Local societies and the potential economic impacts of investments in biogas plants

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Presentation

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- Research focus: Socioeconomic analysis of resource related investment projects in a regional perspective. Renewable energy transformation and local communities.

- Research methods: Socioeconomic Input output analysis and cost benefit analysis for employment, income generation and the local tax base. Dynamic renewable natural resource investment models.

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Main research questions

- Which income- and employment impacts can be expected from an expansion of bio-gas production in the relevant parts of the country?
- In which way is the expected biogas expansion tied to the areas with rural district periphery problems?
- In what way may the expansion of bio-gas production have an influence on such items as the tax base, which constitutes the basis for public service and thereby on settlement in local communities in the periphery?
- Which impacts may the expansion have on the business sectors which are supported by the activity of the biogas plants?

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Why is biogas of interest in a rural and periphery perspective?

- Expectations for Bio-economy as an activity for the periphery.
  - Close to resources
  - Back to the future*
  - Value chains with bio-economic products (IO)
- Limited success with other bio-economy activities
- Political interest in implicit assistance for
  the agricultural sector and rural districts

*Moreno-Cruz, J.& M. Scott Taylor (2012): *Back to the Future of Green Powered Economies*. NBER. 2012.

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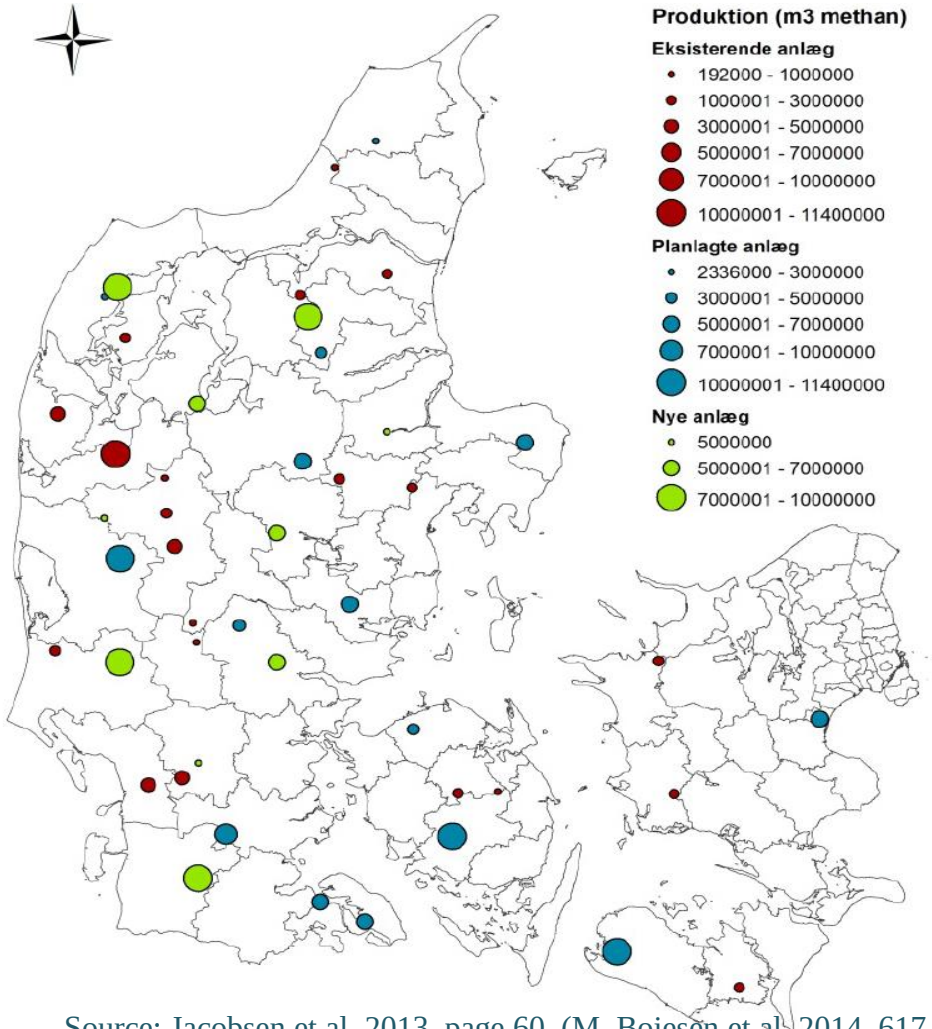
How did we work with the analysis?

