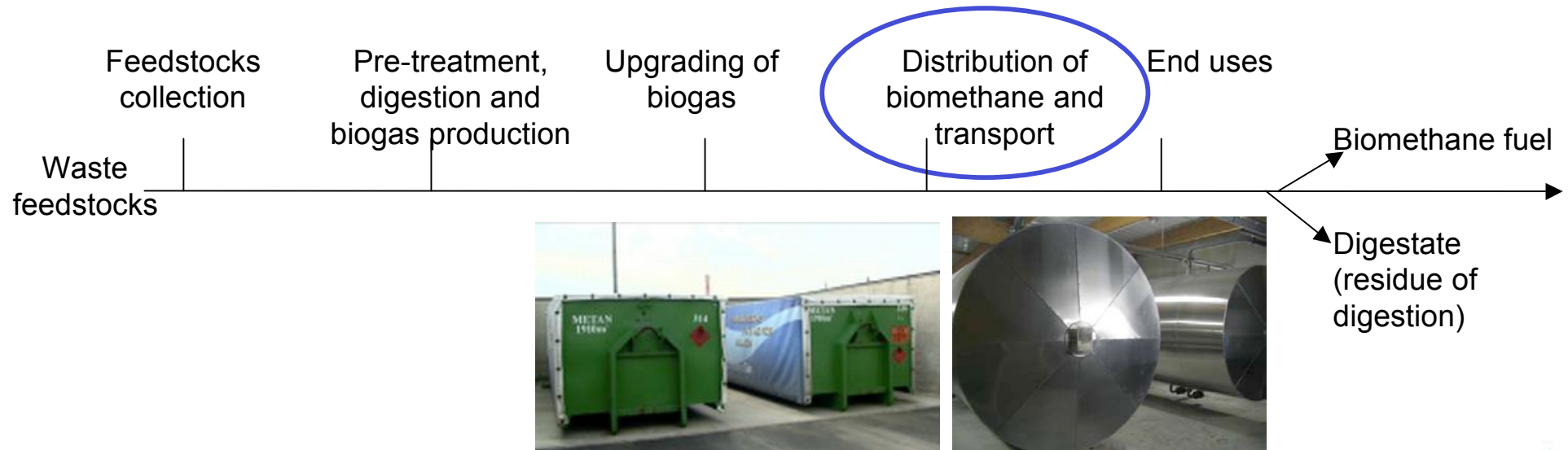
NB: No partner reported essential problems

