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f3 – Swedish Knowledge Centre for Renewable Transportation Fuels

# A Global Overview of Bio-economy Strategies and Visions

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# Purpose

- This overview provides a comparative analysis of strategies and visions for the bio-economy.
- It concentrates on the US, EU, Finland, Germany, Sweden, Canada and Australia. It comments on China, Russia, Brazil and Malaysia. It also briefly outlines the OECD policy agenda for the bio-economy.



# Context

- The bio-economy concept is attracting increasing political, business, public and scientific attention. This is exemplified by the OECD policy agenda in 2009, and the US and EU strategies and visions in 2012.
- Straightforwardly, a bio-economy refers to an economy where the basic building blocks for materials, chemicals, and energy are derived from renewable biological resources.



# OECD: Background

- Published in 2009, "The Bio-economy to 2030: Designing a Policy Agenda" is the outcome of an interdisciplinary foresight project on the bio-economy and biotechnology.
- It provides an analysis of future developments in the three sectors where biotechnology is expected to impact: agriculture, health and industry.



# OECD: Definition

- A bio-economy is a world where biotechnology contributes to a significant share of economic output.
- The emerging bio-economy is likely to involve three elements:
  - the use of advanced knowledge of genes and complex cell processes to develop new processes and products,
  - the use of renewable biomass and efficient bioprocesses to support sustainable production, and
  - the integration of biotechnology knowledge and applications across sectors.



# OECD: Vision

- Biotechnology offers technological solutions for many of the health and resource challenges facing the world.
- It can increase the supply and environmental sustainability of food, feed and fibre production, improve water quality, provide renewable energy, improve the health of animals and people, and help maintain biodiversity by detecting invasive species.

# OECD: Conclusions

1. Prepare the foundation for the long-term development of the bioeconomy.
2. Reverse the neglect of agriculture and industrial biotechnologies.
3. Prepare for a costly but beneficial revolution in healthcare.
4. Turn the potentially disruptive power of biotechnology to economic advantage.
5. Reduce barriers to biotechnology innovation.
6. Promote the integration of biotechnology research across commercial applications.
7. Create an on-going dialogue between governments, citizens and firms.





# US: Key Details

- **Title:** National Bio-economy Blueprint
- **Year:** 2012
- **Author:** White House Administration



# US: Key Definition

- A bio-economy is based on the use of research and innovation in the biological sciences to create economic activity and public benefit.



# US: Key Statements

- **Strategic objectives**

1. Support R&D investments that will provide the foundation for the future US bio-economy.
2. Facilitate the transition of bio-inventions from research lab to market, including an increased focus on translational and regulatory sciences.
3. Develop and reform regulations to reduce barriers, increase the speed and predictability of regulatory processes, and reduce costs while protecting human and environmental health.
4. Update training programs and align academic institution incentives with student training for national workforce needs.
5. Identify and support opportunities for the development of public-private partnerships and precompetitive collaborations.



# US: Key Comments

- It is predominantly a policy document, which is divided in two distinctive parts. The first describes the background and impact of the current US bio-economy and the second deals with strategic objectives for the future.
- The driving forces for the bio-economy in the US are presented as economic growth, societal benefits, health and environment.
- The bio-economy is illustrated through the areas of health, energy, agriculture, environment, and sharing (which refers to the sharing of information between different sectors and organisations).



# EU: Key Details

- **Title:** Innovating for Sustainable Growth: A Bio-economy for Europe
- **Year:** 2012
- **Author:** European Commission



# EU: Key Definition

- The bio-economy encompasses the sustainable production of renewable biological resources and their conversion and that of waste streams into food, feed, bio-based products such as bioplastics, biofuels and bioenergy. It includes agriculture, forestry, fisheries, food and pulp and paper production, as well as parts of chemical, biotechnological and energy industries.



# EU: Key Statements

- **Societal challenges**

1. Ensuring food security.
2. Managing natural resources sustainably.
3. Reducing dependence on non-renewable resources.
4. Mitigating and adapting to climate change.
5. Creating jobs and maintaining EU competitiveness.

- **Main actions**

1. Investments in research, innovation and skills.
2. Reinforced policy interaction and stakeholder engagement.
3. Enhancement of markets and competitiveness in the bio-economy.



# EU: Key Comments

- There are two key documents – a communication document and a working document. The former sets the scene and presents the strategy and working plan for the EU bio-economy. The latter presents the action plan in detail as well as some scenarios and policy interaction.
- The documents provide a policy and technical foundation, and importantly, the documents are based on the results of a public consultation and key stakeholders in the EU.
- Finally, the documents take a global approach regarding societal challenges and the development the bio-economy.