Four possible approaches:

- Agricultural business economics approach - and Incentives.
- Socioeconomic approach - and Costs and Benefits
- Impact analysis and employment - and income generation
- Regional economics basis model analysis - and service sectors.

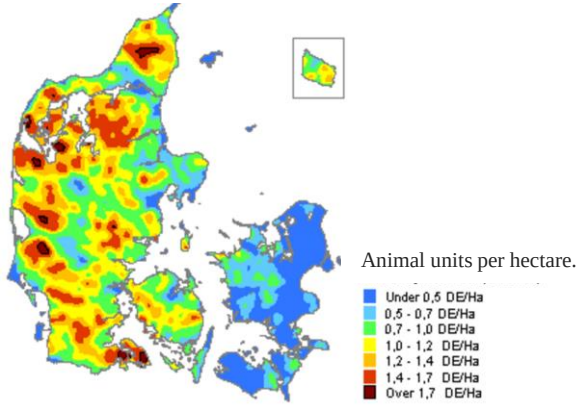
Production, planned and in terms of distance optimally placed new common biogas plants



Source: Jacobsen et al, 2013, page 60. (M. Bojesen et al, 2014, 617-628)

Animal density

Animal units per hectare. Cultivated area.



Source:
http://www.djfgeodata.dk/datasaml/Udskrift/LBR_Dyrehold2003.pdf

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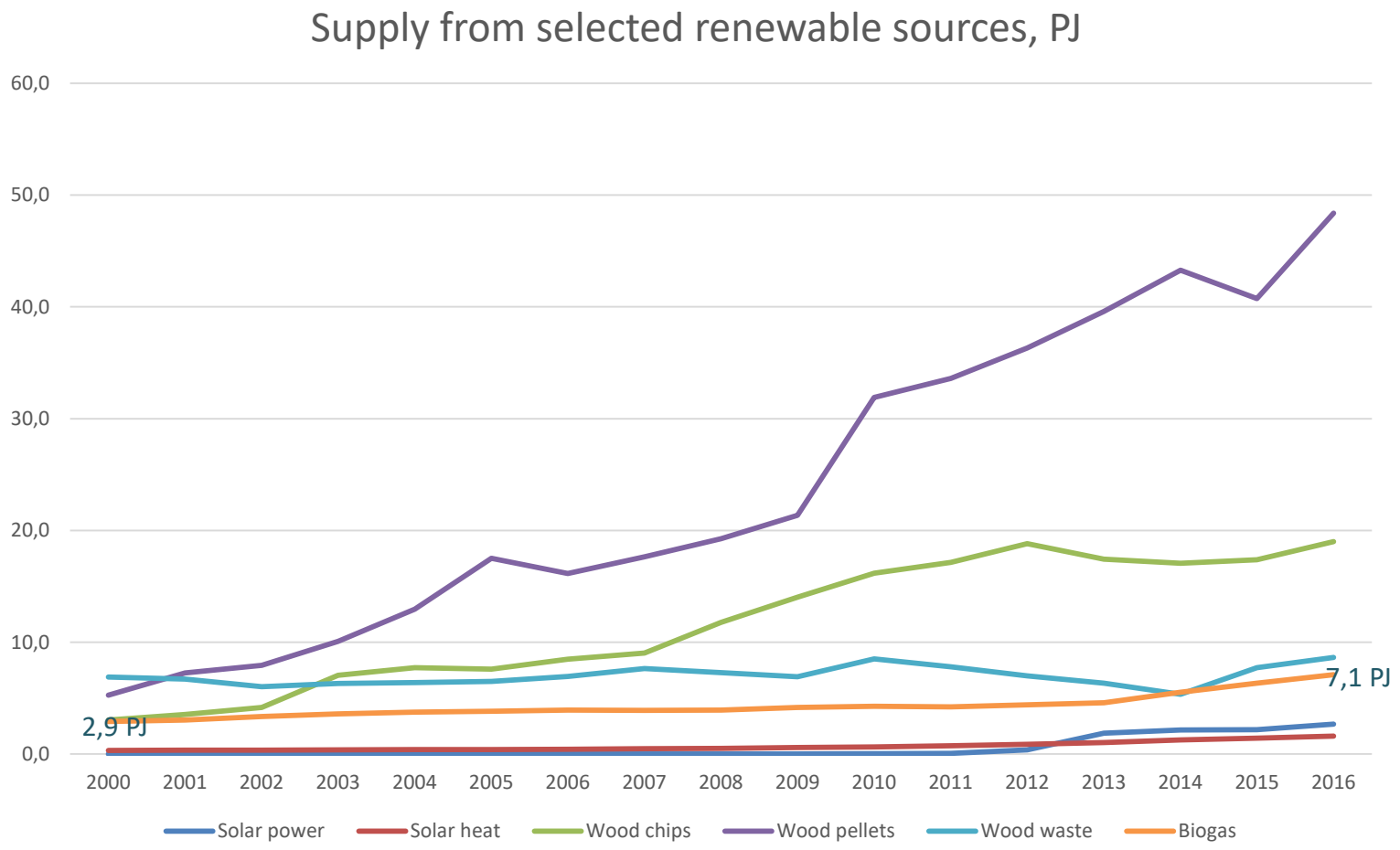

