

**Johanna Mossberg, Lina Eriksson**

**RISE**

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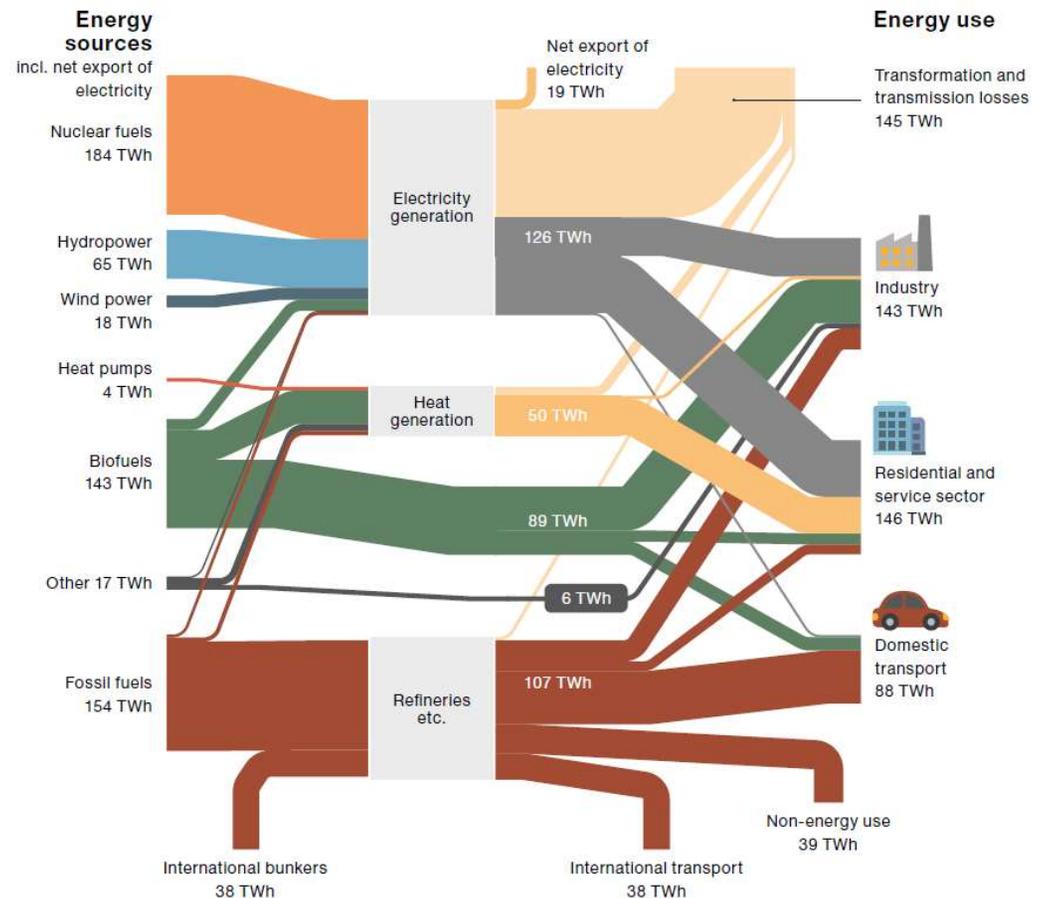
# 1.1 Total primary energy supply (TPES)

TPES in Sweden was 565 TWh in 2017 with 40% (230 TWh) being supplied by renewable energy sources.

Biofuels makes up the largest renewable energy source with 25% (143 TWh), followed by hydropower 11% (65 TWh) and wind 3% (18 TWh).

However, the share of hydropower and wind in the electricity production is 40 % and 10%, respectively.

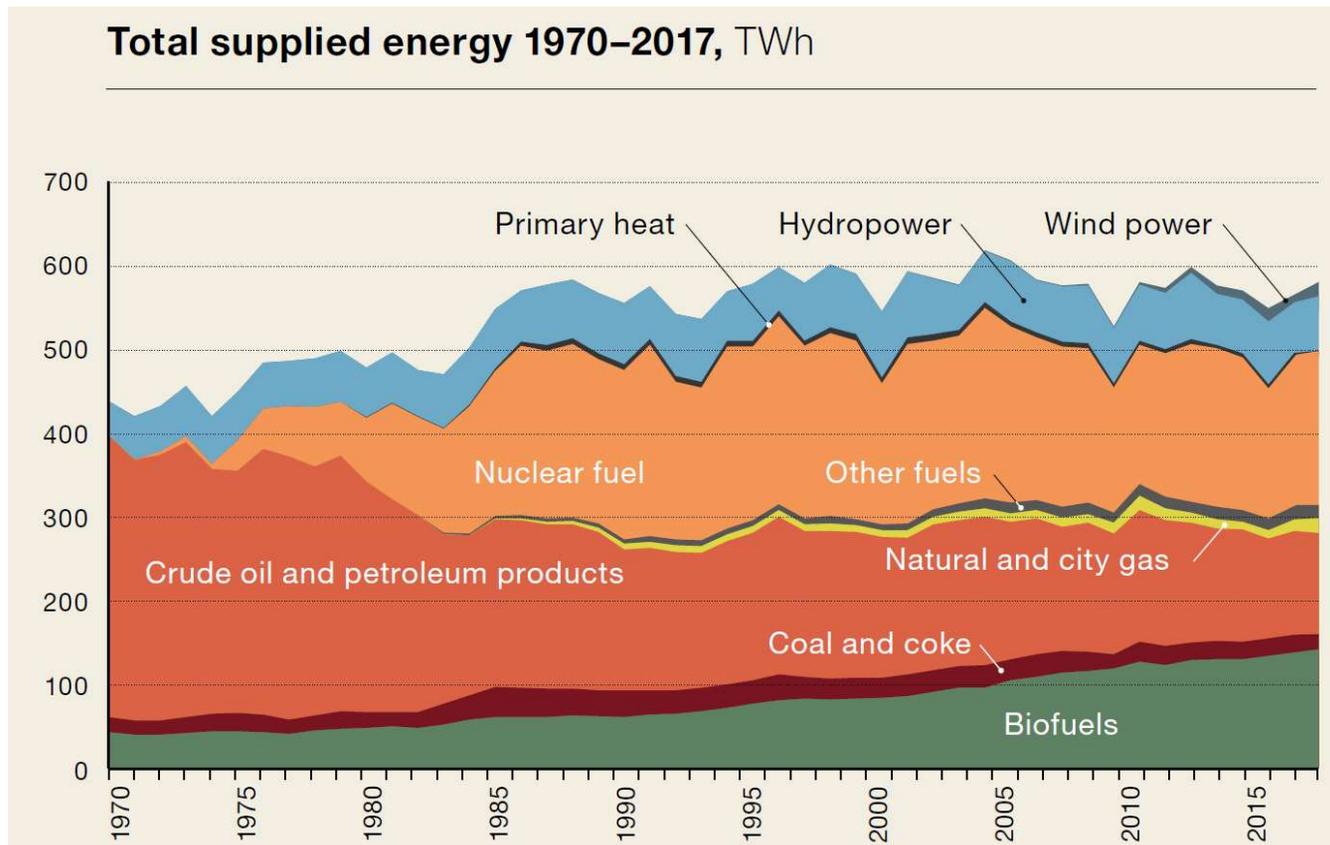
Energy system 2017



Source: <https://energimyndigheten.a-w2m.se/Home.mvc?resourceId=133464>

# 1.2 Contribution bioenergy (1)

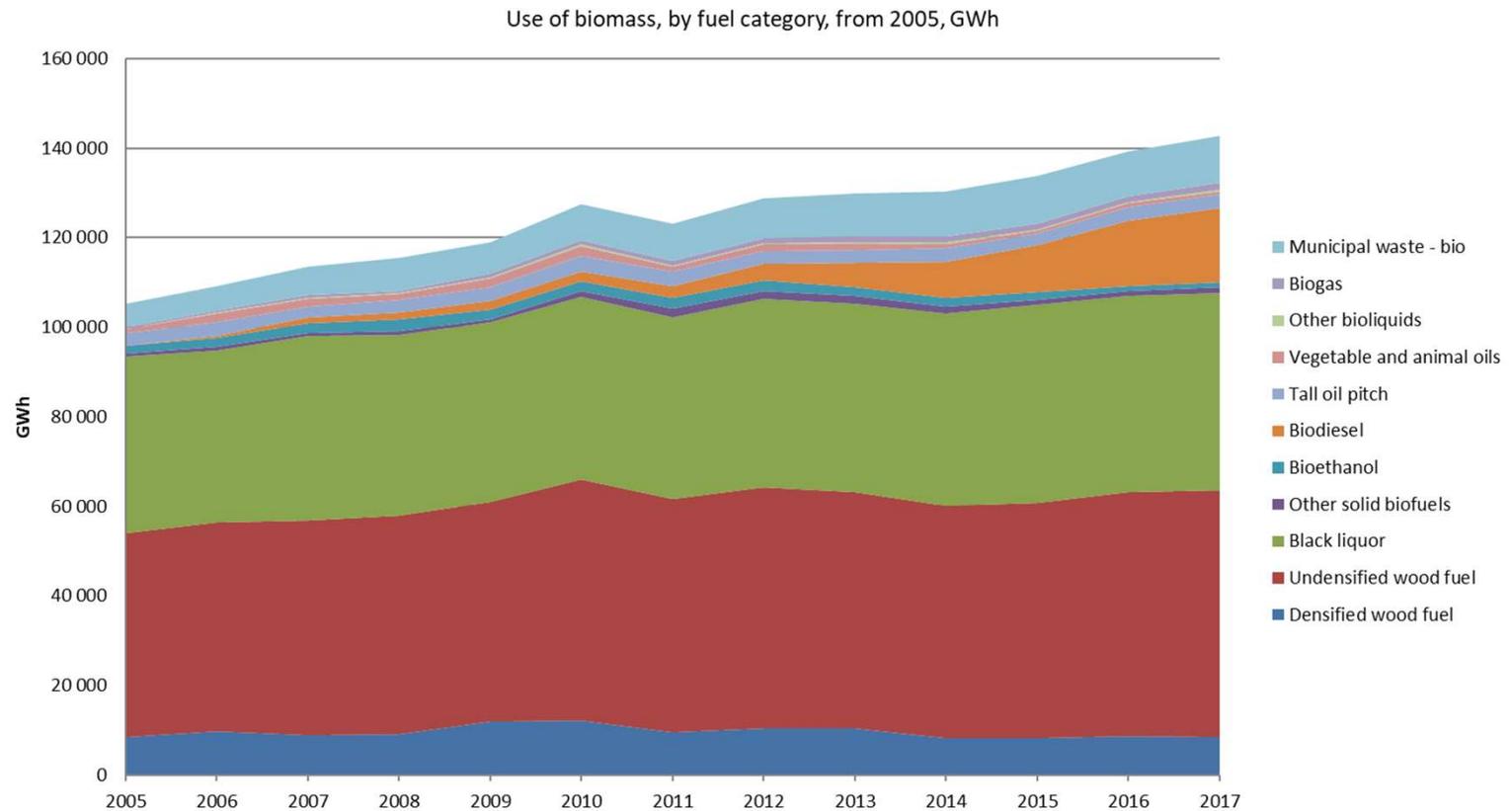
The use of bioenergy has increased with 11% between 2012 and 2017.



