



# The Falköping Model

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# Background

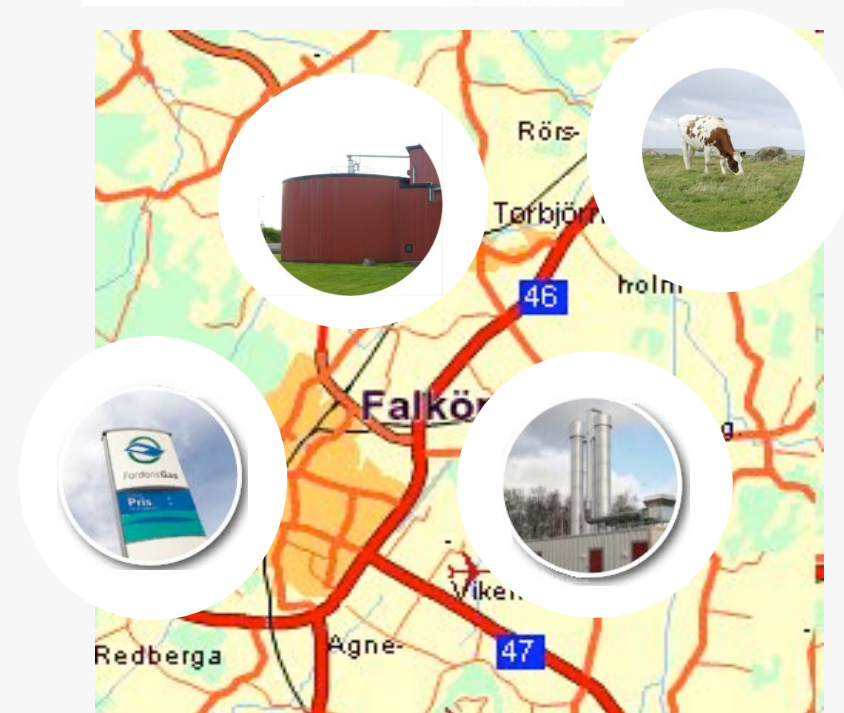
- The municipality of Falköping expanded their biogas production
- Needed to understand the economics of biogas production
- Bachelor's thesis from Chalmers University of Technology
- Included a rough calculation model of the system
- Interest from both Falköping and BiogasMax
- Further development needed to make it more advanced



# The Municipality of Falköping

- The foundation for the model
- Inhabitants: 31 317
- Area: 1 057 km<sup>2</sup>
- Cattle: about 11 000
- Biomethane
  - Raw gas production
  - Upgrading
  - Filling station

**FALKÖPING**  
KOMMUNEN



Source: [www.eniro.se](http://www.eniro.se)

# Development efforts

- Initial version

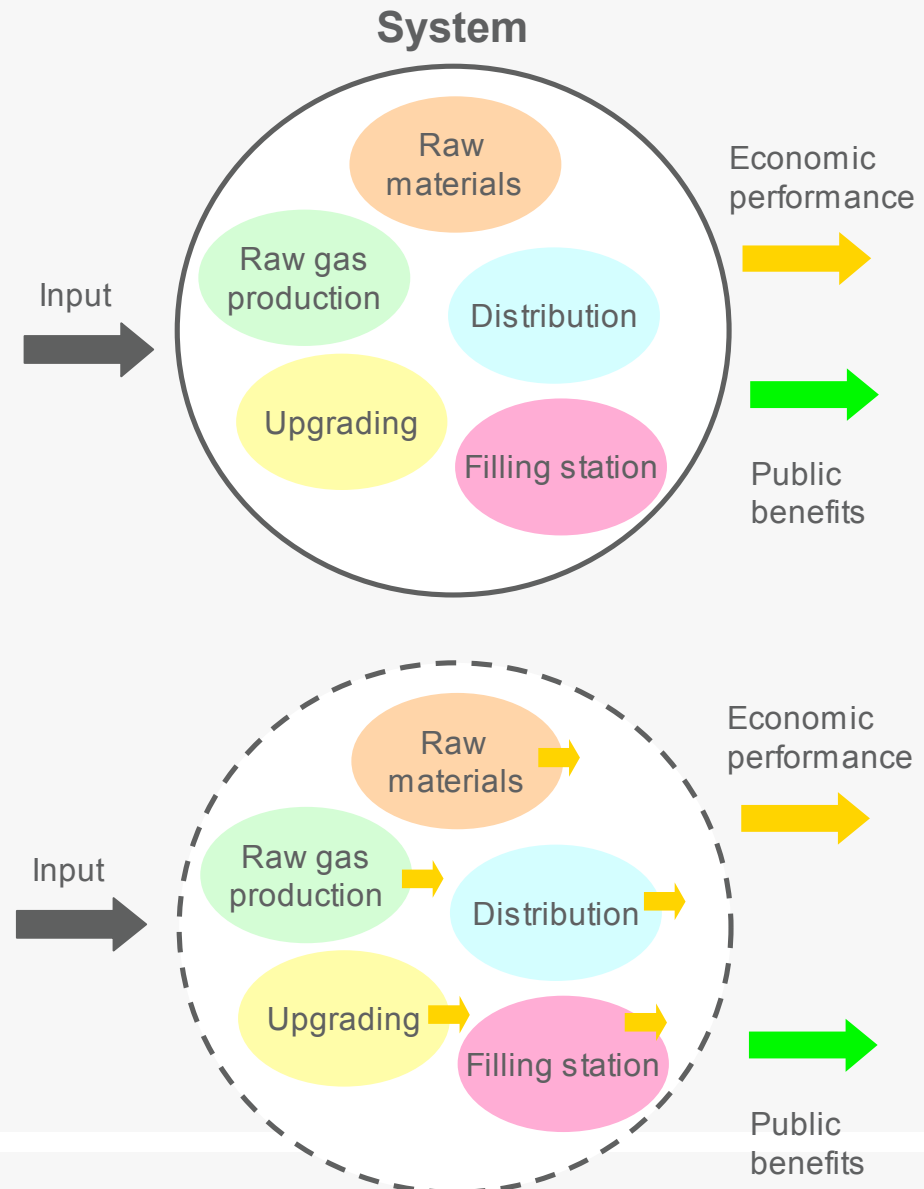
- System perspective
- Data input
- Economic performance
- Public benefits
- Single unit perspective
- No time dimension