Source Dst.dk. ENE2HO

Note: 2012 8% of Raw mater. ~ 4,4 PJ -> 50% ~ 27,5 PJ in 2020 Excl. other sources

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Key figures for IFRO's "Case 2012" plant

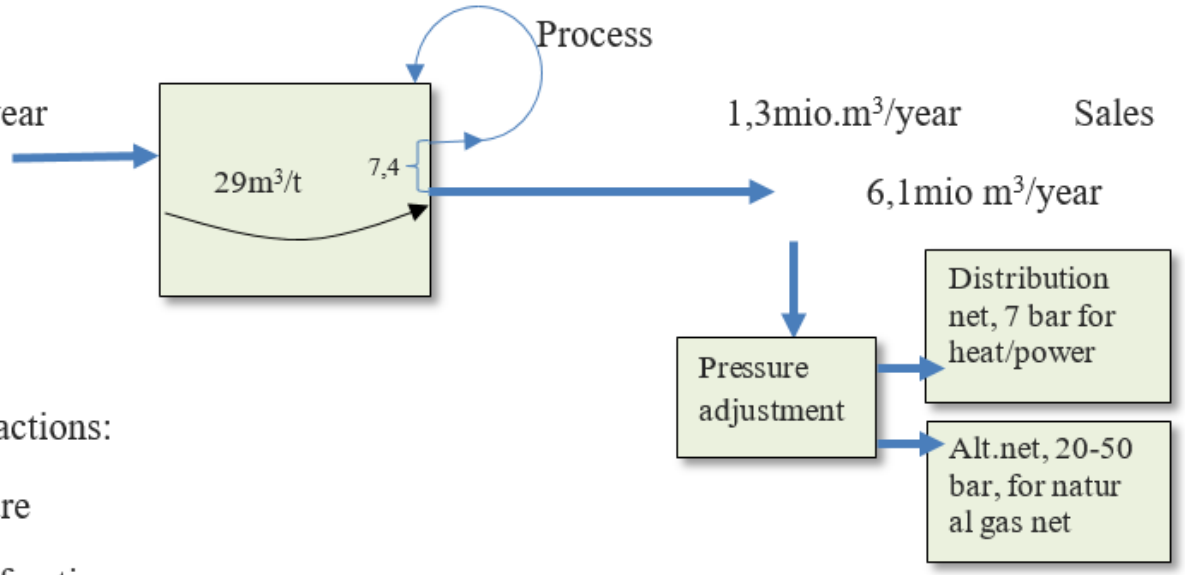
Biomass

Input

Plant

Biogas

Output



Biomass fractions:

78 % manure

12 % fiber fraction

10 % corn ensilage

Choice of the basis for estimation of economic impact

- An aim of 50% recycling in 2010 implies 900 thousand tons available. (Birkmose et al, 2013).
- Comparable to the 2012 level of recycling of 8% or 145 thousand tons dry matter to assess the requirements for the 50 % recycling aim.
- For the calculation an assessment was made of the dry matter requirements for 10 % of the biomass potential in 2020, i.e. biomass of ca. 180,000 tons.
- To be considered either as extra 10 % ambition compared to the 50 % aim or as the consequence of a modification of the ambition to an aim of 40 % of resource base

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Composition of input in Case 2012 plant.

	Input	Share, pct.	Dry matter pct.
Cattle	Sludge	36	7,5
Pigs	Sludge	42	4,9
Cattle	Fiber fraction	5	30
Pigs	Fiber fraction	7	30
Maize		10	33
Total	pct.	100	11,3
Total	1000 tons	256	

Source: Jacobsen et al, 2013.

- Case 2012 has an input of on average 11.3 % dry matter of 255,500 tons or 28,851 tons, according to the table above.
- 10% is maize with a dry matter content of 33 % or 8.480 tons so that ca. 21 thousand tons of the dry matter originates from manure.
- So 8,8 plants of the case 2012 type would cover the capacity needed to use 10 % of the biomass potential for farm manure in 2020.

