

Fuelling Expectations: UK Biofuel Policy

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Abstract

This dissertation analyses the biofuel debate in the UK, focusing on how the UK Government has deployed expectations to legitimise its biofuel policy. The analysis builds on the sociology of expectations, integrated with insights from the multi-level perspective (MLP) on socio-technical transitions.

By the end of the 1990s, a sustainable paradigm permeated UK road transport policy opening a space for biofuel policy to emerge. In the second half of the 2000s, disagreements among UK stakeholders over the translation of EU biofuel targets into UK biofuel policy prefigured later EU-wide discussions over limiting targets for first-generation biofuels. Biofuels critics disagreed with the UK Government and biofuels supporters over how to protect a space for future second-generation biofuels, which were expected to overcome the harm caused by currently available, but controversial, first-generation biofuels. The UK Government and biofuels supporters defended rising targets for available biofuels as a necessary stimulus for industry to help fulfil the UK's EU obligations and eventually develop second-generation biofuels. By contrast, critics opposed biofuels targets on the grounds that these would instead lock-in first-generation biofuels, thus pre-empting second-generation biofuels.

I argue that these disagreements can be explained in relation to the UK Government's responsibilities relating to "promise-requirement cycles", whereby technological promises generate future requirements for the actors involved. Further, I claim that the UK Government's stance reflects what I call a "policy-promise lock-in" – i.e. a situation in which previous policy commitments towards technology innovators of incumbent technologies (currently controversial and potentially driven by several imperatives) are officially justified as necessary for the development of preferable emerging technologies. Finally, my analysis expands the focus of the sociology of expectations, which has hitherto mostly been used to investigate expectations from technology innovators – i.e. scientists or industrialists – by investigating how other types of actor mediate expectations among different parties, in particular, public authorities, industry associations, consultancies, and non-governmental organisations.

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Introduction

The international debate on biofuel policy has degenerated into a heated controversy on the environmental and socio-economic sustainability of biofuels. Impressed by the complex network of expectations involved in that debate, I set out to research how the UK Government has come to endorse a specific set of expectations over others to justify its biofuel policy. To that end, in this dissertation I detail, through an analysis of their statements of expectations, how the UK Government and other participants in the debate have selected, combined, and diffused different visions of UK biofuel policy. Like other analyses grounded in the sociology of expectations, mine does not assess the validity of specific projections, rather it “shift[s] the discussion from *looking into* the future to *looking at* how the future as a temporal abstraction is constructed and managed, by whom and under what conditions” (Brown et al., 2000, p. 4). The future orientation of the debate on the environmental and socio-economic sustainability of biofuel policy takes the discussion into the realm of expectations on technologies and policies, where uncertainty is endemic, and multiple visions of the future compete to gain dominance. Take, for instance, the following two statements of expectations on biofuels:

“... fuels made from biomass [i.e. biofuels] represent an important potential route for achieving the goal of zerocarbon transport, creating new opportunities for agriculture in the UK as well as globally.” (Department of Trade and Industry [DTI], 2003, p. 69)

“It is a crime against humanity to convert agricultural productive soil into soil which produces food stuff that will be burned into biofuel.” (United Nations [UN], 2007, October 26)

In the still ongoing controversy over biofuel policy, the UK Government has endorsed an official vision in which expectations for future technological

generations of biofuels justify the continued support of currently available, but controversial, biofuels. As shown in this dissertation, the UK Government has come to endorse this vision, despite all the uncertainties and disagreements surrounding it.

In the European Union (EU), biofuel policy is led and enforced by the European Commission (EC) through EU Directives which require formal approval from the EU Council and Parliament. Current EU biofuel policy is set out by the 2009 EU Directives on Renewable Energy and Fuel Quality (EU, 2009FQ; 2009RED). These Directives introduced a “binding” target for all EU Member States requiring that renewable transport fuels – in practice, mostly biofuels – represent 10% of total transport fuel consumed by 2020. Before 2009, EU biofuel policy was set out by an EU Directive specifically dedicated to the promotion of biofuels (EU, 2003). Issued in 2003, the Directive initiated EU biofuel policy by introducing two EU-wide biofuel targets: 2.5% by 2005 and 5.75% by 2010. Unlike the 2009 binding target, these were “reference” targets, granting EU Member States greater discretion in setting out their own “indicative” targets. The 2003 Directive also allowed Member States more freedom in deciding how to translate EU biofuel policy into national legislation.

When the controversy over the environmental and socio-economic sustainability of biofuels gained momentum during 2007-2008, UK public authorities and stakeholders called the UK Government to account for its responsibilities for biofuel policy. Multiply constrained – upward by the EU, downward by UK stakeholders, and sideways by other UK public authorities – the UK Government attempted to mediate several parties’ diverging views on the future of biofuel policy. By the end of 2008, the UK Government decided to slow down support for biofuels. This decision reversed previous policy commitments made to the EU and the UK biofuel industry to increase support for biofuels over time. However, it effectively preserved support for biofuels despite calls for a biofuel policy moratorium from other UK public authorities and stakeholders. During this period, the UK Government adopted the vision on biofuel policy that it still holds today.

A key empirical contribution of my research is an explanation of how the UK Government's responsibilities towards technology policies have affected the construction of its current vision on biofuel policy. This contribution stems from the investigation of a series of research questions: (1) How has the UK Government's vision on biofuel policy evolved over time? (2) How have the UK Government's responsibilities in technology policy affected that evolution? (3) Which visions on biofuel policy were competing at the time that the UK Government adopted its current vision on biofuel policy? (4) How have the UK Government's responsibilities in technology policy affected its choice of which visions to select and marginalise within its current biofuel policy?

To investigate this case of competing futures, I integrate the theoretical framework of the sociology of expectations with insights and terminology from the multi-level perspective (MLP). The sociology of expectations made expectations its main object of inquiry, while the MLP is well suited to cases of socio-technical transitions – such as that between generations of biofuel technologies. As a key theoretical contribution, my research extends the focus of the sociology of expectations to actors other than technology innovators. Technology innovators are the actors most closely related to technological development, such as scientists or industrialists or “‘innovations players’ whose hopes and efforts are invested in the success of new technologies” (Pollock & Williams, 2010, p. 2). The sociology of expectations in particular has typically been applied to analyse expectations from these types of actor. In this dissertation, I analyse and interpret the deployment of the expectations of the government in particular, but also of other public authorities as well as of private actors such as industry associations, consultancies, and non-governmental organisations. My analysis addresses a series of theoretical questions: (5) How do previous policy commitments towards technology innovators influence an executive public authority in the construction of its vision of the future? (6) How do public authorities, industry associations, consultancies, and non-governmental organisations diffuse expectations? (7) How could these actors be interpreted through the lens of the sociology of expectations?

To tackle these research questions, I rely on an historical analysis and a cross-sectional analysis, which I report in Part 1 and 2, respectively, of the dissertation.

The historical analysis relies on analyses of a temporal series of official documents issued by several UK and EU public authorities during the period 1994-2012. These official documents contain the “official voice” of public authorities, which assume responsibility for their content by signing them as their own. The analysis includes several official documents from the UK Government departments involved in sustainable road transport and biofuel policies, and issued them in the name of the UK Government. Complementing these documents are official documents from the European Commission and Council. A special focus is on the official correspondence that the Royal Commission on Environmental Pollution (RCEP), the Environment, Food and Rural Affairs Committee (EFRAC), and the Environmental Audit Committee (EAC) exchanged with the UK Government within that period. This official correspondence is here treated as a time-series sample of documents for a comparative analysis of statements of expectations among public authorities over time. The historical analysis unveils how the UK Government’s official vision on biofuel policy evolved from its origins in the sustainable transport debate to the current biofuel controversy. It also shows how previous policy commitments towards technology innovators have distinctively influenced public authorities with executive roles in technology policy – compared with public authorities with other policy remits – in the construction of their visions of the future. The analysis shows that the UK Government disagreed with the RCEP, EFRAC and EAC on several occasions. I will argue that the previous policy commitments of the UK Government towards the biofuel industry have been a critical factor in the definition of its vision, partially explaining those disagreements.

The cross-sectional analysis relies on document analyses of the responses and accompanying documents of a public consultation on biofuel policy. This consultation was launched on the 15th October 2008 by the Department for Transport (DfT) in the name of the UK Government. Around that time, the UK

Government adopted its current vision on biofuel policy. The consultation collected 89 responses, among which several from industry actors, but also from other types of actor, such as industry associations, consultancies, non-governmental organisations, and public authorities among others. The consultation responses are here treated as a purposive and convenient cross-sectional sample of documents for a comparative analysis of the statements of expectations of the UK Government and the consultation participants around the time when the former adopted its current vision on biofuel policy. The cross-sectional analysis unveils the visions competing at that time and which of those visions were selected or marginalised in the current vision of the UK Government. It also shows how other types of actor besides technology innovators have deployed and diffused expectations in the consultation. The analysis indicates that the vision of the UK Government was very similar to that promoted by the biofuel industrialists, but strongly contested by supporters of other visions. I will argue that this finding reconfirms that the previous policy commitments of the UK Government towards the biofuel industry were a critical factor in its definition of future policy, again partially explaining those disagreements.

This introductory chapter contains another four sections. Section 1 delineates the main features of the biofuel policy debate. Section 2 illustrates a conceptualisation of the UK Government as a public authority in a democratic society, which I use as a starting point for my research. Section 3 briefly introduces the theoretical framework adopted in the dissertation. Section 4 outlines the dissertation.

1. Case study: the UK Government's vision on biofuel policy

In the UK, the debate on biofuel policy is currently framed around a policy dilemma involving two opposing sets of expectations: whether to foresee incumbent biofuel technologies as a transitional requirement or as a threat for the future development of emerging biofuel technologies. Incumbent – or currently available – biofuels are generally referred to as “first generation” or

“conventional”, while emerging – or future – biofuels are generally referred to as “second generation” or “advanced” (United Nations Environment Programme [UNEP], 2009, p. 25; International Energy Agency [IEA], 2011, p. 8). This policy dilemma is at the centre of a highly contentious controversy involving a large and heterogeneous multitude of actors with different interests in biofuel technologies and their policies. Within this controversy, the UK Government has endorsed the view that current support for the incumbent industry of first-generation biofuels is a transitional requirement to encourage investment in the development of emerging second-generation biofuels. In what follows, I outline the main features of the biofuel debate and detail the vision of the future that the UK Government has endorsed.

1.1 The wider context

The biofuel debate is grounded on the recognition that fossil fuels are a finite resource and are largely responsible for climate change. Liquid biofuel technologies can process a wide range of organic material (biomass) and convert it into fuels that can be used as substitutes for fossil fuels in road transport – i.e. petrol and diesel derived from crude oil. The value of these technologies is debated with respect to their potential to provide a sustainable solution for mitigating climate change by reducing the consumption of oil in the transport system.

Oil is a fossil fuel, and therefore not a renewable energy source. It takes millions of years to form and oil reserves cannot reform or renew in time to match current and predicted future consumption rates. Oil is thus expected to become increasingly scarce and costly in the next few decades (Royal Society [RS], 2008, pp. 1, 5). Within the last forty years, awareness about the serious negative consequences of oil supply crises has combined with expectations of a future depletion of the oil reserves. The exact point by which all currently available oil will have been extracted and its cost will start to rise permanently – a time referred to as “peak oil” – remains a contested issue however. This uncertainty is partly due to unreliable evidence on the state of oil reserves (Owen et al., 2010, pp. 4744-4745). Furthermore, expectations for new

technologies enabling the exploitation of currently inaccessible oil reserves, other types of fossil fuels, and alternative energies allay fears about an imminent exhaustion of the oil supply (Bardi, 2009, pp. 324-326; Chapman, 2014, pp. 99-100). These concerns are particularly relevant for the transport sector, which is almost completely reliant on oil (Gasparatos et al., 2009, p. 626).

The consumption of fossil fuels has been identified as one of the major anthropogenic drivers of climate change. This liability is grounded in the recognition of the existence of climate change and of human activities as largely responsible for its worsening. According to the International Panel on Climate Change (IPCC), increasing emissions of Green House Gases (GHGs) are among the causes of climate change:

“Changes in the atmospheric concentrations of GHGs and aerosols, land cover and solar radiation alter the energy balance of the climate system and are drivers of climate change. They affect the absorption, scattering and emission of radiation within the atmosphere and at the Earth’s surface.” (Intergovernmental Panel on Climate Change [IPCC], 2007, p. 37)

As for anthropogenic GHGs emissions, human activity is reckoned to have substantially increased the concentration in the global atmosphere of four long-lived GHGs, namely: carbon dioxide CO₂, methane (CH₄), nitrous oxide (N₂O), and halocarbons (a group of gases containing fluorine, chlorine, or bromine) (IPCC, 2007, p. 37). In particular:

“Global atmospheric concentrations of CO₂, CH₄ and N₂O have increased markedly as a result of human activities since 1750 and now far exceed pre-industrial values determined from ice cores spanning many thousands of years ... The atmospheric concentrations of CO₂ and CH₄ in 2005 exceed by far the natural range over the last 650,000 years. Global increases in CO₂ concentrations are due primarily to fossil fuel use, with land-use change providing another significant but smaller

contribution. It is very likely that the observed increase in CH₄ concentration is predominantly due to agriculture and fossil fuel use. The increase in N₂O concentration is primarily due to agriculture.” (IPCC, 2007, p. 37)

In the period 1970-2004, energy supply, transport, and industry were responsible for the largest growth in GHG emissions, while emissions from the residential and commercial buildings, forestry (including deforestation), and agriculture sectors were growing at a lower rate (IPCC, 2007, p. 37). The transport sector in particular is reckoned to be responsible for a share of 13.1% of anthropogenic GHG emissions in 2004 in terms of CO₂-eq (IPCC, 2007, p. 36).

These findings have moved policymakers to take action to reduce fossil fuel consumption and search for alternative and/or renewable energy sources for all sectors of human activity, including transport. Fossil fuels’ finite nature and the related risks of future shortages, as well as their negative impacts on the climate, are widely considered established facts that require solutions.¹ Public authorities in the UK have attempted to shape policies accordingly. However, selecting specific solutions to promote through policy is not straightforward. A first issue is how to balance limited public finances when allocating investments in reducing fossil fuels consumption and developing alternative and/or renewable energy sources. Then there is the problem of selecting the right mix of technologies for these two aims. In road transport, the alternative and/or renewable technologies considered as substitutes for oil include hydrogen, electricity, and biofuels. In the following section, I provide a synthetic account of

¹ As Oreskes and Conway pointed out, even today the existence of climate change and its link with human activity are still contested issues – the authors maintain that there should be no doubts about climate change being a real threat and human activities being partly responsible for it (Oreskes, 2004; Oreskes & Conway, 2010). The high degree of uncertainty that surrounds the science behind climate change provides grounds for controversy. Disputed issues concern, for instance, the causes of the observed increase in global average air temperature. Some question whether this upward trend in temperature is abnormal or simply following long-term climatic variations that we are unable to measure because of the missing data on past climates. Whether and how much humans contribute to it is also questioned. Furthermore, the complexity of the models used in forecasting, indirect measurements, and the missing data on global warming create additional disputes over the validity of predictions of future trends of global temperature and their consequences (BBC Weather Centre, 2009; Harvey, 2010).

the main features of the biofuel debate and the issues that have been considered when biofuels' sustainability has been questioned.

1.2 Biofuels: a solution or a problem?

Electricity and hydrogen are not viable solutions for the short term, particularly as they would entail the replacement of all vehicles and the construction of new fuel distribution systems from scratch, as well as changes to current vehicle uses (e.g. adapting to shorter autonomies, longer refuelling times, different vehicle performances, etc.). By contrast, biofuels are readily available and require major changes to neither the distribution system nor current vehicle uses. Biofuels can be distributed in the existing transport fuel distribution system and can be blended up to 10% in transport fuels without requiring the replacement of the existing vehicle fleet. Thus, they currently represent the only short-term route to replacing oil and mitigating climate change in road transport. In addition, biofuels have been indicated as a solution to fostering rural development, through the economic opportunities created by the production of their feedstock (IEA, 2011, pp. 7, 10).

Yet the production of biofuels is not risk free. Referred to as “first-generation” or “conventional” biofuels, currently used biofuels, if adopted at a large scale, would entail extensive use of agricultural land (IEA, 2008, p. 16; 2011, p. 8). Indeed, most biofuel technologies that are economically viable today employ agricultural crops such as sugar cane, wheat, maize and palm oil, which have traditionally been grown for food and animal feed purposes, as feedstock for their production (IEA, 2008, p. 16; 2011, pp. 12-13). This is a problem, because land is scarce and subject to many competing demands, such as food, animal feed, and wood production, conservation, urban development, and recreation to name but a few (RS, 2008, p. 40). Any increase in the demand for land thus inevitably increases competition and results in upward pressures on the price of land and its related outputs. Accordingly, a large-scale adoption of first-generation biofuels would entail an increase in the demand for agricultural land and consequently raise the prices of agricultural land and its produce. This increased pressure on land is expected to generate, directly and indirectly, land

displacement effects potentially leading to increased carbon emissions – thus potentially contradicting a core aim of biofuel policy – as well as to related adverse phenomena such as deforestation, biodiversity losses, food price crises, and land grabbing in developing countries among others (see section 1.3.1 for more details).

The acknowledgement of the direct and indirect adverse effects of biofuel production led policymakers to promote the development of systems assuring sustainability standards, monitoring biofuel production to ensure the sustainability of biofuels (Lewandowski & Faaij, 2006, p. 87; Van Dam et al., 2008, pp. 752-756; Van Dam et al., 2010, pp. 2446-2450; Chalmers & Archer, 2011, pp. 5682-5683; IEA, 2011, pp. 19-20). Such assurance systems certify biofuels as sustainable if their production abides by certain standards aimed at preventing or containing the above-mentioned adverse effects. Still, it is a contentious matter whether these systems can effectively and efficiently tackle the problems they are meant to address (Nuffield Council [NC], 2011, pp. 32-33, 93-96, 112).

As opposed to first-generation biofuels, “second-generation” or “advanced” biofuels are technologies that can process non-food feedstock, which could be produced in marginal lands or derived from organic wastes. Assuming that their production is properly managed, second-generation biofuels could then avoid or reduce the competition for land with other land uses (IEA, 2008, p. 34; 2011, pp. 12-13). Thus, if coupled with an effective and efficient assurance scheme of sustainability standards, these technologies are expected to soften the adverse effects imputed to first-generation biofuels (IEA, 2008, p. 33; 2011, p. 8). Yet, at the moment, the only technologies that have reached commercialisation are first-generation biofuels. Second-generation biofuel technologies are still confined to laboratories and have not yet translated into economically viable commercial facilities (IEA, 2008, p. 33; 2010, pp. 7, 21; 2011, pp. 12, 35). The following section describes in greater technical detail the issues concerning the environmental and socio-economic sustainability of biofuels.

1.3 Biofuels as sustainable?

In principle, biofuels could be carbon neutral, i.e. the amount of carbon they release when combusted could be equal to the amount of carbon absorbed during the growth of the organic material used to produce them. Nevertheless, when looking at the Life Cycle Assessments (LCAs) of current biofuel supply chains, that neutrality is never achieved (UNEP, 2009, pp. 51-61; IEA, 2011, pp. 16-18). LCAs are methodologies aimed at calculating the net amount of direct and indirect carbon emissions resulting from the entire supply chain of biofuels – i.e. “from-cradle-to-grave” or from the inputs to the final outputs of biofuel production (IEA Bioenergy, 2011, p. 5). When taking into account all these emissions, at their best, biofuels can realise some carbon savings compared to the use of an equivalent unit of fossil fuels (Renewable Fuels Agency [RFA], 2008a, p. 23; UNEP, 2009, pp. 51-61; IEA, 2011, pp. 16-18).

Biofuels' life-cycle emissions depend on the carbon emissions directly and indirectly generated by the demand of inputs for biofuel production and by the direct or indirect carbon emissions saved by the possible parallel production of co-products from biofuel production. In particular, the net carbon saving of a specific biofuel depends on the specific organic material and technology used in production as the demand for inputs and possible production of co-products differ accordingly. Concerning the demand for inputs, the crucial issues concern whether, how much, and which kind of energy, land, pesticides, fertilisers, water, equipment, etc. are used to produce and process biofuel feedstock. With regards to the possible parallel production of co-products, the crucial issues are whether, how much, and which kind of inputs are saved by the use of these co-products in biofuel production or in any other business. For instance, current biofuel production from wheat, maize, and rapeseed produces valuable organic co-products that are suitable as animal fodder because of their high protein content. The overall effect of these co-products is to reduce the land required to produce high-protein crops specifically for animal feed. By reducing the demand for land in the livestock farming business, these biofuel co-products generate emissions savings (RFA, 2008a, p. 33).

Direct carbon emissions refer to the operations directly imputable to biofuel production. More specifically, the emissions resulting from the use of energy in all operations to produce, process, and transport both feedstock and biofuels, as well as from the biochemical reactions following the clearing of land to make space for feedstock cultivation, the ploughing of the fields, the use of fertilisers, pesticides, water, equipment, and so on. Indirect carbon emissions are the reactions that biofuel production induces in other businesses. More specifically, they relate to the direct and indirect emissions generated (or saved) by other businesses reacting to the demand of inputs and to the production of co-products of biofuel production.

