Stockholm Environment Institute

Realizing the vision of a circular food system

A policy dialogue on a sustainable bioeconomy in the Öresund region

SEI workshop report
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1. Introduction

This document reports the results of the fourth workshop run by the project "Policy Dialogues on a Bioeconomy for Sustainable Development". The project is co-financed by the Swedish Innovation Agency, Vinnova, and the SEI Governing Bioeconomy Pathways initiative. The overarching goal of the project is to facilitate a more constructive dialogue on the development of the global bioeconomy. There is a particular focus on analysing national and regional contexts in order to gain a better understanding of what is envisaged by a sustainable bioeconomy and the possible mechanisms for achieving bioeconomy-related goals.

TEXT BOX 1: DESCRIPTION OF A SUSTAINABLE BIOECONOMY

A sustainable bioeconomy involves the "the production, utilization and conservation of biological resources, including related knowledge, science, technology and innovation, to provide information, products, processes and services across all economic sectors aiming towards a sustainable economy" (Global Bioeconomy Summit 2018). The bioeconomy uses knowledge and innovation to add value to primary production, including new and sustainable ways of using waste. Value creation also provides social and environmental benefits, and should support poverty reduction and improved rural development, particularly at the early stages of the supply chain. The appropriate focus and scale of the bioeconomy can differ widely according to state and region, due to variations in climate, resource endowment, institutional capacity and level of economic development. Consequently, the enabling policies and institutions required are also quite heterogeneous. The bioeconomy is often distinguished from a "natural" economy centred on subsistence farming, which is still common in developing countries, and the "fossil fuel" economy, which involves a high dependence on non-renewable resources.

Debates in recent years have shown significant variations in how the bioeconomy is viewed, depending on the context and actors' perspectives. Based on a literature review, Bugge et al. (2016) identify three distinct bioeconomy visions:

- A *biotechnology vision* oriented towards biotechnological development and the commercialization of biotechnology.
- A *bioresource vision* centred around new ways of using and creating value from biological raw materials in different economic sectors.
- A *bioecology vision* that prioritizes environmental sustainability and the importance of ecological processes in economic and technological development.

With these three visions as a backdrop, the SEI Governing Bioeconomy Pathways initiative uses the definition of a bioeconomy agreed at the most recent Global Bioeconomy Summit (see text box 1).

Section 2 provides brief background on the bioeconomy in Sweden and southern Scandinavia more generally. Section 3 describes the workshop methodology and section 4 summarizes the group discussions at the workshop. Section 5 reflects on the methodology used and how the workshop discussions fit within the broader landscape pertaining to bioeconomy narratives.

2. Background to the bioeconomy in the Öresund region, Sweden

Use of the concept of a bioeconomy has become increasingly common in Swedish public discourse over the past decade, although the meaning of the term has altered somewhat over time and depending on the context and messaging. The terminology has also intermingled with related concepts such as a "bio-based economy" or a "circular economy", and this terminological vagueness has been the source of some confusion (Tillväxtanalys 2016a; Skånberg et al. 2016).

For the past five years, however, Sweden's statistics agency has been carrying out a number of projects aimed at defining and quantifying the extent of Sweden's bioeconomy. Tillväxtanalys (2016b) defines the Swedish bioeconomy as comprising a number of individual sectors either fully or partly based on, or that contribute to, the production or processing of biological resources. Its economic value in 2014 amounted to 7.1% of gross domestic product (GDP). At 22.9%, its share of total exports was substantially higher, largely as a result of Sweden's large exports of various forest products. The forest-based sector makes up approximately two-thirds of the Swedish bioeconomy.

Sweden extends more than 1500 km from north to south and therefore exhibits large geographical variations in climate, ranging from tundra in the far north to oceanic in the southernmost regions. This variation naturally affects growing conditions, and consequently also the structure of the bioeconomy. Thus, while forestry and forest-related sectors form the major part of the Swedish bioeconomy, there are regions in the south where agriculture and food processing dominate.

This is especially the case in Sweden's southernmost county, Skåne, which in the composition of its bioeconomy is more akin to continental Europe than to Sweden as a whole. Whereas Sweden's bioeconomy is two-thirds forest-based, roughly half of Skåne's bioeconomy is based on agriculture and food processing (Region Skåne & JTI 2017). Nonetheless, Skåne's bioeconomy puts it in the top three counties in terms of both value-added and employment (Statistics Sweden 2018), highlighting its importance when it comes to Swedish food production. In addition to being Sweden's largest grain producing county, Skåne also produces 70% of all the fruit and vegetables grown in Sweden (LRF 2020).