# Finland: Key Details

- **Title:** Natural Resources: An Opportunity for Change
- **Year:** 2009
- **Author:** Finnish Innovation Fund



# Finland: Key Definition

- A bio-economy for the new generation can provide a wide range of business opportunities, applying innovations based on the conversion of different kinds of biomass into various fibres and chemical compounds, and on innovations based on biological processes.



# Finland: Key Statements

- **Systematic approach**

1. There is a need for a comprehensive systematic approach in natural resource issues that takes account of different phenomena and the mutual linkages and interactions of individual actions on both national and multinational levels.
2. The process of examination must be holistic and the nature of the activity must be flexible.

- **Key areas**

1. Bio-economy
2. Material cycle
3. Regional resources
4. International cooperation
5. Administration and coordination
6. Expertise and communications



# Finland: Key Comments

- Finland is developing an official national strategy and vision on the bio-economy, which is expected in 2013. However, several background documents have been published, including the document analysed in this overview.
- This document highlights both national and global perspectives, and the use of the expression “glocal” links different levels of activity on the bio-economy.
- This document also acknowledges limited resources, the need to address consumption patterns, and the possibility of a self-sufficient society in Finland in terms of nutrients, food and energy.



# Germany: Key Details

- **Title:** National Research Strategy Bio-economy 2030: Our Route Towards a Bio-based Economy
- **Year:** 2011
- **Author:** Federal Ministry of Education and Research



# Germany: Key Definition

- The bio-economy encompasses all those sectors and their related services, which produce, process or use biological resources in whatever form. The bio-economy combines highly research- and knowledge-intensive economic activities in agriculture, forestry and the food sector with the innovative use of renewable raw materials for material and energy use.



# Germany: Key Statements

- **Strategic objectives**

1. In international comparison, Germany aspires to become a dynamic research and innovation centre for bio-based products, energy, processes and services.
2. With its research, Germany wants to meet its responsibilities for global nutrition, as well for the protection of the climate, resources and environment.

- **Key measures**

1. Securing global nutrition.
2. Producing healthy and safe food.
3. Ensuring sustainable agricultural production.
4. Developing biomass-based energy carriers.
5. Using renewable resources for industry.



# Germany: Key Comments

- This document emphasizes the importance of research and innovations in all sectors encompassed by the bio-economy.
- This document is clear and straightforward. It is both policy and technical, and offers examples of solutions contributing to the goal of developing a bio-economy.
- Germany takes a global perspective and responsibility on the bio-economy.
- This document also acknowledges the importance of cross-sector activities as a means for progress.





# Sweden: Key Details

- **Title:** Swedish Research and Innovation Strategy for a Bio-based Economy
- **Year:** 2012
- **Author:** Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning (commissioned by the Swedish Government)



# Sweden: Key Definition

- A bio-based economy (or bio-economy) is an economy based on the following:
  - A sustainable production of biomass to enable increased use within a number of different sectors of society. The objective is to reduce climate effects and the use of fossil-based raw materials.
  - An increased added value for biomass materials, concomitant with a reduction in energy consumption and recovery of nutrients and energy as additional end products. The objective is to optimize the value and contribution of ecosystem services to the economy.



# Sweden: Key Statements

- **R&D needs**

1. The replacement of fossil-based raw materials with bio-based raw materials.
2. Smarter products and smarter use of raw materials.
3. Change in consumption habits and attitudes.
4. Prioritisation and choice of measures.

- **Innovation incentives**

1. Stimulating cross-industry collaboration in research and development.
2. Stimulating the growth of research and innovation environments.
3. Accelerating development, verification and commercialisation of new bio-based solutions.
4. Offering support to small and medium-sized enterprises.



# Sweden: Key Comments

- The focus of this policy document is on R&D needs for the bio-economy. It also highlights the importance of initiatives and measures to foster innovation.
- It includes the need for changed consumption habits in relation to the bio-economy, which is rather unique for the documents analysed in this overview.
- The document also acknowledges a conflict of objectives concerning land use (production and environmental interests). This shows an awareness that biomass is a limited resource.



# Canada: Key Details

- **Title:** The Canadian Blueprint: Beyond Moose and Mountains
- **Year:** 2008
- **Author:** BioteCanda (an industry association representing biotechnology companies)



# Canada: Key Definition

- A bio-based economy focuses on biological tools and products in the production of treatments, diagnostics, foods, energy, chemicals, and materials. A bio-based economy relies on sustainable sources of renewable goods, thereby protecting the environment. At the same time, the bio-based economy seeks to create products with a reduced carbon footprint, further enhancing the environment.



# Canada: Key Statements

- **Key goals**

1. Over the next five years stimulate new capital formation, achieve world-leading efficiency in the use of capital, and create the most bio-friendly tax regime in the world.
2. Over the next five years develop, attract and retain world-class talent in both biotechnology research and the commercialization of innovation.
3. Over the next five years create a new, enabling operational environment to align all government policies, regulations and research and commercialization efforts.