Summing up, all direct and indirect emissions generated or saved by the demand of inputs and the production of co-products of biofuel production would need to be factored in to estimate how much carbon is being released from a specific biofuel supply chain (UNEP, 2009, pp. 51-61). However, none of the existing LCA methodologies is universally considered as comprehensive of all carbon emissions attributable to biofuel supply chains, especially concerning their indirect effects. Several areas of scientific uncertainty persist, fuelling controversy over how to design such a comprehensive methodology. As a result, several LCA methodologies exist, which apply different approaches to analyse different ranges of factors, and which inevitably lead to different estimations of LCA emissions (Scarlat & Dallemand, 2011, p. 1645; Broch et al., 2013, p. 155; Witcover et al., 2013, p. 64). Biofuel critics doubt that it is actually possible to construct such a comprehensive methodology and criticise the lack of consideration for impacts other than the environmental, such as the negative socio-economic impacts of biofuels on developing countries (NC, 2011, pp. 32-33, 93-96, 112). The next subsection focuses in more detail on the implications of the use of land as an input in biofuel production.

1.3.1 Direct and indirect land use changes

Among all the inputs used in biofuel production, land is one of the most problematic (Searchinger et al., 2008). The majority of first-generation biofuels require organic feedstock that must be cultivated on agricultural land, giving rise

to the so-called Direct Land-Use-Changes (dLUC) and Indirect Land-Use-Changes (iLUC) (Searchinger et al., 2008; UNEP, 2009, pp. 63-71; IEA, 2011, pp. 16-18). Direct land-use-changes refer to the land displacement effects directly caused by biofuel cultivation. Indirect land-use-changes refer to the land displacement effects indirectly caused by other businesses reacting to the demand for input or to the offer of co-products of biofuel production.

Direct and indirect land-use-changes can potentially outweigh the carbon savings of biofuels by converting lands with high carbon stocks to other uses; for instance, by clearing forests or by reclaiming peatland to make space to cultivable land or livestock farming. The process would generate a “carbon debt” that could potentially annihilate biofuels’ carbon savings or even increase biofuels’ carbon emissions beyond those released by an equivalent amount of fossil fuels (UNEP, 2009, pp. 63-71). Beyond deforestation, land-use-changes could also generate other adverse phenomena, such as biodiversity losses, increases in food prices, as well as worsening social conditions in rural communities in developing countries. These phenomena are treated in greater detail below:

- Deforestation and Biodiversity Losses – the demand for agricultural land for the cultivation of biofuel feedstock competes with other demands. That competition increases the price of cultivable land and creates an incentive to convert virgin lands to compensate for the lack of offer. In the worst-case scenario, biofuel producers may convert carbon sinks, such as forests or peatlands, for their large-scale, monoculture plantations – i.e. direct land-use-changes. Meanwhile, in reaction to the scarcity of land caused by biofuel production, other businesses may divert further virgin land – i.e. indirect land-use-changes. In both cases, there would be negative implications in the form of biodiversity losses (Food and Agriculture Organisation of the United Nations [FAO], 2008, pp. 55-67; IEA, 2008, p. 30; UNEP, 2009, pp. 63-71).
- Food and Animal Feed Prices Increases – the production of food and animal feed crops directly competes with the production of energy crops

for biofuel production. Attracted by the financial support given to biofuels, farmers may divert land from food and animal feed cultivation to biofuel feedstock cultivation. Such land diversion would eventually increase food and animal feed prices (FAO, 2008, pp. 72-79; FAO et al., 2011, pp. 10, 26-27). The upward surges in prices would be particularly felt in developing countries, as the relative weight of food expenses in household budgets is higher than in richer developed countries (Organisation for Economic Co-operation and Development [OECD], 2007, p. 15; FAO, 2008, p. 72; IEA, 2008, p. 28; Mitchell, 2008).

- Worsening of Social Conditions – seeking greater profits, multinationals would produce biofuels in developing countries to exploit their low-cost work force, greater availability of land, and more favourable climate. Eased by the weaker law enforcement and the more accommodating governments of developing countries, multinationals could eventually infringe human rights by imposing unfair conditions on workers and by depriving local farmers of their land, irremediably compromising their standard of life² (FAO, 2008, pp. 79-85; RFA, 2008a, p. 68; UNEP, 2009, p. 76; FAO et al., 2011, p. 45).

Using organic wastes as biofuel feedstock is considered a possible solution to reduce the competition between biofuels and other land uses. Organic wastes would marginally affect the demand for land. Furthermore, in this case, only the emissions generated by the collection and conversion of wastes would be attributed to biofuel production. Producing biofuel feedstock in marginal or idle land is considered another possible solution to minimise competition over land use. Nevertheless, this last solution would still require an efficient and effective system of sustainability standards capable of ensuring that feedstock production is actually directed into marginal or idle land and that no carbon sink is affected as a result.

² In the UK, biofuels were initially supported as beneficial for the domestic agricultural sector. Nevertheless, it soon became evident that the UK would become a large net importer of biofuels from developing countries. UK biofuel policies then clashed with concerns over the potential negative impact of biofuel feedstock production in those countries.

A few incumbent first-generation technologies convert organic wastes into biofuels. Among these, biodiesel from used cooking oil (UCO) (e.g. vegetable oils used in the food and restoration industry) is considered among the most sustainable biofuels currently available. However, these first-generation technologies can only contribute a small share of the total biofuel requirements, as their capacity is constrained by the limited availability of these specific organic wastes.

Newer generations of biofuels are expected to reduce the negative impacts of first-generation biofuels. In particular, second-generation biofuel technologies would use non-food feedstock, which could be produced in marginal or idle land or even extracted from a wide range of organic wastes. Meanwhile, biofuels produced from algae – referred to as “third-generation” (IEA, 2008, p. 83; UNEP, 2009, p. 25) – would minimise the impact on land even further (IEA Bioenergy, 2010, pp. i-vi; IEA, 2011, p. 8; Adenle et al., 2013, p. 184).

The negative outcomes of future large-scale production of agricultural feedstock for first-generation biofuels are still, for the most, plausible future projections. As a result, current biofuel policies mostly rely on expectations for technologies and policies as major justifications, as the next section explains.

1.4 The UK Government’s vision on biofuel policy

The UK Government is currently justifying biofuel policy by means of three interrelated expectations. Firstly, second-generation biofuels will solve the problems and realise the benefits initially attributed to first-generation biofuels. Secondly, sustainability standards will soon become effective in tackling the problems created by the production of biofuels and be properly implemented in biofuel supply chains. Thirdly, preserving the current market of first-generation biofuels will be necessary to realise the first two expectations. Together, these three expectations support the view that the benefits of yet-to-be developed second-generation biofuels and sustainability standards constitute sufficient

reasons to continue supporting currently available, but environmentally and socio-economically risky, first-generation biofuels.

As I will argue, behind the third expectation there is an implicit rationale. The rationale prescribes that, for public authorities in charge of technology policy, it is necessary to maintain the promises of support made by previous policies in order to maintain the trust of investors, and consequently to maintain effective technology policy in the future. In the specific case of UK biofuel policy, the rationale recommends that the UK Government maintain the policy-promises made to the first-generation biofuel industry. This would be necessary to avoid discouraging the industry from meeting EU commitments in biofuels as well as any current and prospective biofuel investors from undertaking investments in second-generation biofuels and in implementing sustainability standards. In short, this rationale justifies the preservation of the current market of first-generation biofuels as instrumental to techno-scientific advancement in future biofuels. Yet, this rationale and the above expectations remain highly controversial.

2. The UK Government and its democratic obligations

The focal point of this dissertation is the UK Government as participant in the biofuel policy debate in the UK. This dissertation starts from an initial and broad conceptualisation of the UK Government as a public authority of a democratic society. A public authority is here generally defined as an institution funded by public revenue (e.g. taxes) and supposed to perform its roles in the public interest (i.e. common well-being or general welfare) – in principle at least. In a democratic society, a public authority ought to honour transparency and participatory requirements in policymaking, that is, allow “the public” to scrutinise its policies and to directly participate in the legislative process.

According to the Select Committee³ on the Modernisation of the House of Commons,

“... an effective, democratic legislative process must be as open as possible. This means not only that the public should be able to observe every aspect of it, but that they should wherever possible have the opportunity to become involved as active participants. This is a fundamental point of democratic principle, but also a prudent strategy. Members of Parliament have no monopoly on wisdom; the Government has no monopoly on effective consultation. A system which allows the individual or organisation who has spotted a way in which a pending piece of legislation might affect them to bring this readily to the attention of the legislature is less likely to produce laws which are defective or redundant, or which lead to unintended (even unforeseen) consequences ... By ‘the public’, we mean not only individuals, but also the non-governmental organisations, lobby groups and interest groups who seek to influence the form and content of laws. It is an important matter of principle, in a democracy, that citizens should be able to make their views known to legislators, and an accessible legislative process provides access to the many thousands of smaller groups as well as to the larger, better-organised interests.” (Modernisation Committee, 2006, pp. 5, 11)

In this dissertation, I prefer to use the term “taxpayers” when I refer to “the public” for two main reasons. Firstly, the UK Government often refers to “the taxpayer” when it comments on its own responsibilities in technology policymaking (e.g. Defra, 2004, p. 6). Secondly, the term taxpayers relates to the definition here given of public authorities as institutions funded by public revenue. This said, the term taxpayers is here intended in a broad sense and interpreted as an equivalent of “electorate”, and/or “citizens”.

³ The Select Committee on the Modernisation of the House of Commons was appointed on 13th July 2005 by the House of Commons to consider how the House operates and to make recommendations on how the practices and procedures of the House should be modernised (Modernisation Committee, n.d.).

As “an important matter of principle, in a democracy”, the UK Government ought then to allow taxpayers to scrutinise its policies and directly participate in the legislative process (Modernisation Committee, 2006, pp. 5, 11). The publication of official documents in which the UK Government justifies its policy interventions is aimed at ensuring transparency in the policymaking process, which is a precondition to allowing taxpayers to scrutinise policies. The launch of public consultations is aimed at opening up the legislative process, which is a precondition to allowing taxpayers to participate and have their say in policymaking. The UK Government ought to engage with taxpayers also for pragmatic considerations. By collecting valuable insights on policies from taxpayers, it would reduce the risk “to produce laws which are defective or redundant, or which lead to unintended (even unforeseen) consequences”, preserving in this way the positive judgement of taxpayers, and thus legitimacy of policy intervention (Modernisation Committee, 2006, pp. 5, 11). In this effort, it should consider all taxpayers – i.e. “individuals, but also the non-governmental organisations, lobby groups and interest groups who seek to influence the form and content of laws” (Modernisation Committee, 2006, pp. 5, 11).

By extension, the UK Government ought to select expectations from and on behalf of all taxpayers when defining and justifying technology policies. This should be even more the case when the UK Government channels public resources into specific technology developments as it also becomes answerable as a manager of public resources. Yet, as I will show in my analysis, in the case of biofuel policy, the UK Government sought to content not just taxpayers as a whole, but particularly biofuel industrial stakeholders who had been involved with precious policies. Ever since the UK Government promised political and financial support to biofuel industrial stakeholders, its policymaking responsibilities expanded to include specific responsibilities towards these latter. These responsibilities turned out to be a critical factor in the definition of the UK Government’s vision of the future.

A key empirical contribution of my dissertation is to reveal how the reputational stakes of the UK Government in the incumbent industry of first-generation

biofuels were linked to techno-scientific advancement in second-generation biofuels to justify current biofuel support (see also Berti & Levidow, 2014). This linkage complements insights from previous analyses of UK biofuel policy (Dunlop, 2010; Palmer, 2010; Boucher, 2012). My dissertation also sheds light on which voices have been given more weight in the policymaking process, with an analysis of the fourth public consultation on biofuel policy. This analysis builds upon and adds insights to previous analyses of the second and third consultations on UK biofuel policy (Upham & Tomei, 2010; Upham et al., 2011).

To investigate this case of competing futures, I integrate the theoretical framework of the sociology of expectations with insights and terminology from the MLP. In the next section, I briefly summarise these two frameworks.

3. Theoretical framework

Expectations have been the objects of interest of many scholars studying technology policy and technological development. A common view is that expectations – as subjective beliefs about the future – may exert a strong influence in technology development, especially when widely shared. Another common view is that expectations may be used as instruments to influence the beliefs of other actors.

In evolutionary economics, expectations – as “beliefs about what is feasible or at least worth attempting” – are considered to be potentially constraining to the boundaries of technological progress by narrowing the directions in which progress is possible (Nelson & Winter, 1977, p. 57). Once widely shared, such expectations could result in powerful exclusion effects: the community of actors behind a technology may be negatively limited in their imagination by these expectations and, consequently, become “blind” to other technological possibilities (Dosi, 1982, p. 153). In the literature on large technical systems, expectations have been observed to exert a relatively stronger influence in the early phases of their adoption (Hughes, 1994; 2001). Similarly, in the literature on strategic niche management, expectations have been acknowledged as

important elements in defining trajectories for technological developments (Kemp, 1994, p. 1033), especially for technologies at the niche level – i.e. in their early development stages (Schot & Geels, 2007, pp. 615-616; Schot & Geels, 2008, p. 540; Nil & Kemp, 2009, p. 674). In the technological innovation system literature, expectations play an important role within the “guidance of the search” function – i.e. in guiding future development trajectories (Hekkert et al., 2007, p. 423; Bergek et al., 2008, p. 415; Hekkert & Negro, 2009, p. 586).

Expectations for technologies and policies can also be strategically mobilised by actors that compete in securing advantages in the debates governing planning, purchasing, training, regulation, and capital investment in technology development. Within the science and technology policy literature, influential actors, such as governments, industrials, and other authoritative sources, have been observed trying to influence other actors’ beliefs to their own advantage by promoting their own expectations over others (Scrase & Ockwell, 2009, p. 41; Stirling, 2009, p. 254). Thus, seemingly neutral predictions from influential actors may actually hide vested interests in promoting and shaping favoured futures (Stirling, 2009, p. 254). The sociology of expectations has internalised and further extended the above views, prompting me to adopt it for my investigation of competing futures.

3.1 The sociology of expectations

The sociology of expectations assumes that the future is inherently uncertain and possible in multiple forms (Brown et al., 2000, pp. 4-5). A future emerges from the unstable fields of language, practice, and materiality in which heterogeneous actors compete for the right to represent favoured visions of the future (Brown et al., 2000, pp. 4-5). Extensively applied to investigations of contentious futures, this theoretical framework focuses on expectations as the main objects of inquiry. Within this framework, expectations are simultaneously viewed as elements “doing things” per se, as “promises” of future commitments, and as resources strategically “used to do things” (Van Lente, 1993, pp. 185, 190).

Viewed as *doing things*, “expectations can be understood as performative” (Borup et al., 2006, p. 286). Performativity refers to expectations’ power in fostering cooperation and providing direction for decision-making, thus potentially shaping or facilitating future technological developments (Van Lente, 1993; 2000; Brown et al., 2003; Borup et al., 2006). When widely shared, expectations can become a “depersonalized social construction” not attributable to specific individuals or groups of actors, and “part of a generalised and taken-for-granted social repertoire” (Konrad, 2006, p. 431). For instance, “technologies presented as the next generation ... are self-justifying because the notion of next generation is widely accepted” (Van Lente & Rip, 1998a, pp. 222-223).

Viewed as *promises on future commitments*, shared expectations can turn into requirements for the actors enunciating or endorsing them, and so generate “promise-requirement cycles” (Van Lente, 1993, pp. 167, 191-193; Van Lente & Rip, 1998a, pp. 216-217; Van Lente, 2000, p. 58). Expectations contain descriptions of future roles “for the self, others and artefacts” (Van Lente, 1993, p. 195). Enunciating or endorsing expectations means promising to fulfil those roles, which can eventually turn into requirements if those expectations become shared. Technology innovators – or “technologists” – are those expected to propose technological expectations to justify their existence, and later required to fulfil them in practice by the rest of society. By contrast, all other actors – or “government” and “others” – are expected to endorse technological expectations from technology innovators, and are later called to give political-financial support (Van Lente, 1993, p. 167; Van Lente & Rip, 1998a, p. 216; Van Lente, 2000, p. 60).

Viewed as *resources to do things*, expectations are generally used to legitimise actions, communicate intentions, and attract the attention of other actors (Van Lente, 1993, p. 185; Geels & Smit, 2000, p. 882). Aware of expectations’ power, actors strategically use expectations to influence other actors’ views on technological futures in order to favour their own interests. Promises and diffuse scenarios are used to convince funding organisations and attract other practitioners to join the development. Seeking “protected spaces” (Van Lente,

1993, p. 196) and “attention from (financial) sponsors”, technology innovators may exaggerate their promises, potentially leading to “the failure of some future speculations” (Geels & Smit, 2000, p. 881). Such inflated prospects may lead to disappointment when earlier statements fail to match actual outcomes (Borup et al., 2006, p. 289) and undermine the reputations of both individuals and entire fields of innovation (Brown, 2003, p. 6; Brown et al., 2003, p. 1).

The sociology of expectations has mostly been applied to analysing expectations from a specific type of actor here referred to as technology innovators – i.e. the actors most closely related to technological development. A key theoretical contribution of my dissertation is the widening of the focus of the sociology of expectations to types of actor besides technology innovators. Within this dissertation, the framework of the sociology of expectations is applied to investigate the government in particular, but also other public authorities, as well as private actors such as industry associations, consultancies, and non-governmental organisations. All these types of actor have been largely overlooked in the sociology of expectations. Complementing previous analyses in the sociology of expectations, the present study analyses these types of actor through a distinctive analytical perspective that looks at their functional roles and interrelations when diffusing expectations among different parties. Thus, beyond looking at the content and dynamics of their expectations, I investigate how and on whose behalf these actors mediate expectations. As a minor adaptation of that framework in my analysis, I distinguish analytically “technological promises” from “policy-promises”, i.e. the promises public authorities make on their future policy commitments once they endorse technological expectations of technology innovators.

3.2 Integrating the sociology of expectations with the multi-level perspective

To address the case of biofuel technologies, I have integrated the above framework with insights from the MLP on socio-technical transitions. Widely applied to cases of socio-technical transition, the MLP framework provides interesting insights and terminology to interpret how different actors imagined a

socio-technical transition between different technological generations of biofuel technologies. It theorises hierarchical relations among three socio-technical levels – in ascending order: niche, regime, and landscape. A socio-technical regime denotes an established set of cognitive and normative rules as expressed in policy, science, users, markets, etc. A regime can provide space for niches in which radical innovations can take place; niches can eventually change a regime or generate a new one. The socio-technical landscape denotes aspects of the wider political-economic environment, especially policies, which lie beyond the direct influence of actors at the niche and regime levels (Geels, 2004, p. 913; Geels & Schot, 2007, p. 401). All three levels encompass expectations for future developments in inter-dependent ways. In this dissertation, the MLP's framework is used to classify and interpret the visions of the future under analysis.

4. Outline

This dissertation reports the historical and cross-sectional analyses in two separate parts, respectively Part 1 and Part 2. In total, it consists of nine chapters, four appendices, and one glossary as outlined below.

4.1 Chapter 1 – Expectations of technologies and policies

Chapter 1 contains the literature review. The review illustrates in detail the integration of the theoretical framework of the sociology of expectations with selected insights and terminology from the MLP on socio-technical transitions. This integration is intended to improve the framework's interpretative power in analysing expectations of socio-technical transitions – such as those between biofuel generations.

4.2 Chapter 2 – Methods and evidence

Chapter 2 details the research method and evidence used in the historical and cross-sectional analyses. In particular, it introduces the case study method, and

discusses its limits and merits in general and in relation to my research. It then justifies my choice not to integrate my document analyses with interviews. Finally, it provides a detailed explanation of the research design and how evidence has been presented in the following chapters.

4.3 Part 1 – Historical analysis – chapters 3 and 4

Chapter 3 is the empirical chapter of the historical analysis. It reports the evidence drawn from the document analyses of a temporal series of official documents issued by several UK and EU public authorities between 1994 and 2012. During that time, the Royal Commission on Environmental Pollution (RCEP), the Environment, Food and Rural Affairs Committee (EFRAC), and the Environmental Audit Committee (EAC) exchanged official correspondence with the UK Government. This chapter identifies and compares over time the vision of biofuel policy of the UK Government with those of the RCEP, EFRAC, and the EAC. By doing so, it reveals the evolution of the UK Government's vision of biofuel policy during that period.

Chapter 4 reinterprets the findings of the historical analysis through the lens of the sociology of expectations integrated with insights from the MLP of socio-technical transitions. This chapter focuses on how the distinctive policymaking responsibilities of the UK Government – in comparison with the other public UK authorities selected for the analysis – have influenced the way it diffuses expectations for technologies and policies. It is argued that disagreements among UK public authorities can be partially explained by their different responsibilities towards “promise-requirement cycles” – whereby technological promises generate future requirements for the actors involved (Van Lente, 1993, p. 167; Van Lente & Rip, 1998a, p. 216; Van Lente, 2000, p. 60). As for the UK Government's specific deployment of expectations, it is related to a “policy-promise lock-in” – i.e. a situation in which previous policy-commitments towards technology innovators of incumbent technologies (currently controversial and potentially driven by several imperatives) are officially justified as necessary for the development of preferable, emerging technologies.

4.3 Part 2 – Cross-sectional analysis – chapters 5, 6, and 7

Chapter 5 reports evidence from the document analyses of the responses and accompanying documents of the public consultation on UK biofuel policy of the 15th October 2008. Around that time, the UK Government adopted its current vision on biofuel policy. This chapter identifies and compares the visions on UK biofuel policy that were voiced in the consultation and associates them with the specific groups of actor supporting them. In doing so, it uncovers the multitude of visions competing at the time when the UK Government adopted its current vision on UK biofuel policy.