→ state-of-the-art of technologies for biogas upgrading

→ see training session on Wednesday Sept. 9. 2009

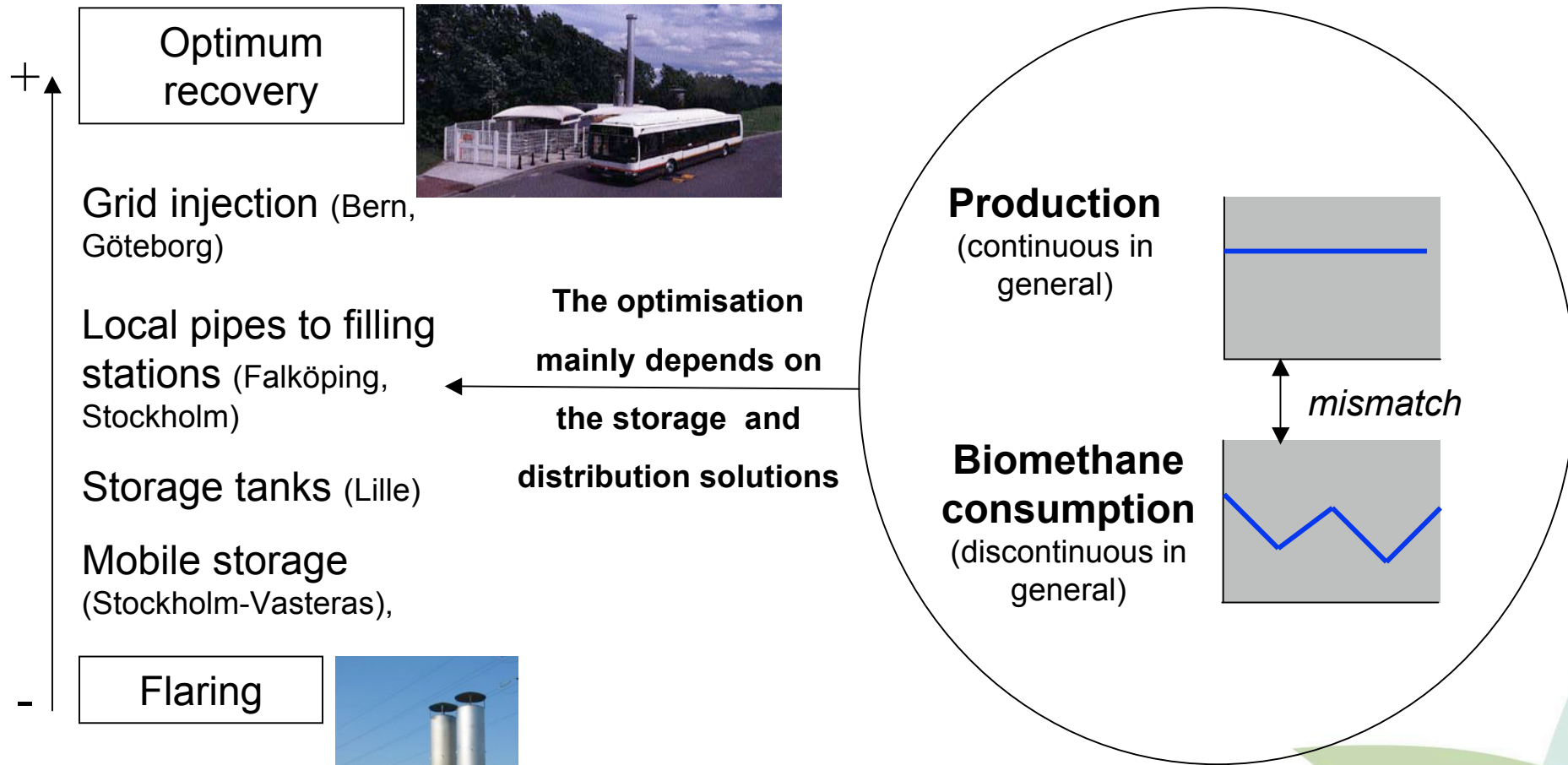


Best practices in Europe



Distribution and transport (1)

■ Which optimisation ?



Distribution and transport (2)

>> Solutions adapted to local contexts and constraints

Which local situation?

« Client areas » **far from production site**
No grid or pipe possible



Mobile storage



Västerås

Clients **close to production site**
(housing, bus depot)



Dedicated pipe and security of supply with back up system (LNG or CNG)



Stockholm, Rome, Lille

Natural gas grid **next to production site**



Grid injection



Bern, Göteborg, Lille

Which solution(s) ?




