

Executive summary

The bioeconomy concept has emerged from niche interest to political mainstream with over 50 countries publishing bioeconomy policies and intentions. It has also grown from a biotechnology-centric vision to an economic activity that spreads across several key sectors and policy families: agriculture and forestry, fisheries, food, trade, waste management and industry. As a result, the bioeconomy policy environment is much more complex than before. One intention of this book is to reflect that changing environment. It sets out what a bioeconomy policy framework might look like based on the familiar innovation divisions of supply- and demand-side policies. It brings up to date the science and technology implications for policy makers.

The bioeconomy concept envisages a gradual replacement of fossil-based feedstocks with bio-based ones. While this replacement implies an inherently more sustainable production system, this is not necessarily the case as organic resources can be overexploited. Bioeconomy policy, first and foremost, must ensure that biomass is collected and used in a sustainable fashion. Ensuring “biomass sustainability” implies living within the boundaries of what the planet can provide. It has come to mean much more than just environmental sustainability, and as such a sustainable bioeconomy also has to create jobs and wealth, and distribute that wealth more evenly.

When the grand challenges of climate change, food security and energy security are added to this mix, the situation becomes even more complex and relates to other large policy areas such as rural regeneration, re-industrialisation, the circular economy and smart specialisation. Bioeconomy policies must align with these larger goals in an efficient manner, with minimal overlap and duplication of effort and by wisely directing public funds. Policies must work across levels, which presents challenges and opportunities: biorefineries are effectively regional facilities and regulation is nation-based, while R&D is international and biomass trade is already global.

The book focuses significant attention on the institutional level, especially at key facilities: biorefineries and bioproduction plants. These are often cast as small- to medium-scale production facilities, often to be built in rural locations so they are closer to the biomass feedstocks. This is a major departure from the highly centralised, integrated oil refinery and petrochemical plant production model that is dominant in the fossil era. This alone has major policy implications: fragmented value chains, high-risk investments in biorefineries, and untried or non-existent industrial ecosystems that demonstrate the need for new forms of public-private partnerships.

Key messages

Biotechnologies, including industrial biotechnology and engineering (or synthetic) biology, remain a big part of the bioeconomy concept, offering great potential in this future vision. These can be regarded as platform technologies that span several key sectors – agriculture and crops, food and beverage, pharmaceuticals, chemicals and materials, energy

and even national security. However, large technical obstacles remain as the cost of bioproduction is generally still too high. All too often research success is not accompanied by commercialisation. There are large skills gaps, and countries will continue to struggle with making and educating the bioproduction workforce.

Additionally, national bioeconomy strategies tend to demonstrate intent and commitment, but be short on detail, due in large part to the large range of related policy families, including tax, innovation, industry, agriculture, waste and trade. Experience shows that policy must take account of both supply- and demand-side measures, yet the latter, while a potential source of innovation, has tended to be overlooked by governments. Demand-side measures include public procurement, regulation, standards, consumer policies and user-led innovation initiatives. They also include lead market initiatives to address market and system failures in areas with pressing social needs. All should be seen as necessary components of a sustainable bioeconomy policy framework as supply-side measures alone are unlikely to build this future vision.

In many engagements with the bio-based private sector, the most consistent message is that bioeconomy policies have to be stable and long-term so that the private sector has the confidence to invest. One suggestion has been to have a 15-25-year competitive advantage over the fossil industry. Expensive as that may seem, fossil subsidies are still astronomically high, and climate change is real. Risk mitigation for the private sector goes beyond policy certainty, although the latter is a very important factor. Financial instruments for building public-private partnerships have to be attractive and not overly bureaucratic.

A carbon price and carbon tax seem like the logical way to raise the large sums required to finance the public contributions of such projects. Pricing carbon emissions through a carbon tax should be a powerful incentive to invest in cleaner technologies and adopt greener industrial processes.

Objections to subsidising young technologies of any sort for climate change mitigation can be based on arguments around market distortion caused by subsidies. However, there is no such thing as a “level playing field” between the fossil industries and any of the green industries – including industrial biotechnology and engineering biology, which are foundational technologies of a bioeconomy. The fossil industries are over one century old and fossil fuels subsidies are still gargantuan: therefore the argument seems hollow. Removing fossil fuel subsidies and pricing the environmental damage of those industries would put a completely different complexion on their economics, and would make arguments against green bioindustries much less convincing.

Finally, all is dependent on sustainability of the feedstocks, the processes and the products of a bioeconomy if the mistakes of the past are not to be repeated in the future. Biomass sustainability as a policy subject is extremely complex and cannot be resolved without international – if not global – support.



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