Source: <https://energimyndigheten.a-w2m.se/Home.mvc?resourceId=133464>

# 1.2 Contribution bioenergy (2)

During 2005-2017 the fuel category with the largest increase is biodiesel (345%, 12 922 TWh) followed by biogas (40%, 457 TWh).



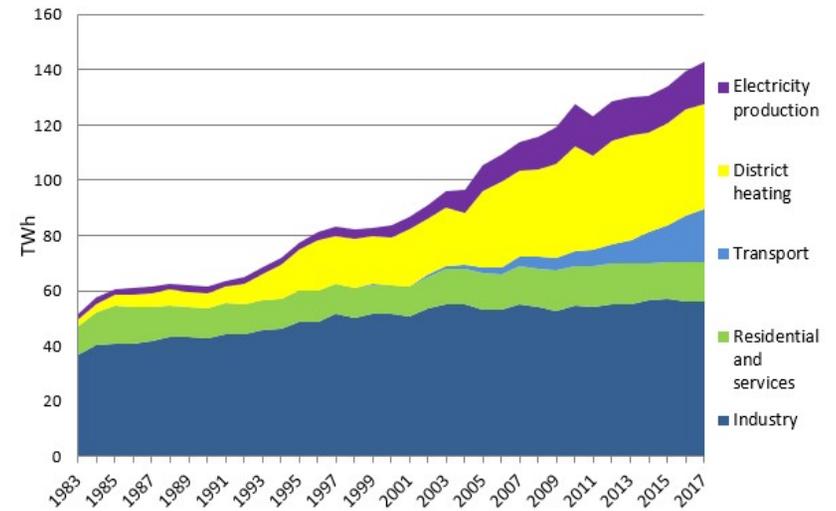
Source: <https://www.energimyndigheten.se/en/facts-and-figures/statistics/>

# 1.2 Contribution bioenergy and expected evolution

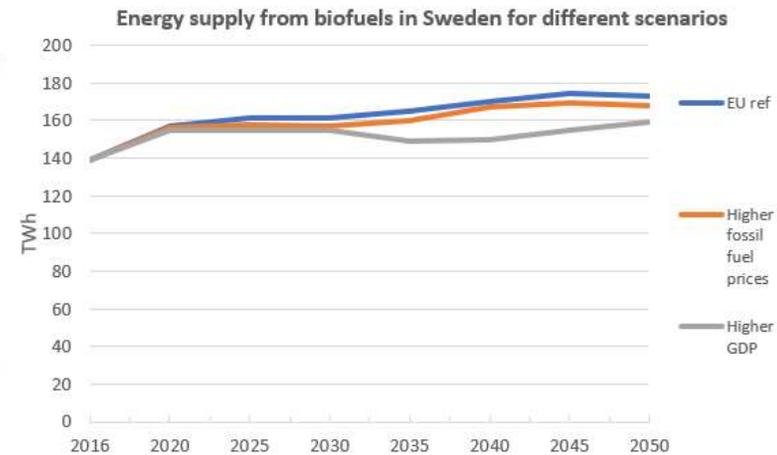
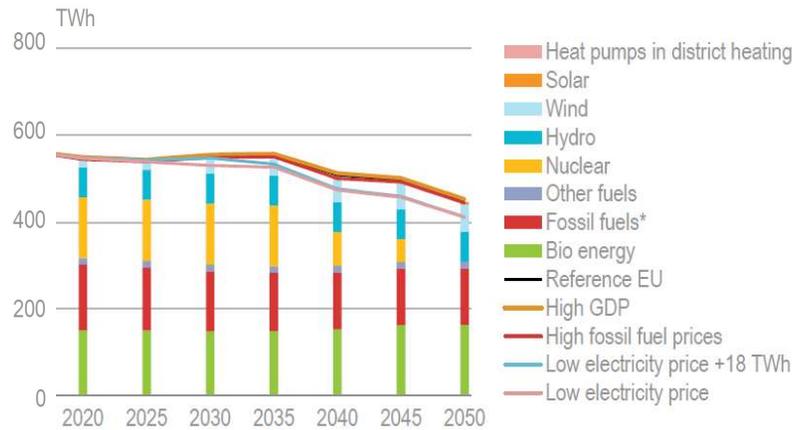
The use of biomass has increased significantly in the transport sector, while the use in other sectors have remained fairly constant over the last 5 years.

The Swedish Energy Agency has made long term projections for the energy system until 2050 and in all the different scenarios the TPES decreases and the supply of bioenergy and wind power increases, but at different pace.

Use of biomass, per sector, from 1983, TWh



Source: <https://www.energimyndigheten.se/en/facts-and-figures/statistics/>



Source: <https://energimyndigheten.a-w2m.se/Home.mvc?resourceId=133529>

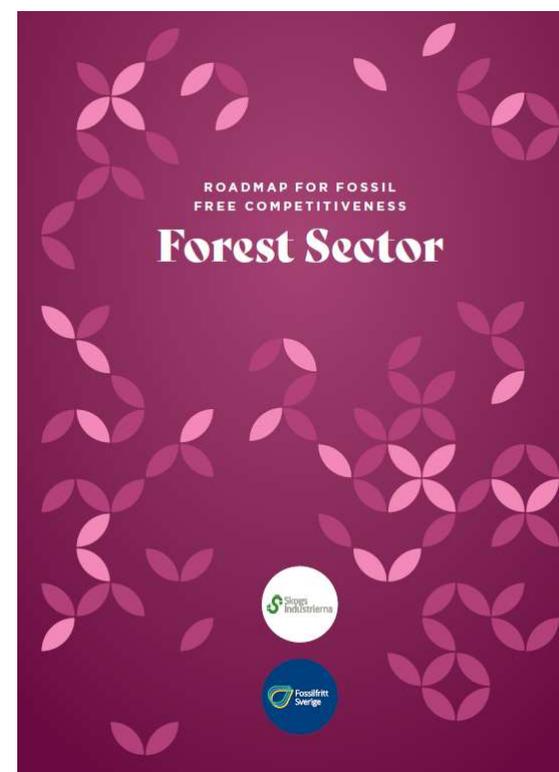
# 1.2 Contribution bioenergy and expected evolution – biofuels

Although Sweden has good conditions for producing larger quantities of biofuels, today approximately 85 % is imported.

In the Forest industry's roadmap for fossil-free competitiveness, it is estimated that in 2030 it is possible to produce up to 10 TWh biofuels from forest residues and side streams such as branches and tops, bark and/or lignin.

In a study from 2017, conducted by the Swedish University of Agriculture (SLU) and Lund University, arable land-based iLUC-free raw material, i.e. biomass that does not cause changed land use, is estimated to contribute 4-10 TWh further to domestic biofuel production by 2030.

According to an analysis that forms the basis for the National Forest Program, the supply potential is estimated to increase to 70-90 TWh per year by 2050. The potential relates to raw material from forestry, agriculture and aquatic systems. This energy potential can be used directly for production of fuel or indirectly to release larger volumes of industrial side streams which in turn can be refined into fuel.

