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Cross-sector supply chains for metallurgical biocarbon

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The HåBiMet projects

"Sustainable Biocarbon for Metallurgical uses" in Swedish.

Currently three concurrent projects with social, policy and technological dimensions.

The consortium includes research actors, metal industries and biocarbon producers.

The project was initiated to better understand a situation where there is large interest in metallurgical biocarbon, but still no mature market.

Metal industries lack large supply volumes to switch to biocarbon, but biocarbon producers cannot scale up without larger demand.

Creating sustainability, predictability and supply security despite growing demand for biomass is a key challenge.

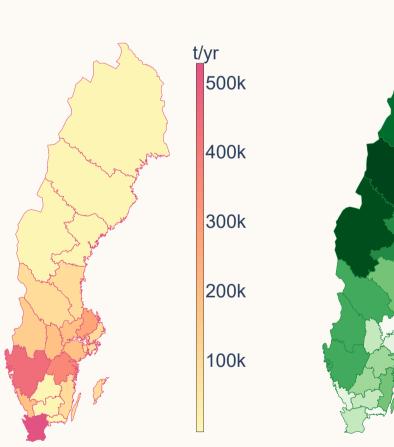
An interdisciplinary approach and involvement across traditional sector boundaries have gained insight into factors hindering market development.



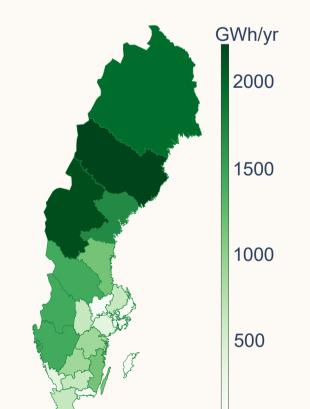
Forestry biomass

Sweden has a large forestry sector, but forests are desired to act both as a carbon sink and as a producer of biomass raw materials. Ideally, biocarbon should be produced from residues, such as unused tops and branches or sawdust.

Today, a large fraction of these residues are used in the district heating sector. In the future, e-fuel production and chemical industries are expected to also compete for the materials.



Straw collection potential by region in Sweden (t/yr)



Sustainable extraction potential of tops and branches (GWh) [1]

High quality and suitable biomass

Easing

competition

Gridlock

the

The development of an efficient market for metallurgical biocarbon in Sweden is hindered by complex uncertainties. Enablers that could help the market develop:

- Cross-sectoral cooperation involving both biomass producers and biomass consumers
- Efficient utilisation of pyrolysis coproducts
- Clarification of policy and regulation to support production and use of metallurgical biocarbon
- Inclusion of metallurgical applications in standardisation of biocarbon products

Metallurgical biocarbon

Solid carbon products are needed in steelmaking and alloy production. In scrap-based steelmaking, the carbon optimises slag behaviour and is an alloying element. In other process, like production of ferrochromium, the carbon acts as a chemical reductant for e.g. chromite ore.

Research has confirmed the viability of using biocarbon materials to replace fossil metallurgical carbon products, but the material demands are high. The requirements on biocarbon products vary between metallurgical applications, but some typical requirements have been identified.

Typical requirements for metallurgical biocarbon:

- Low ash contents
- High density
- Low P, S
- High fixed carbon

Alternative feedstock

Agricultural biomass

Though smaller than the forestry sector, the agricultural sector in Sweden also produces large amounts of underutilised biomass. There is also an interest in biochar as a soil conditioner or carbon sink.

Agricultural residues replacing chemical feedstocks or producing biofuels reduces the demand pressure on forests.

[1] Based on data from Skogforsk 2023

[2] Fahlén Hammar et al. 2025

High product cost

CONTACT

Conversion technologies

High temperature pyrolysis is the most promising method for producing solid biocarbon of metallurgical quality.

Several actors are scaling up production, but fossil products are still considerably cheaper.

Pyrolysis of woody biomass

Coproduct valorisation

Gases and heat can be used by energy and chemistry sectors. Efficient utilisation will reduce demand pressure on forest biomass.

Sweden has a large district heating sector, which could become a producer of metallurgical biocarbon.

Better profitability

Large volumes required

Pyrolysis gas Pyrolysis oil Waste heat