Chapter 6 investigates which voices the UK Government selected and marginalised when constructing its vision on biofuel policy. The UK Government sought views on three alternative policy options for biofuel support. In their responses, participants opted for the policy option more aligned with their own visions on UK biofuel policy. In the analysis, I subdivided participants according to the policy option they supported and synthesised, and reinterpreted their visions through the sociology of expectations framework integrated with the MLP on socio-technical transitions.

Chapter 7 analyses how industry associations, consultancies, non-governmental organisations, and public authorities mediate expectations of technologies and policies among different parties. Referring to the work of Pollock and Williams, it then compares those types of actor with “promissory organisations” (Pollock & Williams, 2010). Finally, it proposes the broader definitions of private and public “intermediaries of promise” as a starting point for a deeper analysis of the role played by the different types of intermediaries that populate technology policy arenas.

4.4 Chapter 8 – A space for intermediaries of information on technologies: some insights from economics

Chapter 8 follows Parts 1 and 2 of the dissertation. Within this chapter, I wish to explain how I eventually came to conceptualise the roles of specific actors,

which I define as “intermediaries of promise”, in mediating information on technologies among different parties. In order to do so, I firstly present some reflections on my own mind-set, which is greatly influenced by both the sociology of expectations as well as by my previous background in economics. Reflections and insights from these literatures are organised and presented as an analytical model, which helps illustrate the roles of specialisations of resources, expertise, and reputation in the diffusion of expectations and visions of technologies. The “intermediaries of promise” that I observed in my case studies are then reinterpreted through that analytical model.

4.5 Chapter 9 – Conclusions

Chapter 9 concludes the dissertation with some final comments on the phenomenon of technology innovators “hyping” their statements of expectations. While doing so, I emphasise the main conceptualisations that I have proposed in this dissertation. This chapter invites scholars to consider some of the findings and insights presented in this dissertation and to undertake further research on issues yet to be explored by the sociology of expectations.

4.6 Appendices – 1, 2, 3, and 4

Appendix 1 provides further details on how the UK Government publishes official documents and launches public consultations via its departments. It also provides details on how the RCEP, EFRAC, and the EAC exchange official correspondence with the UK Government. Appendix 2 compares the lists of organisations that the DfT used to invite participants to the consultation under analysis and to the previous three consultations on UK biofuel policy. Appendix 3 reports the complete list of questions surveyed by the consultation under analysis. Appendix 4 provides a synthetic account of the biofuel industrial context at the time of the consultation under analysis.

4.7 Glossary

The glossary lists and explains all acronyms and initialisms used throughout the dissertation.

Chapter 1 – Expectations of technologies and policies

Introduction

In my research, I investigate how the UK Government and other participants in the UK biofuel policy debate have selected, combined and diffused different visions of UK biofuel policy through an analysis of their statements of expectations. As an example of such statements:

“In the longer term, second generation biofuel technologies have the potential to reduce pressure on land because they can use a wider range of feedstocks, including waste. However, the Government does not believe it is feasible to wait for technological improvements before utilising biofuels. It is through stimulating a market for biofuels that we will encourage investment and the development of advanced technology.”
(DfT, 2008b, p. 11)

The above statement contains expectations of second-generation biofuel technologies and UK biofuel policy. The sociology of expectations offers relevant insights for an investigation of these kinds of statement, as I illustrate in this chapter.

The chapter is divided into five sections. Section 1 reviews the main insights from the sociology of expectations on how to conceptualise expectations. Section 2 illustrates insights on the temporal and spatial dynamics of expectations. Section 3 relates my research contributions to the sociology of expectations. Section 4 explains in detail the integration of the sociology of expectations with the multi-level perspective (MLP) on socio-technical transitions. Section 5 discusses how expectations are here intended in terms of agency and structure.

1. Expectations in the sociology of expectations

Several disciplines have looked at expectations as important elements in technology development (Borup et al., 2006, p. 285). Within Science and Technology Studies (STS), the sociology of expectations has made the future its central object of enquiry, prompting me to consider its framework the most appropriate for an investigation of competing futures. This literature has variously investigated expectations, visions and promises related to technological developments.

“While expectations in their general form can be defined as the state of looking forward (from Latin, *expectatio*, looking, waiting for), technological expectations can more specifically be described as real-time representations of future technological situations and capabilities. Similar terms, which are commonly used, like technological ‘promises’ and ‘visions’ are largely overlapping with ‘expectations’ but emphasize to a higher degree their enacting and subjectively normative character. They stress that expectations are wishful enactments of a desired future. By performing such futures, they are made real and in this sense expectations can be understood as performative. Along with positive promises and hopes of future capabilities, fears and concerns about future risks are parallel features of these kinds of dynamics. Both positive expectations and fears of risk – though different in character and having different dynamics – can be seen to have considerable influence on the discussion technological change.” (Borup et al., 2006, p. 286)

The sociology of expectations views expectations as elements “doing things”, as “promises” of future commitments, and as resources strategically “used to do things” (Van Lente, 1993, pp. 185, 190).

1.1 Expectations as performative

By aligning beliefs on the future, expectations influence decision-making in the present, ultimately affecting the development of technologies in the future. In

this sense, expectations can be conceptualised as “*performative or constitutive*” of the future (Borup et al., 2006, pp. 286, 289). Widely shared expectations can become a “depersonalized social construction”, not attributable to specific individuals or groups of actors, and “part of a generalised and taken-for-granted social repertoire” (Konrad, 2006, p. 431). For instance, when technologies are presented as the “next” or “new” generation superseding the “old” generation, they become “self-justifying because the notion of next generation is widely accepted” (Van Lente & Rip, 1998a, pp. 222-223) and “the notion of an old generation suggests that it is natural to replace it by a new one” (Van Lente, 2006, p. 215). Whenever they become societal assumptions or “collective”, such expectations can even guide or justify the actions of those who do not necessarily share them (Konrad, 2006, p. 431). Thus, statements of expectations do not simply represent futures that do not exist in the present, but also *do* something in the present (Van Lente, 1993, p. 190).

Expectations operate from the macro level of national policymaking to the meso level of sectors and innovation networks, down to the micro level of scientists and engineers (Van Lente, 1993, pp. 181-182; Borup et al., 2006, p. 286). They rearrange resources in the present by shaping political “agendas” and by creating “protected spaces” for the development of technologies (Van Lente, 1993). Such “future-oriented abstractions ... guide activities, provide structure and legitimation, attract interest, and foster investment. They give definition of roles, clarify duties, offer some shared shape of what to expect and how to prepare for opportunities and risks” (Borup et al., 2006, pp. 285-286). Expectations may eventually evolve into a “reality that shapes the strategic actions of the actors” (Brown et al., 2001, p. 28) and lead to a general reduction of the perceived risk surrounding technology developments, which, by their nature, are extremely uncertain and risky (Van Lente, 1993, pp. 186-187).

Expectations as “shared, though flexibly interpreted, cluster of visions” alter social reality by creating, reinforcing, or destroying social connections, or linkages (Van Lente, 1993, p. 190; Borup et al., 2006, p. 289). They model current society with the formation of “communities of promise” (Brown, 2003, p. 6; Martin et al., 2008a, pp. 30-32; Martin et al., 2008b, p. 129), “niches” (Geels

& Smit, 2000, p. 880), or “worlds” of heterogeneous actors who share a common interest in promoting a technology and are connected by the mutual dependencies in their activities (Van Lente & Rip, 1998b, p. 234).

As opposed to collective expectations, “specific” expectations should be identified instead as those attributable to and held by individual actors or specific groups of actors (Konrad, 2006, p. 431). Aware of their power, actors can choose to use their statements of expectations strategically in an attempt to influence collective expectations or other actors’ specific expectations. Thus, another analytical way of thinking about statements of expectations is as *resources* that actors use to do things (Van Lente, 1993, pp. 185-190).

1.2 Expectations as strategic resources

Viewed as *resources to do things*, expectations are generally stated to legitimise choices, reduce uncertainty, and attract the attention of other actors (Van Lente, 1993, p. 185; Geels & Smit, 2000, p. 882). For instance, actors such as researchers, firms, and governments routinely use statements about the development of technologies to legitimise claims about their strategies or policies (Brown et al., 2001, p. 28) or “*legitimise, justify, back their arguments, give reasons in general*” (Van Lente, 1993, p. 185). The release of statements of expectations can also be aimed to “allow decision-making and *reduce the uncertainty* inherent in technological developments” (Van Lente, 1993, p. 185). The strategic interaction of actors affects the evolution of technological developments. Actors are aware of the interdependence of their decisions and act accordingly. By communicating, agreeing, and working on a shared vision of the future, actors can foster coordination and collaboration, and thus reduce the “indeterminacy” resulting from the unknown outcomes of their interactions. In their effort to reduce future uncertainties, actors might then reveal their intentions in advance by publicly disclosing statements of expectations of technologies (Van Lente, 1993, pp. 186-189). In a way, expectations could be seen “as ‘bids’ about what the future might be like, that are offered by agents in the context of other expectation bids” (Berkhout, 2006, p. 301).

Actors may also disclose statements of expectations to “mobilize funds, [and the] attention of other actors” (Van Lente, 1993, p. 185). In their attempt to “get a hearing”, actors tend to “hype” their statements (Borup et al., 2006, p. 290). Hype as distortion towards over-optimism may be genuine and involuntary, but also strategic and voluntary:

“The reason that initial promises and expectations are too optimistic is *not* that forecasters or futurists are ignorant or shortsighted ... Initial promises are set high in order to attract attention from (financial) sponsors, to stimulate agenda-setting processes (both technical and political) and to build ‘protected spaces.’” (Geels & Smit, 2000, p. 881)

Promises and expectations can then be voluntarily skewed towards optimism to convince funding organisations and other practitioners to join technological development.

“Already at the very earliest stages of a field’s formation, actors use ‘hypes’ and ‘hopes’ as a means to initiate movement, position themselves and others, build alliances and marginalise competing fields – this is how networks and industry structures emerge.” (Brown et al., 2003, p. 5)

Thus, within the sociology of expectations, expectations are not simply seen as descriptions of future realities, but also as performative elements and strategic resources. A third way to conceptualise technological expectations is as promises of future commitments made by the actors who enunciate or endorse them. This conceptualisation was originally proposed by Van Lente, and is detailed in the next section

1.3 Expectations as promises on commitments: Van Lente

Van Lente analytically subdivides actors into “technologists” and the “rest of society”. Technologists would be the actors who are “mandated” by the rest of society to bring about technical progress on behalf of the whole society (Van

Lente, 1993, p. 156). Their mandate would descend from a belief⁴ in “technical progress” that is shared by the whole society; a belief which would characterise Western society in particular (Van Lente, 2000, pp. 43-44).

“... technical progress ... contains an element of ongoing evolution, an unfolding logic that is captured in the notion of ‘next generation’. The notion is part of the rhetoric of a progress that should not be stopped.”
(Van Lente, 1993, p. 153)

Technologists would then be called on by the rest of society “not only to maintain existing technological systems”, but also and foremost to design new technological systems (Van Lente, 1993, p. 157; 2000, p. 50).

Van Lente refers to this subdivision between technologists and the rest of society as “a question of social dynamics, a question of the division of labour at the societal level”, which is beyond the scope of his analysis (Van Lente, 1993, p. 153; 2000, p. 50). Van Lente only claims that this subdivision of labour has the character of a “mandate” and results from a shared belief in technical progress (Van Lente, 1993, p. 153; 2000, p. 50). In this subdivision of labour, technological promises are an “inherent part of technology”. Technologists are in charge of producing inventions, which by definition do not exist in the present. Thus, technologists have to rely not only on their “certainty of invention, but also on the promise of invention” (Van Lente, 1993, p. 158; 2000, p. 52). As Van Lente states:

“The technologist is certain that he will make discoveries. He or she lives on the (modern) certainty that inventions will be done, that is, on the certainty that there will be something like technological progress. This is not just a personal conviction: the technologist can live this way because

⁴ Van Lente contends that, instead of conceptualising the promise of technology, as a belief in progress, a better notion is the “ideograph”. According to Van Lente, “taking the generic promise as a belief fails to make clear how it actually works in the dynamics of concrete developments” (Van Lente, 1993, p. 168). However, this is not a relevant concept for the other concepts I am interested in and that I want to discuss in these sections. Van Lente discusses the notion of ideograph in his PhD thesis (Van Lente, 1993, p. 149; see also Van Lente, 2000, pp. 44-50).

society expects this from him, and lends him the space to work at inventions.” (Van Lente, 1993, p. 157; 2000, p. 51)

In other words, “the ‘raison d’être’ of technologists is the technological promise” (Van Lente, 1993, p. 158; 2000, p. 52). As a consequence, technologists inevitably depend on “audiences that have to be receptive to their promises” (Van Lente, 1993, p. 158; 2000, p. 52).

Technologists seek and obtain a renewal of their mandate through technological promises. “Generic and specific technological promises are the currency in which the transactions in this social contract are concluded”. They are “defined by this implicit social contract, and their identity and self-image are related to it”. Through a mandate technologists can obtain “a space, a mandated territory, within which they count as experts”. In these spaces, “they are the ones who are allowed to speak first, they can in the first instance determine what is to happen” (Van Lente, 1993, p. 159; 2000, p. 53). Such “spaces” are a “macro analogy of a 'niche' within a firm that protects search processes ... Here again, the 'niche' or 'space' is actively sought, created and maintained through actor-strategies” (Van Lente, 1993, p. 168). Arguably, such “protected spaces ... may be created and maintained thorough expectations” (Van Lente, 1993, p. 196).

However, the “boundaries and the nature of a mandate are always debatable” (Van Lente, 1993, p. 159; 2000, p. 54). As Van Lente and Rip argue, especially when the boundaries of such a mandate are threatened, actors identified as “spokespersons” who “speak *for* a technology” as a field (Van Lente & Rip, 1998b, p. 231) would come to the fore and speak in the name of the mandated territory (Van Lente, 1993, p. 160; 2000, p. 54). “They are not spokespersons in the sense that they *represent* an organisation, but are more like those who on their own initiative speak for an economic sector or an academic discipline” (Van Lente & Rip, 1998b, p. 231). Acting as “promise champions”, they promote the promise that represents their own technological field, rather than speaking directly in favour of their own interests, and are aware that “[their] fate is connected to the fate of that promise” (Van Lente & Rip, 1998b, pp. 231-232). Spokespersons or promise champions “need not be individuals ... a plethora of

collective actors has emerged to carry and protect new developments ... such collective actors are heterogeneous – combining, explicitly or implicitly, science, industry, government, and sometimes also social organizations” (Van Lente & Rip, 1998b, p. 232). They might be actors in universities, industries, and even “within the government, which becomes more and more involved in technological developments” (Van Lente, 1993, p. 160).

To maintain a mandate from the rest of society, technologists and their spokespersons are required “to take care of the territory” and “to guard over ‘technological progress’”. If these activities are neglected, “they can be confronted with this and called to account.” In the event of technological promises “in danger of not being pursued sufficiently”, technologists would then risk being “blamed” for it (Van Lente, 1993, p. 160; 2000, p. 54). As Van Lente states:

“The interaction of technologists with their surroundings is regulated in terms of the general promise of technological progress. Their work, their opportunities and their obligations can be described as a mandate since they are relatively free to pursue their activities, but they must also be able to indicate that they do not neglect technological progress. If a promising technology becomes salient, they cannot really permit themselves to ignore it.” (Van Lente, 2000, p. 60)

Thus, as soon as a technological promise becomes shared, the rest of society requires technologists to fulfil it, but are also required to support these latter in their effort. Once that promise is fulfilled, the rest of society will continue demanding technologists to renew their technological promise as a condition for its continued support. Technologists would be then required to constantly formulate and spread promises about new technologies in order to justify their existence. The implications of the belief in technological progress and of the mandate for technologists would be threefold:

“First, when specific technologies take part in the generic promise of technology, they tend to become *self-justifying*, i.e. their legitimation will

get tautological. The legitimation, then, is: we need the new technology because it will be the future technology. Second, due to their mandate, technologists may interpret the development of a specific technology as a *necessity*: for themselves to work on, and for other[s] to support them. Third, the actual development of specific technologies will follow a *pattern* that can be characterized as a transition from promise to requirement.” (Van Lente, 1993, p. 161)

This pattern creates an “unstoppable train”, a continuous motion towards technical progress, allowing one to think of technological development as driven by a “self-fulfilling prophecy” (Van Lente, 1993, p. 165; Van Lente & Rip, 1998a, p. 215; Van Lente, 2000, pp. 57-59). As Van Lente and Rip state:

“Technological promises function as a yardstick for the present and as a signpost for the future. The implication for the dynamics of concrete developments is that what starts as an ‘option’ can be labelled a technical ‘promise’, and may subsequently function as a ‘requirement’ to be achieved, and a ‘necessity’ for technologists to work on, and for others to support.” (Van Lente, 1993, p. 167; Van Lente & Rip, 1998a, p. 216; Van Lente, 2000, p. 60)

Van Lente thinks that this phenomenon of promises being converted into requirements is general and ubiquitous in technological development (Van Lente, 1993, p. 194).

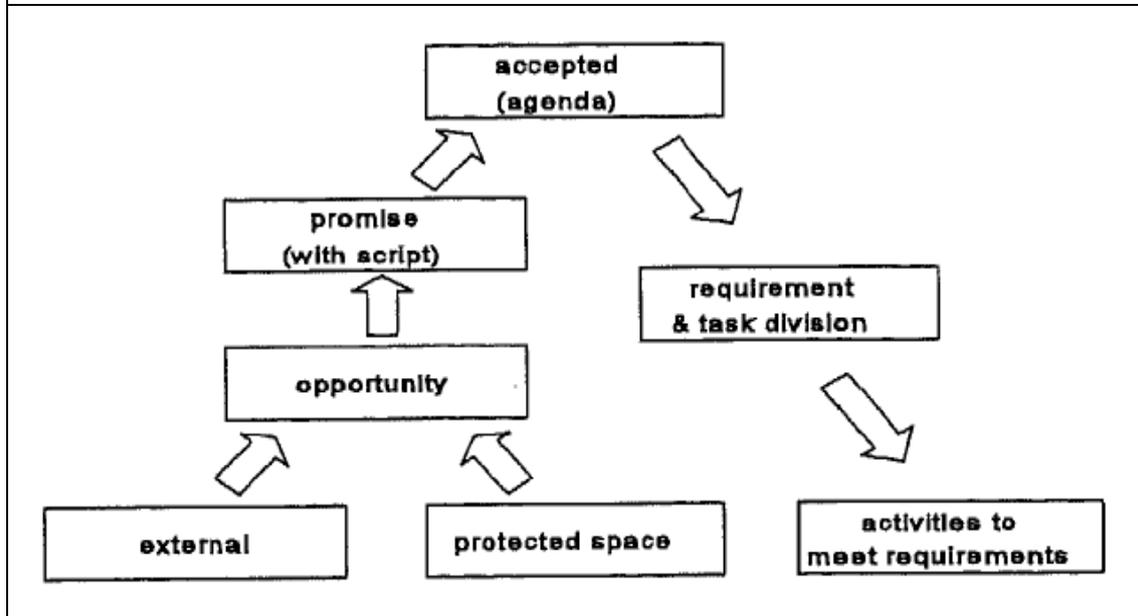
1.3.1 Promise-requirement cycles

Promise-requirement cycles imply that technological expectations “get accepted and become part of an agenda”. Presented as promises and generated within or even without a protected space, these technological expectations/promises are subsequently converted into requirements for the actors involved. At the same time, a protected space is created or maintained, forming a background for the conversion of other promises to requirements. Subsequent promise-requirement cycles would then be superimposed upon each other, forming

spirals (Van Lente & Rip, 1998a, p. 223). Figure 1 presents a scheme describing the dynamics of the conversion of promises to requirements.

Figure 1: conversion of promises to requirements

(Source: Van Lente & Rip, 1998a, p. 223)



The conversion option-promise-requirement-necessity should not “suggest inevitability ... [because] many promises remain just that, or remain unheard” (Van Lente & Rip, 1998a, p. 222). One necessary condition for a promise to be converted into a requirement is its inclusion in what Van Lente and Rip call an “agenda” and the “presence (creation, or emergence) of a protected space” for technologists, which “is linked and adjusted to the agenda-building process” (Van Lente & Rip, 1998a, p. 222). “Protected spaces ... may be created and maintained through expectations” (Van Lente, 1993, p. 196; Van Lente & Rip, 1998a, p. 223). Within such protected spaces, “subsequent promises are accepted more easily” and give rise to spirals of promise-requirement cycles (Van Lente & Rip, 1998a, p. 223). Thus, a key element is the inclusion of the promise in the agenda and the presence of dedicated protected spaces (Van Lente, 1993, p. 195) that are collective entities.

Not being an “autonomous and deterministic socio-technical process”, this conversion would then depend on the actions and interactions of “technologists, firms, and governments”. More specifically, such a conversion would be “a

consequence of actors assessing what is 'feasible', what is 'obsolete', and what is 'necessary', and of the efforts that follow these assessments" (Van Lente, 1993, p. 167; Van Lente & Rip, 1998a, p. 216; Van Lente, 2000, p. 60). Thus, a promise-requirement cycle would ultimately depend on the promise being endorsed and becoming shared.