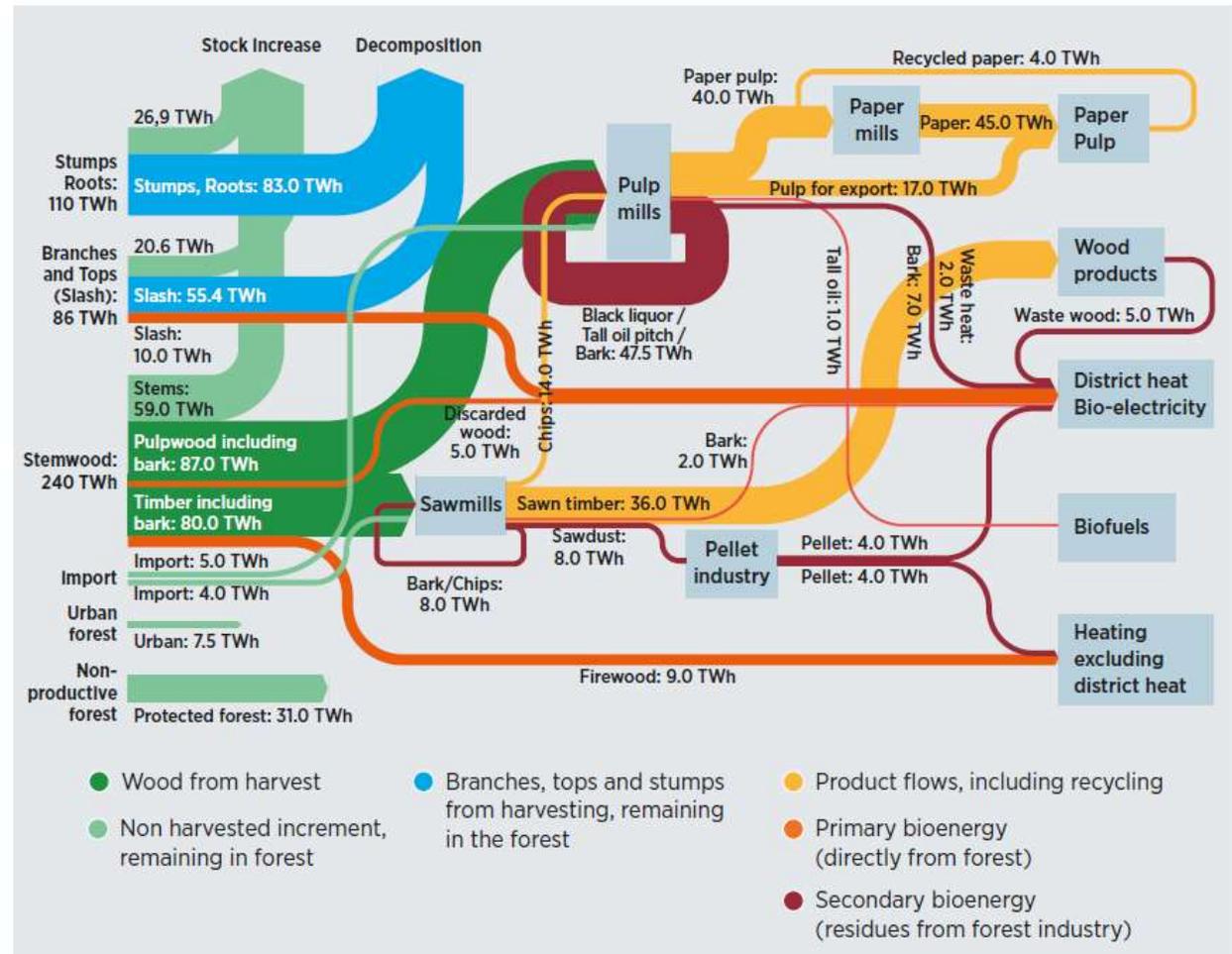


# 2. Biomass and energy flows from Swedish forest

Figure 2.3 Biomass and energy flows from Swedish forest

Around 50% of the total fellings of stem wood is used for production of pulp, paper and wood products.

(~90TWh out of 181 TWh in 2015)



Source: <https://www.irena.org/publications/2019/Mar/Bioenergy-from-boreal-forests-Swedish-approach-to-sustainable-wood-use>

# 3. Bioenergy policies and status of implementation (1)

Bioenergy related policies and tax measures in Sweden:

- 1970s: energy taxes to diversify energy use, promote the use of biomass for heat and decrease dependence on oil
- 1991: introduction of a carbon tax, high on heat, lower on industry. Has since been raised multiple times, mainly on the heating and service sector, and lately also on industries which are not part of emission trading (ETS).
- 2003: Green certificate scheme to promote new renewable electricity production
- 2007: Tax exemptions for biofuels for transport to be used to 2013. Annual prolongation since then with some major adjustments
- 2012: Electricity Certificates Act. Together with Norway, a common electricity certificate market was installed in order to increase the production of renewable electricity by 26.4 TWh by 2020. In 2016 the goal was raised to 30 TWh.
- 2016: Framework agreement on energy and climate including no net emissions of GHGs 2045 and thereafter achieve negative emissions, by 2040 electricity generation is to be 100% renewable and by 2030 Sweden's primary energy use per GDP is 50% more efficient than in 2005. A plan for the work is made every 4 years.
- 2017: Climate Policy Framework including the 2016 Framework agreement and that the transport sector should reduce its GHG emissions by 70% from 2010 to 2030.
- 2018: Fuel switch - a gradual reduction of greenhouse gas emissions by addition of biofuels in gasoline and diesel. Implemented 1 July 2018. In 2019 the levels were 2.6 % for gasoline and 20 % for diesel. Linear increase of addition levels until 2030 are proposed.

# 3. Bioenergy policies and status of implementation (2)

- 2018: Bonus malus system to support new low emission vehicles. New vehicles with low emissions of carbon dioxide qualify for a bonus at purchase, while new vehicles with high emissions of carbon dioxide will be taxed at a higher rate for the first three years.  
<https://www.transportstyrelsen.se/en/road/Vehicles/bonus-malus/>
- 2018: The government assigned a delegation for circular economy to strengthen the transition to a resource efficient, circular and biobased economy
- 2019: Raised tax on fossil fuels used to produced heat in CHP plants → push for a switch to biofuels
- 2019: Abolished tax reduction for the use of diesel in vehicles in the mining industry → push for biofuels and electricity
- 2019: The parliament decided to instruct the government to make a National bioeconomy strategy. The Government has stated that the strategy should be developed together with the green industries and contribute to increased access to biomass and employment throughout the country and create environmental and climate benefits. Work is ongoing.
- 2020: Obligation to provide environmental information to consumers at fuel pumps about the climate impact and origin of fuels, such as petrol, diesel, gas and more.
- 2021: Reduction obligation in aviation through addition of bio jet fuel is suggested to start at 1 % and gradually increase to 30% in 2030. However, this is still being investigated.

## 4. Research focus related to bioenergy and biorefining

The most ambitious projects up to 2019 in Sweden's overall energy R&D portfolio concern development of new bioenergy technologies and biorefinery processes in the area of:

- gasification of black liquor
- synthesis of liquid fuels via gasification
- saccharification and fermentation of woody cellulose
- extraction/separation/isolation/processing of lignin

These technologies have all been considered central for advancing biorefinery development and deployment.

## 4. Research focus related to bioenergy and biorefining

- Biofuels – all sectors
- Co-production of biofuels and biochemicals
- New materials (strongly related to incumbent pulp and paper industry)
- Forest and agricultural residue based biorefineries and conversion processes
- Industry integrated biorefineries and biorefinery processes
- BECCS/BECCU – Bioenergy with Carbon capture and storage and Bioenergy with Carbon capture and utilization

# 5. Commercial biorefineries – some examples

Please note: some of the examples are biobased production integrated in a non-biobased context such as Preems production of HVO, also note that the list is non-exhaustive.

- AAK – Dalby
- Domsjö Fabriker
- Ecobränsle, Karlshamn
- Kraton Chemical AB Refinery, Sandarne
- Lantmännen Agroetanol
- Adesso Bioproducts, Stenugsund
- Preem (e.g production of HVO)
- Pyrocell (under construction)
- ST1 Gothenburg, Ethanol (Etanolix)Plant (NEOT)
- Sunpine
- Södra Mönsterås (methanol)
- Södra Mörrum (recycling textile fibres)
- ...

# Pyrocell

Pyrocell is a company jointly owned by Setra and Preem, providing an important link in the value chain for renewable fuel. Setra has the raw material, sawdust, while Preem has refineries and filling stations.

Currently, Pyrocell is building a pyrolysis plant alongside Setra's sawmill in Gävle. Here sawdust will be processed into bio oil and the production capacity will be 26 000 tonnes/year. The bio oil produced will be ready for further processing at Preem's refinery in Lysekil and the plant is expected to be in operation during 2020.

Read more: [www.setragroup.com/en/pyrocell/](http://www.setragroup.com/en/pyrocell/)



Source: <https://www.setragroup.com/en/pyrocell/>

[www.task42.ieabioenergy.com](http://www.task42.ieabioenergy.com)

# AAK – Dalby

AAK is the world's leading manufacturer of high-quality vegetable specialty fats. These fats are used as a substitute for milk fat and cocoa butter, trans-free solutions for fillings in chocolate and confectionery products and in the cosmetics industry.

AAK have two factories in Sweden, one in Karlshamn and one in Dalby.

In Dalby the plant has been in operation since 1934, they refine vegetable oils and their products are sold mainly to the food industry and large households.

The plant in Karlshamn is a multifactory with all the company's business areas represented. Swedish-grown rapeseed is an important raw material while a large number of different vegetable fats are shipped directly to the plant from the growers in Europe, Asia, Africa and America.

The Nordic region is an important domestic market while special products are exported from Karlshamn all over the world.

Read more: <https://www.aak.com/>

ACH MEDIA / PRESSRELEASER / 2019 / AAK LANSERAR AKOPLANET™ FÖR ATT MÖTA DEN SNABBT VÄXANDE EFTERFRÅGAN PÅ VÄXTBASERADE LIVSMEDEL

4 jun 2019 CET

## AAK lanserar AkoPlanet™ för att möta den snabbt växande efterfrågan på växtbaserade livsmedel

AAK, världsledande inom vegetabiliska oljor och fetter av hög förädlingsgrad, har lanserat AkoPlanet™, en ny portfölj av skräddarsydda lösningar för livsmedelsproducenter som utvecklar växtbaserade alternativ till kött-, mejeri- och glassprodukter.

"Veganska, vegetariska och flexitariska kosthållningar blir allt vanligare vilket skapar nya och spännande möjligheter för livsmedelsproducenter", säger Johan Westman, AAK:s koncernchef och VD. "Denna utveckling är naturligtvis väldigt intressant för AAK eftersom vi har mer än 100 års erfarenhet av att arbeta med växtbaserade livsmedelsingredienser."

AkoPlanet™ gör det möjligt för livsmedelsproducenter att ta vara på branschmöjligheter som hälsa, näring och hållbarhet, och samtidigt möta den snabbt växande efterfrågan på växtbaserade produkter bland konsumenterna, i synnerhet den s.k. millenniegenerationen. Hållbara inköp är en viktig aspekt för den här målgruppen och alla råvaror som används i AkoPlanet™-portföljen är som ett minimum spårbara till odlingsregionen.

AAK kommer att använda AkoPlanet™-portföljen i sin unika kundgemensamma produktutvecklingsstrategi för att tillsammans med kunder skapa skräddarsydda lösningar.

"Med hjälp av optimala formuleringar av oljor och fetter kan många av de viktigaste egenskaperna hos animaliska produkter återskapas", säger Henning Villadsen, Business Development Director vid AAK. "Detta har positiva konsekvenser för smak, struktur och andra sensoriska egenskaper hos växtbaserade livsmedel, vilket gör det möjligt för våra kunder att skapa valsmakande alternativ till kött-, mejeri- och glassprodukter."

För ytterligare information, vänligen kontakta:



# Domsjö Fabriker

The biorefinery Domsjö Fabriker AB refines wood into products with strong environmental profile. In addition to the main products cellulose, bioethanol and lignin the biorefinery produces more and more complementary products such as carbon dioxide, biogas, bio resin and soil improvers.

The production unit is located outside of Örnsköldsvik and the company Domsjö is part of the Indian business group Aditya Birla Group. The biorefinery originates from the sulphite pulp mill that was started in 1903 and has since yearly 2000's been transformed into the modern biorefinery it is today.

The production capacity is 230 000 tonnes cellulose, 120 000 tonnes lignin and 20 000 tonnes bioethanol. The production of biogas from the biological treatment plant is one of the largest in Sweden.