Concerned sites

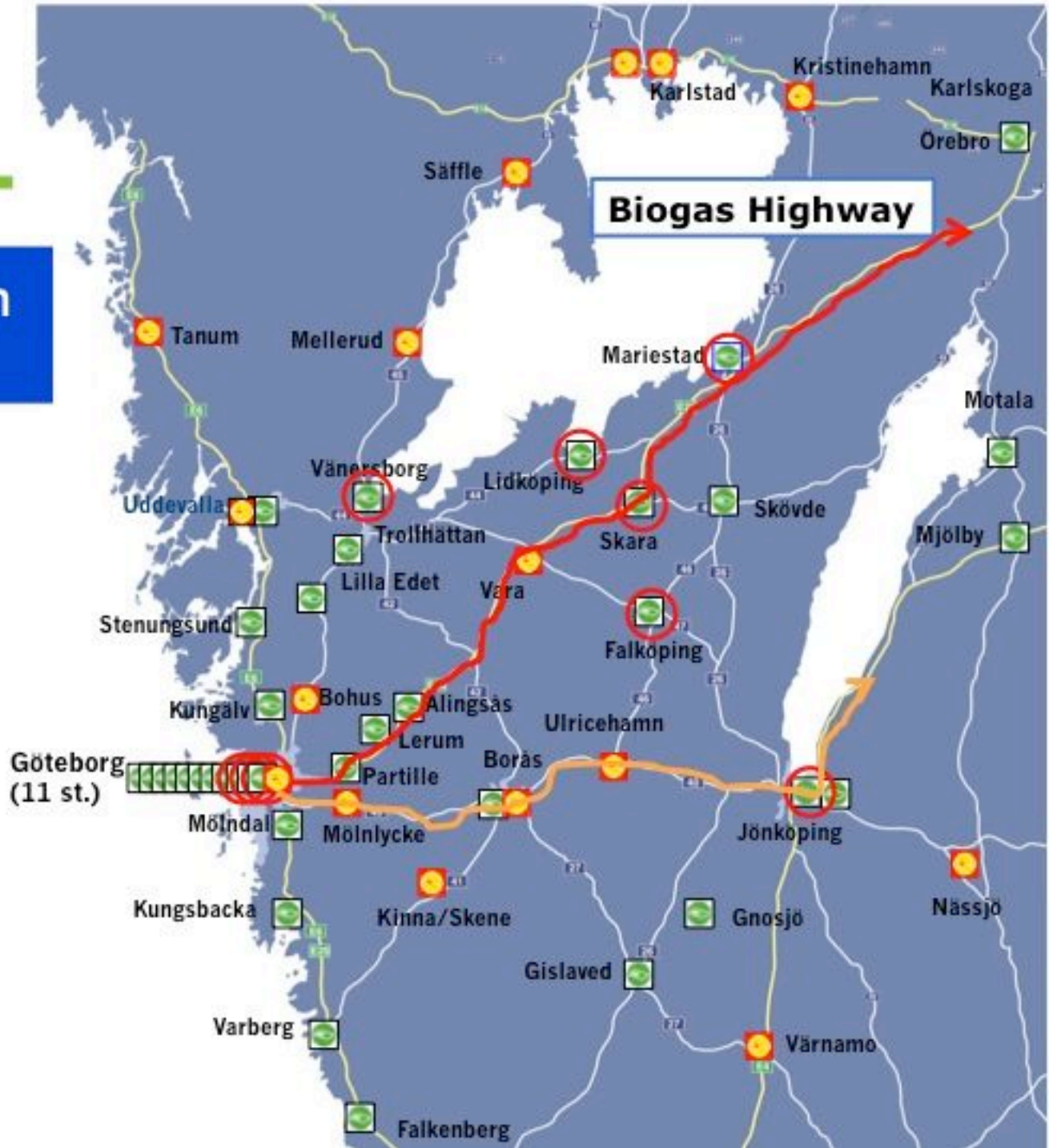


- **The answer of the “Chicken and Egg” dilemma**
 - The distribution network will make people buy CNG cars!!
 - The distribution network will make car manufacturers produce new/more models of energy efficient vehicles
- **Need for public incentives** (location finding, ground financing...)
- **Need for common technical/safety rules for the building and the operation**
- **Need for urban planning rules**
 - The example of the Region of Lombardy