Bjuv, a small rural community in Skåne with a population of around 8500, has long been an important location for the county's bioeconomy, and the processing of vegetables in particular. The processing facility in Bjuv, which was built and operated by Findus, was acquired by Nomad Foods in 2016. The company subsequently decided to close the plant, with the loss of 400 jobs. This had a substantial impact not only on the local community, but also on farmers in the area who had sold their produce to the processing facility for many years. In 2018, however, a newly formed company, Foodhills, purchased the facility with the aim of collaborating with Bjuv municipality and Skåne Regional Council on establishing a reference test and pilot plant in order to devise innovative methods, technologies and business solutions to achieve sustainable, circular food production systems.

3. Bioeconomy policy dialogue in Sweden: process methodology

3.1 Defining the scope of the workshop

In defining the focus of the Swedish policy dialogue workshop, the project team aimed to highlight aspects of the Swedish bioeconomy that had not previously been studied to any great extent. Much of the Swedish bioeconomy discussion has focused on forestry and the forest industry. It was therefore thought valuable to focus on other sectors of the Swedish bioeconomy and to take a different geographical perspective than the national one.

In this context, the project team identified that the ambitions of Foodhills in the wider context of developments in agriculture and food processing might offer interesting concrete examples and experiences of work to achieve a sustainable bioeconomy. Following discussions with Foodhills, it was decided to collaborate on the organization of a workshop in the autumn of 2019. The objective would be to focus on the development of a 2050 vision for a sustainable bioeconomy in the Öresund region, which in addition to Skåne in Sweden also includes eastern Denmark. A second objective was to analyse how Foodhills and its partner companies could contribute to a sustainable bioeconomy in the Öresund region. Furthermore, Foodhills' previously developed vision for its work to 2030 (see table 1 and Foodhills 2019) was also incorporated into the workshop process.

3.2 Workshop process

Development of the workshop process took as its starting point the approaches used at similar workshops held in Tallinn (Canales et al. 2020) and Bangkok (Gladkykh et al. 2020) in the spring of 2019. However, the varying contexts of the different workshop locations meant that the Swedish process had to be adjusted somewhat. Whereas the Bangkok workshop used only one target year (to 2050), the fact that Foodhills had already developed a vision for 2030 provided an opportunity to use this date as an intermediate step.

The day was set up to begin with a session that was more focused on Foodhills and the shorter timeframe, and then to expand the conceptual scope to the entire Öresund region and the timeframe to 2050. The workshop was therefore built around three sessions of collaborative working, in which the 16 participants were divided into three groups of 5–6 persons. These groups remained together throughout the workshop and were set up in such a way that each group was a fairly representative sample of the larger set of participants. The work of each group was led by a facilitator and notes were taken by a rapporteur. Two-thirds of the participants represented various stages of the food value chain, such as farming, food processing, food brands and the suppliers of food processing machinery. The remainder of the participants came from public sector agencies, academia and research institutes. The invitations were distributed by Foodhills to ensure that the participants were the best possible fit for the planned tasks.

In **session 1**, the three groups were asked to develop a timeline for achieving the Foodhills 2030 vision. This task was structured as a so-called think-write-share exercise, where participants individually devise action points that are then presented in round-robin fashion. Each action point was posted on a whiteboard. Once all the action point suggestions had been presented, a discussion followed on the design and sequencing of the timeline.

In **session 2**, each group was asked to develop a vision of what would characterize a sustainable bioeconomy in the Öresund region in 2050, based on the definition of a sustainable bioeconomy (text box 1). This was done using a variation of the think-write-share process, where the participants were asked to contribute "vision components" in four different categories: one realistic vision, one optimistic vision and one fantastic vision, as well as a risk that needed to be addressed.

Session 3 mirrored session 1 in that it also aimed to develop a timeline with action points, but this time focused on how Foodhills and its partner companies could contribute to a sustainable bioeconomy in the Öresund region by 2050.

3.3 Post-workshop process

After the workshop, the notes by the rapporteurs were compiled into a report of the discussions of each group. A draft version of the report was distributed to the participants to allow comments and suggested edits, although only one participant chose to do so. The report was then edited into a final version and translated from Swedish to English. Section 4 is based on this report.