The cellulose is utilized in textile, hygiene, food, medicine and paint industry. The lignin is used in concrete, oil and feed industry while the bioethanol is used as biofuel, refrigerant, flushing liquid and for chemical products.

At Domsjö Fabriker there is R&D capacity for the entire textile value chain.

Read more:

<http://www.domsjo.adityabirla.com/en/Sidor/Startpage.aspx>



Source: <http://www.domsjo.adityabirla.com/sidor/Domsjo-Fabriker.aspx>

[www.task42.ieabioenergy.com](http://www.task42.ieabioenergy.com)

# Energifabriken Ecobränsle

In Karlshamn, at the site of an old dairy, the company Energifabriken produce biodiesel from rapeseed and bio-methanol.

Production started in 2006 and the plant has a capacity of 50 000 m<sup>3</sup> RME per year. The glycerol, obtained as a by-product, is used as protein feed for cows or for biogas production

Energifabriken is a small company that distributes and sells biofuels in Sweden. They operate in the entire chain from cultivation to production of environmentally friendly fuels.

Read more: <https://energifabriken.se>



Source: [www.energifabriken.se/om-oss-pressbilder](http://www.energifabriken.se/om-oss-pressbilder)

# Kraton Chemical AB Sandarne

Production at Kraton Chemical AB in Sandarne, outside Söderhamn, takes place in two separate factory units, the distillation plant and the resin derivative factory. The raw material consists of crude tall oil and with a distillation capacity of about 170,000 tonnes of tall oil per year the plant is one of the largest in the world for tall oil distillation.

The fractions extracted through distillation in Sandarne are pitch oil, pine resin, pine fatty acid, distilled tall oil, pre-oil and ejector steam. The resin derivative factory further refines pine resin to binders for the paint and glue industry.

The distillation plant in Sandarne originates from the 1930s when a small factory was built next to a pulp and paper mill. The factory was later expanded, and the derivate factory added.

The plant in Sandarne was previously owned by Arizona Chemicals but was bought in 2015 by Kraton, a worldwide company with almost 70 years as a market leader in polymer and tall oil-based specialty chemicals.

Read more: [www.kraton.com](http://www.kraton.com)



Source: <https://kraton.com/company/locations.php>

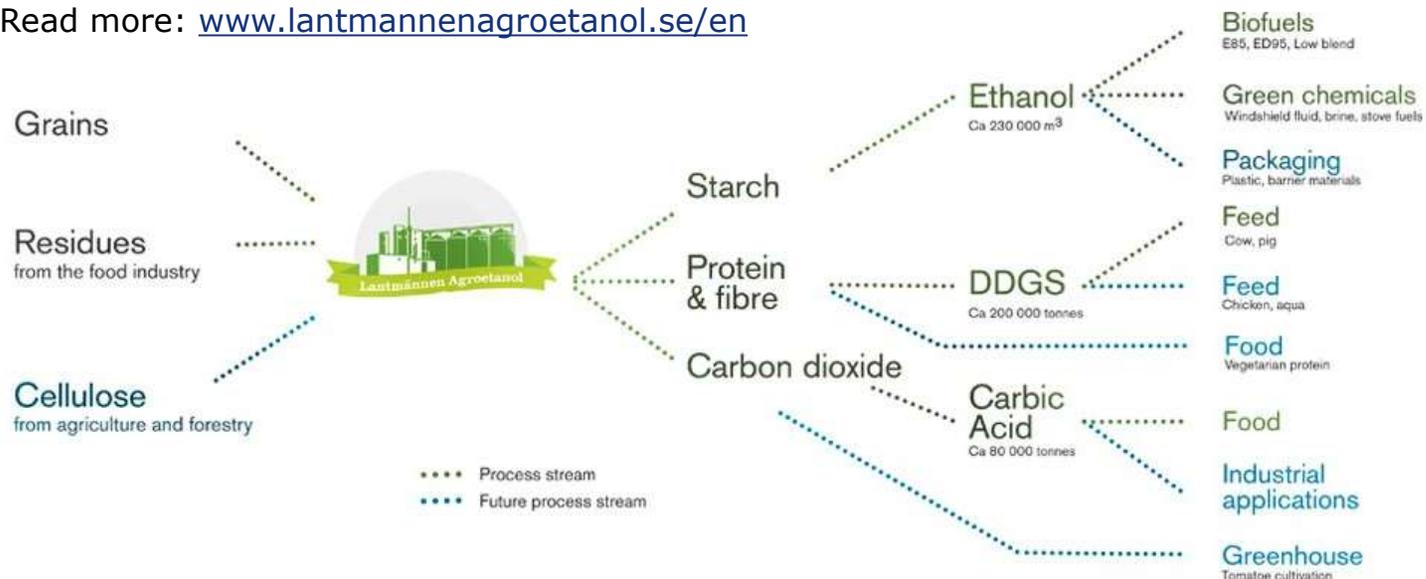
# Lantmännen Agroetanol

Lantmännen Agroetanol is the largest biorefinery in the Nordic region, it is a part of Lantmännen, an agricultural cooperative owned by 25,000 Swedish farmers.

The production facility in Norrköping started up in January 2001. In November 2008, a second production line was started. The capacity today is about 230 000 m<sup>3</sup> of ethanol and 200,000 tons of protein feed (DDGS). In addition 80 000 tonnes of carbon dioxide is delivered to the neighboring company AGA for carbonic acid production.

Agroetanol mainly refine grain (600 000 tons/year), but also produce growing volumes of Advanced Biofuels from second generation raw materials such as waste and residues from the food industry.

Read more: [www.lantmannenagroetanol.se/en](http://www.lantmannenagroetanol.se/en)



Source: [www.lantmannenagroetanol.se/en](http://www.lantmannenagroetanol.se/en)

# Adesso/Perstorp RME plant

In Stenugnsund the petrochemical company Perstorp produce biodiesel (RME) and glycerol from rapeseed. The sales of the RME is managed by Adesso Bioproducts (previously a Perstorp subsidiary). The production started in 2007 and has a maximum capacity of 180 000 m<sup>3</sup> RME per year.

The profitability of the production has been credited to the utilization of Perstorps existing infrastructure and the high purity of the obtained glycerol.

Perstorp has developed a new after-treatment process and using it they produce a new biodiesel suitable for the Nordic climate called Verdis Polaris™

Read more: <http://www.adessobioproducts.se/>



Source: [www.ostersund.se/download/18.4e7cbec51540b9bf5e7d670e/1461670531551/Lars-Lind\\_Perstorp-AB.pdf](http://www.ostersund.se/download/18.4e7cbec51540b9bf5e7d670e/1461670531551/Lars-Lind_Perstorp-AB.pdf)

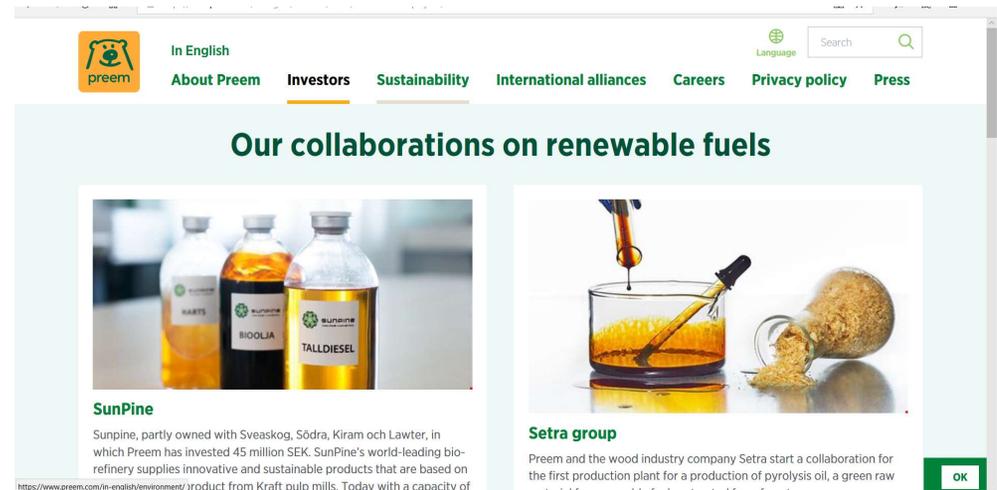
# Preem

Parts of PREEMs Gothenburg refinery have been transformed into a bio refinery - a Green Hydro Treater - where renewable raw materials can be fed straight into the manufacturing process and a completely ordinary diesel is obtained. Today, the feed consists of raw tall diesel from SunPine.

Already in 2008 PREEM announced the plan to start making biodiesel from tall oil. The retrofit of the refinery in Gothenburg was completed in 2009 and since 2010 PREEM has produced renewable diesel based on tall oil. In 2014, PREEM made investments to expand the biofuels facility and increase the biofuels production capacity by over 60%. The expansion of the plant was completed in 2015, bringing the annual production capacity to 800,000 tonnes of tall oil diesel. In 2019 PREEM made additional investments in Gothenburg to enable a further increase of production with 50%.

Currently, PREEM is also planning a new facility at the Gothenburg refinery. Annually, the new unit is expected to produce approximately one million m3 of renewable diesel and renewable aviation fuel, which represents approximately 25% of Sweden's estimated need for renewable fuels in 2030. It is expected to be in operation by 2021.

Read more: [www.preem.com](http://www.preem.com)



The screenshot shows the Preem website's navigation bar with the Preem logo, 'In English', and links for 'About Preem', 'Investors', 'Sustainability', 'International alliances', 'Careers', 'Privacy policy', and 'Press'. Below the navigation bar is a search box. The main content area features a heading 'Our collaborations on renewable fuels' and two featured articles. The first article, titled 'SunPine', includes an image of three bottles labeled 'HARTS', 'BIODIESEL', and 'TALLDIESEL'. The second article, titled 'Setra group', includes an image of a laboratory setup with a beaker, a pipette, and a jar of biomass. A small 'OK' button is visible in the bottom right corner of the screenshot.

# Sunpine

The Sunpine plant in Piteå was started in 2010 and the company is now owned equally by Preem, Sveaskog, Södra and Lawter. At the plant crude tall oil is converted into tall diesel (refined to HVO at Preem) with a production capacity of 100 million litres of tall diesel per year.