Costs in biogas plants for 10 % of biomass potential base in 2020.

Cost structure		
		Costs
Use in production		1000 Dkr.
Electricity		12.602
Maintenance		
Pumps		1.124
Macerator		225
Stir		1.124
Struvit cleaning		450
Removal of sand		562
Maintenance gas cleaning		1.760
Other use materials		440
Water e.a.		440
Other tech. analysis		440
El & control		2.640
Other maintenance		2.640
Total maintenance		11.845
Own transport		
Wages		16.680
Fuel		11.224
Other transport expenses		8.096
Total transport		43.410
Transport re-investment		4.972

Source: Own calculations based on Jacobsen et al (2013)

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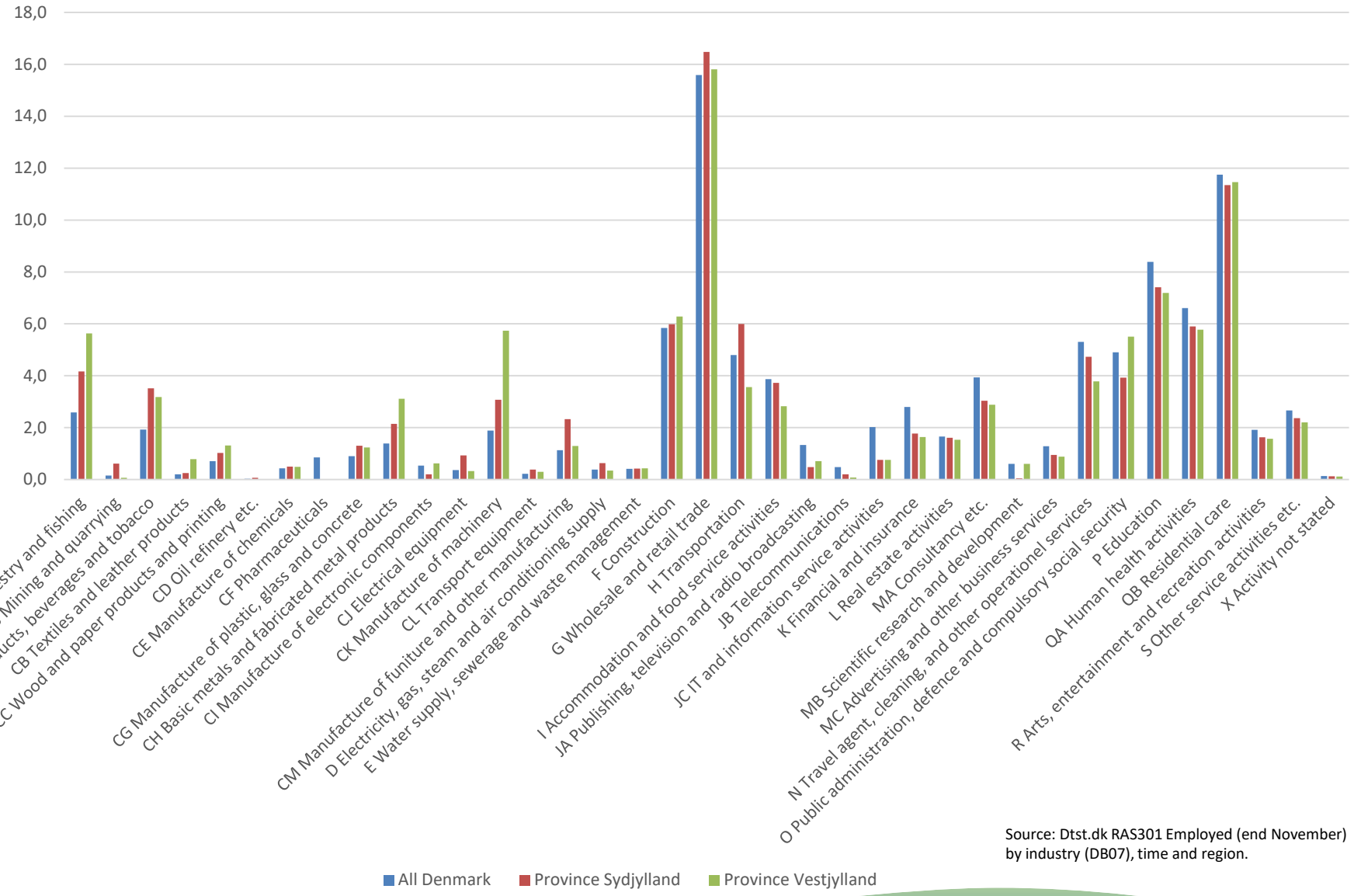
Employment shares in industries 2015



Source: Dtst.dk RAS301 Employed (end November) by industry (DB07), time and region.