In principle, this conversion may even be reversed and undone, but at "increasing costs and work" (Van Lente, 1993, p. 167; Van Lente & Rip, 1998a, p. 216; Van Lente, 2000, p. 60). As activities become "interlocked", the "pressure to recoup such investments" increases, and "the more is invested", the more likely there will be "increasing resistance" to a cycle reversal or undoing (Van Lente, 1993, p. 167; Van Lente & Rip, 1998a, p. 217; Van Lente, 2000, p. 60).

Technological expectations describe a future scenario where specific actors are expected to play determinate roles⁵ (Van Lente, 1993, p. 191; 2006, pp. 216-217; Van Merkerk & Van Lente, 2008, pp. 643-644). These "may be explicit (the statement includes a list of roles) or implicit (the statement assumes a list of roles)" (Van Lente, 1993, p. 191). In this regard, Van Lente maintains that:

"... an option or new possibility [that] is presented as a promising new route ... becomes accepted as such, thereby invoking new interactions, leading to new task divisions and specifications to be met. This, in short, is the conversion of a promise to requirement." (Van Lente, 1993, p. 193)

Through promise-requirement cycles, a technological expectation or promise may then become a required action – e.g. a technical specification to be fulfilled and/or political support or a protected space to be provided (Van Lente, 1993, p. 167; Van Lente & Rip, 1998a, p. 216). As Van Lente and Rip point out:

⁵ Van Lente suggests conceptualising these roles as "scripts", borrowing the concept from semiotic analysis. However, this is not relevant for the other concepts I am interested in and that I want to discuss in these sections. Van Lente discusses the use of this concept in his PhD thesis (Van Lente, 1993, pp. 190-192).

“Once technology promises are shared, they demand actions, and appear as a necessity for technologists to develop, and for others to support them. At the same time, the options which are considered feasible and promising are translated into requirements, guidelines and specifications.” (Van Lente, 1993, p. 165; Van Lente & Rip, 1998a, p. 216; Van Lente, 2000, p. 58)

Thus, when enunciating expectations or endorsing expectations enunciated by others, it is as if the actors are promising to fulfil the role allocated to them in those future scenarios. In this way, technological expectations can be seen as promises of future commitments by their proponents and by other actors who assess and endorse them. As seen above, when these promises become shared, they also turn into specific requirements for the actors involved (Van Lente, 1993, p. 167). At the very general level of society, those roles would imply “technologists” promising and fulfilling expectations of technologies, and “governments” and “others” supporting and monitoring the work of the former.

Enunciating or endorsing expectations is then equivalent to promising to fulfil the specific roles that these expectations imply “for the self, others and artefacts” (Van Lente, 1993, p. 195). When these promises have become shared and endorsed, the actors involved are then obliged to fulfil them. As Van Lente and Rip state:

“Behind the promise-requirement cycles lies the dynamic of expectations: as soon as expectations are shared they assume a life of their own. The basic point is that when expectations are shared they create a pattern into which the actors themselves may be locked.” (Van Lente & Rip, 1998a, p. 217)

Sociologists of expectations maintain that enunciating or endorsing technological expectations does not automatically generate accountability. However, it does prompt responses and generate the expectation that the actors involved with those expectations should provide further justifications (Borup et al., 2006, p. 289). A risk faced by proponents or endorsers of

technological expectations is then an excessive mismatch between past promises and actual developments. Such mismatches may entail dire consequences for the reputations of both single individuals and entire fields of innovation (Brown, 2003, p. 6; Brown et al., 2003, p. 9). As failed promises then, “expectations and the frequent disappointments to which they lead are accompanied by serious costs in terms of reputations, misallocated resources and investment” (Borup et al., 2006, p. 289).

Expectations are inherently dynamic, changing shape over time and across the actors holding them. The following section highlights the main findings of previous analyses on the temporal and spatial dynamics of expectations.

2. Dynamics of expectations: temporal and spatial

Within the sociology of expectations, a number of analyses have attempted to shed light on how and why expectations change over time and across space, as briefly summarised in the following.

2.1 Temporal dynamics of expectations

Expectations tend to follow “alternating cycles of hype and disappointments” over time (Borup et al., 2006, p. 290). Surges of hype followed by disappointment appear to be a normal dynamic in the way expectations operate in science and technology development (Brown et al., 2003, p. 1; Borup et al., 2006, p. 290). After a hype surge, expectations may undergo minor adjustments or complete switches from positive to negative; depending on the seriousness of the following disappointment. Disappointments may be then classified in relation to their severity and the consequential effects on the innovation process – e.g. “disillusionment”, when the innovation process continues; “disenchantment”, when public support decreases; “disappointment”, when innovation activities slow down; and “total disappointment”, when innovation activities are strongly reduced or abandoned (Ruef & Markard, 2010, pp. 333-335). These dynamics are more pronounced in the early stages of technological development. Emerging technologies are characterised by high uncertainty and

unstable environment. At these early stages, roles among actors lack formal agreements, and quality controls and regulations on expectations are likely to be poorly defined. The high uncertainty of these moments may result in the release of visions that are likely to differ from future reality (Borup et al., 2006, p. 289; Bakker et al., 2011, pp. 153-154). Another possible reason explaining why initial expectations are often too optimistic relates to their use as strategic resources. Hype may not be the result of forecasters' ignorance, but of the use of expectations as resources to catch attention (Geels & Smit, 2000, pp. 881-882). Especially in the early stages of technology development, expectations are determinants to raise support and recruit stakeholders (Borup et al., 2006, p. 289; Bakker, 2010, p. 6540; Bakker et al., 2011, p. 159; Bakker et al., 2012a, p. 423; Konrad et al., 2012, p. 1096). This may prompt the actors involved in technology development to voluntarily create early surges of hype to catch attention and mobilise interest. This phenomenon can be conceptualised as a multiplayer prisoner dilemma where actors compete to get a hearing (Bakker, 2011, p. 166; Bakker & Budde, 2012, pp. 557-558). The gains resulting from actors choosing to be "modest" – i.e. choosing not to voluntarily distort their statements towards optimism – would be perceived only at the collective level, only in the long term, and only if all other actors have also remained modest in the meantime. Such collective modesty and honesty would limit the ex-post misallocations of resources and damage to reputations following the disappointments caused by overoptimistic claims. However, if all other actors behave modestly and honestly, there is a strong incentive for any single actor to cheat and voluntarily hype statements. By hyping statements, any single actor can attract more attention than competitors who have instead behaved modestly and honestly, at least in the short term. If it is assumed that all actors are selfish, opportunistic, short-term minded, and do not trust each other, any single actor would then prefer to hype statements even when taking into account the superior gains at the collective level that would follow more modest and honest behaviour. Since hyping statements would provide gains only to the actor who hypes first, all actors have an incentive to be the first to hype and to outpace competitors in doing it. In other words, the short-term, individual gains in betraying the long-term, collective welfare would induce all actors to hype statements. Therefore, the observed frequent mismatch between early

expectations and real outcomes may be the result not only of genuine and involuntary over-optimism, but also of voluntarily created hype.

2.2 Spatial dynamics of expectations

Expectations tend to vary across the different social groups involved in technological development. Different actors “attach different levels of trust to expectations” (Borup et al., 2006, p. 292). A general correlation seems to exist between higher confidence in expectations and detachment from the research activity in the relevant field. The less influence a social group of actors feel they have on the realisation of expectations and the more distant they are from the uncertainties experienced in research, the higher their tendency to place high authority and confidence in expectations (Brown & Michael, 2003, p. 13; Brown et al., 2003, p. 6; Borup et al., 2006, p. 292). Furthermore, within the same social group of actors, individuals might show different levels of confidence in expectations, depending on the specific audiences addressed. For instance, it has been observed that researchers, when discussing with their colleagues, tend to express more contradictory expectations of the future of technologies. Whereas, when “wearing a public entrepreneurial hat” they show more confidence in the promises of their own research field (Brown & Michael, 2003, p. 13; Brown et al., 2003, p. 6; Borup et al., 2006, p. 292). As another example, it has been observed that staff members within R&D programmes may act as technology “selectors” towards technology innovators and then “emphatically act as technology enactors [or promoters] toward their leadership”, aiming primarily to ensure their job security (Bakker et al., 2012b, p. 1069). Different social groups of actors also differ in their sensitivity to disappointments following the failure of expectations. For instance, research communities may appear more cautious when dealing with emerging expectations and, at the same time, less concerned about possible disappointments following their failed realisations than the more competitive and exposed business communities (Borup et al., 2006, p. 294). For these latter, at stake are their “position in the relevant agendas of research institutes, laboratories of firms and government schemes” in the short term, and their “market share” in the long term (Van Lente & Bakker, 2010, p. 707). As another example, industrial actors have been observed

reacting more quickly to disappointments than research institutes. Within this context, hype-disappointment cycles appear to affect more actors “with a high sensitivity to external legitimacy (e.g. listed on a stock-exchange), research organizations with little base funding or actors with a weak strategic embedding of the new technology” (Konrad et al., 2012, p. 1096). Nevertheless, “in the context of large governmental programs and initiatives, while both public and private sectors have an obligation to justify decisions and investments, this is far more pressing for public sector legitimacy” (Borup et al., 2006, p. 295). In all cases, the “interpretative flexibility and the social patterning of expectations across communities often arises from asymmetries in access to the information on which expectations are based” (Brown & Michael, 2003, p. 13; Borup et al., 2006, p. 292).

3. Situating the UK Government’s current vision on biofuel policy

The above insights into the temporal and spatial dynamics of expectations lead one to think that any investigation of the endorsement of a specific vision should inevitably take into account the dynamics of the expectations forming it. In the words of Brown, such an investigation would need to look at the “situatedness” of expectations (Brown, 2003, p. 10; Brown & Michael, 2003). Brown suggests looking at the actual contexts and conditions in which expectations are embedded – or the temporal and spatial situatedness of expectations – as a way to shed light on their disparities and volatilities (Brown, 2003, p. 10; Brown & Michael, 2003).

Following Brown’s suggestion, in my research, I apply a “situated” approach to analyse the temporal evolution and spatial differences of the UK Government’s vision on biofuel policy. To investigate the temporal evolution, I narrow the focus to a number of public authorities and their contributions to the UK biofuel policy debate since its origins in the sustainable transport debate. To investigate the spatial differences, I identify and compare “who said what” about how to envision UK biofuel policy in a public consultation proposing changes to that policy. This consultation was launched around the time when the UK

Government adopted its current vision on UK biofuel policy (a detailed account of this analysis will be given in Chapter 2).

3.1 Policy-promises and actors other than technology innovators

One of the key empirical contributions of my research is to provide an explanation of how the UK Government's responsibilities towards technology policies have affected the construction of its current vision on biofuel policy. To emphasise how those responsibilities have been related to that vision, I analytically distinguish "technological promises" from "policy-promises" – i.e. the promises that public authorities make regarding their future policy commitments, such as in the provision of political and financial support to a specific industry. Sociologists of expectations may criticise this distinction as deceptive, especially in relation to what I call "policy-promises of support". These in particular may be objected to as simple conversions of technological promises into requirements for public authorities – or for "governments" and "others" in Van Lente's terms. My contention is that public authorities often promise support for the future, but do not always deliver it. Thus, while the "actual delivery of support" may be interpreted as the "requirement that public authorities are called to execute in relation to the technology promises that they have endorsed from technology innovators", their promises of future support remain nothing more than promises yet to be fulfilled. That said, "policy-promise" is meant to be a general and practical term including all types of promises, not only those of support. As I defined them, policy-promises are objects of enquiry overlooked in the sociology of expectations, presumably because of the focus of this latter on the technology promises of technology innovators – i.e. the actors most closely related to technological development, such as technology scientists or industrialists or "innovations players" whose hopes and efforts are invested in the success of new technologies" (Pollock & Williams, 2010, p. 2).

My research fills this gap by shedding light on how executive public authorities endorse official visions in relation to their previous policy-promises to technology innovators. Another key theoretical contribution of my research is an

expansion of the focus of the sociology of expectations to types of actor other than technology innovators. Beyond industrial actors in biofuel and other industrial areas, my analysis investigates the UK Government in particular, as well as other public authorities, industry associations, consultancies, and non-governmental organisations. My research adopts a distinctive analytical perspective with respect to that of the sociology of expectations. In analysing the types of actor above, the focus narrows down onto their functional roles and interrelations in diffusing expectations among different parties. Therefore, in addition to analysing the content and dynamics of their expectations, my research investigates how and on behalf of whom these actors mediate expectations. This investigation provides the basis for a reflection on how these functional roles may be conceptualised through the lens of the sociology of expectations. In later chapters, I will comment in detail and relate my work to two analyses which have looked at the UK Government in particular (Eames et al., 2006, pp. 367-368; Beynon-Jones & Brown, 2011, p. 647), and an analysis which theorised “promissory organisations” as specialised intermediaries of expectations (Pollock & Williams, 2010, p. 2).

In my research, I deploy the sociology of expectations to investigate expectations belonging to different levels – e.g. technical performances of biofuel technologies, potential impacts of policies related to those technologies, and even exogenous phenomena somewhat related to the biofuel technological system. In the analysis, I classify expectations according to the three nested levels of the MLP on socio-technical transitions – i.e. niche, regime, and landscape. This integrated framework is well suited to interpreting the different visions proposed by the actors participating in the debate on UK biofuel policy.

4. Classifying expectations: the multi-level perspective

The integration of the sociology of expectations with the MLP has previously been proposed and successfully applied to investigate cases encompassing expectations belonging to different levels (Truffer et al., 2008, p. 1363; Budde et al., 2012, p. 1074). Furthermore, the applicability of the sociology of

expectations to the analysis of expectations of biofuel technologies has been considered before – e.g. Alkemade and Suurs studied expectation patterns in biofuels and other road transport renewable technologies in the Netherlands, drawing on the sociology of expectations among other theoretical frameworks (Alkemade & Suurs, 2012, pp. 449-450). Finally, the MLP has been successfully applied to the analysis of cases of socio-technical transitions between different technologies, including cases of biofuels – e.g. Hillman and Sanden used the MLP, in combination with other theoretical frameworks, to predict how current policy choices could determine the development of alternative transport fuels, among them biofuels, in Sweden to 2020 (Hillman & Sandén, 2008, p. 1281). These precedents strengthen my belief that an integrated framework, combining the sociology of expectations and a classification of expectations based on the MLP, is suitable for this case study on an expected socio-technical transition between different generations of biofuels.

4.1 Expectations and the multi-level perspective on socio-technical transitions

According to the MLP on socio-technical transitions:

“The stability of established sociotechnical configurations results from the linkages between heterogeneous elements. The elements and the linkages are the result of activities of social groups which (re)produce them.” (Geels, 2002, p. 1259)

For instance, within the road transport system as a socio-technical configuration:

“Road infrastructures and car regulations ... are built and maintained by transportation ministries. Cultural and symbolic meanings of cars are produced in the interaction between users, media and societal groups. User practices and mobility patterns emerge from the daily use of cars by user groups. Industry structures are the outcome of mutual positioning and strategies of car manufacturers and their suppliers. The

technological knowledge embodied in cars is created by car designers and engineers, while cars as artefacts are produced by car manufacturing firms. The activities of these different groups are aligned to each other and co-ordinated.” (Geels, 2002, p. 1259)

To shed light on the dynamics behind this coordination of activities, the MLP theorises hierarchical relations among three nested socio-technical levels – in ascending order: *niche*, *regime*, and *landscape* (Geels, 2002, p. 1261). These levels are “not ontological descriptions of reality, but analytical and heuristic concepts to understand the complex dynamics of sociotechnical change” (Geels, 2002, p. 1259).

Niches constitute the “micro” level and account “for the generation and development of radical innovations” (Geels, 2002, p. 1260; Geels & Kemp, 2007, p. 443). Emerging innovations are initially unstable socio-technical configurations usually characterised by lower performances than established technologies. Serving as “incubation rooms”, niches protect emerging technologies “from ‘normal’ market selection in the regime” (Geels, 2002, p. 1261). These protected spaces are carried and developed by small networks of dedicated actors who are usually outsiders and marginal to the larger networks behind regime technologies.

Socio-technical regimes constitute the “meso” level and account for the “stability of existing technological development and the occurrence of trajectories” (Geels, 2002, p. 1261). Socio-technical regimes derive from the notion of “technological regimes” (Geels, 2002, p. 1259; 2004, p. 910; 2007, p. 642; Geels & Kemp, 2007, p. 443; Geels & Schot, 2007, p. 400). In technological regimes, the development of technologies follow specific “technological trajectories” due to shared cognitive routines in the engineering communities behind the technologies (Geels, 2004, p. 910; Geels & Schot, 2007, p. 400). The notion of socio-technical regime expands the notion of technological regime by including scientists, policymakers, users, and special interest groups as relevant players in shaping the patterning of technological development (Geels, 2002, p. 1260; Geels & Kemp, 2007, p. 443; Geels & Schot, 2007, p. 400). A

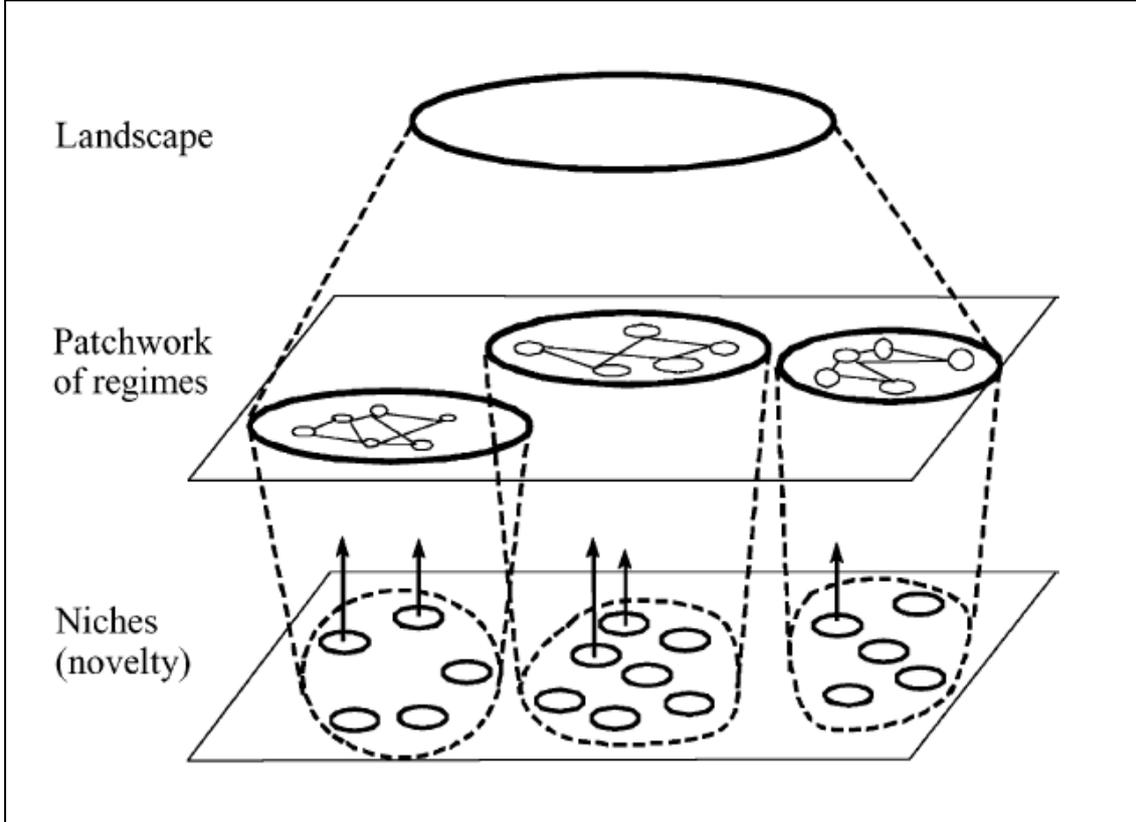
socio-technical regime would result from the stabilisation of activities and the alignment of interests of that broader community of social groups into a specific technological trajectory (Geels, 2002, pp. 1259-1263; 2004, pp. 910-915; Geels & Schot, 2007, pp. 400-401). Regimes stabilise technological trajectories in many ways. For instance, by establishing cognitive routines that constrain the imagination of researchers and engineers, by enforcing regulation and standards, by adapting lifestyles to technological systems, and by locking into specific technological developments, investments in resources, and expertise (Geels, 2002, pp. 1259-1263; 2004, pp. 910-915; Geels & Schot, 2007, pp. 400-401).

Socio-technical landscapes constitute the “macro” level and consist of “slow changing external factors, providing gradients for the trajectories” (Geels, 2002, pp. 1259-1263; 2004, pp. 910-915; Geels & Schot, 2007, pp. 400-401) – i.e. macro-economic dynamics, cultural patterns, macro-political developments, and in general everything that forms “an external structure or context for interactions of actors” (Geels, 2002, p. 1260). This “exogenous environment” is “beyond the direct influence of niche and regime actors” (Geels & Kemp, 2007, p. 443; Geels & Schot, 2007, p. 400).

Within this nested hierarchy (see Figure 2), a regime can provide space for niches to develop. Niches may eventually stabilise, thus changing the previous regime, or evolve into a new regime, replacing the old one. The landscape denotes aspects of the wider context, lying beyond the direct influence of actors at the niche and regime levels (Geels, 2002, pp. 1259-1263; 2004, pp. 910-915; 2007, pp. 643-646; Geels & Kemp, 2007, pp. 443-444; Geels & Schot, 2007, pp. 400-401).