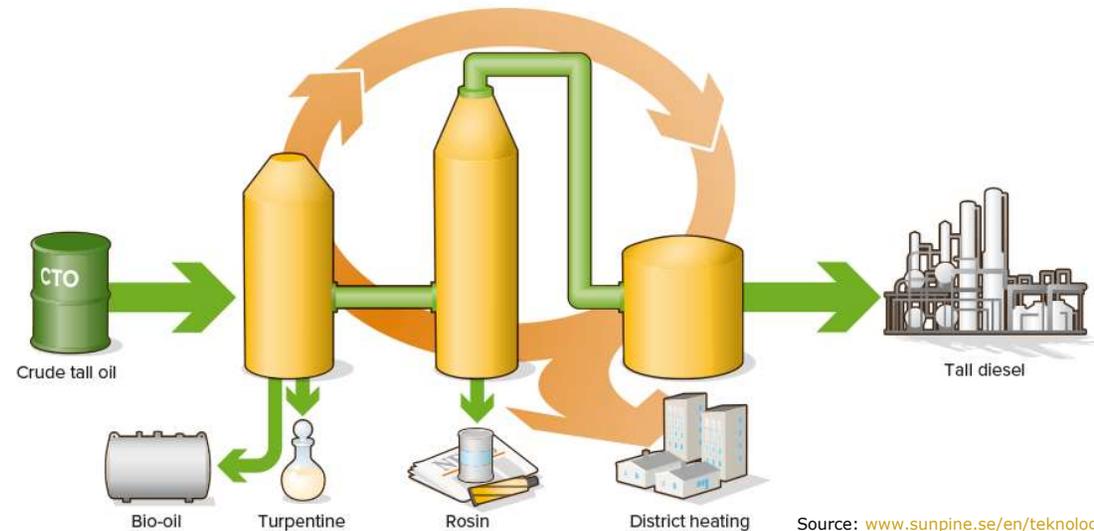
A new production line for rosin was built in 2015 and by the end of 2016 stable production was reached. Rosin, being an existing product on the global market, independent of political decisions, contributes to the company's profitability and product diversification. The annual rosin production capacity at Sunpine is 24,000 tonnes.

In addition to biodiesel and rosin, Sunpine produces around 50 000 tonnes of bio-oil, 200 tonnes of sulphate turpentine and delivers 1,500,000 kWh of district heating annually.

A second production line is currently under construction and it's expected to be finished during 2020 thereby increasing the production capacity by 50%.

Read more:

[www.sunpine.se/en](http://www.sunpine.se/en)



Source: [www.sunpine.se/en/teknologi/](http://www.sunpine.se/en/teknologi/)

# ST1 Gothenburg Ethanol Plant

The Ethanol plant in Gothenburg was started in 2015 and is The first Etanolix® plant delivered to the international market by St1 Biofuels Oy. It is fully integrated into the functions and logistics of St1 oil refinery in Gothenburg and has an annual production capacity of 5 000 m3 of advanced bioethanol. In addition, a by-product is obtained which is used as animal fodder or for biogas production.

The plant recycles feedstocks such as biowaste and process residue from local bakeries and bread from shops that is past its sell-by date into ethanol for transport fuel. 20 000 tonnes of feedstock is needed to reach the plants annual production capacity of ethanol. The production capacity of the plant is leased to North European Oil Trade Oy (NEOT), which is an oil and biofuel wholesale trading company.

This project was the first in which an ethanol production plant was integrated at an existing oil refinery to produce waste- and residue-based ethanol on a sustainable basis and it was selected for inclusion in the Life+ programme of the European Commission.

Read more: [www.st1.eu](http://www.st1.eu)



Source: [www.st1.eu](http://www.st1.eu)

[www.task42.ieabioenergy.com](http://www.task42.ieabioenergy.com)

# Södra Mönsterås

A plant for purification of crude bio-methanol is being commissioned at Södras pulp mill in Mönsterås, production started in early 2020. The plants capacity is 5500 tonnes and it is designed to handle the entire crude methanol flow obtained from the mill's methanol stripper.

Södra is Sweden's largest forest-owner association, with 52,000 forest owners as its members and the new purification technology was developed by them and Invico. The concept has been purchased by Andritz and Södra is now the first to install the equipment.

Biomethanol can be used as fuel, as low-blend in gasoline, as feedstock in the production of RME or as a green chemical. At present its unclear how the methanol will be used and by whom. However, Södra is interested in using it as fuel for trucks and the company is involved in several projects focusing on this. Furthermore, Södra has said that policies will strongly influence whether the methanol will be sold in Sweden or abroad.

Read more: [www.sodra.com](http://www.sodra.com)



Source: [www.sodra.com/sv/om-sodra/pressrum/pressmeddelanden/sodra-forst-i-varlden-med-fossilfri-biometanol/](http://www.sodra.com/sv/om-sodra/pressrum/pressmeddelanden/sodra-forst-i-varlden-med-fossilfri-biometanol/)

[www.task42.ieabioenergy.com](http://www.task42.ieabioenergy.com)

# Södra Mörrum – Once more

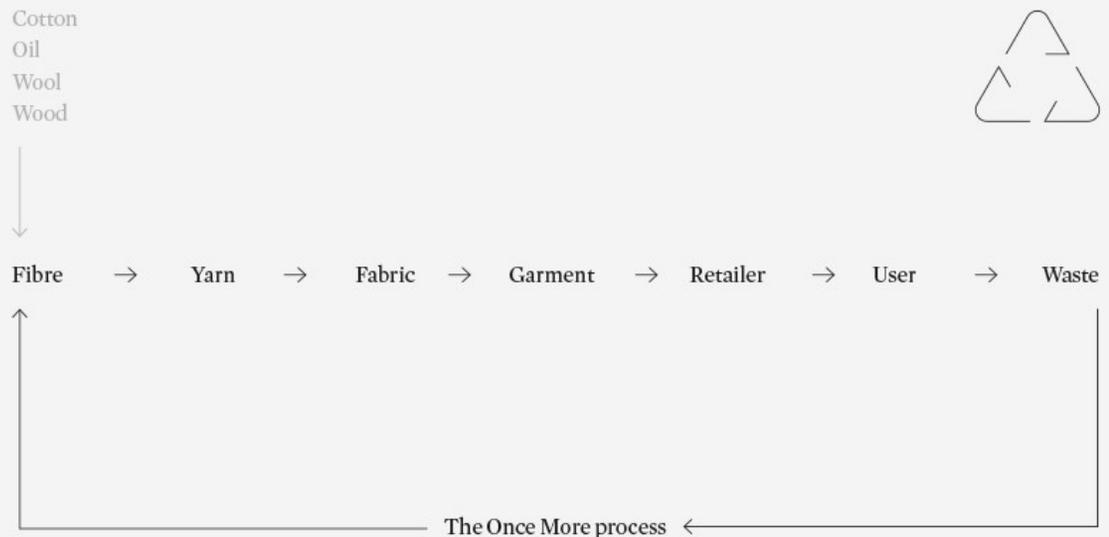
At Södras pulp mill in Mörrum a new technology for recycling textile fibers has been installed. Södra's new technique can separate the cotton and polyester in polycotton blends, which is one of the most widely used textiles on the market. The pure cotton fibres are then added to the wood-derived textile pulp, which can be used to make new textiles.

During the autumn, Södra's pulp mill at Mörrum produced pulp by adding 20 tonnes of used textiles. At present, Södra can only accept white textiles, but the aim is to also find a decolouring solution. The goal is also to investigate the possibility of extracting a stream of residual products from the polyester.

Södra will be able to accept viscose and lyocell in addition to polycotton blends.

Production will commence at a low rate of 30 tonnes this year, but the long-term target is to add 25,000 tonnes of textiles to the company's pulp production.

## The new, circular textile chain



# 6. Regional initiatives - examples

Note that the list is non-exhaustive.

- BioEconomy Region
- BioFuel Region – Bioeconomics regions in collaboration
- BOBIC – Bothnia Biobased Industries Cluster
- Climate leading process industry
- Food Valley of Sweden
- Lignocity
- The Biorefinery of the future
- The Paper Province
- ...

# Bioeconomy Region

The Interreg project «The Bioeconomy Region» was created in 2017 by several actors in inner Scandinavia. Over three years, the intention is that the project will stimulate new, wood-based innovations and support small and medium-sized companies to increase their market and their international competitiveness in the forest bioeconomy. To achieve this, the project is implementing initiatives throughout the whole value chain, from direct support measures and training initiatives to linking together different stakeholders and creating new meeting places in the region.

The Swedish project owner is Region Värmland and the Norwegian project owner is Viken County Municipality. In total, 41 different partners in Sweden and Norway are involved in the project and the total budget is € 4.4 million and the project will end by May 2020.

Read more: <https://bioeconomyregion.com>



Source: <https://bioeconomyregion.com>

# BioFuel Region, Umeå

The BioFuel Region was founded in 2003 and is funded by members, regions and the EU. They wish to drive the transition to a bioeconomy and a fossil-free vehicle fleet. They work for sharper action programs and action plans, from municipal to European level, to facilitate development in northern Sweden. BioFuel Region initiate, coordinate and collaborate on projects. By channeling, coordinating and facilitating work between municipalities and other actors they enable implementation of creative projects and wish to speed up the transition to a bioeconomy.

BioFuel Region encourage their members in the change work and can contribute expertise from their networks. Their members are municipalities and companies in Sweden's four northernmost counties and their office is in Umeå.

In 2017 BioFuel Region, together with Region Västerbotten, initiated **Swedish regions for a bioeconomy**, which is a bioeconomic network for Sweden's regions. The network exists to develop and facilitate the regions' work on bioeconomy, but also to influence policy both nationally and at EU level. The network now includes 12 of Sweden's regions. The project started in 2017 and will continue until 2020. It is financed by the regions themselves and the Swedish Agency for Economic and Regional Growth with a total budget of SEK 3.6 million.

Read more: <https://biofuelregion.se/en/>



# Bothnia Biobased Industries Cluster – BOBIC, Piteå

Bothnia Bioindustries Cluster (BOBIC) is Northern Sweden's driving force for further development of the biobased industry and a renewed society based on a biobased economy.

Piteå Science Park coordinates the cluster, which is supported by the European Regional Development Fund and was started in 2015.

Cooperation within BOBIC is based on the region's specific conditions and the forest value chain, which creates the conditions for the development of existing or additional bio-based industry. In order to bring new innovations to commercialization, BOBIC will use business ideas, entrepreneurs, technology suppliers and financing that are available both regionally and globally.

