

Title

European biofuel research and innovation policy answering global challenges

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There are two global challenges which demand concerned actions and where the use of biofuels can contribute, such as climate change and access to sustainable energy. However, biofuel exploitation has also contributed to increased food prices because of changes in land use for producing the biomass used for the biofuels and to decreasing biodiversity because of the usage of biodiverse territories for biofuel crops. Therefore the development and deployment of second generation biofuels has been prioritized, both by politicians and research groups.

This paper will analyse the policy approaches adopted to address these multiple challenges, especially at the European level and at the national level. As countries studied we have selected the United Kingdom and the Nordic countries, Denmark, Finland, Norway and Sweden. We apply the theoretical framework developed in the Eu-SPRI Exploratory Initiative “The emergence of challenge-driven priorities in research and innovation policy” which will be presented in a joint paper by Kallerud et al. In this paper, relevant EU and national policy documents and instruments will be examined in terms of how they address the specific features and implications of ‘grand challenges’ as rationale for policy intervention and how they address possible unintended effects, such as indirect land use, food security and biodiversity. This abstract will give a short overview of the dimensions analysing EU policy, while the complete paper will look as well into the national policy.

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Introduction

The deployment of biofuels was thought to contribute to less GHG emissions and better access to renewable energy resources and by addressing two global challenges: climate change and energy security. However, the biofuel technology is contested. Biofuel RD&D has taken place under conditions of scientific uncertainty, disagreement and knowledge deficits, with this contestation being explicitly recognised in the IPCC Special Report on Renewable Energy (IPCC 2011). In fact a variety of concerns about bioenergy risks have been evident in the scientific literature for several years (Upham et al, 2012). These include the use of arable land for food, e.g. Searchinger et al (2008), Ariza-Montobbio and Lele (2010) and Ariza-Montobbio et al.

(2010); control of access to resources (including land, water and genomes); loss of biodiversity, e.g. Wakker (2004); net GHG emissions from direct and indirect land use change, e.g. Upham et al. (2009), Ravindranath et al. (2010) and Lapola et al (2010); and inadequate governance systems, e.g. Upham et al. (2009) and Tomei and Upham (2009).

Rhetorical framing

European biofuel innovation policy is illustrative of a domain in which the direction, pace of development and responsiveness of policy to civil society and scientific concerns are all contested. As such it provides a case for discussion of how European RD&D might be conducted differently. Although we should not conflate EC biofuels policy and biofuels *innovation* policy, the two are unavoidably and closely connected. EC biofuel policy to date has thus been predicated on 'successful' technological innovation – on an *imaginary* or vision of how the sector will be at a future date (Levidow, forthcoming).

There exist several EU directives related to climate change which relate to biofuels. In the early policy documents biofuels are usually referred to in the wider context of climate change or renewable energy, however many of the later documents relate more specifically to biofuels. In 2003 the European parliament and the council approved the promotion of the use of biofuels or other renewable fuels for transport in a directive known as the biofuels directive, EC Directive 2003/30/EC (European Commission, 2003). The negotiation process was described as "difficult" (Di Lucia and Nilsson, 2007, p. 533) and the main conclusions of the Directive were in the form of an indication of European¹ and national targets for increased biofuel consumption within transport, leaving the different countries to choose the most appropriate policy instruments.

While the nation states were working on this, EU continued to work on the theme and in 2006 an EU Strategy for Biofuels was produced (European Commission, 2006). In this Strategy, the Commission defined the role of biofuels, and stressed the importance of national targets. The strategy continued to support research and innovation, particularly in order to improve production processes and to lower costs. Research and development into second generation biomass and biofuels (i.e. originating from the processing of ligno-cellulosic feedstock such as straw and forest residues) is to be promoted via the seventh framework programme and the development of industry-led European technology platforms.

¹ Europe established the goal of reaching a 5.75% share of renewable energy in the transport sector by 2010.

The 2003 directive was evaluated in 2007 (European Commission, 2007) and it was concluded that most countries had reduced their original targets or not reached their targets for various reasons. EC biofuels policy has assumed – indeed required – that there is a shift from first to second generation feedstock with improved environmental performance. The 2008 vote by the European Parliament's Industry and Energy Committee for a 5% share for renewable fuels by 2015 and 10% by 2020 was conditional on at least 20% of the 2015 target and 40% of the 2020 goal (i.e. 4% of total 2020 fuel sales) being met from "non-food and feed-competing" second-generation biofuels (European Parliament, 2008). This resulted in a new directive 2009/28/EC where targets for renewable energy use by 2020 are increased to 10% for every member state (European Commission, 2009a). At the same time a directive on fuel quality was passed Directive 2009/30/EC – Fuel Quality Directive, taking an important step forward on standardisation, so important in the development of new technologies (European Commission, 2009b).