4. A sustainable bioeconomy in the Öresund region: how to get there

4.1 Session 1 results: fulfilling the Foodhills 2030 vision

The first session of the workshop focused on how the Foodhills platform could achieve its internal vision for 2030 (see table 1).

Table 1. The Foodhills vision for 2030

"Food Valley of Sweden": the Foodhills 2030 vision	
• Food Valley of Sweden is a world-renowned concept • Sister facilities exist in other parts of Sweden • Significant export of both food and new production systems • Swedish food production has increased by 15% while negative environmental impacts have decreased • The market share of greenhouse-grown vegetables has doubled • Sweden exports smart solutions for greenhouse cultivation	• Vegetables grown on open land gain market share thanks to pre-cooking and vacuum packaging • Collaboration between sectors enables packaging that reduces waste • Test kitchens and pilot facilities are frequently used • The Foodhills restaurant becomes a meeting point for scientists, engineers, producers and consumers • The parking lot is full of electric vehicles, many of which have international registration plates • Swedish representatives are ubiquitous at international agricultural and food fairs

Foodhills 2019 (translated from Swedish by the first author of this brief)

On the key actions required to achieve Foodhills' 2030 vision, the participants emphasized that scaling, coordination and cross-sectoral cooperation were central components. While the Foodhills facilities present great opportunities for hosting a business cluster based on the principles of industrial symbiosis and circularity, several practical issues need to be addressed to achieve this. Some of these issues are common to most early development ventures, linked to procuring stable funding, building partnerships and setting up routine processes for working with intellectual property. Others are more specific to the food value chain in focus at Foodhills. A theme that ran through the discussions in at least two of the three groups is that the establishment of sustainable food value chains necessitates an approach that works for all the individual steps from farm to consumer, and avoids thinking in silos.

A key starting point is to educate and inform consumers about the importance of minimizing the environmental impacts of food production so they become more willing to choose products with a minimal footprint. This would then make it profitable for farmers to adopt practices or make investments that enable more sustainable production. The intermediate steps, such as processing, packaging and distribution, are areas where Foodhills can play a key role in terms of accelerating innovation. Key areas mentioned were systemic approaches that enable efficient resource flows between partners in a context of industrial symbiosis, as well as more consumer-oriented aspects such as better tailoring of package sizes to single-person households, which are becoming increasingly common in Sweden.

Table 2. Key action points from the three groups to fulfil the Foodhills 2030 vision.

Group 1	Group 2	Group 3
• Secure more long-term financing (2020–21) • Invest in coordination between initiatives, in logistics and in terms of products and residual flows (2020–21) • Investigate opportunities, including raw material availability, for setting up biodiesel and bioplastics production (2022–23) • Establish fish farming and develop investment in probiotic foods (2023–24)	• Secure long-term stable financing (2020–21) • Attract a major food player to establish an innovation centre at Foodhills (2020–21) • Build an attractive innovation environment with coordination and mediation services (2020–2021) • Work to establish higher education in food processing at the Foodhills site through partnerships with universities (2022–23)	• Sign up to the Livsmedels-företagen Sustainability Manifesto to be Fossil-free by 2030 (2020) • Engage with equipment suppliers in e.g. microwave technology to launch test site at Foodhills (2020–21) • Invest in plant breeding in collaboration with SLU, LU and Lantmännen (2020–21) • Begin planning for the establishment of a production facility for plant-based beverages (2022–23)

4.2 Session 2: developing a vision of a sustainable bioeconomy in the Öresund region in 2050

As the groups developed their individual visions of a sustainable bioeconomy in the Öresund region in 2050, some aspects of what this would entail were common to all three. Notably, there seems to have been broad agreement on the need for a sustainable bioeconomy to have fully circular resource flows and a zero carbon footprint as central features. In addition, the participants acknowledged the need for climate change adaptation. This was deemed a necessity because the region, like the world as a whole, is expected to have experienced significant climate change by 2050. Among the adaptation measures mentioned were production systems based on no-tillage and multi-cropping. However, some participants also emphasized the need to adapt to societal tensions that could arise as spillover effects from climate change in other parts of the world, leading to increased global migration. To address this, further strengthening the role of food as a "social adhesive" could become an important tool. On changing eating patterns, the participants argued that a sustainable bioeconomy would be characterized by a high share of protein coming from vegetable sources, but also from insects. Another interesting feature worthy of note was a shift in focus in high-tech plant breeding efforts towards improving taste, in order to bring to market "tomatoes that actually taste like tomatoes".

