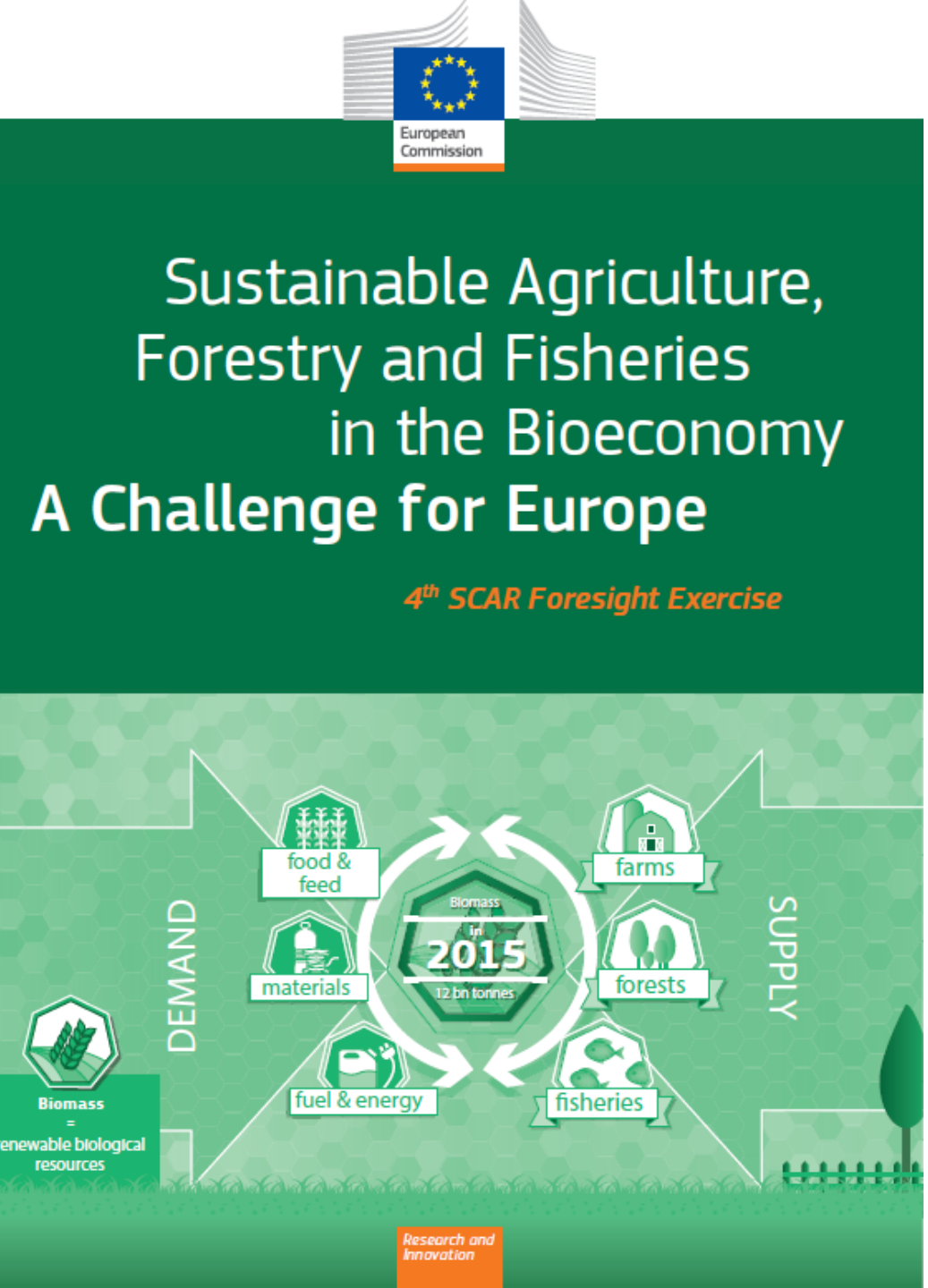


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# Purpose

- To identify **emerging research questions**
- To anticipate future **innovation challenges**
- To support the implementation of the European **Bioeconomy strategy**
- To explore what might happen by developing the Bioeconomy Paradigm within the fundamental constraint of **sustainability**

# Key questions

- How are the primary sectors affected by/can they contribute to/ the implementation of the Bioeconomy Strategy and CAP reform?
- How can the bioeconomy improve food security, environmental quality and other societal challenges?
- How should innovation in the bioeconomy be implemented? What are the opportunities and risks for the different sectors, social groups and regions?

