# Strategic Knowledge and Innovation Agenda

## SCAR Bioeconomy Strategic Working Group

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Common Agricultural and wider bioeconomy reSearch Agenda

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- by a survey addressed to the SCAR Bioeconomy SWG members (n=12) primarily based on the Bioeconomy strategy 2012, its review and the monitoring as well as open-ended questions;
- in a SCAR Bioeconomy SWG Workshop in Tallinn, 7-8 December 2017 (18 members present). In the workshop new research topics and actions for FP9 were brainstormed and potential financial instruments were discussed.
- in a SCAR Bioeconomy SWG Workshop in Brussels, 15 February 2018 (26 members present).

The material was analysed by the Luke research group (see the list of authors) and discussed with SCAR Bioeconomy SWG on 15 February 2018 in Brussels and 17 April 2018 in Berlin.

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# Introduction

Bioeconomy is fundamental for the transition process towards a more sustainable economy in Europe. This is how the Member States and Associated Countries (MS/AC) organized in the Bioeconomy Strategic Working Group (BSW) of the Standing Committee on Agricultural Research (SCAR) see the bioeconomy. They are committed to action on the regional and national levels, and also jointly on the European level. Today, more than ever, the changing political, societal, economic and ecologic circumstances (e.g. Circular Economy Package; CAP post 2020; Paris Climate Agreement; ongoing climate change; need to produce more sustainably and resource-efficiently) make it necessary for Europe to move forward on a path to a more inclusive, sustainable and innovative economy and society.

The BSW is convinced that the bioeconomy offers solutions to many of the challenges Europe is and will be facing. Continued and increased efforts in R&D funding, in technology transfer, innovation, training and market creation are necessary. Involving wider society, and in particular the primary producers farmers and foresters into the bioeconomy value chains, and sharing the benefits and opportunities of the bioeconomy with primary producers is a key issue in this endeavour will be important, as well as taking a more global perspective.

This Strategic Knowledge and Innovation Agenda (SKIA) gives a view of the BSW where to put efforts in the EU research and innovation agenda. In the SKIA, the vision approach has been chosen instead of the mission approach that has been recenty promoted for the 9$^{th}$ Framework Program, Horizon Europe.The central vision is “Achieving an inclusive and sustainable Bioeconomy for Europe”.
This vision is broken down into three goals for the bioeconomy (Fig.1):

- an up to date monitoring, assessment, foresight on bioresources, impacts and resource flows;
- moving towards a demand driven sustainable bioeconomy; and
- systemic solutions for a more bio-based circular economy and more circular bioeconomy.

The SKIA describes three corresponding and interconnected sets of research topics and actions, as well as tools and measures to support the growth of the bioeconomy and to achieve these goals: knowledge and information needed for the bioeconomy from a systemic change perspective; future development paths of the bioeconomy; and social and technical solutions the bioeconomy can offer now and in the future.

This document should be read together with the other policy recommendations made by the BSW, especially the actions proposed by MS/AC during the workshop of February 15 2018, which were then prioritised on the meeting of April 16 and 17 2018.


**Figure 1.** Key elements of the Strategic Knowledge and Innovation Agenda: The vision and goals with related actions. The content is described in the following chapters.

# 1. KNOWLEDGE AND INFORMATION – the bioeconomy from a systemic perspective

**A systemic understanding of bioresources (availability, production, composition, potential uses; in the widest sense: biomasses and other resources, such as genetics and ecosystems) across the sectors and at various scales from local to global is a necessary foundation for developing the bioeconomy in its full potential, and increasing the competitiveness of bio-based products and services against fossil-based products. It also provides a basic understanding of the impacts, opportunities and challenges of the bioeconomy, designing regulations needed and reducing barriers where they impede the future development of a sustainable bioeconomy. This information can also be exploited in land-use, water-space-use and spatial planning more generally.**

## 1.1. Understanding of the current bioeconomy systems

**What – research topics:**

- basic digital data on bioresources including information on geographical location, composition, environmental & climate aspects as well as economic aspects
- balance sheets on input-output flows

**How – actions needed:**

- harmonization and synthetization of data and making the data available
- developing 5G network to facilitate data collection and deliver evenly in all geographical sites
- knowledge transfer

## 1.1. Developing a systemic perspective on the bioeconomy

**What – research topics:**

- data on all dimensions of bioeconomy (production, use and circulation) as well as from different sectors of bioeconomy at local, national, regional, European and global level

**How – actions needed:**

- developing bioeconomy monitoring systems and observatories
- developing holistic assessment tools based on resources inventories

**"Bioeconomy is a broad field and creating a systemic understanding of it is a huge task. This work needs private and public partners. First focus is perhaps needed on some sectors of bioeconomy that we can monitor and ask what the effects of new technologies are and how the sectors are interconnected."** SCAR SWG members, Brussels 15 Feb. 2018.

# 2. FORESIGHT AND PATHWAYS AHEAD – the future development of the bioeconomy

**The transition to a competitive, ecologically sustainable and socially acceptable bioeconomy needs to be demand-driven. This requires rethinking and redesigning the regulatory system and associated market design and financial instruments. To enhance and accelerate this transition, a better understanding of the barriers and drivers, tradeoffs and risks throughout the chains and across the sectors and spatial scales is needed. Design and demonstration of different transition pathways are based on systematic research and multidimensional monitoring and assessments.**

## 2.1. Promotion of demand-driven bioeconomy

**What – research topics:**

- branding bioeconomy based products and market communication
- focus on new performances offered by bio-based products (lightness, health aspects etc.)
- development new business concepts and models ("first, think small and local and after that, big and global")
- re-organisation of product and service value-chains and networks as well as related new cost and benefit sharing systems and ownership
- modells for assessing impacts of strategies on socio-economical and environmental systems in order to build science-based policy
- development of legal, regulatory and institutional frameworks and policies for new markets
- rethink and redesign of regulation
- focus on consumer preferences and behavior