Filling stations in west Sweden

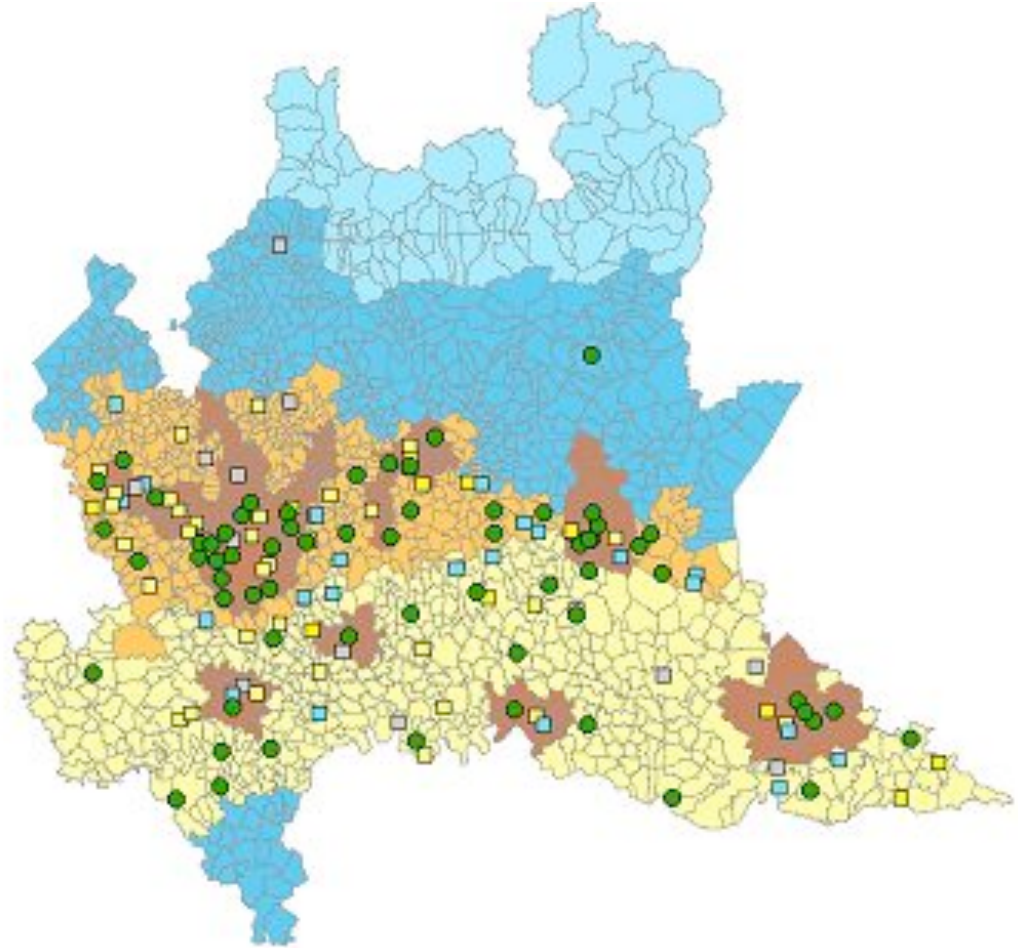
-  Existing
-  Under construction
-  Planned



■ The Region of Lombardy

– 148 CNG filling stations:

- 88 are in operation
- 14 are under construction
- 12 have been authorised
- 34 are planned



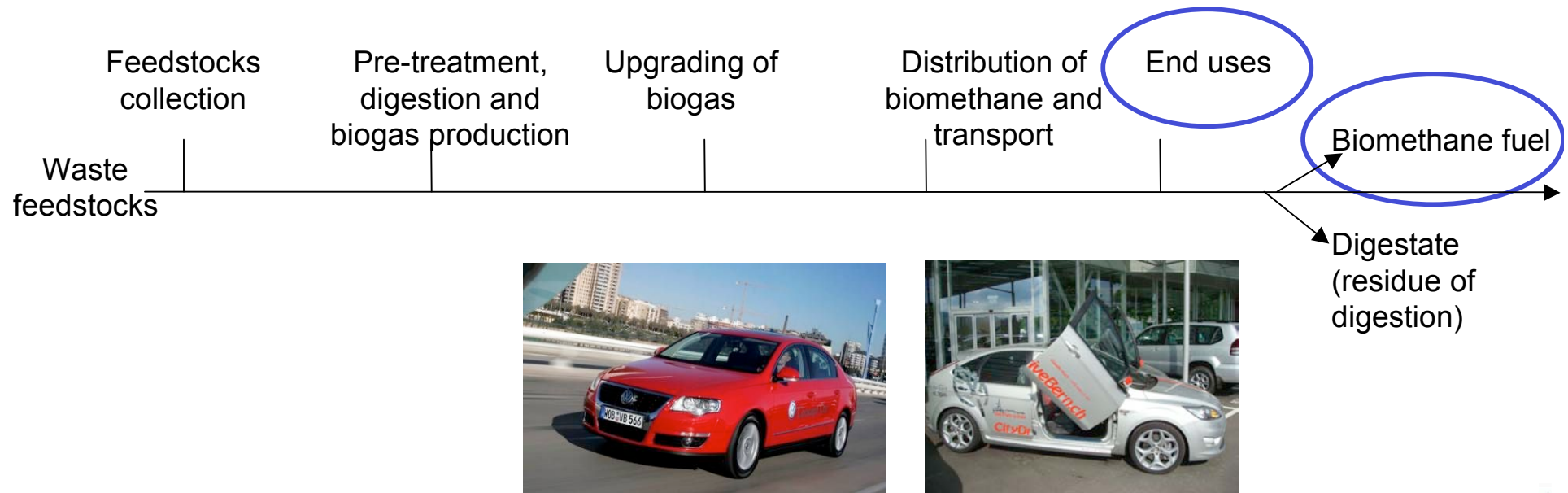
Transport the biomethane by using the NG infrastructure