Members of BOBIC are: Billerud Korsnäs, Erebia, Luleå University of Technology, RISE ETC, SCA, Setra, Smurfit Kappa, Suncarbon, Sunpine, Sveaskog, PodComp, Swerea MEFOS, Swerea SICOMP, Wibax.

In addition, Luleå University of Technology, both the Department of Industrial Environmental and Process Engineering and the Department of Energy Science, as well as LTU Green fuels, are strategic partners.

Read more: <https://www.piteasciencepark.se/case/bothnia-bioindustries-cluster-bobic/>

# Climate leading process industry, Western Sweden

Climate leading Process Industry strives for a fossil-independent industrial region in Western Sweden, that is a world leader in the production of chemicals, materials and fuels based on renewable and recycled raw materials.

The initiative is funded by Vinnova and Region Västra Götaland, it was started in the beginning of 2019 and will go on for 10 years. The total budget is SEK 116 million and it is run by Johanneberg Science Park and RISE in close cooperation with Region Västra Götaland.

The climate-leading Process Industry involves the entire West Swedish Chemical and Materials cluster with some 40 members from academia, industry and the public sector, all of which have the transition to a fossil-independent and circular economy high on their agendas.

The initiative is expected to halve the region's carbon dioxide emissions, create up to 500 new jobs and about 10 new green chemical companies in the region.

The initiative is divided into four focus areas: **Return refinery** focusing on recycled plastics as a raw material, **Renewables** focusing on forest based raw materials, while **Climate Leading Process Technology** and **Climate Leading Value Chains** address common issues among Western Swedish Chemical and Materials Cluster.

Read more:

<https://www.johannebergsciencepark.com/en/node/17258>



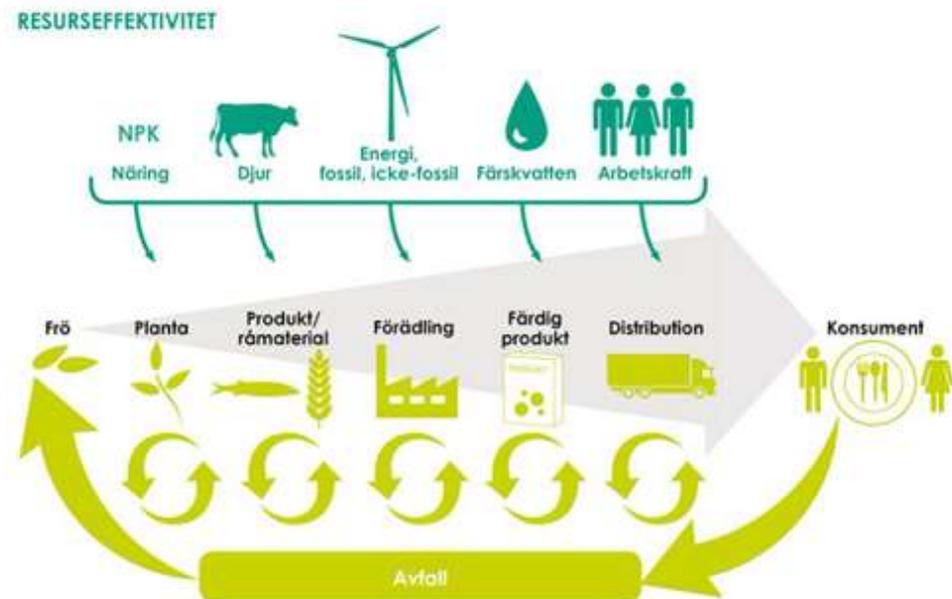
# Foodvalley of Sweden, Bjuv

Food Valley of Sweden is a collaboration between Region Skåne, Innovation Skåne, Bjuv Municipality and Foodhills AB with the support of Swedish Agency for Economic and Regional Growth. The aim of the collaboration is to create a reference and development center for circular food production in public/private collaboration – the food equivalent to Silicon Valley on Foodhill's premises in Bjuv.

Foodhill is a company owned by Backahill, Lantmännen, Magihill and Health runner. Their vision is to become a leader in Europe on circular food production systems.

In Foodhill's premises in Bjuv - a total of 100,000 square meters spread over 2,500 rooms - has plenty of space for both small and large companies. There are pilot factories, test beds, taste laboratories, a wastewater treatment plant, a biogas plant, packaging lines and everything else needed to produce food on all scales.

Read more:  
[www.foodhills.se/food-valley-sweden/](http://www.foodhills.se/food-valley-sweden/)



Source: <https://foodhills.se/food-valley-sweden/>

# Lignocity, Bäckhammar

Lignocity is an open test-bed where companies, universities and innovators can develop and scale up technology that refines lignin to new climate-friendly fuels, chemicals and materials. It is located next to the paper and pulp mill Nordic Paper in Bäckhammar, which supplies the plant with raw materials.

LignoCity has technology for separating lignin and knowledge to process it through various processes. The plant was established in 2006 by Innventia to demonstrate the LignoBoost process owned by Valmet. The LignoBoost demonstration plant has a capacity of 8 000 tons of lignin per year and it is possible to obtain a lignin that is so clean it can be used as a raw material for carbon fibre. LignoCity is one of the few test beds in the world with sufficient resources for upscaling.

LignoCity2.0: *Low carbon economy through the development of LignoCity*, is a project focusing on commercializing sustainable processes and products linked to lignin. The goal is to make it easier for small and medium-sized companies and innovators to take the step from idea to market, to develop the area of use for an underutilized raw material, minimize costs and time between development phases and lead cooperation platforms for lignin-development. It is a three-year project that extends internationally and is collaboration between RISE Research Institute of Sweden, Paper Province, the Municipality of Kristinehamn and Karlstad University.



# The Biorefinery of the future

The Biorefinery of the Future is a VINNVÄX initiative that RISE Processum runs together with municipalities, regions, industry and academia in the Västernorrland and Umeå regions with funding from VINNOVA.

The goal of the initiative is to create higher values from forest resources and growth in bioeconomy in the region, based on industry needs.

The initiative started in 2008, when funding was granted from VINNOVA, and the vision was to establish a creative and leading region for the development of the future biorefinery using forest raw materials and energy crops as raw material.

Read more:

[www.processum.se/sv/spprocessum/projekt/framtidens-bioraffinaderi](http://www.processum.se/sv/spprocessum/projekt/framtidens-bioraffinaderi)



Source: <https://www.processum.se/sv/spprocessum/projekt/framtidens-bioraffinaderi>

# The Paper Province

The Paper province is a corporate cluster with more than 100 member companies within the forest value chains, from local suppliers to global giants. It was started in 1999 by seven companies with a common need – recruiting competent staff. The initial need was later developed to the present Paper Province – where the focus is collaboration in the use of forest raw materials to achieve a sustainable society.

Paper Province is now a world-leading cluster within the forest bio-economy. On behalf of their member companies, they work with innovation and development, the supply of a skilled work force, meetings and networks, internationalization and marketing. Bringing together companies and organizations in a single large network, in order to liberate the world from fossil raw materials.

Read more: <https://paperprovince.com/en/>



## 7. Demo plants

- Biorefinery Demonstration Plant, Örnsköldsvik
- Lignoboost Demo Plant, Bäckhammar (described under Lignocity in previous section)
- Gobigas - biomass gasification and biomethane synthesis pilot demonstration plant in Gothenburg (mothballed)

# Biorefinery Demo Plant, Örnsköldsvik

The Biorefinery Demo Plant has all the necessary steps to convert biomass to final products like e.g. carbohydrates, lignin, proteins, enzymes, chemicals, material and ethanol. The plant is situated outside of Örnsköldsvik, in the same area as Domsjö Fabriker.

The plant is owned by RISE Processum, it has been in operation for more than 10 years and is operating 24 hours per day, 7 days a week with a capacity of 1-2 tonnes of feedstock per 24 hours.

The continuous operation of the plant provides opportunities to study the operational disturbances that arise in the process during long-term operation in the form of coatings, clogging and material wear.

At the plant customers and partners can scale up their research, fractionate biomass or produce larger amounts of intermediates or products needed for development and market introduction.



# GoBiGas

GoBiGas is a demonstration and research facility, where Göteborg Energi has conducted large-scale biogas production by means of gasifying forestry residues, such as tops and branches.

The decision to build the demonstration plant GoBiGas 1 was taken in 2008 – 2010. The project was awarded financial support from the Swedish Energy Agency. The plan was that GoBiGas 1 would be followed by a much larger plant, GoBiGas 2, which would commercialize the technology. The plans for the second stage were shelved in 2015 when the biogas market had not reached the development that was forecasted in order to reach profitability in the project.

The technology in GoBiGas has been developed in close cooperation with Chalmers University of Technology and the project's suppliers. The production of biogas has followed two stages – gasification of the biomass, followed by methanation of the product gas to biogas.

The GoBiGas plant was inaugurated in the Spring of 2015 and in December the same year biogas from the plant was delivered to the grid for the first time. Since its start of operation, the plant has produced and delivered 65 GWh of biogas and in February 2018 the plant reached its maximum capacity of 20 MW. The plant has primarily used pellets as fuel.

In April 2017, the Management and Board of Göteborg Energi decided to actively search for a new owner for the plant. That process was concluded in March 2018 when Management and the Board decided to discontinue the project and stop operations.

## 8. Larger pilot plants - examples

- Anneberg
- Colabitoil
- LTU Green Fuel
- RenFuel
- SCA Obbola
- SunCarbon
- Slurry Hydrocracker
- (many research infrastructures at RISE and the universities)
- ...

# Anneberg

The facility at Anneberg, outside Svalöv in Skåne, is a pilot-scale biorefinery run by Indienz AB, a spin-off company from Lund University. It was started in 2013 and here researchers, students and the business community test and evaluate processes for extracting biogas, bio manure and chemicals from biomass.

The raw material is residual products from agriculture and forestry and the chemicals that are extracted, can be used for example in the production of biodegradable plastics.

At the biorefinery it's studied how different types of biomass can be pretreated for refining. An important track has been the use of bacteria and various types of microorganisms that can facilitate the breakdown of, for example, cellulose in residues from agriculture and forestry.

The production facilities provides the possibility for large scale fermentation in full-grade biotechnological vessels; from shake flask level up to 20 m<sup>3</sup> productions.

Projects performed during 2019 involve the production of biohydrogen in 500L scale and recombinant protein at kg level.