**How – actions needed:**

- demonstration of new market model projects, for policy framework for developing new markets
- creating new markets and attracting investors (e.g. industry)
- strengthening co-operation at regional and interregional co-operation across sectors

## 2.2. Exploring and monitoring the development of the bioeconomy

**What – research topics:**

- assessing and monitoring of the production systems and the impact of social-economic transition pathways
- identifying the barriers and drivers, challenges and opportunities as well as winners and losers and risks (e.g. health and cyber) in transition to bioeconomy
- exploring the tradeoffs between different dimensions of sustainability (ecological, economic, social and cultural) and types of ecosystem services
- better understanding interplay between various scales and regions (local-global, rural-urban)
- assessing the effectiveness of regulatory framework
- definitions and boundaries of bioeconomy and sustainability
- developing a method for assessing the effectiveness of the regulatory frameworks (past-present-future)
- role and responsibility of public and private partners in the digitalization

**How – actions needed:**

- developing indicators to describe the development of bioeconomy with all its sectors and including economic, social, ecological and cultural dimensions of sustainability
- a long term stable regulatory and policy frameworks and supportive elements to create new markets and attract investors
- developing a framework for education and training in bioeconomy, to make citizens and economic actors aware of the stakes

**"How to make the transition to a demand-driven bioeconomy? First, we need a better understanding of consumer behaviours and choices as well as analysis of different target groups. The transition to a demand-driven bioeconomy may need subsidies and promotion on the markets. Overall we need more communication, education and dissemination across the society to clarify the advantages of bioeconomy."** SCAR SWG members, Brussels 15 Feb. 2018.

# 3. SOLUTIONS for and by bioeconomy – systemic social and technical solutions

**Bioeconomy can be seen as a solution for sustainable territorial or place-based development at various scales. New products and services are based on innovative combinations of old and new materials and processes, sustainable intensification of the use of materials and processes, as well as reorganization of the value chains that meet the consumers' needs. Urbanization and growing middle class are megatrends underpinning the focus on urban bioeconomy, rural-urban interaction and urban fringe areas.**

## 3.1. Developing new products and services for bioeconomy

**What – research topics:**

- diversifying product and service portfolios with next/new generation bio-based products, utilizing also territorial/regional as well as old varieties and methods,
- using life cycle assessments for new products and services
- design of high value bio-based products and services;
- investigating and exploiting new raw materials
- circularity, cascading principle and end of lifecycle of bio-based products
- developing new products and services for well-being based on ecosystem services (e.g. drugs, bio-pesticides)
- use of digitalization (e.g. Mobile Apps and MyData) and artificial intelligence
- modern biotechnology and synthetic biology
- re-organization of product and service value-chains and networks as well as related cost and benefit sharing systems
- exploring safe material circulation (incl. cyber and health)

**How – actions needed:**

- plants and infrastructures suited for small to medium scale actors through best practices, technical and scientific network supported by the government
- R&D including mobilizing capital, regulation/legislation, policy, standardizations
- enhancing territorial/regional governance
- simplification of bureaucracy
- PPPs and open calls needed

## 3.2. 'BIOCITIES' – future bioeconomy "hotspots"

In the discussion, the idea of "biocities" or similar communities came up as a platform for research and innovations, and as a testbed for innovative social and technical solutions. Biocities would aim to:

- optimize the logistics
- use climate-smart construction
- cover the daily needs of consumers, public procurement
- the circulation of nutrients and raw materials,
- deploy urban agriculture and high value biobased products
- sustainable and secure food system (waste free, good soil condition, soil free food production, intelligent packaging)

**"Solutions of bioeconomy should be social, not only technological. As an example, why not to develop management of urban bio-based products e.g. side-products and waste by small scale players to get adequate living conditions and income. We need research that engage local governments, farmers' representatives, business sector, NGOs and local communities."**
SCAR SWG members, Brussels 15 Feb. 2018.

# 4. TOOLS AND MEASURES – supporting the growth of the bioeconomy

**Overall, the growth of the bioeconomy requires a more coherent research framework, with systemic and more holistic approaches. A better contribution of economics, social and political sciences are needed to bridge the current gaps in the knowledge. Public-private and science-society partnerships build a crucial base for both knowledge production and actions. Growth of the bioeconomy is supported by novel financial instruments, but also more flexible and innovative use of the current ones. Participatory approaches are platforms for awareness raising and capacity building. Below some issues that are needed to enhance all research and innovations to support the growth of bioeconomy are presented:**

**Research:**

- holistic frameworks and concepts
- transdisciplinary research
- systemic approaches
- role of social innovations, social sciences
- more focus on consumers and citizens

**Actions:**

- new public-private partnerships
- assessing the risks, cost and benefits sharing
- a stable long term regulatory and policy frameworks and supportive elements
- capacity building of stakeholders
- innovative means of communication
- participatory processes
- knowledge transfer focus groups
- promotion of international R&D networking

**Practical tools:**

- bioeconomy decision support systems (DSSs) for policy making, farmers and landowners
- machine intelligence in operations

**Financial instruments:**

- crowd funding, as a new alternative investment form
- both big investments and smaller projects
- utilization and optimization of different financial instruments
- tailoring current financial instruments to better meet the needs instead of introducing new ones
- making investments from private sector more attractive instead of regulations

**"How to foster research and innovations in bioeconomy: 1) use pilot plants and production lines (test beds) that cover various areas of bioeconomy; 2) develop clusters among the stakeholders of bio-economy; and 3) organize a competition for becoming a bioeconomy region."**
SCAR SW members, Brussels 15 Feb. 2018.


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