- Transporting biomethane over distances from producer to end user can be made practically in two ways:
 - via high-pressure canisters on swap body trucks (higher cost)
 - or through the existing natural gas grid (lower cost)
- Biomethane injection is in operation in Bern and Göteborg
- Lille injection facility is expected to be started by the end of the year

Lille injection facility >>



Best practices in Europe



Expanding CNG vehicles (1)

- **Biomethane vehicles** are operated in fairly **large numbers** at all demonstration sites.
- The experience of biomethane vehicles dates back **over ten years** in some cases.
- Biomethane is used in **many different kinds** of vehicles. Buses and waste collection are the most common applications
- The biomethane vehicles are used in **everyday service** and fulfill the requirements of the fleet operators.



Expanding CNG vehicles (2)

- **Policy strategies** to promote biomethane vehicles have been applied in several sites:
 - Communication campaigns in Bern and Göteborg.



Expanding CNG vehicles (3)

Communication campaigns in Bern

Campaign 1: Testimonials



Campaign 2: are you old fashioned?



Expanding CNG vehicles (4)

- Policy strategies to promote biomethane vehicles have been applied in several sites:
 - Network of Clean Drivers in Stockholm (investment grants for biomethane vehicles).
 - Specific Parking Policy for clean vehicles (Stockholm and Göteborg).
 - Exemption from congestion charge for biomethane vehicles in Stockholm.
 - Green Procurement with mandatory use of clean vehicles.



Expanding CNG vehicles (5)



Rome Biomethane waste trucks



Lille Biomethane waste trucks



Bern light duty vehicle



Bern biomethane bus

Stockholm Airport biomethane



Lille service car



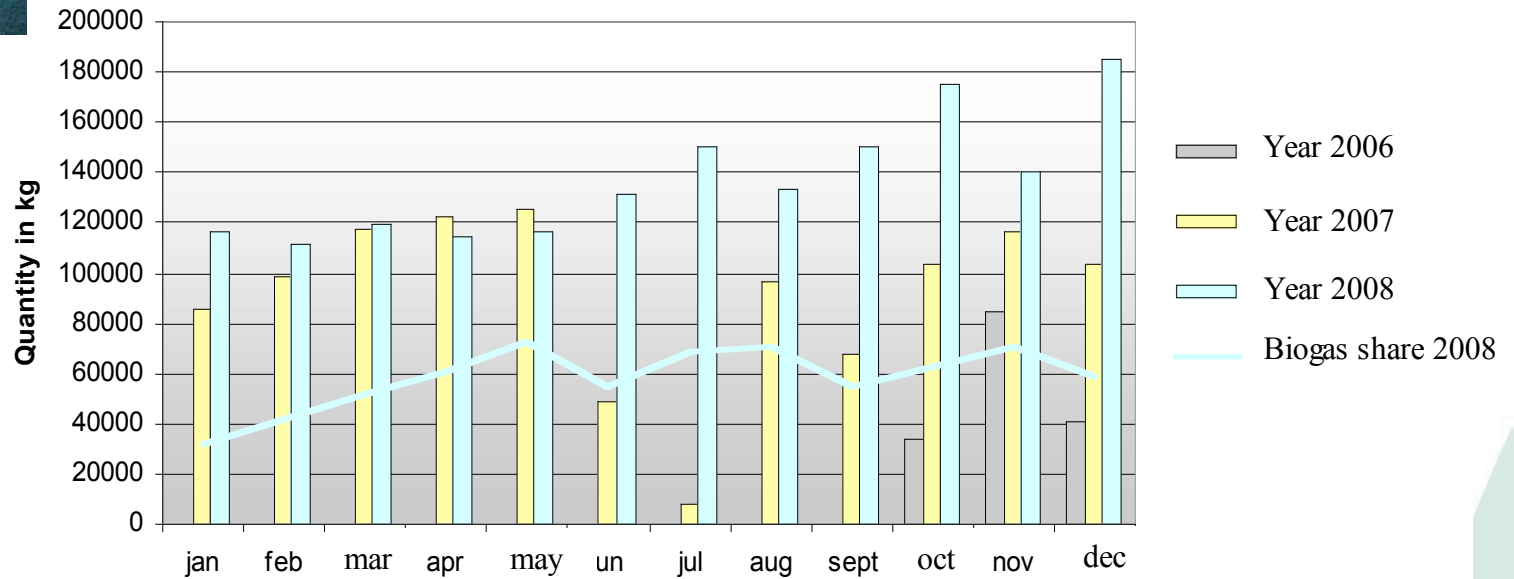
Expanding CNG vehicles (6)