# Canada: Key Comments

- There is no official national strategy and vision for the bio-economy in Canada. However, the document analysed here is often presented as the key source for the bio-economy. It has been produced by an industry association representing biotechnology companies.
- It is a policy document describing the role of the bio-economy in Canada in the past, present and future. This document highlights the need for immediate action and the role of biotechnology.
- Interestingly, there is a sub-national strategy and vision on the bio-economy in British Columbia, which also formed a bio-economy committee.





# Australia: Key Details

- **Title:** Biotechnology and Australian Agriculture: Towards the Development of a Vision and Strategy for the Application of Biotechnology to Australian Agriculture
- **Year:** 2008
- **Author:** ACIL Tasman (prepared for Biotechnology Australia and the Department of Agriculture, Fisheries and Forestry)



# Australia: Key Definition

- Modern biotechnology involves the use of complex scientific technologies and techniques, which are applied to living organisms or their products to develop new products or services. Modern biotechnology offers considerable potential for Australian agriculture, the economy and the Australian community.
- Because biotechnology is increasingly converging with other technologies, care should be taken to ensure that biotechnology policy, including agribiotech policy, is not developed in silos. Increasingly the focus should be moving from sectoral policy to policy for the emerging bio-economy.



# Australia: Key Statements

- **Strategic imperatives**

1. A national path to market for biotechnology products and services will be needed, where the intended use might be sensitive (particularly with GM crops).
2. Building consumer knowledge of biotechnology science and its application (including its risks and potential benefits) and building consumer confidence in biotechnology regulation.
3. Refocus the current regulation of GM from an input-based process to an output-based process, to ensure consistency across emerging biotechnologies and to reduce regulation burden and compliance costs.
4. Australia must be engaged in international biotechnology science and research (part of the bio-economy), to maximise the inflow of new agricultural biotechnology techniques, products and services.



# Australia: Key Comments

- There is no official national strategy and vision for the bio-economy in Australia. The purpose of the document analysed here is to inform the Australian Government on how to move forwards on biotechnology in agriculture.
- The emerging bio-economy is highlighted in this document as critical to biotechnology and agriculture. It maps the current situation, identifies opportunities and threats, and policy recommendations.
- Interestingly, there is a web portal on the bio-economy in Australia maintained by the Commonwealth Scientific and Industrial Research Organisation. It defines the bio-economy, lists projects and discusses key issues.



# Discussion (1)

- The different definitions from the analysed countries and regions show limited coherence of the bio-economy concept at present.
- Interestingly, the US definition appears to suggest that the fossil-based economy and bio-based economy can exist together, in contrast to the EU interpretation which implies a significant shift can occur from the established fossil-based economy to a bio-based economy.

# Discussion (2)

- Strategies and visions for the bio-economy are under development in significant countries and economies around the world.
  - **Russia:** It has an innovation plan and a bio-economy plan for 2030.
  - **China:** It has a three step bio-economy growth plan from 2007 to 2020.
  - **Brazil:** It has a document on how it can act in developing the bio-economy, both nationally and globally.
  - **Malaysia:** It has launched a bio-economy initiative and a national biomass strategy with three phases from 2005 to 2020.

# Discussion (3)

- There at least five points about the bio-economy strategies and visions that demand critical attention:
  - **Sustainability focus:** Sustainability is not heavily emphasized and it is over shadowed by economic growth.
  - **Measures of success:** Few measures are presented in the documents, but the importance of measures is highlighted.
  - **Scarcity of resources:** This is only mentioned in a few of the documents.
  - **Consumption patterns:** It is not addressed except for the documents by Finland and Sweden.
  - **Stakeholder interaction:** This is acknowledged in the documents as critical, but needs increased efforts.



# Summary

- This overview shows that there is a worldwide interest in developing the bio-economy.
- The bio-economy concept is currently flexible and it is interpreted differently in different countries and regions.
- Many countries have published, or are preparing, strategies and visions on the bio-economy.
- Some countries have established organisations and networks to stimulate and develop the bio-economy.
- Sustainability is recognised as important. However, the driving force behind the bio-economy is the opportunity for economic growth and innovation.



# Sammanfattning

- Denna studie visar att det finns ett stort intresse runt om i världen att utveckla biobaserad ekonomi.
- Definitionen av biobaserad ekonomi/bioekonomi är inte enhetlig utan tolkas olika i olika länder och regioner.
- Många länder antingen har publicerat, eller håller på att sammanställa, nationella strategier och visioner om biobaserad ekonomi.
- Några länder har bildat organisationer och nätverk för att stimulera och utveckla den biobaserade ekonomin.
- Hållbarhet anses vara viktig, men den främsta drivkraften för utveckling av biobaserad ekonomi är möjligheten till ekonomisk tillväxt och innovation.



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