4.3 Session 3: how can Foodhills help enable the vision of a sustainable bioeconomy in the Öresund region in 2050?

Some of the key areas and action points identified for Foodhills to focus on to drive the development of a sustainable bioeconomy by 2050 overlapped with the action points in Foodhills' internal 2030 vision. Examples include stronger partnerships with education providers at all levels, from primary schools to PhD programmes, in order to instil a sense of the importance of sustainable food systems in future professionals and food consumers. The absence of a substantial "green premium" is sometimes seen as an obstacle to the accelerated growth of markets for food products with very low environmental footprints. However, this may be the result of poor understanding among the general public of how the food system interacts with the natural environment and how negative impacts might be mitigated.

The longer term, 2050 perspective also presented opportunities for new ways of thinking about strategic action points. One finding to emerge from two of the groups was the importance of not being afraid of high-risk projects that might seem highly ambitious and uncertain at this point. It was deemed important to set long-term goals that are ambitious or even daring in

order to build enthusiasm and support. Some of the long-term action points that came out in the final session could be seen as fitting into this category, such as proposals to aim for the large-scale greenhouse production of "tropical" products such as tropical fruits or coffee. However, participants also emphasized the need to think about what might form the basis for the development of valuable niche markets in the future, to avoid getting trapped in market competition based strictly on cost. One market sector that could have potential, in part based on long-term trends pertaining to demographics, is the role of food in preventive healthcare, which is expected to become more important for an aging population. An associated aspect is that a growing proportion of the global population is lactose-intolerant, which could act as a driver of demand for plant-based dairy alternatives.

Table 3. Key action points from the three groups on how Foodhills can help to enable a sustainable bioeconomy in the Öresund region by 2050

Group 1	Group 2	Group 3
• Commit to a visionary goal; do not be afraid of high-risk projects • Work on supply and demand at the same time to build sustainable markets • Collaborate with others to increase the status of food in society • Integrate value networks	• Work towards a zero-vision for emissions, waste and net energy use • Work on consumer-centric innovation • Identify and focus on niche products in premium segments • Integrate Foodhills' testing and development operations into university education	• Develop Swedish-grown coffee • Investigate which products can be produced in a "vegairy", a dairy with vegetable raw materials • Quantify and highlight the sustainability aspects of all value chains • Establish Foodhills sister facilities in other locations around the world

A final note worth mentioning is that one potentially important obstacle in working towards a sustainable bioeconomy is that different actors may have very different ideas about what this would mean in detail. Developing long-term, ambitious and potentially high-risk projects is likely to be made even more risky by the absence of a joint view on what the end-goal really is.

5. Discussion

The results from this and the accompanying workshops will be analysed in more detail in an upcoming publication. Nonetheless, it is valuable to make some preliminary observations at this point.

First, on the methodology, while developing action points aimed at 2030 proved easier than putting together a vision and associated action points for 2050, there was value in using both perspectives. The approach of analysing both 2030 and 2050 was used in the Tallinn workshop (Canales et al. 2020) but had proved problematic and was therefore not used in the second workshop in Bangkok (Gladkykh et al. 2020). Because Foodhills had already developed a 2030 vision, however, it seemed sensible to draw on this resource for the workshop. It added an interesting element, as it made the long-term discussions more lively and stimulated a good exchange of ideas. That said, it proved more difficult to collate these discussions into a coherent vision and a structured timeline. It is likely that developing the 2050 vision would have required more than one day to anchor it properly among the participants.

On the workshop content, it should be noted that the workshop discussions cut across all three bioeconomy visions as defined by Bugge et al. (2016). The bioresource vision is probably the one that permeated most strongly throughout the workshop, with its focus on strategies for economic development through the utilization of bioresources and the development of new value chains to

this end. Aspects of the bio-ecology vision were also included, especially in the focus on resource efficiency and the circular flows that are integral components of the Foodhills concept. The biotechnology vision arguably featured least prominently, although discussions along these lines highlighted how biotechnological tools can be valuable but should be used for purposes other than those that are most common today, with a stronger focus on taste and quality.

In conclusion, the methodology proved to be a fruitful way to tease out a wide variety of ideas from the individual participants, and also move in a relatively short timeframe from ideas to goals and then timelines. The challenge will be to take this further and go from ideas, goals and timelines to practical implementation.

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