# The bioeconomy concept

- Bio-economy or bio-based economy *"… encompasses the production of* ***renewable resources*** *and their conversion into food, feed, bio-based products and bio-energy. It includes agriculture, forestry, fisheries, food and pulp and paper production, as well as parts of chemical, biotechnological and energy industries*" (EC, 2012)

# Two premises

1. Biomass **is underexploited**:
    1. Too much waste not used optimally
    2. More material and energy can be extracted from current biomass streams
2. The biomass potential **can be upgraded** by
    1. Closing yield gaps
    2. Introducing new or improved species
    3. Introducing new and improved extraction and processing technologies

# Bioeconomy scenarios

| | | **Supply growth of biomass** | | |
|---|---|---|---|---|
| | | Low | medium | high |
| **Demand growth for biomass for materials & energy** | low | | A – BIO-MODESTY | |
| | medium | | | |
| | high | C – BIO-SCARCITY | | B – BIO-BOOM |

# Scenario A: BIOMODESTY

- Modest growth in demand for biomass for non-food use
- Possible reasons:
  - Biobased solutions not competitive
  - Alternative solutions break through fast (e.g., cheap solar)

# Scenario B: BIOBOOM

- High growth in demand for non-food uses and high growth in supply of biomass
- Possible reasons:
  - Alternative technologies slow and biobased technologies competitive
  - Limited resistance towards new technologies and products (e.g., insects, algae)
  - Africa rising
  - …

# Scenario C: BIO-SCARCITY

- High growth in demand for non-food uses, but low growth in supply of biomass
- Possible reasons:
  - Alternative technologies slow and biobased technologies competitive
  - Climate change negative impact on supply
  - Resistance against biotech, insects, etc.
  - …

# Conclusions from scenarios

- Topics are **robust** – no new topics are to be put on the agenda
- However, **priorities** will be different in different scenarios, as they represent different challenges and opportunities related to the bioeconomy
- Key insight is the importance of **governance**
- Important **regional** differences apply

# Conclusions from scenarios

- **Bio-modesty**: pull-effect of bioeconomy disappears, urgency to develop bio-based technologies decreases, other ('third') pathways (next to fossil and bio) exist
- **Bio-scarcity**: governance extremely important, social and political issues high on agenda
- **Bio-boom**: high-throughput system, ecosystem carrying capacity high on agenda

# Recommendations: Bioeconomy Principles

Bioeconomy principles should be reflected in research & innovation agenda:

- **Food first**
- **Sustainable yields**
- **Cascading**
- **Circularity**
- **Diversity**

# Scope & Themes

- Broadening scope
  - **Horizontally**: simultaneous consideration of all sources of biomass to optimize synergies and minimize threats
  - **Vertically**: integration of upstream and downstream sectors into research addressing primary sectors
- Thematic areas: 8 themes

② digital revolution

⑦ governance

consumer

⑥ socio-cultural dimensions

food & feed

materials & chemicals

energy

⑤ business models

primary production

① ecological intensification

ecosystems

③ resilience

④ new energy landscape

⑧ foresight

time

# KIS for the bioeconomy

- **Challenge-oriented** in addition to curiosity-driven
- **Transdisciplinary** = transcending pre-existing disciplines and methodologies
- **Socially distributed** = knowledge creation in diverse forms, in diverse places and by diverse actors → socially inclusive
- **Reflexive** = research as dialogic process and co-creation between all actors (‘multi-actor’)
- **New rewarding and assessment systems** = quality control transcending classical peer review, old taxonomies in science + multi-actor means multi-quality
- **Competencies** for researchers, extensionists, policymakers, end-users → important role for education + resources to be invested by actors

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