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Economic impact per year of an expansion of common biogas plants by 10% of the resource base in 2020.

	Employment	Income generation	Tax revenue
		Gross Value Added	Indirect and local income-
	FT Persons	Mio. Dkr.	Mio. Dkr.
Direct impact on biogas plants	103	31	8
Input for plants, direct and indirect impact	58	33	11
Induced impact via consumption	49	31	10
Total	209	95	29

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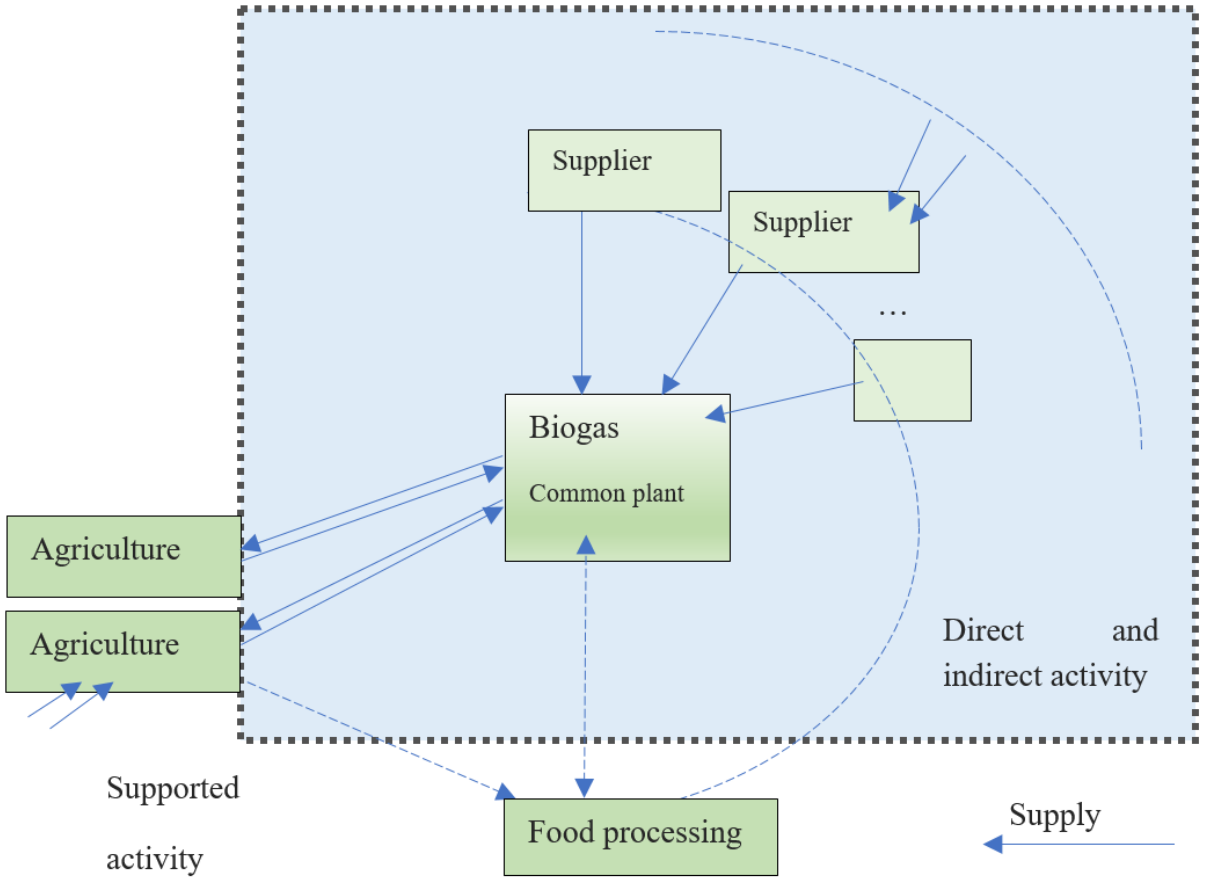
Supported activity

Not covered in the estimation of direct and indirect impact of biogas plants.