Read more: [www.indienz.com](http://www.indienz.com)



Source: <http://indienz.com/>

# Colabitoil

Colabitoil's pilot plant in Norrsundet is used for development of products and process for large-scale production of HVO. The plant has been in operation since 2017, the production is based on used cooking oil and production capacity is 1400 m<sup>3</sup> per year.

The pilot plant is also used in the development of the company's new petrol and aviation fuel products. During 2019 a smaller test facility, for the development of a process for production of both gasoline and aviation fuels from ethanol, was constructed. The production is based on Organofuel's international patent-pending technology and the pilot has a capacity of 50 liters/h.

In the future Colabitoil is interested in using fiber sludge, a residual product from the pulp and paper industry, as a source of lipids for biodiesel production. This would be done by breaking down the fibers with the help of microbes, something that has already been tested in lab-scale.

Read more:

[www.colabitoil.com](http://www.colabitoil.com)



Source: <https://bioenergitidningen.se/biodrivmedel-transport/colabitoil-tecknar-avtal-for-produktion-av-fornybart-flygbransle-och-bensin>

# LTU Green Fuel

LTU Green Fuel in Piteå is one of the world's most advanced pilot plant for gasification of various biomass to synthesis gas and green fuels. Luleå University of Technology runs the plant in partnership with Chemrec and Haldor Topsö. There is also a consortium of national and public actors connected to the plant.

The pilot plant is designed for 24-hour operation and has been running for 28,000 hours since 2005 for technology verification and in various research and development projects.

Research Focus is:

- New raw materials such as pyrolysis oil, powdered fuels of various kinds and liquefied organic waste
- New ultra-clean diesel engines where Volvo tests ten trucks with the "green" diesel Bio DME
- Innovations in synthesis processes (membranes, thermophoretic cyclones, reserved fuel cells and pressurized electrolysis)
- Provide the infrastructure for external projects and be a national infrastructure for green fuel research
- New methods for in situ measurements
- New methods for pre-treatment (Solvolys, etc.)

# RenFuel

The company RenFuel has developed and patented a method for processing lignin from the pulp industry's renewable residual black liquor into lignin oil with the product name Lignol.

In 2017 a pilot plant with organic catalysis of lignin to biocrude with 3000 tonnes per year capacity was started. It is situated at the paper and pulp mill Nordic Paper in Bäckhammar. The biocrude is intended for HVO production externally.

RenFuel have partnered with PREEM and Rottneros, in the plans to build the world's first large scale lignin plant for biofuels at the pulp mill in Vallvik, through the company LignolProduktion AB. The plant is estimated to handle 30-35 000 tonnes of lignin annually and be in operation Q1 2021. However, since the summer of 2019 Rottneros has paused their engagement in the project.

Read more: <https://renfuel.se/?lang=en>



Source: <https://renfuel.se/technology/?lang=en>

# SCA Obbola

In 2017, SCA built a pilot plant for production of liquid biofuels and chemicals from black liquor at their containerboard mill in Obbola outside of Umeå in Northern Sweden. The pilot plant uses black liquor, a by-product from the mill's production of kraft pulp, as raw material for production of lignin oil and further processing into liquid biofuels and chemicals.

The pilot plant only produces one or a few liters per hour, but it is large enough to provide realistic production conditions for evaluating the potential of the process and test the technology's capability.

SCA sees a large potential in the production of liquid biofuels that may replace petrol or diesel in standard vehicles. A process has begun to investigate the prospects of placing a biorefinery adjacent to the Östrand pulp mill in Timrå. If the evaluation at the pilot plant in Obbola proves promising the full-scale evaluation will take place at Östrand. The prospected plant in Östrand would have a production capacity of up to 300,000 tonnes of biofuels.

Read more: [www.sca.com](http://www.sca.com)

# Slurry Hydrocracker (SHC)

**The Slurry-Hydrocracker** is an open and neutral pilot plant owned by RISE in Piteå where new technologies for production of fossil free transportation fuels can be developed, tested and verified. The plant was inaugurated in 2017 and it provides the opportunity to study the entire value chain from raw materials to liquid fuel. With its size, it is an important step for scaling up methods of cracking lignin-based bio oils into biofuels, including, for example, the development of suitable catalysts, the impact of various bio oils, the design of inputs in the process, corrosion studies, process and product development.

Read more: <https://www.ri.se/en/what-we-do/projects/slurry-hydrocracking-bio-oils-complex-refinery>

# SunCarbon Membrane Pilot

The first part of the SunCarbon process is a membrane filtration step. With this separation method, lignin can be removed without use of acid or other chemicals that can have a negative impact on the pulp and paper mill. SunCarbon has a **Membrane pilot**, built for scale-up of the SunCarbon process that has been in operation at the kraft mill in Piteå since December 2016. It has a capacity to recover 1.5 kg lignin per hour and is designed to test different operating parameters and membranes from different suppliers.

Read more: [www.suncarbon.se/en](http://www.suncarbon.se/en)

# 9. Biorefining related funding & Major innovation activities

- Formas
  - Some larger programs related to the bioeconomy
  - Focus on societal transitions
- F3
- Strategic research environments (funded separately)
  - Bio4Energy
  - Chalmers Energy Initiative
- The Swedish Energy Agency
  - Bioenergy
  - Biofuels (several programs)
  - Energy transition / system aspects
- VINNOVA - Sweden's innovation agency
  - BioInnovation
  - Challenge-Driven Innovation
  - Vinnv ax
- Other
  - Industry related funding (foundations)

***On the following slides in-depth description will be given to a selection of Major innovation activities.***

# BioInnovation

BioInnovation is a joint industry initiative funded by Vinnova, the Swedish Energy Agency and Formas with the vision that Sweden has a bio-based economy by 2050.

- Focus areas are:
  - Chemicals & Energy
  - Materials
  - Construction & Design
- Up till now:
  - 8 calls
  - 241 MSEK
  - Material (42%), Construction & Design (28%) and Chemicals and Energy (27%)

<https://www.bioinnovation.se/>

# Bio4Energy

Bio4Energy, a Strategic Research Environment appointed by the Swedish government, was born in late 2009 when the Swedish government agreed to offer a constellation of 44 biorefinery researchers its support.

The government's generous support, topped up with contributions from the member universities and external funds won as a result of it, have allowed Bio4Energy to expand from the initial 44 to 220 researchers in February 2020, originating from several countries but affiliated with one or more of Bio4Energy's founding member organisations.

Bio4Energy is a research environment that create links and collaboration within the academic cluster and cooperation with industrial actors. Tools and methods for sustainable and efficient biorefinery based on forest raw material and organic waste are developed by researchers at Umeå University, Luleå University of Technology and Sweden's Agricultural University, together with industrial partners.

Read more: [www.bio4energy.se](http://www.bio4energy.se)



# Chalmers Energy Initiative

The Chalmers Energy Initiative (CEI) is based on the raised level of funding for strategically important research areas appointed by the Swedish Government in the Bill "A Boost to Research and Innovation".

Chalmers has been granted SEK 58 million per annum from 2012 and in **total SEK 230 million for the period 2010-2014**. The President of Chalmers has pledged to provide additional support to Chalmers Energy Initiative corresponding to at least 50% of the sum granted.

CEI consists of four research areas where **Energy Combines** is one. Within Energy Combines research is focused to three areas; Thermochemical conversion of biomass, Chemical and biochemical conversion of biomass, and Process integration

**Chemical and biochemical conversion** of biomass aim to develop the lingo-cellulosic-based process industry. One objective is to partly transform today's chemical pulp mills into energy combines for production of fuels and products.



Source: <https://www.chalmers.se/en/areas-of-advance/energy/cei/Pages/default.aspx>

[www.task42.ieabioenergy.com](http://www.task42.ieabioenergy.com)

# f3 – Swedish knowledge centre for renewable transport fuels

f3 Swedish Knowledge Centre for Renewable Transportation Fuels is a nationwide centre for collaboration between industry, academia, research institutes and authorities engaged in contributing to a sustainable transport sector.

f3 is financed jointly by the centre partners and the region of Västra Götaland.

The work of f3 is summarized in three parts:

- Collaboration
- External communication
- Initiating and carrying through projects with a system perspective

Together with the Swedish Energy Agency, f3 finances ***The collaborative research program Renewable transportation fuels and systems.***

- Time period: 2018 – 2021
- Funded by the Swedish Energy Agency (22 MSEK), the f3 partners (11 MSEK) and by co-financing in the projects (at least 11 MSEK).

Read more: <https://f3centre.se>

# Swedish Energy Agency

- **The Biofuels program**

In this program academia, business and institutes will gain knowledge and develop technologies needed for a broad market introduction of biofuels produced from lignocellulose or residual products.

- Time period: 2017 – 2023, Budget: 270 MSEK
- Focus areas:
  - Thermochemical conversion processes
  - Biochemical conversion processes
  - System issues, integration and biorefinery concept

- **Develop sustainable biofuels for aviation**

In April 2018, the government commissioned the Swedish Energy Agency to promote sustainable biofuels for aircraft. The assignment includes that the Swedish Energy Agency will announce funds to support research and development of sustainable biofuels for aviation and establish an innovation cluster.

The Swedish Energy Agency may pay out a total of 60 MSEK during the period 2018-2020, of which a maximum of 10 MSEK may be used to support the innovation cluster.

- Up till now: 17 projects have been awarded 52 MSEK

# Swedish Energy Agency cont..

- **Demonstrate ethanol as fuel for heavy transport**

In April 2018, the government commissioned the Swedish Energy Agency to promote sustainable biofuels for heavy transports. The assignment includes that the Swedish Energy Agency will announce funds to support to establish an innovation cluster. The demonstration part of the innovation cluster includes up to 25 trucks.

More information: [www.ethadrive.se](http://www.ethadrive.se)

- **Demonstrate liquid biogas as fuel for heavy transport**

In April 2018, the government commissioned the Swedish Energy Agency to promote sustainable biofuels for heavy transports. The assignment includes that the Swedish Energy Agency will announce funds to support to establish an innovation cluster.

All over Sweden, production, distribution and usage of liquified biogas (LBG) will be demonstrated within the frame of the innovation cluster Drive LBG. Swedish Gas Association is coordinating the demonstrations and distributes the governmental subsidies (in total 180 MSEK) to the demonstration projects. An important part of Drive LBG is the support to nearly 200 long haul trucks that will run on LBG, mainly Scania and Volvo trucks.