In 2010 the European Commission issued the "Energy 2020 – a strategy for competitive, sustainable and secure energy" on energy policy and highlighted the delay in delivery in relation to the Lisbon treaty (European Commission, 2010). The emphasis is on the urgency of improving energy efficiency and "making the technological shift" to new clean energy technologies. In 2011 a new roadmap was issued for the low-carbon economy in 2050 (European Commission, 2011). Regarding biofuels the roadmap stated:

"Sustainable biofuels could be used as an alternative fuel especially in aviation and heavy duty trucks, with strong growth in these sectors after 2030. In case electrification would not be deployed on a large-scale, biofuels and other alternative fuels would need to play a greater role to achieve the same level of emissions reduction in the transport sector. For biofuels this could lead, directly or indirectly, to a decrease of the net greenhouse gas benefits and increased pressure on bio-diversity, water management and the environment in general. This reinforces the need to advance in 2nd and 3rd generation biofuels and to proceed with the on-going work on indirect land use change and sustainability" :(European Commission, 2011, p. 9).

It is only recently, in October 2012, that the Commission has begun to formally acknowledge that there are serious problems with its existing policy and that second and third generation biofuels need to be more rapidly prioritised. Hence the proposals of COM(2012) 595 final include the requirements that: (a) biofuels produced in refineries starting operation after 1st July 2014 meet a threshold of at least 60 % GHG reduction and for older refineries at least 35% until 31 December 2017 and at least 50% from 1 January 2018; (b) to include indirect land use

change (ILUC) factors in GHG reporting; (c) to limit the contribution of food crop-based biofuels and bio-liquids to 5% of liquid fuel supply, while retaining renewable energy and carbon intensity reduction targets; (d) to more strongly incentivise biofuels with no or low indirect land use change emissions, particularly second and third generation biofuels (including algae, straw and wastes) (EC, 2012).

Multi-objective policy

EU policy on biofuels has multiple objectives and motives: besides providing means for acting on climate change and providing renewable energy resources this policy has the objective to develop a cost-competitive European biofuel industry (EBTP, 2012), using the global challenges as “business opportunities”. An important part of this for some European countries is the provision of additional or replacement markets for agricultural and agro-forestry output, in part as a means of compensating for increasingly liberalised and competitive international markets.

Geographical scope and interaction

The importance of international collaboration and joint efforts is important for the R&I policy initiatives on biofuels. Central is the collaboration in several European Technology platforms, such as the European Biofuels Technology Platform (EBTP), the ETP Forest-Based Sector Technology Platform, the SusChem ETP and the ETP Plants for the Future. Joint programming initiatives are less developed in this field.

The European Biofuels Technology Platform (EBTP, 2012) lists some of the main biofuel RD&D policy initiatives, though the major incentive to RD&D is the supply obligation rather than any one particular initiative or programme. Among these initiatives are: (1) the establishment of the European Biofuels Technology Platform (EBTP), which in 2007 produced a Strategic Research Agenda and Strategy Deployment Document identifying key RD&D working lines for the next decades (EBTP, 2008). This was updated in 2010 to account for sustainability concerns and argued that R&D on sustainability related tools and data need higher priority and increased public funding accordingly (EBTP, 2010). (2) The European Industrial Bioenergy Initiative (EIBI), one of the industrial initiatives launched under the SET Plan (European Strategic Energy Technology Plan) ‘to support demonstration or reference plants for innovative bioenergy value chains which are not yet commercially available’ (EBTP, 2012). (3) Network and research priority-defining initiatives: the Biofuels Research Advisory Council – BIOFRAC; European Technology Platforms (ETPs) and ERA-Nets involved in research such as ‘sustainable chemistry’, plant biotechnology, agriculture and transport.

Governance and participation of stakeholders

The European Technology platforms unite a variety of stakeholders from industry, resource providers, research and technology development organisations and NGOs in a public private partnership. However, the degree of stakeholder engagement varies across ETPs and in relation to biofuels most of the main environment and development NGOs have been deeply sceptical.

Time-frame

In 2006 the Biofuels Research Advisory Council produced “Biofuels in the European Union: A vision for 2030 and beyond”. This document includes a strategic research agenda focusing on second generation biofuels using lignocellulosic biomass and refining concepts. The document also includes a roadmap for technological development, suggesting R&D on second generation biofuels and into biorefineries in the period up until 2010, then during the next 10 years the deployment of second generation biofuel production is expected and large scale production is predicted on the long term, i.e. after 2020.