Figure 2: multiple levels as a nested hierarchy

(Source: Geels, 2002, p. 1261)



Within the MLP, “shared belief systems and expectations, which orient perceptions of the future and hence steer actions in the present”, are acknowledged as “important cognitive rules” for the stabilisation of socio-technical systems (Geels, 2004, p. 910). Nevertheless, as Budde, Alkemade, and Weber have pointed out: “While studies using the MLP investigate the role of expectations these studies did not use the MLP as such to structure and classify the expectations” (Budde et al., 2012, p. 1075).

The integration of the sociology of expectations with the MLP “builds on the assumption that there are not only activities and institutions, but also expectations and visions about future activities and institutions related to these levels” (Budde et al., 2012, p. 1075). Accordingly, the MLP can also be applied “as a framework to analyze expectations in addition to ‘real world’ developments and activities” (Budde et al., 2012, p. 1075). Within this integrated framework, the MLP levels – i.e. niche, regime, landscape –all encompass expectations for

future developments in interdependent ways. Expectations belonging to the niche level are those closely referring to the community of researchers and engineers constituting the niche, and to their work. Niche expectations are likely to be rather specific and to be of a highly technical nature. Expectations belonging to the socio-technical regime level refer to the interrelations between specific technological developments and the network of social groups forming their socio-technical regimes. Regime expectations are likely to be more general and to be of a more socio-economic nature. Expectations belonging to the socio-technical landscape level refer to long-term deep structural trends with broad socio-economic implications. Landscape expectations are likely to be very general and refer to broad environmental and socio-economic contexts.

As Budde, Alkemade, and Weber observed in their study on hydrogen fuel cell vehicles: “different types of actors relate their strategies to different kind of expectations”, industrial actors being more focused on regime expectations and policy actors more concerned with landscape expectations (Budde et al., 2012, p. 1081). My analyses confirm this observation: in the UK biofuel policy debate, UK public authorities and industrial stakeholders mostly referred to expectations pertaining to the landscape and regime levels.

5. A final comment on agency

Before proceeding with the analysis, it is important to discuss how this dissertation views statements of expectations in relation to the debate on agency and structure in technological development. Agency-centred views tend to emphasise the social construction of technology and overlook how material and social structures enable or constrain actions. Conversely, structure-centred views tend to emphasise technological determinism and neglect how human and nonhuman agencies combine and affect technological development. Defining the boundaries of agency and structure in technological development always entails a risk of overestimating or underestimating one or the other (Smith, M. R. & Marx, 1994, pp. iv-xiv; Garud & Karnoe, 2001, pp. 1-12; Klein, H. K. & Kleinman, 2002, pp. 28-31; Bijker et al., 2012, pp. xix-xxi).

In the narrower focus of this dissertation, the discussion revolves around how strategic, individual statements of expectations shape performative, collective expectations and vice versa. When widely shared, expectations may become performative and, therefore, influence actors in their beliefs and use of statements – as “structures to be realised”, shared expectations “do not exist yet, but nevertheless exert force” (Van Lente & Rip, 1998a, p. 225). Yet, widely shared expectations depend on actors who continuously contribute to their formation by diffusing statements of expectations. Therefore, one may wonder how much actors are influenced by performative expectations – as *prospective structures* – when releasing their statements of expectations (Van Lente, 1993, pp. 185, 190; Van Lente & Rip, 1998a, p. 225).

My research is based upon the acknowledgement that actors diffusing expectations and expectations as prospective structures are indissolubly interconnected – or, in a similar vein to Giddens on social systems: “The constitution of agents and structures are not two independently given sets of phenomena, a dualism, but represent a duality ... [i.e.] the structural properties of social systems are both medium and outcome of the practices they recursively organize” (Giddens, 1986, p. 25). Within this dissertation, an actor’s release of statements of expectations is never considered a “one-way process”, but rather always dependent on a “process of continuous exchange of expectations”, where “individual or collective actors influence collective expectations, [and] ... are themselves subject to the influence of collective expectations” (Konrad, 2006, p. 432). In other words, when analysing statements of expectations, I always assumed the existence of that dual relationship – i.e. sources were influenced by and, at the same time, potentially contributed to, the formation of collective expectations when releasing their statements.

Chapter 2 – Methods and evidence

Introduction

My research started from the same “compelling feature[s]” from which “all case study research starts” – i.e. a “desire” to produce an invaluable and deep investigation leading to an “insightful appreciation of the ‘case(s)’”, and a belief “that examining the context and other complex conditions related to the case(s) being studied are integral to understanding the case(s)” (Yin, 2003, p. 4). This chapter explains how I designed my research from this initial desire and belief.

This chapter consists of four main sections. Section 1 introduces the case study method. Section 2 discusses limits and merits of this method in general and in relation to my research. Section 3 explains my choice to focus on document analyses. Section 4 illustrates in detail the research design and explains how evidence has been presented in the empirical chapters.

1. Research method: my choice to rely on the case study method

The case study method can be and has been applied to interrogate a wide range of very diverse topics – e.g. decisions, individuals, organisations, institutions, programs, processes, events, and even phenomena (Stake, 1995, pp. 1-2; Hancock & Algozzine, 2006, p. 15; Swanborn, 2010, p. 5; Yin, 2013, p. 17). Despite the established, widespread usage of this research method, the term “case study” remains a “definitional morass” (Gerring, 2004, pp. 341-342; 2006, p. 17). Definitions in the literature differ in their breadth and/or in the importance given to specific defining features (Fidel, 1984, pp. 1-2; Gillham, 2000, p. 1; Yin, 2003, p. 4; Gerring, 2004, pp. 341-342; Hartley, 2004, p. 26; Gerring, 2006, pp. 17-26; Hancock & Algozzine, 2006, pp. 15-16; Swanborn,

2010, p. 13; Woodside, 2010, pp. 1-2; Yin, 2013, pp. 17-19). There is even disagreement on whether to consider the case study a method or a “research strategy” (Hartley, 2004, p. 323).

Nevertheless, there seems to be agreement on at least two, minimal defining features – i.e. a case study is (1) an in-depth, empirical inquiry into one or a few cases; (2) in which contextual conditions are crucial to understanding what is being studied.⁶ In case studies, what is being studied is “not isolated from its context ... but is of interest precisely because the aim is to understand how behaviour and/or processes are influenced by, and influence context” (Hartley, 2004, p. 323). Accordingly, the case study method is appropriate whenever the boundaries between what is being studied and its contextual conditions are not clear (Yin, 2003, p. 4; 2013, p. 11), and/or when several factors and relationships are involved, but there are no basic laws to predetermine which of these are relevant for the analysis (Fidel, 1984, p. 273; Swanborn, 2010, p. 15).

Versatile and flexible, the case study method may serve different research purposes and interests. The primary research purpose of a case study may be as diverse as *explorative* (i.e. when the aim is to explore and find directions for further inquiry), *descriptive* (i.e. when the aim is to describe what is being studied, especially in relation to the relevant context), and/or *explanatory* (i.e. when the aim is to draw causal relationships and theoretical conclusions) (Yin, 2003, pp. 5-6; 2013, pp. 7-8). Guiding a case study may be either *intrinsic* or *instrumental* interests (Stake, 1995, pp. 3-4, 77). An intrinsic interest refers to the situation in which a researcher’s main interest is gaining a better understanding of what is being studied, rather than generalising findings and/or refining theories. In other words, a researcher simply has a genuine interest in a specific case, not necessarily linked to the possibility of generalising findings to other cases and/or refining a theory. An instrumental interest refers to the situation in which a researcher’s main interest is in generalising findings and/or refining theories, rather than understanding in-depth and in particular what is

⁶ These two features in particular help distinguish case studies from other research methods, such as experiments, where what is studied is deliberately divorced from the context and surveys, with their limited ability to deal with the context (Yin, 2013, p. 18).

being studied. In other words, when a researcher selects a case for the possibility of generalising findings to other cases and/or to refine theories, and the interest in the case is secondary (Stake, 1995, pp. 3-4, 77).

A main determinant in designing case study research is thus “the degree to which the aim of the case study is to analyse particular, unique circumstances or to focus on generalization” (Hartley, 2004, p. 326). Depending on that degree, the research may be designed either as a *single* case study or *multiple*⁷ case study⁸ (Yin, 2003, pp. 7-9; 2013, p. 19). Multiple-case designs are generally believed to produce more “compelling” evidence, “powerful” conclusions, and consequently are considered to be more “robust” than single-case designs⁹ (Yin, 2013, pp. 53, 61). That said, “the single-case design is eminently justifiable under certain conditions – where the case represents (a) a critical test of existing theory, (b) a rare or unique circumstance, or (c) a representative or typical case, or where the case serves a (d) revelatory or (e) longitudinal purpose” (Yin, 2013, p. 52). Last but not least, the choice of how many cases to focus on is also, inevitably affected by time and resource constraints (George & Bennett, 2005, p. 31; Yin, 2013, pp. 53, 60).

My research stems from my initial, “intrinsic” interest in understanding how the UK Government came to endorse a specific set of expectations over others to justify its biofuel policy. Rather than finding and extending broad generalisations to other cases, the research interest is in deriving contingent and context-specific generalisations to help explain a single, specific case – i.e. the UK Government’s endorsement of a specific vision. In such a case, “The detailed

⁷ Multiple case studies are also identified as *collective* (Stake, 1995, p. 4)

⁸ Either design may also be defined as *holistic* or *embedded* depending on whether the study investigates cases (single or each of the multiple) as whole units of analysis or rather pays attention also to subunits (Yin, 2013, pp. 50-52, 59-60). The analysis of subunits can be helpful to expand and deepen the investigation, and so produce insights that apply to the whole unit of analysis – i.e. the single or each of the multiple cases (Yin, 2013, pp. 50-52, 59-60).

⁹ As in multiple experiments, the underlining logic of multiple case studies is *replication*, either *literal* (i.e. selecting cases so that they predict similar results) or *theoretical* (i.e. selecting cases so that they predict contrasting results but for anticipatable reasons) (Yin, 2013, p. 54). The *replication* logic differs from the *sampling* logic, which requires statistical procedures to select large samples and aims at statistically inferring – i.e. generalising results – from samples to entire populations or universes (Yin, 2013, pp. 55-56). Therefore, multiple case studies do not produce generalisable results in statistical terms. Nevertheless, because of their underlying replication logic, multiple case studies are generally considered more robust than single case studies.

knowledge of the organization and especially the knowledge about the *processes* underlying the behaviour and its *context* can help to specify the conditions under which the behaviour can be expected to occur” (Hartley, 2004, p. 331). In my case study, moreover, the boundaries between what is being studied and contextual conditions are all but clear, while no obvious and unequivocal ways seem to exist to predetermine which factors and relationship are relevant for the analysis. Therefore, to shed light on the government’s endorsement, the investigation cannot neglect to analyse the contextual conditions in which it occurred – e.g. historical events, other competing visions on biofuels, other actors interacting with the UK Government, and so on. These considerations have convinced me that a case study is the appropriate research method for my research.

My research started as a preliminary “exploratory” investigation, and progressively evolved into an in-depth, “descriptive” analysis of behaviours and related contextual conditions throughout a period spanning from the mid-1990s to the present. Drawing on this “longitudinal”, “single” case study, I reinterpreted evidence in an “explanatory” fashion to refine previous interpretations of UK biofuel policy as well as theoretical insights of the framework adopted in the analysis.

2. Case study method: advantages and disadvantages

My choice to adopt a single-case study as a research method entails both advantages and disadvantages. The merits and limits of the case study method are here discussed in general and in relation to my research in particular.

An advantage of case studies is their flexibility in exploring new research avenues (Gerring, 2006, pp. 39-43). Within case studies, deductive approaches, which apply theory to data, can be integrated or even completely substituted with inductive approaches, which derive theory from data. This flexibility allows the researcher to analyse “deviant or outlier cases” that might potentially lead to the discovery of “new hypothes[e]s and variable[s] of interests” (George &

Bennett, 2005, pp. 20-21). Another advantage of case studies is that they “allow a researcher to achieve high levels of conceptual validity, or to identify and measure the indicators that best represent the theoretical concepts the researcher intends to measure” (George & Bennett, 2005, p. 19). Theoretical concepts may refer to variables that are not measurable quantitatively, thus ruling out quantitative approaches in the analysis. By analytically comparing qualitative variables across different actors and/or contexts, “case studies allow for conceptual refinements with a higher level of validity over a smaller number of cases” (George & Bennett, 2005, pp. 19-20). Another advantage of case studies is their holistic approach to the in-depth investigation of case-specific causal mechanisms: “Within a single case, we can look at a large number of intervening variables and inductively observe any unexpected aspects of the operation of a particular causal mechanism or help identify what conditions present in a case activate the causal mechanism” (George & Bennett, 2005, p. 21). The large number of intervening variables and contextual conditions, however, imposes constraints on the number of cases that can be included in the analysis. That is because it is “Often, though not invariably ... easier to establish the veracity of a causal relationship pertaining to a single case (or a small number of cases) than for a larger set of cases” (Gerring, 2006, p. 43). Nevertheless, even “the investigation of a single case may allow one to test the causal implications of a theory, thus providing corroborating evidence for a causal argument” (Gerring, 2006, p. 45).

Summing up, a case study is an appropriate method to explore, describe, and derive explanatory concepts or causal relationships pertaining to specific behaviours and contextual conditions within a limited number of cases. These concepts and causal relationship may be eventually generalised into theoretical propositions – i.e. it can be used to produce analytic generalisation (Yin, 2013, pp. 5-8, 15). Thanks to the flexibility of this research method, my research derived insights of the case, which refined previous explanations of UK biofuel policy, and the theoretical framework deployed in the analysis.

An inherent limit of case studies is that they “produce generalisations that are narrower or more contingent” to the specific cases under analysis (George &

Bennett, 2005, p. 22). All “Case study research suffers problems of representativeness because it includes, by definition, only a small number of cases of some more general phenomenon” (Gerring, 2006, p. 43). Therefore, a case study cannot be taken as a “sample” that can be used to formulate statistical generalisations on populations or universes (Yin, 2013, p. 15). A related limit of case studies is that they “remain much stronger at assessing whether and how a variable mattered to the outcome than at assessing how much it mattered” (George & Bennett, 2005, p. 25). Appropriate for “identifying the scope conditions of theories and assessing arguments about causal necessity or sufficiency in particular cases”, case studies are generally not suited for “estimating the generalized causal effects or causal weight of variables across a range of cases” (George & Bennett, 2005, p. 25). This is because, “it is difficult to arrive at a reliable estimate of causal effects across a population of cases by looking at only a single case or a small number of cases” (Gerring, 2006, p. 44). Another limit of case studies is their reliance on the subjective judgement of the investigator. In a case study, findings and conclusions can be negatively affected by biases induced by the investigator. Investigators “may fail to realize that by implicitly or explicitly limiting their sample of cases ... they may bias their sample with regard to a wider set of cases about which they are trying to make inferences” (George & Bennett, 2005, p. 25). “Cognitive biases” may lead to “selecting only cases whose independent *and* dependent variables vary as the favored hypothesis suggests, ignoring cases that appear to contradict the theory, and overgeneralizing from these cases to wider populations” (George & Bennett, 2005, pp. 24-25). Other “selection biases” may relate to the “selection of a cases based on their “intrinsic” historical importance or on the accessibility of evidence” (George & Bennett, 2005, pp. 24-25). All these biases “*understate or overstate*” the relationships on which generalisations are drawn (George & Bennett, 2005, p. 24). Therefore, “unless ... [the investigators] carefully define and limit the *scope* of their findings to a well-specified population that shares the same key characteristics as the cases studied” (George & Bennett, 2005, p. 25), the risk is to “ ...“overgeneralizing” findings to types or subclasses of cases unlike those actually studied” (George & Bennett, 2005, p. 32). Ways to prevent or, more realistically, to limit investigator-induced biases in case studies are to design

appropriate, rigorous, and systematic procedures for every step of the research, as well as to ensure transparency when reporting evidence (Fidel, 1984, p. 276; Yin, 2013, p. 14). Other limits of case studies are that they usually require a considerable amount of time and resources to be completed and that they often entail dealing with substantial volumes of evidence (Yin, 2013, p. 15). Depending on the topic studied, case studies may combine several techniques to collect evidence – e.g. document analyses, interviews, direct observations to name a few. All data-collecting techniques require time and resources, which means that there is a trade-off to solve between time and resources available and number and types of techniques that can be used to retrieve evidence. Depending on which requirements have been set in terms of rigorous procedures and transparency in reporting evidence, case studies may also result in sizable documents, which may be challenging to read. The volume of evidence collected in case studies is generally quite substantial, which means that there is a trade-off to solve between transparency in reporting evidence and readability of the resulting analysis.

Summing up, a case study is not an appropriate method to produce statistical generalisations, measure frequencies and/or estimate causal relationships. It is also highly dependent on the skills of the researcher in avoiding understated or overstated generalisations as well as in finding an appropriate compromise between time and resource constraints, the amount and type of data retrievable, and transparency in presenting results. In my research, I did not aim to produce statistically generalisable conclusions. Rather, I attempted to find context-contingent generalisations with a high degree of explanatory power in relation to the specific case under analysis. Transparency has been a major guiding principle in reporting evidence – i.e. I have tried to report sources as accurately as possible, and to reduce to a minimum any modification of the original text (e.g. by making extensive use of quotes), so as to provide the reader with direct (if mediated) access to the primary materials that I used as evidence for my arguments. This explains the lengthy empirical chapters in this dissertation. My research aims and some practical considerations led me to rely exclusively on document analyses, and not to include interviews, as the next section explains.

3. Evidence: my preference for document analyses over interviews

The case study method is generally associated with the use of a variety of data sources (Fidel, 1984, p. 274; Gillham, 2000, pp. 1-2; Yin, 2003, p. 4; Hartley, 2004, p. 324; Hancock & Algozzine, 2006, p. 16; Baxter & Jack, 2008, p. 554; Swanborn, 2010, p. 15; Yin, 2013, p. 18). Widely used in qualitative research in general (Holstein & Gubrium, 2004, p. 140), interviews are often used either as a primary or supplementary data-collecting technique also in case study research. A main reason motivating my choice not to integrate interviews with my document analyses relates to my research requirements. Other practical reasons relate to the period and kinds of events and actors analysed as well as to time management issues.

My research investigates how specific actors have released statements of expectations to specific audiences and within specific contextual conditions. For such an investigation, the statements for analysis need to be authentic – i.e. exactly those that their sources released to their intended audiences, and at the exact time and specific locus of their interaction with their audiences. Interviews may be used to interrogate the sources of those statements. However, statements collected in this way would be decontextualised, as well as unavoidably influenced by the interviewing process (Holstein & Gubrium, 2004, p. 142).

My research analyses behaviours and contextual conditions that mostly took place in the recent past, and then looks at how they can be related to recent developments. With its analytical focus on a recent, but concluded, past, my research is thus mostly retrospective (De Vaus, 2006, pp. 268-269). Retrospective interviews – i.e. questioning about the past – can be used to interrogate a recent past. Interviews asking about past events, even recent ones, and especially about past, subjective beliefs, or opinions are, however, affected by several problems that undermine their reliability. A first major problem relates to the limits of human memory. Interviewees may simply misremember events. A second major problem is the tendency of interviewees

to reconstruct and reinterpret the past in light of present circumstances. This is especially the case for interviews about subjective states – e.g. beliefs or personal opinions. A third problem is selective recall, that is, some details are likely to have been forgotten, leaving only those that the interviewees subjectively experienced as more significant. Beyond these problems, there is always the possibility that interviewees may deliberately set out to mislead, distort, and/or falsify their accounts (Richards, 1996, pp. 200-201; De Vaus, 2006, pp. 268-269).

My research also investigates how several diverse types of actor have differently deployed statements of expectations. Such an investigation requires samples of actors as large and heterogeneous as possible. The specific analytical focus is on large organisations, such as public authorities, industry associations, non-governmental organisations, and consultancies. The members of the majority of the organisations analysed in my research may be generally classified as belonging to an “elite”:

“... the whole notion of an elite, implies a group of individuals, who hold, or have held, a privileged position in society and, as such ... are likely to have had more influence on political outcomes than general members of the public.” (Richards, 1996, p. 199)

Interviews of influential members of society are generally referred to as elite interviews (Richards, 1996; Gillham, 2000; Berry, 2002; Moyser, 2006). Notoriously, elite “interviewees especially weigh the pluses and the minuses of the exchange” (Moyser, 2006, pp. 85-86), raising problems in terms of access:

“... by definition, elites are less accessible and are more conscious of their own importance; so problems of access are particularly important ... and inevitably, elite interview samples tend to be a lot smaller.” (Richards, 1996, p. 200)

Factors affecting access may include “the image of the potential interviewer, the research project or even the host institution or social science in general ...

Perceived ideological, social or even sartorial or gender similarities [or dissimilarities] ... [as well as] the research agenda, [as this can be] ... very sensitive in particular circumstances or to particular elites” (Moyser, 2006, pp. 85-86). These factors directly affect the risk of interviewees’ outright rejection of the interview, and consequently the sample size and the reliability of the data retrieved.

Despite these drawbacks, interviews, by lending themselves to different types of research question, are still “one of the most flexible methods available” in qualitative research (King, 2004, pp. 20-21). Therefore, it may be argued that, even as a secondary source of data, my research would have benefited from interviews designed as supplements to the document analyses. Such interviews could have been helpful in interpreting relevant documents, and confirming findings, and, perhaps, even in providing access to relevant, unpublished, or not yet available information or first-hand information on the personal backgrounds, outlooks, and motivations of the people involved (Richards, 1996, p. 200; Moyser, 2006, pp. 85-86). Nevertheless, interviews remain extremely time consuming, and, in my specific case, also particularly risky in terms of the reliability and authenticity of the data produced.