- Enhanced version (SWECO)

- Major overhaul
- Multiple actor and system perspective
- Economic performance of system and actors
- Time dimension – 15 years
- User friendly
- Tested in another municipality

- Final version (SWECO)

- “Light” and Advanced version
- Simplified



# The Falköping Model

- Excel based calculation model
  - Requires basic excel skills
  - Easy to update
  - Transparent
  - Allow users to make improvements
- Basic version
  - A few input parameters
  - Pre-defined average values
  - Rough estimation of the system
- Advanced versions
  - Adapt it to your local conditions
  - Consists of 14 main sheets



## Focus & Logic

- The focus is on biomethane production for cars
  - Substantial environmental benefits
  - Expanding market
- Supply Chain Management perspective
  - How do you match supply and demand?
  - Describe the market demand for biomethane in your region
  - Match your supply capabilities
- Falköping Model
  - Input your municipal and private vehicles
  - Input your available raw materials
    - Waste
    - Sewage
    - Manure
    - Crops
  - Input filling stations and upgrading facilities to match the market demand
  - Input raw gas production facilities to match the raw gas demand
  - Look at the system performance

# Logic – Match supply and demand



## User & usage

- Local government
  - Describe a future local system
  - Improve current systems
  - Learn about how different components of the system interact
  - Basis for investment decisions
- Companies & other actors
  - Communicate the benefits of local biogas production
  - Understand the economic conditions for biogas production
  - Learn about dependencies
  - Basis for investment decisions
- Workshop
  - Gather local government and stakeholders
  - Use the guide to investigate the local conditions for a biogas system
  - Basis for discussion and joint decision making

# Example sheets

FalkopingModellInitial\_5a [Kompatibilitetsläge] - Microsoft Excel

Start Infoga Sidlayout Formler Data Granska Visa Utvecklare

Klistra in Tecken Justering Tal Villkorsstyrd formatering Formatera Cellformat Infoga Ta bort Format Sortera och filtrera Sök och markera Redigering

O28 fx

**Checklist**

**Important to change**

1 Important to change. Different in every case  
 2 Good to change. To get a more conform modell  
 3 Not so necessary to change. Literature value, etc.

Sheet	Input	Unit	Value	Changed	Importance
Datainput	Liquid waste	ton	1000	Yes	Important to change. Different in every case
Datainput	Solid waste	ton	3000	Yes	
Datainput	Sevage sludge	ton	25480	Yes	
Datainput	Cattle manure	heads	5000	Yes	
Datainput	Pig manure	heads	0	No	
Datainput	Facillity prod. waste (gear 1)	number	1	Yes	
Datainput	Facillity prod. sewage (gear 1)	number	1	Yes	
Datainput	Facillity prod. agriculture (gear 1)	number	1	Yes	
Datainput	Sales price: biogas	EUR/Nm <sup>3</sup>	0,2	No	
Datainput	Efficiency gain / grant investment waste	%	0%	No	
Datainput	Efficiency gain / grant investment sewage	%	0%	No	
Datainput	Efficiency gain / grant investment agriculture	%	0%	No	
Datainput	Facillity upgrading (gear 1)	number	1	Yes	
Datainput	Sales price: biomethane	EUR/Nm <sup>3</sup>	0,45	No	
Datainput	Efficiency gain / grant investment upgrading	%	0%	No	
Datainput	Original private market: Cars	number	21	Yes	
Datainput	Original private market: Buses	number	1	Yes	
Datainput	Original private market: Lorries	number	10	Yes	
Datainput	Original private market: Taxis	number	1	Yes	
Datainput	Original private market: Others	number	0	No	
Datainput	Original public market: Cars	number	3	Yes	
Datainput	Original public market: Buses	number	0	No	
Datainput	Original public market: Lorries	number	0	No	
Datainput	Facillity Filling station (gear one)	number	0	No	
Datainput	Sales price: Vehicle gas	EUR/Nm <sup>3</sup>	0,72	No	
Datainput	Efficiency gain / grant investment filling station	%	0%	No	
Datainput	Gate fee for liquid waste	EUR/ton	15	No	
Datainput	Gate fee for solid waste	EUR/ton	83,7	Yes	
Datainput	Gate fee for sewage sludge	EUR/ton	0	No	
Datainput	Sales price: manure	EUR/ton	0	No	
Datainput	Sales price: other wast	EUR/Nm <sup>3</sup>	0,25	No	
Datainput	Sales price: other sewage	EUR/Nm <sup>3</sup>	0,25	No	
Datainput	Sales price: other agriculture	EUR/Nm <sup>3</sup>	0,6	No	

Capacity planning Distribution Public benefit Checklist Breaking point distribution Comparison pipeline - lorry Fredrik Testar Figures for calculations

Klar 75%

# Summary

- Excel based calculation tool
  - Biomethane for vehicle use
  - Supply chain perspective
  - Light and Advanced version
- Target audience
  - Local government
  - Companies and stakeholders
- Interested in a workshop?
  - Contact SWECO

# Thank you for your attention!

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