- Agriculture
  - Primary sectors exogenized
  - Reciprocal supply
- Food processing
  - Slaughter plants
  - Diaries
  - Other food processing

Direct and indirect impact of biogas plant activity and supported activity



Supported activity in agriculture.

	Income generation	Employment
	Gross Value Added	
	Mio. Dkr.	FT Persons
Direct impact in agriculture	1613	2786
Indirect impact at suppliers for agriculture	174	270
Induced impact via consumption	540	860
Total	2326	3916

Supported activity in Slaughter Plants.

	Income Generation	Employment
	Gross Value Added	
	Mill. Dkr.	FT Persons
Direct impact in slaughter plants	701	1706
Indirect impact	241	426
Induced impact via consumption	789	1310
Total	1703	3442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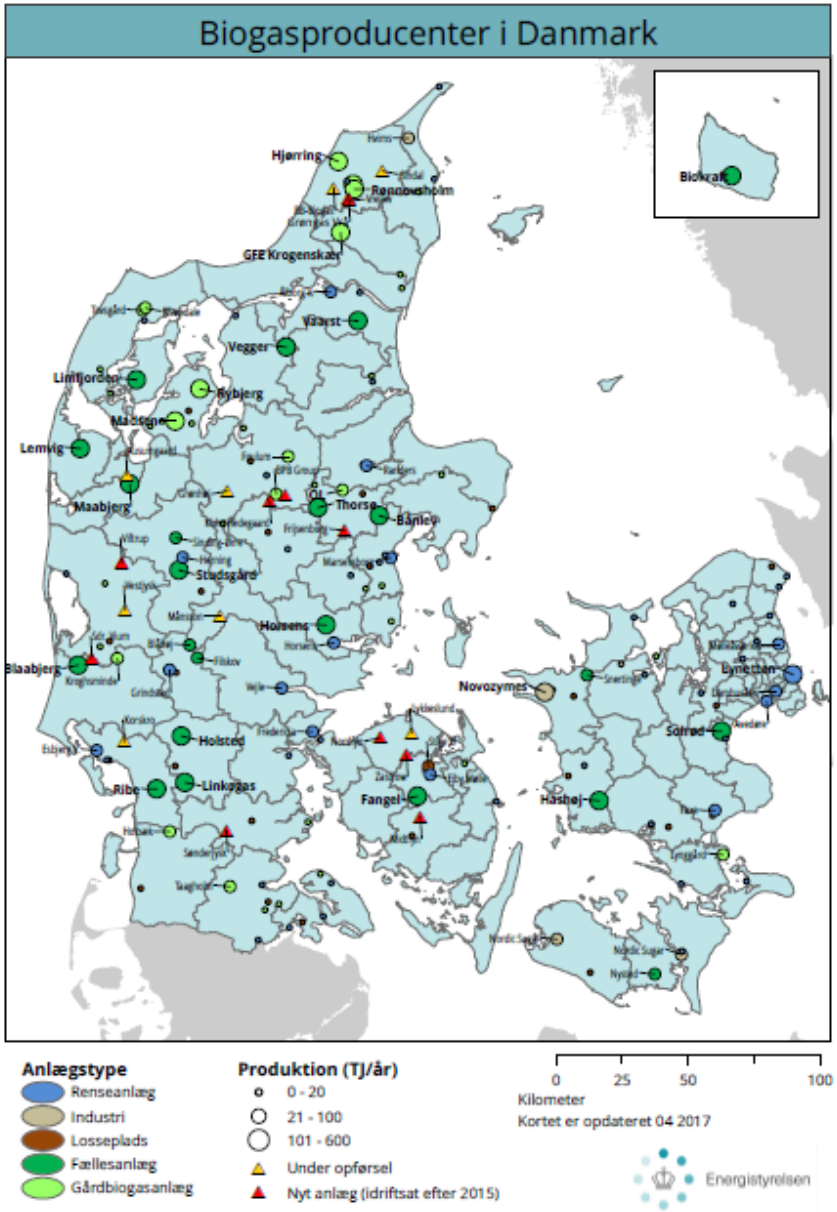
Supported social activity

Not covered in the quantitative estimations of employment and income generation

- Cooperation between agriculture, heat and power plants and consumers
- Innovative environment
- Cohesion
- Investments, continual upgrading
- Attraction of funding from innovation and cohesion funding
- Change in industry structure from primary to service sectors
- Export opportunities
- Local and regional service sectors in consulting etc.



Status April 2017

Source: Energistyrelsen ens.dk.
Biogasproducenter i Danmark.