All that considered, I have given priority to expanding my document analyses, and focus on original, written documents, which, as primary sources of data, “hold the greatest value in the validity and reliability of historical analysis” (Lundy, 2008, p. 396). This preference relates to conceptual, methodological, and practical reasons:

“A *document* can be defined as any symbolic representation that can be recorded or retrieved for analysis. *Document analysis* refers to an integrated and conceptually informed method, procedure, and technique for locating, identifying, retrieving, and analyzing documents for their relevance, significance, and meaning.” (Altheide, 1996, p. 3)

In conceptual terms, documents can be seen as “resources that are employed to create versions of reality and self-representations” (Atkinson & Coffey, 2004,

p. 57). My research tracks and compares over time the visions and self-definitions of several actors. For this kind of investigation, documents are valuable data sources. Comparing documents published throughout the historical period by the sources of interest enables the tracking and comparison over time of visions and self-definitions.

In methodological terms, documents are an appropriate data source for retrieving authentic statements – i.e. representative in relation to their sources, as well as to the exact contextual conditions under, and purposes for, which they were produced. My research questions require the analysis of statements of expectations produced at the exact time and locus of the interaction between their sources and audiences. Analysing documents issued at the exact time of the events by the actors of interest ensures the authenticity of their statements.

In practical terms, documents can be very efficient and reliable data sources (Bowen, 2009, p. 31). Documents are unaffected by the research process – or “non-reactive” (Bowen, 2009, p. 31). This means that the same documents can be analysed several times, thus making their analysis rather practical and flexible, as well as by different investigators, thus making their analysis verifiable in terms of reliability. Documents are unrelated to the research process – i.e. produced for purposes other than those underlying the research process. This means that they may not be appropriate sources of information to answer all types of research question. However, it also means that they only need to be sought and collected, not elicited and produced by the researcher in interaction with specific individuals, and/or within specific spatial and temporal settings. Documents may be relatively easy to access – e.g. published documents do not require authors’ permissions and/or ethical consent, thus saving time and resources. Finally, documents may be extremely rich, detailed, and cross-referenced sources of information, thus reducing the need to search for additional data sources to verify information.

Ultimately, whether document analyses may be considered appropriate and sufficient, or instead require additional collection of evidence via other data sources, primarily depends on whether the documents analysed fully address

the research questions. In my research, I analysed a substantial number of documents that proved to be extremely rich sources of information for the research questions. The amount of available documents and their richness of content convinced me to focus exclusively on document analyses. These analyses turned out to be rather time-consuming, but also satisfying and appropriate to answering my research questions, and thus did not require additional sources of evidence. The suitability of the selection of documents analysed here in relation to my research questions will become evident in the next sections, in which I explain the research design that I followed in my research.

4. Research design and presentation of case study evidence

A research design may be generally defined as: “the logical sequence that connects the empirical data to a study’s initial research questions and, ultimately, to its conclusions” (Yin, 2013, p. 26). In other words, it is a “logical plan” that guides the research from the initial set of questions to be answered, through the processes of collecting, analysing and interpreting empirical data, to some set of answers (Yin, 2013, p. 26). The main purposes of a research design are to enable the “full investigation” of specific research questions (Hancock & Algozzine, 2006, p. 31), and “to avoid the situation in which the evidence does not address the initial research questions” (Yin, 2013, pp. 26-27). One of the ultimate purposes of a research design is to justify any inference and/or conclusion drawn from the analysis. A research design should then effectively deal with a series of related issues – i.e. (1) how to find evidence for answers to the research questions, and (2) how to analyse that evidence.

Besides adopting a logically consistent research design, it is also important “to present the evidence in your case study with sufficient clarity (e.g., in separate texts, tables, and exhibits) to allow readers to judge independently your later interpretation of the data” (Yin, 2003, p. 15). As a general principle, it is advisable to clearly demarcate evidence from interpretation (Yin, 2003, p. 15). Thus, a final issue to deal with is (3) how to report the evidence.

4.1 Research questions and evidence

What drove me to embark upon this dissertation was my intrinsic interest in finding out how the UK Government came to endorse a specific set of expectations over others to justify its biofuel policy. From that initial interest, I set out to pursue a related empirical research aim – i.e. to show how the UK Government’s responsibilities towards technology policies have affected the construction of its vision on biofuel policy. My choice to deploy the sociology of expectations as the main framework for the analysis then offered me the opportunity to pursue another theoretical aim – that of expanding its focus on technology innovators with an analysis of other types of actor. For each research aim, I developed and investigated a series of related research questions that defined the boundaries of the research.

To address my research questions, I used a “situated approach”, which recommends considering both temporal and spatial dimensions when investigating expectations (see Chapter 1). In adopting that approach, I designed my research as a combination of what I call a “historical analysis” and a “cross-sectional analysis”. The historical analysis looks at the temporal dimension of the case by focusing on a temporal series of policy documents issued from the mid-1990s to present. One of the main purposes of this longitudinal study is to observe and describe the evolution of the UK Government’s vision on biofuel policy within that period. The cross-sectional analysis looks at the spatial dimension of the case by focusing on the responses to a public consultation¹⁰ that was launched around the time when the UK Government adopted its current vision on biofuel policy. One of the main purposes of this cross-sectional study is to identify and compare the visions that were voiced at the time the UK Government adopted that vision. The two types of analysis complement each other, share the same analytical focus – i.e. the UK Government’s current vision on biofuel policy – and deploy the same data

¹⁰ The consultation here analysed is the fourth of the DfT on biofuel policy (DfT, 2008a). Insights into the second (DfT, 2007b) and third (DfT, 2007a) DfT consultations on biofuel policy are retrieved from previous academic analyses (Upham & Tomei, 2010; Upham et al., 2011) – see Chapter 6.

collection technique – i.e. document analysis. However, each analysis addresses different – though related – research questions. As a result, the two analyses also differ in the range of actors and types of document considered. These differences motivated my choice to report the analyses in two separate parts.

4.1.1 The historical analysis: research questions and evidence

The historical analysis firstly addresses the following empirical research question:

- (1) How has the UK Government's vision on biofuel policy evolved from its origins in sustainable road transport policy to the current controversy on biofuel policy?

To answer this question, the historical analysis narrows the focus to a temporal series of policy documents issued by a selection of UK Government departments. The departments included in the analysis are: the Department for Transport (DfT) – formerly Department of the Environment, Transport and the Regions (DETR); the Department for Environment, Food and Rural Affairs (Defra); the Department of Trade and Industry (DTI); and the Department of Energy and Climate Change (DECC). These departments have been selected because of their policymaking responsibilities for sustainable road transport and biofuel policies in the UK. Also included in the analysis are the European Commission and Council, because of their overarching policymaking responsibilities in both sustainable transport and biofuel policies across the European Union.

Sustainable road transport and biofuel policies overlap in policy areas as diverse as transport, energy, environment, and agriculture. Such overlapping has muddled the distribution of policy responsibilities among the several government departments leading on these policy areas. These departments participated in the debates on sustainable transport and biofuel policies as representatives of the UK Government. Despite the muddled delegation of

policy responsibilities, UK departments merged their fragmented, multiple voices by issuing official documents in the name of “the Government”. Investigating the implications of the multiple nature of the UK Government’s “official voice” is beyond the scope of this dissertation. To reflect how UK departments have enacted that voice, I treat and report their statements as those of the UK Government – i.e. in the way UK departments wanted those statements to be read (as statements of “the Government”). At any rate, all statements are referenced to the respective UK department authoring them. The distribution of policy responsibilities among the UK Government departments involved in sustainable transport and biofuel policies is explained in detail in the empirical chapter (Chapter 3).

To track the evolution of the UK Government’s vision on biofuel policy, the historical analysis reconstructs the official voice of “the Government” by following over time the interventions of its departments in the debates on sustainable transport and biofuel policies. The documents analysed span from the mid-1990s to present – i.e. from the origins of the biofuel policy debate in sustainable transport policy debate to the current biofuel controversy. This makes them a suitable temporal sample of documents for a longitudinal analysis of the evolution of the UK Government’s vision.

The historical analysis ultimately addresses the following empirical research question:

- (2) How have the UK Government’s responsibilities towards technology policy affected the evolution of its vision on biofuel policy?

To answer this question, the historical analysis narrows the focus to a temporal series of correspondence undertaken between the Royal Commission on Environmental Pollution (RCEP), the Environment, Food, and Rural Affairs Committee (EFRAC), and the Environmental Audit Committee (EAC) and the UK Government throughout the historical period under analysis. In this correspondence, the RCEP, EFRAC, and the EAC strongly disagreed with the UK Government on how to envision the future of sustainable road transport and

biofuel policies, and questioned its policy responsibilities. To investigate these disagreements, the analysis compares over time the vision on biofuel policy of the UK Government with those of the RCEP, EFRAC, and the EAC. This comparison reveals how the former related its policy responsibilities to the construction of its vision on biofuel policy differently from the latter, thus partially explaining their disagreements.

The RCEP, EFRAC, and the EAC had limited influence¹¹ in the legislative process (see Appendix 1). Nevertheless, they could initiate a formal correspondence by publishing formal reports addressed to the UK Government, which was then called to reply through formal publications (House of Commons Information Office [HoC IO], 2009). The RCEP, EFRAC, and the EAC exchanged official correspondence with the UK Government at relatively regular intervals throughout the historical period analysed. The RCEP was among the first UK public authorities to engage in the debate on sustainable road transport policy, and addressed the UK Government with two reports on the issue, in 1994 and 1997. In the related debate on biofuel policy, EFRAC addressed the UK Government with two reports on the issue, in 2003 and 2006. The EAC followed EFRAC addressing the UK Government with a report on biofuel policy in 2008. Their relatively regular distribution over time makes this correspondence a suitable temporal sample of documents for a comparative analysis of the different ways in which public authorities in the UK construct their visions in relation to their policymaking responsibilities.

With specific regards to public authorities with executive roles in technology policy – e.g. the UK Government in this case – the sociology of expectations literature has overlooked the analysis of their policy-promises. This is presumably because of its focus on technology innovators and their expectations and promises on technological advancements. The term policy-promise here refers to the promises of public authorities on their future policy

¹¹ The RCEP's remit was limited to policy advice, without any executive role in policymaking and in the administration of public resources for technology development. EFRAC and the EAC are institutions appointed to scrutinise and call to account the UK Government on its policies towards Parliament, but their remits exclude executive roles in policymaking and in the administration of public resources for technology development. The current UK Government closed down the RCEP in March 2011.

commitments, such as, for instance, the provision of political and financial support to a specific industry. To address this gap, the historical analysis addresses the following theoretical research question:

- (3) How do previous policy-promises of support for technology innovators influence an executive public authority in the construction of its vision of the future?

The historical analysis provides an empirical basis for analysing and theoretically reinterpreting how previous policy commitments of executive public authorities towards an industry may turn out to be a critical factor in their definition of the future.

The historical analysis processed exclusively official documents. UK public authorities use the general label “official documents” when referring to key Departmental Papers, Command Papers, and House of Commons Papers (The Stationery Office [TSO],). Public authorities issue these documents in their name and assume responsibility for their content – in a way, these documents may be said to contain public authorities’ “official voice”. Within these documents, public authorities support their positions on specific policy proposals or statements of policy before the whole audience of taxpayers.¹² All official documents here analysed were rich sources of statements of expectations on technologies and policies, and, implicitly or explicitly, also contained views on what the governmental responsibilities in policymaking ought to be. Publicly available by definition, these documents were relatively easy to find and collect. They proved to be extremely valuable data sources for the analysis of the different ways in which the UK Government, the RCEP, EFRAC, and the EAC have constructed their own official visions of the future, and publicly endorsed them to the whole audience of taxpayers.

¹² Although the UK Government and the RCEP, EFRAC, and EAC were the direct correspondents in the official correspondence, these were official documents meant to be published online – i.e. meant to address the wider audience of taxpayers.

To reconstruct the temporal sequence of the official documents to include in the analysis, I started by searching the most recent documents in the websites of the above-mentioned public authorities. From the references listed in those documents and websites, I tracked the sequence of previous official documents back to the origins of the UK biofuel policy debate in the sustainable transport policy debate. Particularly useful for this retrospective search was the UK Government Web Archive, in the website of the National Archives, which stores all official documents and previous versions of the institutional websites of all UK Governmental departments (National Archives, n.d.).

4.1.2 The cross-sectional analysis: research questions and evidence

The cross-sectional analysis firstly addresses the following empirical research question:

- (4) Which visions on biofuel policy were competing at the time when the UK Government adopted its current vision on biofuel policy?

To answer this question, the cross-sectional analysis processes the responses and accompanying documents of the fourth public consultation on biofuel policy, launched on the 15th October 2008 by the DfT in the name of the UK Government. Around that time, the UK Government adopted its current vision on biofuel policy. To identify the visions that were competing at that time, the cross-sectional analysis reconstructs the visions of the consultation participants. As argued below, this consultation can be considered a purposive and convenient cross-sectional sample of documents for a comparative analysis of the visions that were competing at the time when the UK Government endorsed its current vision.

An issue that needs to be addressed in designing a public consultation is how to recruit those who supposedly represent the public (Fishkin, 2006, p. 57). This issue is just one among the many to consider for a comprehensive evaluation of a public consultation as a public engagement mechanism (Rowe & Frewer, 2000; OECD, 2001; Rowe & Frewer, 2004; OECD, 2005; Rowe & Frewer, 2005;

Rowe et al., 2005; Rowe et al., 2008). Such an evaluation of the consultation under analysis is beyond the scope of this research. In the following, I evaluate only the recruitment process of the fourth public consultation on biofuel policy as it helps to understand who the respondents were and, therefore, what can be inferred from their responses.

Public consultations may recruit respondents in different ways: self-selection; selection by sampling techniques that attempt to be representative with non-probability sampling, or that specifically aim to ensure representativeness with probability sampling¹³ (i.e. random samplings); they may even be selected in their totality (i.e. virtually all members of the population or universe are consulted) (Fishkin, 2006, p. 59). In the consultation under analysis, as in the previous three on UK biofuel policy, the DfT omitted to explain in detail which sampling techniques it used to recruit participants, and only provided instructions on how to participate. Analysis of these instructions reveals that the recruitment process was certainly non-probabilistic – i.e. not guided by statistical theory.

¹³ Sampling techniques are distinguished into *probability samplings* and *nonprobability samplings*. Probability samplings are sampling techniques that require that (1) each unit of the target population or universe must have a known mathematical chance of being selected, (2) which must be greater than zero and (3) which must be numerically calculable (UN, 2005, p. 32; Lohr, 2009, p. 25; Everitt & Skrondal, 2010, p. 340). In probability sampling, groups of units in the sample are represented in the same proportion as in the target population or, when unequal probabilities are used, the data are reweighted so as to reflect the target population proportions. The purpose of a probability sample is to produce a statistically significant and representative sample of the target population, suitable for hypothesis testing and drawing statistical inferences (Wilmot, 2005, p. 3). The mathematical nature of probability samplings permits one to consider the estimations made with the survey as scientifically grounded. As probability samplings are constructed according to statistical theory, the estimations made on the sample can be inferred to represent the target population and the sampling errors can be calculated (UN, 2005, p. 32). Many possible random selection procedures exist and vary depending on the characteristics of the target population and research study.

Nonprobability samplings are sampling techniques that rely on the subjective judgement of the researcher and do not require random selection in the procedure of sample units' selection (Wilmot, 2005, p. 3). As opposed to probability samplings, the use of nonprobability samplings is not guided by statistical theory. It follows that they are likely to be affected by biases and that the assessment of their reliability can only be done through subjective evaluation. As nonprobability samplings fail to abide by probability theory, it is not possible to estimate the magnitude and direction in terms of overrepresentation or underrepresentation of their biases (UN, 2005, p. 34). Thus, no statistical method exists to determine and measure whether and how much, in probabilistic terms, a nonprobability sampling is representative of the target population. The general preference for probability samplings over nonprobability sampling is based on the belief that the former are more accurate, more rigorous, and less affected by biases than the latter (UN, 2005, p. 32).

In all four biofuel consultations, the DfT published an invitation document on its website with the explicit purpose of opening the consultation to anyone potentially interested in participating – either as an individual or as a representative of an organisation (DfT, 2004b, p. 29; 2007b, p. 2; 2007a, p. 3; 2008a, pp. 5-6). In the second and in the fourth (the one under analysis), the DfT also invited participants to contact the department with suggestions of other possible interested individuals or organisations (DfT, 2007b, p. 2; 2008a, pp. 5-6). In all four biofuel consultations, the DfT also used preselected lists of “stakeholders” to send the invitation documents directly to specific organisations. The DfT never clarified what it meant by “stakeholders” and the criteria used to create and update the lists. Apparently, it also failed to publish the complete lists of stakeholders contacted. The lists of stakeholders published in the invitation documents of all four consultations (DfT, 2004b, Annex E; 2007b, Annex D; 2007a, Annex J; 2008a, Annex C) contain slightly more than half of the stakeholders the DfT declared it had contacted in the following summaries of responses¹⁴ (DfT, 2004a, Introduction; 2007d, p. 3; 2008d, Introduction; 2009c, p. 1). Nevertheless, comparison of those (possibly incomplete) lists seems to suggest that the DfT most likely updated and expanded the list of the first consultation, and used its updated versions in the subsequent consultations (see Appendix 2). Furthermore, the nature of the stakeholders listed in the invitation documents seems to suggest that the DfT most likely aimed to collect expert views and, at the same time, maintain heterogeneity among the respondents when compiling the lists. Indeed, the lists contain a very heterogeneous mix of organisations, which could all be said to be expert in diverse aspects of biofuel policy.

The above instructions can be reinterpreted in terms of sampling techniques. The main sampling technique implemented by the DfT was *self-selection or volunteer sampling*¹⁵ – i.e. opening the consultation to anyone willing to

¹⁴ First consultation: 100 declared in introduction versus 60 listed in annexes; second consultation: 400 declared in introduction versus 235 listed in annexes; third consultation: 400 declared in introduction versus 244 listed in annexes; fourth consultation: 400 declared in introduction versus 241 listed in annexes.

¹⁵ In self-selecting sampling, respondents self-select themselves by volunteering to participate. Self-selection sampling tends to recruit the individuals and/or organisations that care the most

participate. It also permitted *snowball sampling*¹⁶ – i.e. allowing participants to suggest other participants. It remains unclear whether the DfT compiled the lists of stakeholders directly invited to participate using *expert sampling*¹⁷ – i.e. eliciting expert views – and/or *heterogeneity sampling*¹⁸ – i.e. eliciting heterogeneous views – or simply according to convenience. Self-selecting sampling belongs to the category of *accidental, haphazard, or convenience samplings*. These non-probability samplings are commonly used when it is irrelevant, impractical, or unethical to enlist random units from the target population – i.e. they are used mostly because of their practical convenience, rather than their relevance to a specific research purpose (Trochim, 2006, October 20). Snowball, expert, and heterogeneity samplings belong to the general category of *purposive or judgmental samplings*. In these non-probability samplings, the criteria used to recruit participants – e.g. their expertise or heterogeneity – are more important than the randomness of the selection process or the representativeness of the resulting sample (Trochim, 2006, October 20).

The non-probabilistic nature of the consultation's recruitment process implies that neither the participants nor their views can be said to be statistically representative of any populations of stakeholders or universes of vision – however such populations and/or universes may be defined. Therefore, the

about the issues under consultation. The majority of potential respondents usually remain silent, resulting in large self-selection biases (Trochim, 2006, October 20).

¹⁶ In snowball sampling, respondents are firstly identified according to certain criteria of inclusion, and then asked to provide further contacts that match the same criteria. Snowball sampling tends to recruit respondents that know each other, and therefore, that are likely to share similar views. This sampling technique tends to marginalise respondents with different views, and not to produce diverse samples (Wilmot, 2005, p. 6; Trochim, 2006, October 20; Everitt & Skrondal, 2010, p. 401).

¹⁷ In expert sampling, respondents are recruited in relation to their demonstrable expertise, and/or experience in the specific knowledge areas of interest. The purpose of this sampling technique is to elicit the views of specific respondents variously identified as “experts” regarding the issues under consultation. Expert sampling can produce representative samples of a specific population of experts, provided that the criteria used to identify all expert units belonging to such a population are explicitly and unequivocally defined (Trochim, 2006, October 20).

¹⁸ In heterogeneity (or diversity) sampling, respondents are recruited primarily because of their differing views. The purpose of this sampling technique is to collect as many views as possible on the issues under consultation, including *outliers* or unusual views, in an attempt to reconstruct the whole spectrum of all possible views relevant to the specific issues. Therefore, the concern is not to represent proportionally the population of respondents holding views in the issues of interests, but to elicit the views from participants that are as heterogeneous as possible (Trochim, 2006, October 20).

findings derived from the analysis of the consultation participants and their visions are not generalisable in statistical terms. In other words, the visions of the consultation's participants can only be said to be those of the individuals and organisations most interested in participating among those aware or made aware of its launch – i.e. they are not statistically representative of all visions competing at the time of the consultation's launch. This conclusion applies to the qualitative analysis of the consultation responses made by the UK Government, and, by extension, also to my own analysis. Keeping this limitation in mind, the consultation responses can be still treated as a *convenient and purposive sample* of documents for a cross-sectional analysis of the visions on biofuel policy that were competing at the time when the UK Government endorsed its current vision on biofuel policy.