Captive fleets:



- In Bern, 50.5 % of the bus fleet is fuelled with biomethane**

Biomethane sales



Expanding CNG vehicles (7)

Individual vehicles

Motivations of individuals for choosing a CNG car?

Question: Give your spontaneous reaction on the following keywords

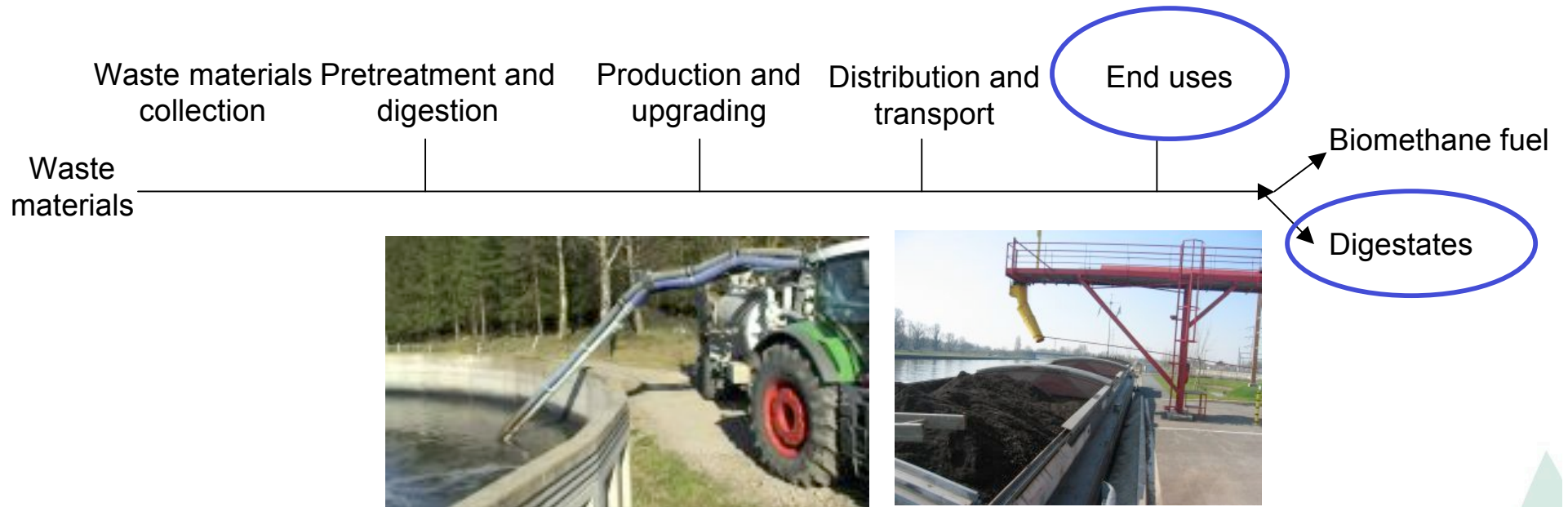
- Lower taxes
- Investment subsidies
- Lower gas consumption
- Lower fuel prices
- Technical security
- Long driving distance
- More power
- Available in all classes
- Lower investment cost
- Large choice of makes
- Number of fuelling stations