More information: [www.drivelbg.se](http://www.drivelbg.se)

# The SET-Plan and SET4BIO

- JRC together with DG RES, ENER set up the Implementation Working Group for action 8, Bioenergy and Renewable Fuels for SustainableTransport in June 2019, IWG8
- SET Plan action 8 CSA Support project call in august 2019 (LC-SC3-JA-2-2018-2019)
  - RISE (Coordinator) applied for SET4BIO project together with VTT (FI), SINTEF (NO), FNR (DE), CIRCE (SP) and ETA Florence (IT)
  - Budget 1MEuro during 3 years
  - Positive evaluation results received 14th of November 2019. Now under grant agreement preparation.



# 10. Major stakeholders

***A non exhaustive list*** of major stakeholders within:

- Industry & SMEs
- Research Institutes & Universities
- Governmental organizations
- Non-governmental organizations
- Financial organizations & others

# 10. Major stakeholders Industry and SMEs

Name	Website	Name	Website
Adesso Bioproducts	<a href="http://www.adessobioproducts.se">www.adessobioproducts.se</a>	PREEM	<a href="http://www.preem.se">www.preem.se</a>
BILLERUDKORSNÄS	<a href="http://www.billerudkorsnas.se">www.billerudkorsnas.se</a>	Pyrocell	<a href="http://www.setragroup.com/en/pyrocel">www.setragroup.com/en/pyrocel</a>
Colabitoil	<a href="http://www.colabitoil.com">www.colabitoil.com</a>	Renfuel	<a href="http://www.renfuel.se">www.renfuel.se</a>
Domsjö	<a href="http://www.domsjo.adityabirla.com">www.domsjo.adityabirla.com</a>	SCA	<a href="http://www.sca.com">www.sca.com</a>
E.ON	<a href="http://www.eon.se">www.eon.se</a>	SEKAB	<a href="http://www.sekab.com">www.sekab.com</a>
Energifabriken	<a href="http://www.energifabriken.se">www.energifabriken.se</a>	Setra	<a href="http://www.setragroup.com">www.setragroup.com</a>
Foodhills	<a href="http://www.foodhills.se">www.foodhills.se</a>	Skellefteå Kraft	<a href="http://www.skekraft.se">www.skekraft.se</a>
HOLMEN	<a href="http://www.holmen.com">www.holmen.com</a>	SmurfitKappa	<a href="http://www.smurfitkappa.com">www.smurfitkappa.com</a>
Indienz	<a href="http://www.indienz.com">www.indienz.com</a>	St1	<a href="http://www.st1.eu">www.st1.eu</a>
Kraton Chemical	<a href="http://www.kraton.com">www.kraton.com</a>	SunCarbon	<a href="http://www.suncarbon.se">www.suncarbon.se</a>
Lantmännen Agroethanol	<a href="http://www.lantmannenagroetanol.se">www.lantmannenagroetanol.se</a>	Sunpine	<a href="http://www.sunpine.se">www.sunpine.se</a>
Metso	<a href="http://www.metso.com">www.metso.com</a>	Sveaskog	<a href="http://www.sveaskog.se">www.sveaskog.se</a>
MoRe Research	<a href="http://www.more.se">www.more.se</a>	Sveaskog	<a href="http://www.sveaskog.se">www.sveaskog.se</a>
Norra Skogsägarna	<a href="http://www.norra.se">www.norra.se</a>	Södra	<a href="http://www.sodra.com">www.sodra.com</a>
Nouryon	<a href="http://www.nouryon.com">www.nouryon.com</a>	Umeå Energi	<a href="http://www.umeaenergi.se">www.umeaenergi.se</a>
Organo Fuels Sweden	<a href="http://www.organofuelsweden.com">www.organofuelsweden.com</a>	Valmet	<a href="http://www.valmet.com">www.valmet.com</a>
Perstorp	<a href="http://www.perstorp.com">www.perstorp.com</a>	Wargön Innovation	<a href="http://www.wargoninnovation.se">www.wargoninnovation.se</a>
Piteå Science Park/Bothnia Bioindustries Cluster	<a href="http://www.piteasciencepark.se">www.piteasciencepark.se</a>	Övik Energi	<a href="http://www.ovikenergi.se">www.ovikenergi.se</a>

# 10. Major stakeholders

## Universities

Name	Website
Chalmers University of Technology	<a href="http://www.chalmers.se">www.chalmers.se</a>
Karlstad University	<a href="http://www.kau.se">www.kau.se</a>
KTH Royal Institute of Technology	<a href="http://www.kth.se">www.kth.se</a>
Luleå University of Technology	<a href="http://www.ltu.se">www.ltu.se</a>
Lund University	<a href="http://www.lu.se">www.lu.se</a>
Mid Sweden University	<a href="http://www.miun.se">www.miun.se</a>
Linköping University of Technology	<a href="http://www.liu.se">www.liu.se</a>
SLU - The Swedish University of Agriculture	<a href="http://www.slu.se">www.slu.se</a>
Umeå University of Technology	<a href="http://www.umu.se">www.umu.se</a>

## Research Institutes

Name	Website
IVL Swedish Environmental Research Institute	<a href="http://www.ivl.se">www.ivl.se</a>
RISE- Research Institutes of Sweden	<a href="http://www.ri.se">www.ri.se</a>
VTI-The Swedish National Road and Transport Research Institute	<a href="http://www.vti.se">www.vti.se</a>

# 10. Major stakeholders

## Governmental organizations

Name	Website
Swedish Energy Agency	<a href="http://www.energimyndigheten.se">www.energimyndigheten.se</a>
The Ministry of the Environment	<a href="http://www.government.se/government-of-sweden/ministry-of-the-environment/">www.government.se/government-of-sweden/ministry-of-the-environment/</a>
The Ministry of Infrastructure	<a href="http://www.government.se/government-of-sweden/ministry-of-infrastructure">www.government.se/government-of-sweden/ministry-of-infrastructure</a>
The Swedish Forest Agency	<a href="http://www.skogsstyrelsen.se">www.skogsstyrelsen.se</a>
The Swedish Board of Agriculture	<a href="http://www.jordbruksverket.se">www.jordbruksverket.se</a>
Swedish Environmental Protection Agency	<a href="http://www.naturvardsverket.se">www.naturvardsverket.se</a>

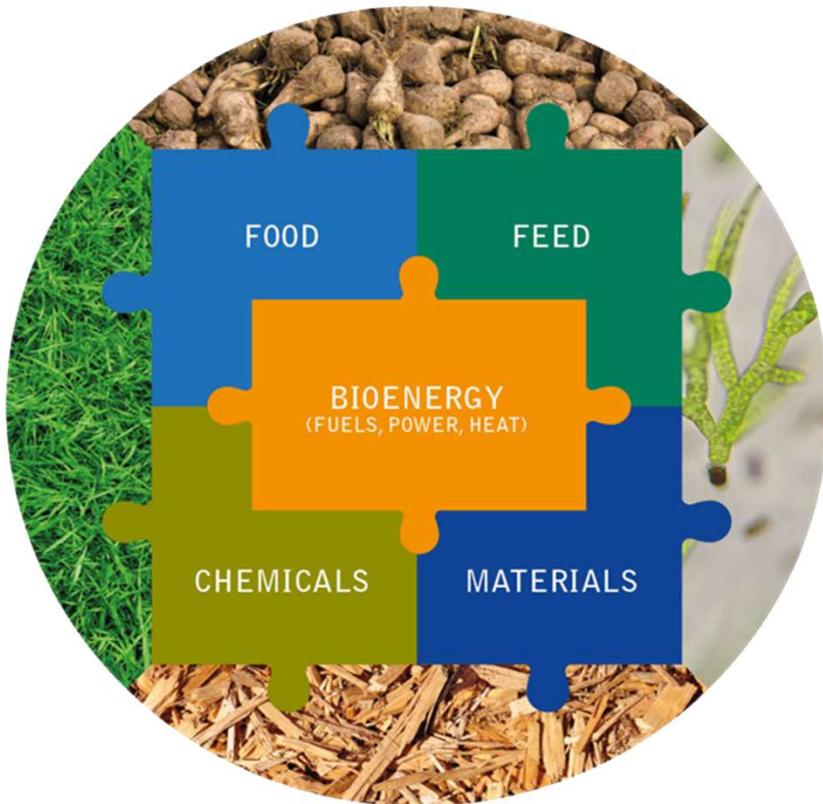
## Non- governmental organizations

Name	Website
BioInnovation	<a href="http://www.bioinnovation.se">www.bioinnovation.se</a>
Energiforsk	<a href="http://www.energiforsk.se">www.energiforsk.se</a>
IKEM - Innovation and Chemical Industries in Sweden	<a href="http://www.ikem.se">www.ikem.se</a>
LRF - The Federation of Swedish Farmers	<a href="http://www.lrf.se">www.lrf.se</a>
SPBI - Swedish Petroleum & Biofuels Institute	<a href="https://spbi.se">https://spbi.se</a>
Swedenergy- Energiföretagen i Sverige	<a href="http://www.energiforetagen.se">www.energiforetagen.se</a>
Swedish Bioenergy Association	<a href="http://www.svebio.se">www.svebio.se</a>

# 10. Major stakeholders

Funding agencies etc.

Name	Website
FORMAS	<a href="https://formas.se/">https://formas.se/</a>
Mistra - The Swedish Foundation for Strategic Environmental Research	<a href="http://www.mistra.org">www.mistra.org</a>
Swedish Energy Agency	<a href="http://www.energimyndigheten.se">www.energimyndigheten.se</a>
Swedish Environmental Protection Agency	<a href="http://www.naturvardsverket.se">www.naturvardsverket.se</a>
The Kempe Foundation	<a href="http://www.kempe.com">www.kempe.com</a>
The Knowledge Foundation	<a href="http://www.kks.se">www.kks.se</a>
The Swedish Research Council	<a href="http://www.vr.se">www.vr.se</a>
VINNOVA	<a href="http://www.vinnova.se">www.vinnova.se</a>



**IEA Bioenergy**



**Task42 – Biorefining in a Circular Economy**

### **Contact Details**

Click to enter  
contact details

IEA Bioenergy Website  
[www.ieabioenergy.com](http://www.ieabioenergy.com)

IEA Bioenergy Task42 Website  
[www.task42.ieabioenergy.com](http://www.task42.ieabioenergy.com)