The cross-sectional analysis ultimately addresses the following empirical research question:

- (5) How have the UK Government's responsibilities in technology policy affected its choice of which visions to select and marginalise within its current vision on biofuel policy?

To answer this question, the cross-sectional analysis compares the UK Government's vision with those of the consultation participants. It also identifies and emphasises contrasts between the UK Government's self-definition of its own policy responsibilities in biofuel policy and the participants' views on what those responsibilities ought to be. The participants disagreed with the UK Government and among themselves on the future of biofuel policy, and, implicitly or explicitly, also on what the policy responsibilities of the UK Government as executive public authority in biofuel policy ought to be. By comparing those visions and views, the analysis reveals how the UK Government selected and marginalised voices in relation to its policy responsibilities, thus partially explaining the disagreements.

The consultation consisted of two parts, covering a total of 20 questions: *Part 1 – Future levels under the RTFO* (the first 13 questions) and *Part 2 – Longer-*

term issues related to transposition of the European Directives (the last 7 questions). The cross-sectional analysis draws evidence from all the responses to the 20 questions. However, in the responses to the specific questions listed below, the participants revealed their views on the future of biofuel policy and on the UK Government's related policy responsibilities, more than in the responses to the other questions. These latter addressed more technical issues and were thus less rich in statements of expectations (for the full list of consultation questions see Appendix 3).

The first part of the consultation focused on proposed policy changes directly affecting short-term support for incumbent producers of first-generation biofuels (for a detailed account of the biofuel industrial context see Appendix 4). The second, third, and fourth questions in particular confronted the issue of whether current support for biofuels – i.e. the annual rates of the Renewable Transport Fuel Obligation (RTFO) – should be left unchanged, frozen, or slowed down. The sixth question then invited participants to comment on the impact assessment produced by the DfT for the three options proposed. The responses to these questions were particularly rich in statements of expectations on the expected benefits and damages of the current support for first-generation biofuels. In these responses, the participants also criticised the UK Government for not honouring its responsibilities in biofuel policy, thus revealing their views on what those policy responsibilities ought to be. The exact wording of the questions:

- *Question 2. Do you agree or disagree that the obligation levels should be left unchanged?*
- *Question 3. Do you agree or disagree with freezing the obligation level at 2.5 per cent?*
- *Question 4. Do you agree or disagree that the rate of increase in the RTFO should be adjusted in line with Professor Gallagher's recommendations?*
- *Question 6. Do you agree with the costs as set out in the Impact Assessment?*

The second part of the consultation focused on policy changes affecting long-term support for prospective investors in second-generation biofuels. These policy changes were related to the future transposition of two upcoming European Directives into UK law. The seventeenth and eighteenth questions in particular sought views on the EU proposals to readdress future biofuel policy to promote second-generation biofuels and on how to encourage the development of second-generation biofuels in general. The twentieth question then invited participants to mention any other issue that should have been taken into consideration in relation to the two proposed EU Directives. The responses to these questions were particularly rich in statements of expectations on how to establish the optimal conditions for industry to develop second-generation biofuels in the future. In these responses, the participants also criticised the UK Government for not honouring its responsibilities in biofuel policy, thus revealing their views on what those policy responsibilities ought to be. The exact wording of the questions:

- *Question 17. Would the double rewards proposed under the RED be adequate to encourage second generation biofuels?*
- *Question 18. What other mechanisms could better encourage the development of second generation biofuels?*
- *Question 20. Taking into account the requirements of both draft Directives, are there any other issues which need consideration when we transpose these into UK legislation?*

The sociology of expectations literature has mostly been applied to analysing the expectations of technology innovators. Several of the organisations that participated in the consultation were technology innovators in biofuels and other industrial areas. Several other types of organisation participated, such as public authorities, industry associations, consultancies, and non-governmental organisations. To expand the focus of the sociology of expectations from technology innovators to other types of actor, the cross-sectional analysis addresses the following theoretical research question:

- (6) How do public authorities, industry associations, consultancies, and non-governmental organisations diffuse expectations?
- (7) How could they be interpreted through the lens of the sociology of expectations?

The analysis of the consultation provides an empirical basis for the analysis and theoretical reinterpretation of the roles played by these specific types of actor in diffusing expectations on technologies and policies in consultations.

The cross-sectional analysis narrows the focus to the *invitation document*, the participants' *responses*, and the two *summaries of responses* of the fourth consultation on biofuel policy. These documents have interesting features for analysis.

At the launch of the consultation, the DfT published in its website an invitation document containing the UK Government's policy proposals – explained in detail – and the list of questions to be used to consult the public. Participants were given two months to answer – from the 15th October to the 17th December 2010. After the closure of the consultation, the DfT analysed the responses and published two summaries of responses – one for each part of the consultation – to provide its own reply to each question and inform the public of the consultation outcome and subsequent policy changes (DfT, 2008a, pp. 5-6).

The invitation document and the summary of responses are official documents that the DfT issued in the name of the UK Government. Within these documents, the UK Government presented the reasons and justifications behind the policy proposals and self-defined its own responsibilities in biofuel policy. By comparing these documents, it is possible to show how the UK Government selected and marginalised the voices of the consultation participants, and, subsequently, defended the public endorsement of its official vision to the whole audience of taxpayers.

The participants could choose whether to submit their responses anonymously and confidentially or allow the DfT to disclose their responses upon request¹⁹ – i.e. to make them available to anyone requesting them (DfT, 2008a, pp. 5-6). In the summaries of responses, the DfT provided a synthetic account of all opinions received from participants for each question. However, to guarantee confidentiality, it only listed and synthesised the opinions without any clear indication of their authorship.²⁰ To reconnect participants to their respective responses, I had to retrieve and analyse the original responses. Responding to my request, the DfT forwarded me the responses of 66 organisations. The fourth consultation collected 89 responses in total, 68 of them from organisations. According to the list of 68 organisations published in the summaries of responses, the two missing responses from organisations are that of a biofuel producer – Good Fuel Cooperative & Golden Fuels, and that of an industry association – Confederation of Passenger Transport (CPT). The responses of the “members of the public” – as defined by the DfT – could not be made available for this research (DfT, 2009c, Annex A; 2009d, Annex A).

The responses were not meant for publication, but rather to feed into the UK Government’s summaries of responses, though, if consent was given, they could potentially be released by the DfT to anyone who requested them. These documents can thus be considered as primarily addressed to the UK Government. This latter is critical to considering the consultation responses as authentic documents, revealing how several different actors variously attempted to influence the policymaking process with statements of expectations.

To complement and confirm the self-definitions the participants gave in their consultation responses, I retrieved additional information from their websites. All consultation participants under analysis are organisations with institutional websites. Webpages such as “home”, “about us”, “information for investors”, “mission”, “statute”, and the like were particularly useful. Within these webpages

¹⁹ In accordance with the “code of practice on consultation” (BERR, 2008).

²⁰ The only exception was a synthesis of the opinions concerning the obligation levels in the executive summary of the first summary of responses (DfT, 2009c, pp. 2-4). In this synthesis, several opinions were listed together and referred to two broader and undefined categories, namely: the “biofuel producers and a number of other industry organisations” and the “environmental groups, NGOs and other organisations” (DfT, 2009c, p. 3).

in particular, the organisations describe themselves and their core activity/business.

4.2 Method of data analysis

My research deploys a method of data analysis that can be categorised as *thematic analysis* – i.e. “the most commonly used method of analysis in qualitative research” (Guest et al., 2011, p. 11).

“Thematic analysis is a data reduction and analysis strategy by which qualitative data are segmented, categorized, summarized, and reconstructed in a way that captures the important concepts within the data set.” (Ayres, 2008, p. 867)

Primarily a descriptive strategy, thematic analysis codifies qualitative data to ease the identification, arrangement, and systematisation of ideas, concepts, and categories uncovered in a specific data set (Ayres, 2008, p. 867). Every method of qualitative data analysis involves some sort of coding (Van Den Hoonaard & Van Den Hoonaard, 2008, pp. 186-187):

“Coding consists of identifying potentially interesting events, features, phrases, behaviors, or stages of a process and distinguishing them with labels. These are then further differentiated or integrated so that they may be reworked into a smaller number of categories, relationships, and patterns so as to tell a story or communicate conclusions drawn from the data.” (Benaquisto, 2008, p. 85)

A flexible coding frame – i.e. “a scheme that lays out key concepts, their definitions, and criteria for recognition” (Benaquisto, 2008, p. 85) – generally emerges and evolves while the analysis progresses. Recurring codes within the data – e.g. phrases, terms, expressions and the like – are then regrouped into constructs, which are then analysed in connection and in reference to their specific sources (Firmin, 2008, p. 869).

Such constructs in thematic analysis are referred to as “themes”. Coding in thematic analysis may be highly dynamic; coding, data management, the development and refinement of themes, and the identification of patterns across the data may not occur sequentially as in a clearly predetermined process, but throughout the analysis (Ayres, 2008, p. 868).

Thematic analysis may derive themes “both from data (an inductive approach) and from our prior theoretical understanding of whatever phenomenon we are studying (an a priori, or deductive approach)” (Bernard & Ryan, 2010, p. 55). When deductively constructed, thematic coding may, for instance, draw “from already-agreed-on professional definitions found in literature reviews” (Bernard & Ryan, 2010, p. 56), although more often, “themes are derived empirically – [i.e.] induced from data” (Bernard & Ryan, 2010, p. 56). In particular, the inductive approach is preferred in research inspired by Grounded Theory (Strauss & Corbin, 1994, p. 273; Glaser & Strauss, 2006, p. 5). Generally, “In thematic coding, the analyst frequently begins with a list of themes known (or at least anticipated) to be found in the data” (Ayres, 2008, p. 867).

In my research, I deployed what may be defined as a “hybrid process of inductive and deductive thematic analysis” where both theory-derived and data-derived codes were used to codify data (Fereday & Muir-Cochrane, 2006). In the preliminary, explorative phase of the document analysis, many of the terms that I encountered in the documents were rather similar to the terminology used in the multi-level perspective (MLP) on socio-technical transitions – e.g. technological regime, niches, lock-in, etc. This was one of the reasons that convinced me to integrate the sociology of expectations with the MLP. The resulting classification of expectations into different levels – i.e. niche, regime, landscape – is the theory-derived coding that helped me identify and classify single statements of expectations. These statements were then reconstructed and reduced to visions – i.e. constructs or “themes” regrouping together coded expectations – according to the same classification. The visions of the actors analysed in my research are the initial themes on which my research focused. The process involved going back and forth from raw data – i.e. statements of

expectations in the original documents – to visions – i.e. my reproduction of those statements – in an effort to identify new themes. Continuous scrutiny and comparison of visions then helped me to organise ideas, highlight temporal and spatial patterns, and highlight concepts that appeared to emerge from the data. During this process, other themes inductively emerged during the analyses: for instance, the dilemma over whether preserving support for first-generation biofuels was an essential means to fulfil expectations on second-generation biofuels becoming available – or else an environmentally dangerous, counterproductive means to fulfil those expectations. In the following sections, I provide more specific details on the practicalities involved in the application of my method of data analysis.

4.2.1 Historical analysis: method of data analysis

In the historical analysis, I started with preliminary readings of all the text of the official policy documents and correspondence selected for analysis. This helped me to identify and highlight any part of the text containing statements of expectations on the future of sustainable road transport and/or biofuel policies. I then extracted and recorded in a Word document the highlighted parts of the text as quotes – i.e. exact text, referenced to the author and the date of publication of the original document. In the Word document, all quotes were subdivided by author, put in chronological order, and related to the coevolution of contextual conditions. To compare the UK Government's vision and those of the other public authorities under analysis, I placed the quotes extracted from the official correspondence into separate sections from those retrieved from the official policy documents. Doing so helped me to identify differences and similarities between their visions.

The official policy documents and correspondence analysed discussed issues pertaining to all three socio-technical levels as theorised in the MLP. For each public authority under analysis, I thus processed selected quotes by marking statements of expectations according to the distinction among landscape, regime, and niche levels. This helped me to reorganise these statements into visions. Visions were then reclassified according to the MLP levels and

reattributed to their respective authors. This helped me to track the evolution of the visions of the public authorities under analysis during the sustainable transport and biofuel policy debates. It also allowed me to identify their different views on the above dilemma and on what the policy responsibilities of the UK Government ought to be. The Word document eventually evolved into the “historical analysis” chapter.

4.2.2 Cross-sectional analysis: method of data analysis

In the cross-sectional analysis, I started with preliminary readings of the invitation document, all consultation responses, and the two summaries of responses. This helped me to identify and highlight any part of the text containing statements of expectations on the future of UK biofuel policy. As above, the highlighted parts of the text were then extracted and initially recorded in a Word document as quotes – i.e. the exact text, referenced to the author and the date of publication of the original document. In the analysis, I subdivided consultation participants into categories by using their *self-definitions* – i.e. the actors’ own definition of their own organisational nature and/or institutional role in biofuel policy. I retrieved these self-definitions from their consultation responses and/or from their websites (see section 4.3.2 for further details). I then subdivided the Word document into separate sections representing the categories of actors, and allocated selected quotes within them according to the category of actors of their respective authors. Doing so helped me to identify differences and similarities across the several categories of actor participating in the consultation.

The invitation document, consultation responses, and two summaries of responses mostly dealt with issues pertaining to the niche level as theorised in the MLP. For each category of actor, I thus processed selected quotes by marking statements of expectations according to the niche-level distinction between first-generation and second-generation biofuels. This helped me to reorganise the statements into visions. Visions were then regrouped in relation to the policy proposals of the consultation on current support for first-generation biofuels and future support for second-generation biofuels. This helped me to

emphasise convergent, divergent, and shifting expectations on first-generation and second-generation biofuel technologies and related policies among the different categories of actors. It also allowed me to identify the different views of the consultation participants on the above dilemma and on what the policy responsibilities of the UK Government ought to be. The Word document eventually evolved into the “cross-sectional analysis” chapter.

4.3 Reporting evidence

Increasing transparency and allowing the reader to interpret the data have been my main guidelines in reporting evidence. To increase transparency and show which evidence supports which interpretation, I reported the historical analysis and the cross-sectional analysis in two separate parts, respectively Part 1 and Part 2 of this dissertation. Each part starts with its respective empirical chapter, which reports evidence from the respective analysis. Within each part, interpretations and theoretical reflections are condensed in the chapters following the empirical ones. In the empirical chapters, quotes containing statements of expectations have either been paraphrased or extracted and reported in direct quotation. In paraphrasing quotes, I tried to preserve the original text as far as possible. The statements quoted directly were those that included more statements of expectations than other similar quotes from the same author.

4.3.1 Historical analysis: reporting evidence

In the empirical chapter of the historical analysis, evidence is reported in two main sections, reflecting an analytical subdivision of the period under analysis into two phases. The first section covers the 1990s – i.e. when sustainable road transport policy started to be debated in the UK. The second section covers the 2000s – i.e. when biofuel policy started to be debated in the UK. The official correspondence between the UK Government and the RCEP took place in the first historical period, the official correspondence between the UK Government and EFRAC and the EAC in the second.

4.3.2 Cross-sectional analysis: reporting evidence

In the empirical chapter of the cross-sectional analysis, evidence from the invitation document, participants' responses, and summaries of responses is reported in separate sections to highlight the differences between the UK Government's vision on biofuel policy ex-ante and ex-post consultation. Evidence from consultation responses is further subdivided into actor categories to emphasise the contrast between the visions and views of the different types of actor participating in the consultation.

To classify participants, I attempted to reconstruct the classification that the DfT reported in the summaries of responses (DfT, 2009c, Annex A; 2009d, Annex A). The resulting classification approximately matches the DfT's (see Table 1). Reproducing the exact classification of the DfT is not possible for several reasons. Firstly, the DfT failed to specify which participants were included in which category – it only provided a table counting the participants per category and a list of participants in alphabetic order. Secondly, it failed to explain in detail the criteria defining the classification labels. Thus, any attempt to reproduce its classification is inevitably affected by subjective interpretations of those labels. This is particularly problematic in several ambiguous cases, which are difficult to classify because they could belong to more than one category. Lastly, the DfT miscounted the number of participants, thus adding further uncertainty.

Nevertheless, by following (what is likely to be) the approach the DfT deployed to classify participants, it is possible to arrive at a similar classification. In the invitation document, the DfT asked participants to state whether they were responding as single individuals or on behalf of a company or other organisation. From those responding on behalf of a representative organisation, the DfT requested further details on whom their organisation represented (DfT, 2008a, p. 5). It is then quite likely that the DfT subdivided participants according to the *self-definitions* they provided in their responses. Most of the organisations sent responses containing self-definitions of their core business and/or main activity. For those that failed to do so, it remains unclear whether the DfT

inferred their nature from sources other than their consultation responses. However, given the limited time that the DfT had to analyse and report the consultation responses (from the 17th December 2008 to the 28th January 2009 for the first summary of responses), an in-depth investigation seems unlikely. As for the distinction among “oil producers/refiners”, “biofuel producers”, and “other business” in particular, the DfT seems to have regrouped industrial actors according to their degree of proximity to biofuel production and biofuel policy.

To classify participants, I followed a similar approach to the one described above and used the ten categories used by the DfT – though I modified the label of two categories to better reflect their nature. More specifically, I tracked and analysed the participants’ self-definitions of their core business and/or main activity both in their responses and in their websites. To classify industry actors in particular, I looked at how their businesses were related to the legal requirements of the UK biofuel policy. By doing so, I constructed a classification that approximately matches the DfT’s – though some categories are more approximate than others (see Table 1).

Table 1: DfT classification vs Dissertation classification			
DfT classification		Dissertation classification	
Biofuel producers	12	Biofuel producers (1)	12
Oil producers/refiners	7	Obligated suppliers (2)	7
Other business	9	Other business (3)	4
Other	5	Other (4)	2
Academic	3	Academic	3
Trade association	12	Industry associations (5)	20
Consultancies	1	Consultancies (6)	2
Non-governmental organisations (NGOs)	8	Non-governmental organisations (NGOs) (7)	7
Local government and non-departmental public bodies (NDPBs)	10	Local government and non-departmental public bodies (NDPBs) (7)	11 (4+7)
Members of the public	22	Members of the public (8)	22

TOTAL	89	TOTAL (9)	92
<p>(1) The DfT did not provide a response from the biofuel producer Good Fuel Cooperative & Golden Fuels.</p> <p>(2) I preferred to rename the DfT's "oil producers/refiners" category as "obligated suppliers" and populate it according to the RFA's list of obligated suppliers for the RTFO obligation year 2008/2009 (RFA, 2010, p. 18). This list offers a clear-cut criterion of subdivision that helped me distinguish uncertain cases – i.e. organisations potentially belonging to both the "biofuel producers" and "oil producers/refiners" categories. My category seemingly matches its DfT counterpart.</p> <p>(3) The DfT's "other business" category outnumbers mine by five units – probably because mine includes only industrial actors and excludes all representative organisations (see note 5).</p> <p>(4) The DfT's "other" category outnumbers mine by three units – probably because mine includes only respondents unclassifiable with respect to all the criteria here mentioned and excludes all representative organisations (see note 5).</p> <p>(5) I preferred to rename the DfT's "trade association" category as "industry associations" to underline their role as representative organisations of sponsor industries and to avoid confusion with trade unions. The DfT's "trade associations" is outnumbered by my "industry associations" category by eight units – probably because mine includes all private organisations whose core business is representing an industry irrespective of the core business of the industry represented. The DfT did not provide the response of an industry association – Confederation of Passenger Transport (CPT).</p> <p>(6) The DfT's "consultancies" category is outnumbered by mine by one unit – probably because only one of the two participants clearly stated in its response that it was a consultancy. The other respondent included in my category appears to be a consultancy from its website – although it remains a borderline case between "consultancies" and "industry associations".</p> <p>(7) The DfT's "non-governmental organisations (NGOs)" category outnumbers</p>			

mine by one unit, while the DfT's "local government and NDPB" category is outnumbered by mine by one unit – probably because of the affinity between NDPBs and NGOs. For my classification, I subdivided them according to their legal and/or financial links with governmental departments, identifying NDPBs as relatively more linked, and NGOs as relatively less linked to the UK Government.

- (8) The responses of "members of the public" – as defined by the DfT – were not available for this research.
- (9) According to the summaries of the responses, this consultation collected 89 responses in total, of which 22 were from "members of the public". However, in their annexes, the summaries of responses list the names of 68 organisations as respondents. Hence, there must be a mistake in the DfT's classification of respondents as these figures do not add up (DfT, 2009c, Annex A; 2009d, Annex A).

PART 1

Chapter 3 – Historical analysis

Introduction

This is the empirical chapter of the historical analysis, which focuses on a chronological sequence of official documents issued by several UK and EU public authorities during the period 1994-2012. This historical period has been divided analytically into two phases. The first covers the 1990s, which saw the emergence of the debate on sustainable road transport policy in the UK; the second covers the 2000s, which saw the emergence and evolution of the debate on biofuel policy in the UK. Official correspondence was undertaken between the UK Government and the Royal Commission on Environmental Pollution (RCEP) in the first phase, and between the UK Government and the Environment, Food and Rural Affairs Committee (EFrac) and the Environmental Audit Committee (EAC) in the second phase.

Evidence relating to the two historical phases is reported in two corresponding sections: section 1 covers the first phase, section 2 covers the second.