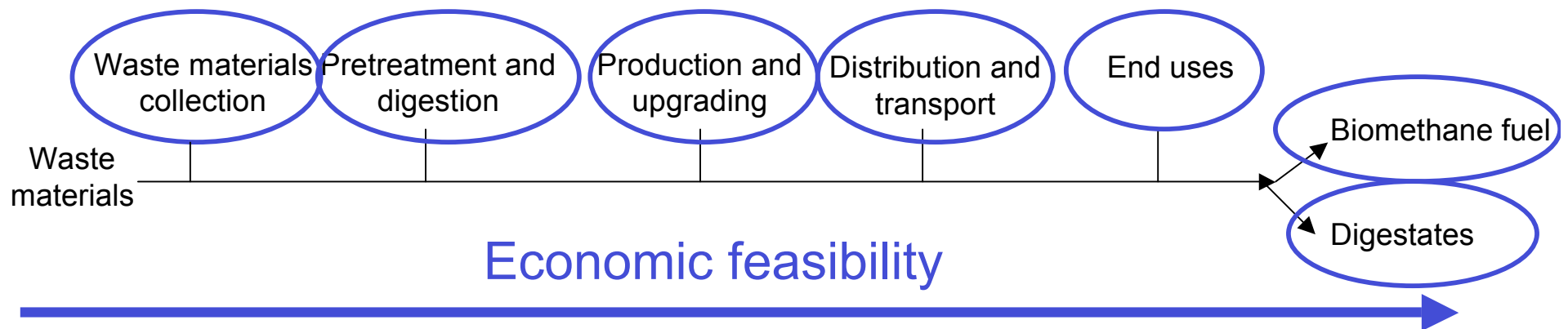
- **More important** +



Best practices in Europe



Best practices in Europe



How to ensure economic feasibility (1)

?

- Green Certificate for biomethane grid injection
 - based on existing mechanism (electricity)
 - already in operation in Bern and Göteborg
 - soon in France !
- Long term perspective for investors (biomethane producers)
 - purchase obligation of the biomethane for 15-20 years ?
- Balanced incentives policies (on a EU level ?)
 - long term policies for biowaste management (New Directive ?)
 - long term tax policies both on fuels and waste treatment options
 - No competition between the feed-in tariffs (electricity, heat, fuel)



How to ensure economic feasibility (2)

?

- Common technical rules
 - European standard for fuelling station (work has been done !)
 - European quality standard for grid injection (ongoing)

- Support/obligation to develop the distribution infrastructure
 - local authorities can help through their urban planning responsibility
 - development of cooperation with the natural gas industry

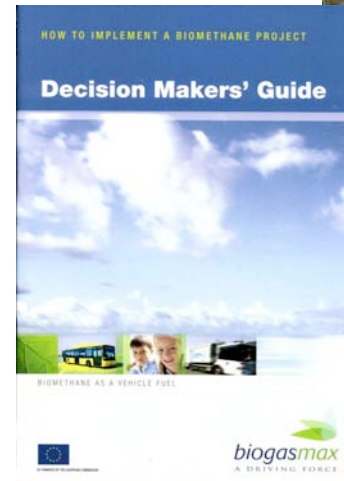
- Develop a closed-loop system
 - Biomethane development is a local/regional business !
 - Associate waste and transport management
 - Set up of local/regional clusters : Biogas Väst in West Sweden



How to ensure economic feasibility (3)

?

- Increase the knowledge of stakeholders
 - BiogasMax training sessions
 - BiogasMax Tool
 - Car dealers training



- Synergy with the Natural Gas industry
 - safety/technical specification of vehicle, filling station, pipes...
 - security of supply





Harmonising the biomethane technical specification...

Parameter	SWEDEN	SWITZERLAND	FRANCE	Unit
		Requirement		
Methane (CH ₄)	> 96% volume	≥ 96 %		% (V/v)
Dew point at max. pressure of injection point	-9°C at 200 bar (32 mg/m ³)	- 8	T < 5°C at service pressure of the grid	°C
Mist, dust		technically free		(-)
Odourisation	13 mg/m ³	According guidelines (SVGW G11)	15 < THT < 40 mg/Nm ³	(-)
Heating value (H _{u,n})	12,15	10.6 – 13.1	9.5 to 10.5 kWh/Nm ³ à 0°C	KWh/Nm ³
Upper Wobbe index (W _{u,n})	> 12.4	13.3 – 15.7 local deviation accepted (+0.7/-1.4)	8.10	KWh/Nm ³
Relative density		0.55 – 0.7	0.555<d< 0.7	(-)
Oxygen (O ₂)	< 1% volume	≤ 0.5	< 0.01% mol.	% (v/v)
Carbon dioxide (CO ₂)	< 4% volume (CO ₂ + O ₂ + N ₂)	≤ 6	< à 2.5% mol.	% (v/v)



Biogasmax on the move...

- Cooperation still ongoing
- Visit www.biogasmax.eu