1. First phase: the 1990s, landscape and regime visions on road transport policy

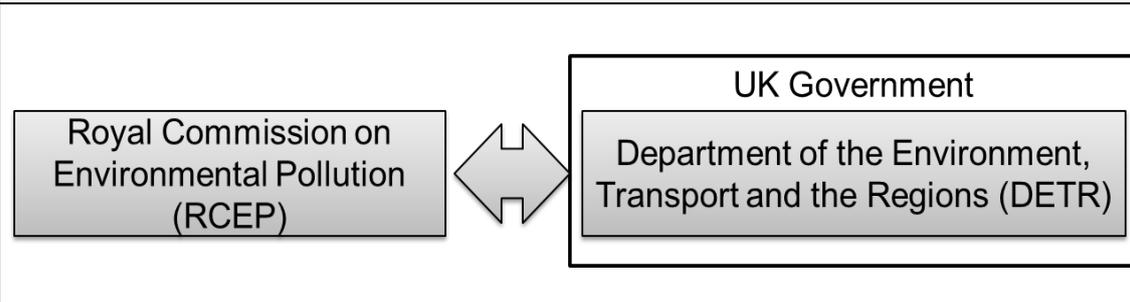
Even before climate change gained predominance as a policy priority, the UK Government had already embraced a sustainable development paradigm in policymaking. A notable exception was transport policy, which was neglected by the UK Government in its quest for sustainable development until the end of the 1990s. The national election of 1997 marked a turning point in transport policy. The newly elected UK Government abandoned the “predict-and-provide” paradigm of its predecessor, and officially endorsed a sustainable development paradigm in transport policy (RCEP, 1994, p. 81; Goodwin, 1999). The change in paradigm influenced the formation and firm establishment of a new landscape

vision. Later on, the UK Government used that landscape vision to justify the inclusion of biofuels in its regime vision on sustainable road transport policy. Among the participants in the debate ongoing at the time, the Royal Commission on Environmental Pollution (RCEP) was one of the most authoritative and one of the first to propose the new landscape and regime visions on sustainable road transport policy (Ferguson & Skinner, 2002, pp. 6, 35).

The debate on sustainable road transport policy had been historically framed into a series of key drivers, notably: improving air quality, mitigating noise pollution, tackling congestion, tackling climate change and ensuring energy security (Energy Saving Trust [EST], 2002, p. 9). Before the end of the 1990s, air quality had dominated the other key drivers. However, by the end of the decade, the priority of policy objectives changed as climate change gradually gained predominance, while progressive tightening of emissions standards for vehicle manufacturing eased the delivery of air quality objectives (EST, 2002, p. 9).

In 1997, the Department of Transport (DoT, established in 1981) was reformed as the Department of the Environment, Transport and the Regions (DETR), and its policy responsibilities extended from transport policy to include environmental and rural policies. The DETR initially shaped road transport policy reflecting the policy priorities dominant at that time – i.e. tackling air pollution, traffic congestion, noise pollution, local environmental degradation and climate change, this latter gradually gaining predominance over the others. Fuel security and fuel poverty were also taken into account and given increasing prominence. By 2002, the notion of sustainability – originally defined in relation to environmental concerns – had expanded its meaning to include economic and social objectives (Performance Information Unit of the Cabinet Office [PIU], 2002, p. 35).

Graph 1: public authorities map – first phase



1.1 UK Government: from predict-and-provide to sustainability

Until the end of the 1980s, forecasts of traffic growth were positively associated with a growing economy²¹ and the expansion of transport infrastructures was seen as the appropriate response to those forecasts. UK road transport policy was based on the economic principle of comparative advantage: investments in transport infrastructure would stimulate economic growth in other sectors of the economy by easing the movement of goods and people between areas with different comparative advantages (Ferguson & Skinner, 2002, p. 15). Preserving economic growth was an imperative, even at the expense of environmental degradation.

At the time, the landscape vision of the UK Government on road transport predicted that an expanding economy would endanger itself by fuelling an uneconomical growth in traffic. The logical response to this economic malaise seemed to be provision of additional space, which could be done by expanding the road network (RCEP, 1994, p. 81; Goodwin, 1999; Ferguson & Skinner, 2002, p. 5). The emphasis was on expanding roads rather than on looking for more environmentally sustainable ways to regulate and contain traffic growth (Ferguson & Skinner, 2002, pp. 15-16). This “predict-and-provide” paradigm

²¹ As reported by Defra, the DTI and the DfT: “Transport demand is still growing but the rate of growth has decelerated since the early 1990s relative to growth in GDP ... Each percentage point increase in GDP is accompanied by a significantly smaller increase in the movement of goods and people than was the case when Roads to Prosperity was published” (Defra et al., 2007).

constituted the backbone of UK road transport policy (RCEP, 1994, p. 81; Goodwin, 1999; Goulden et al., 2014, p. 140).

Nevertheless, as the 1990s approached, a new paradigm based on the concept of sustainable development was gaining prominence over the predict-and-provide paradigm (Goodwin, 1999, p. 660). Building new roads was no longer considered a credible solution to traffic growth, and was increasingly criticised for leading to unacceptable environmental damage (RCEP, 1994, p. 233). For the first time, addressing the forecast increases in traffic with additional road supplies was universally recognised as unrealistic (RCEP, 1994, p. 88; 1997, p. 1; Goodwin, 1999, pp. 658-659). Perhaps the last policy document fully endorsing the predict-and-provide paradigm was *Roads for Prosperity*, a white paper published in 1989 promoting a large road-building programme in the UK (DoT, 1989). Billed as “the biggest road-building programme since the Romans” (Defra et al., 2007, p. 19), the programme encountered opposition from an increasingly environmentally concerned public opinion and was eventually abandoned (RCEP, 1997, p. 1).

1.2 The RCEP and the UK Government: official correspondence, 1994-1997

During the 1990s, the debate on the role taken by transport policy in sustainable development gained prominence (Goodwin, 1999, p. 662; Ferguson & Skinner, 2002, p. 6). The RCEP contributed to this debate with its 18th report in 1994 and its 20th in 1997 (RCEP, 1994; 1997).

In the UK, the RCEP enjoyed a reputation as a highly authoritative institution. Its 1994 report *Transport and the Environment* attracted considerable attention in the media and amongst transport and environment professionals, who considered the findings of the inquiry ground-breaking (Ferguson & Skinner, 2002, pp. 6, 35). The RCEP was among the first UK authoritative institutions to address the debate on transport policy in a comprehensive and holistic way, by looking at innovative solutions to reduce traffic growth and taking into account a very broad range of environmental impacts. The overarching conclusion of its

1994 report, that current transport trends were far from sustainable, presented a substantial challenge to the UK Government (Ferguson & Skinner, 2002, pp. 5-6).

Criticised for having neglected such an important sector as transport in the quest for sustainability, the UK Government felt it had to step into the debate and, in April 1996, launched a green paper entitled *Transport – The Way Forward: The Government’s Response to the Transport Debate*. This was the first comprehensive statement of policy on inland transport since the 1977 white paper (RCEP, 1997, p. 3). The UK Government stated that the green paper represented its response to the RCEP’s 1994 report. The green paper recognised several of the concerns highlighted in the transport policy debate. Still, it was rather insubstantial and lacked any clear policy proposal (Ferguson & Skinner, 2002, p. 8).

The UK Government had not always been prompt in responding to the RCEP’s reports and did not always accept the Commission’s recommendations. However, prior the 1996 green paper, it had always submitted detailed and formal responses (Ferguson & Skinner, 2002, pp. 8, 12). The RCEP refused to accept the green paper as a Government response to its 1994 report on the basis that it did not satisfy the established requirements of formality and detail. It also lamented that the green paper did not represent a change in policy in consideration of the report’s conclusions (Ferguson & Skinner, 2002, p. 8). The RCEP thus called on the UK Government to resubmit a formal response. The refusal of the UK Government to satisfy this second call prompted the RCEP’s decision to launch a second report on transport policy in autumn 1996 (RCEP, 1997, p. 1). The RCEP stated that its decision to do so was motivated by its “conviction that the full extent of the challenge presented by the future of transport was becoming even more starkly evident” (RCEP, 1997, p. 1). It also lamented that “recent action has been too little and too slow to provide the prospect of a substantial shift in transport trends” (RCEP, 1997, p. 12).

Entitled *Transport and the Environment - Developments since 1994*, the RCEP’s second report was produced much faster than dictated by standard

procedure. The RCEP wanted to avoid publishing the report in the immediate run-up to the national election, which was set to take place in the first half of 1997 (Ferguson & Skinner, 2002, p. 9). Yet, it also reckoned that, to exert greater influence on the newly elected government, the report had to be published not too long after the middle of 1997 (RCEP, 1997, p. 1). The RCEP eventually published the report in September 1997, hoping that it would “prove timely in relation to preparation of the planned White Paper” of the UK Government (RCEP, 1997, p. 1). The 1997 report substantially reiterated what was written in the 1994 report.

In 1997, the Labour Party replaced the Conservative Party as the UK Government. The orientation of the new government gave the RCEP hope of a different reaction to their recommendations on transport policy (Ferguson & Skinner, 2002, p. 11). A year later – in July 1998, the newly elected UK Government published the first environmentally minded white paper on transport (DETR, 1998b), which also announced the forthcoming publication of a formal response to the RCEP’s 1997 report – which came in December 1998 (DETR, 1998a).

1.3 The RCEP: landscape vision in road transport policy

From the end of the 1990s, a new landscape vision permeated the debate on sustainable road transport. A sustainability development paradigm replaced the previously dominant predict-and-provide paradigm (RCEP, 1994, p. 81; 1997, p. 1; Goodwin, 1999). The new paradigm reformulated the problem of road transport as a trade-off between an economy in expansion and an endangered environment. Within the new landscape vision, climate change had gained predominance, while air pollution, congestion, noise and environmental degradation continued to represent pressing issues. The RCEP was among the first public authorities in the UK to promote the new landscape vision and to call upon the UK Government for an urgent rethink of road transport policy. Among other pressing issues, the RCEP highlighted concerns about the large and increasingly detrimental impact of road transport on human health (by

increasing air pollution), on climate change (by increasing GHG emissions) and on energy security (by increasing fossil fuel consumption).

The transport sector had become the most important source of air pollution, almost all air pollutants coming from road transport (RCEP, 1994, p. 24; 1997, p. 17). The RCEP warned that “the present use of road vehicles may be causing serious damage to human health by triggering or exacerbating respiratory symptoms and by exposing people to carcinogens from vehicle emissions ... [Therefore,] the situation should ... be regarded as unsustainable” (RCEP, 1994, p. 36; 1997, p. 19).

The transport sector had also become the fastest growing source of carbon emissions in the UK economy, responsible for almost a 25% share of the CO₂ emissions produced by the whole UK economy. Within that share, 87% came from road transport (RCEP, 1994, pp. 43, 239; 1997, pp. 25-26). Taking these trends into account, for the RCEP, “it would not be acceptable to rely solely on reducing emissions from other sectors of the economy” (RCEP, 1994, p. 239). The gravity of climate change and “the scale of [GHG emissions] reductions needed” warranted action in the transport sector too²² (RCEP, 1994, pp. 43, 239; 1997, pp. 25-26).

Road transport in particular had reached a 40% share in the total oil products consumed in the UK and was expected to further expand that share in the future (RCEP, 1994, p. 21). Even though the RCEP expected oil to remain available for some decades, oil was a finite resource, while road transport was not expected to reduce its almost complete dependence on it in the short-medium term. Such considerations led the RCEP to the conclusion that relying on oil for transportation should not consequently be regarded as sustainable in

²² The RCEP acknowledged the argument that “reducing carbon dioxide emissions from transport may not be the most cost-effective way of reducing total emissions and even that some further increase in emissions from the transport sector might be accepted and compensated for by larger reductions elsewhere” (RCEP, 1994, p. 44). However, it defended the need for intervention by advancing three reasons. Firstly, the scale of the reductions needed implied that all sectors of the economy had to make a contribution, as the exemption of any sector would have implied an unsustainable policy. Secondly, transport was reckoned to have a large potential for increased efficiency in energy use at a relatively affordable cost. Finally, as transport has also other undesirable effects on the environment other than affecting climate change, policies designed to achieve major reductions in carbon dioxide emissions from transport could also bring other important benefits for the environment (RCEP, 1994, p. 239; 1997, pp. 25-26).

the long term (RCEP, 1994, p. 142; 1997, p. 33). Aggravating all the above issues were the usual forecasts of dramatic increases in traffic (RCEP, 1994, p. 239; 1997, pp. 1, 105).

1.4 The RCEP: regime vision in road transport policy

In the 1994 report, the RCEP endorsed an innovative regime vision integrating a sustainable development paradigm into transport policy – a vision substantially reconfirmed in the 1997 report. This vision for sustainable road transport may be framed into short, medium and long terms.

For the short term, the primary aim of sustainable transport policy ought to be reducing the need for movement and this could be best achieved by a gradual shift away from lifestyles depending on high mobility and especially in the intensive use of cars (RCEP, 1994, p. 233). The RCEP stressed the importance of integrating transport policy with land use policy in an attempt to minimise the need for transport, increase the proportions of trips made by less environmentally damaging means and halt any loss of conservation, cultural, scenic or amenity areas due to new transport infrastructure development. Meanwhile, the demand for new transport infrastructure ought to be reduced to a minimum and likewise the use of non-renewable materials in the vehicle industry (RCEP, 1994, p. 234; 1997, pp. 105-107). By reducing the dominance of cars and lorries and providing alternative modes of access to town and cities, the RCEP expected short-term improvements, not least in terms of quality of life.

For the medium term, intervening in public transport and influencing motorists' choices would be more effective measures than investing in research and development in alternative vehicles technologies and "new low polluting fuels". In the medium term, the RCEP expected technological advancements to be mostly limited to improvements of internal combustion engines in reducing emission and increasing fuel efficiency, eventually leading to more fuel-efficient and less polluting conventional vehicles (RCEP, 1997, p. 33). This because it foresaw oil as "unlikely to be replaced in the medium term as the source of

power for the great majority of road vehicles” (RCEP, 1994, p. 142; 1997, p. 33). The RCEP noted that “considerable effort” had been devoted to developing alternative propulsion methods of road vehicles to the internal combustion types, but there had been “little tangible progress so far” (RCEP, 1994, p. 96). It also argued that alternative fuels have disadvantages as well as advantages in pollution terms, with no optimum fuel in environmental terms. It then concluded that:

“... there would not be any overall environmental advantage in widespread use of alternative fuels in the UK, and such use should not be expected in the medium term, barring large-scale government or EC [European Commission] intervention.” (RCEP, 1994, p. 125; 1997, p. 32)

For the long term, the RCEP instead considered technological advancements in new vehicle and fuel technologies to be essential for the transition to sustainable road transport. Oil being a finite resource and therefore unsustainable in the long term, the RCEP contended that “eventually an alternative or alternatives will have to be found” (RCEP, 1994, p. 142; 1997, p. 33). The RCEP expected hydrogen fuel cells to eventually become “the preferred technology for electric propulsion”, since there was “no overall benefit for the environment in the widespread use in the UK of electrically powered cars and heavy vehicles of the types at present available” (RCEP, 1994, p. 143; 1997, pp. 34-35).

Within this regime vision, no clear roles were assigned to biofuel expectations.²³ The RCEP only speculated that the above considerations could prompt a “closer interest in those fuels that can be obtained from crops [i.e. biofuels], despite their higher cost and, in some cases, other drawbacks” (RCEP, 1994, pp. 142-143). The drawbacks to which the RCEP was referring were: the extensive land required for cultivating energy crops, the possible adverse incentive in using unsustainable agricultural practices – with the consequent damages to habitats, and the “conflicting findings” about the overall energy

²³ Any reference to biofuels disappeared in the RCEP’s 20th Report of 1997.

balance of biofuels (RCEP, 1994, pp. 142-143). The RCEP also commented on a proposal for an EU Directive on Bioethanol,²⁴ which at the time was under negotiation. The RCEP indicated that the European Commission's interest in biofuels was related to concerns over how to deal with the crop surpluses produced under the Common Agricultural Policy. Seemingly casting doubts on the real intentions behind the proposal, the RCEP also stressed that environmental groups were opposing it (RCEP, 1994, pp. 142-143).

1.5 UK Government: endorsement of the landscape and regime visions

The UK Government led by the Conservative Party up to 1997 refrained from embracing the landscape and regime visions proposed by the RCEP, and turned down the RCEP's repeated calls to reply formally and in detail to the 1994 report. Apart from the provision of new roads, the UK Government seemed reluctant to intervene too incisively in transport policy. It had embraced a neoliberal economic ideology (Docherty et al., 2004) – an ideology grounded in the belief that markets could restore cost efficiency and dynamism to inefficient public sectors. Neoliberalism prescribed the transfer of control of the economy from the public to the private sectors, with public authorities playing the reduced role of market regulators. Endorsing that ideology, the UK Government supported and implemented liberalisation and privatisation processes in the UK public sectors.

Introducing environmental regulations in transport after its liberalisation and privatisation would have reversed previous policy commitments towards private industry called to administer the areas of public transport touched by those

²⁴ As Van Thuijl and Deurwaarder pointed out: "During the 1990s the production and use of biofuels started in several European countries and expanded significantly. At the same time, policy at a European level was initiated, mainly from the viewpoint of security of energy supply. EU policy focussed on the possibilities for tax ex-emption, but the Commission failed to get its proposals approved by the Member States. Then, the 1997 White Paper 'Energy for the future: Renewable sources of energy' mentioned a possible 18 Mtoe¹ liquid biofuels in 2010. The 2000 Green Paper 'Towards a European strategy for the security of energy supply' was the start for a more comprehensive policy, in which biofuels should contribute to a proposed ambitious target of 20% alternative fuels (biofuels, natural gas, hydrogen) in 2020. This policy was more detailed in a proposal for a Directive in 2001, where targets for the three alternative fuels were proposed. Only the biofuel targets for 2005 (2%) and 2010 (5.75%) made it into an EU Directive in 2003, viz. the 'Directive on the promotion of the use of biofuels or other renewable fuels for transport'" (Van Thuijl & Deurwaarder, 2006, p. 8).

processes. In addition, interventions aimed at influencing public choices towards more sustainable means of transport could have disappointed motorists, who had become a majority of the population (Goodwin, 1999, p. 660; Ferguson & Skinner, 2002, p. 7). Last but not least, the fragmentation of the public transport sector resulting from its liberalisation and privatisation had also weakened perceptions about the feasibility of these interventions (Ferguson & Skinner, 2002, p. 7). Close to a national election, these policy revisions were certainly not an appealing option for the Conservative Party. These concerns most likely explain the Conservative Government's decision not to endorse the RCEP's 1994 report. Nevertheless, such policy resistance did not prevent the landscape and regime visions promoted by the RCEP from gaining increasing prominence in the sustainable transport debate.

In an attempt to gain a hearing from the newly elected Labour Government, the RCEP published its second report on transport soon after the national election (Ferguson & Skinner, 2002, p. 11). That report essentially reiterated the findings of the first report, that the ultimate goal of transport policy should be a transition to sustainable transport, and repeated its call for the UK Government to revise road transport policy. As these recommendations seem to imply, the RCEP was concerned neither about the negative implications for the industry involved in the liberalisation and privatisation processes, nor about the political implications for the Conservatives.

Not liable for the policies enforced by its predecessor, the newly elected Labour Government realigned transport policy with the RCEP's visions. In 1998, it officially intervened in transport with an environmentally minded white paper, *A new deal for transport: better for everyone* (DETR, 1998b). Soon after, it published a detailed and formal response to the RCEP's 1997 report (DETR, 1998a, Foreword). The UK Government defined the 1997 report as "a valuable and very timely contribution" to its effort to formulate a new transport policy and, together with the 1994 report, was "important" in influencing its thinking on the issues concerned (DETR, 1998a, Foreword). The UK Government also acknowledged the RCEP's work as "central" in setting its agenda of interventions in the transport sector and recognised that there was a "clear

resonance” between that work and the white paper (DETR, 1998a, Foreword). Among those resonances was the acknowledgement that the consequences of forecast traffic growth were unacceptable and that the UK Government had to take action to secure more sustainable transport for the future. Previous policies were blamed for being “dominated by the short term” (DETR, 1998a, Foreword; 1998b, p. 5). The predict-and-provide paradigm was rejected on the basis that it simply “didn’t work” and that “more and more roads is not the answer to traffic growth” (DETR, 1998b, p. 5).

Meanwhile, climate change had become “the greatest global environmental threat facing the international community” (DETR, 1998b, pp. 5-6). In 1998, the UK Government committed the UK to a reduction of greenhouse gas emissions to 12.5% below 1990 levels over the period 2008-12 according to the Kyoto Protocol²⁵ on climate change (United Nations Framework Convention on Climate Change [UNFCCC], n.d.-a). In 2000, it further committed the UK to a domestic target of carbon dioxide emissions 20% below 1990 levels by 2010 (DETR, 2000b, p. 6).

By the 2000s, the landscape vision on sustainable road transport was firmly established, with UK public authorities endorsing it in their official publications (DTLR, 2001, Paragraph 2.4; EAC, 2001, Paragraph 6; DfT, 2002, Foreword; EST, 2002, p. 9; PIU, 2002, p. 12; DTI, 2003, p. 63; EFRAC, 2003, p. 8; DTI, 2006, p. 126; EAC, 2006, p. 14; EFRAC, 2006, p. 5; DTI, 2007, p. 235; DfT, 2009b, p. 22). By contrast, the role of biofuels in the regime vision kept evolving throughout that decade.

2. Second phase: the 2000s, biofuels in the regime vision on road transport policy

The UK Government marginalised biofuels in its regime vision on sustainable transport, at least until 2002, when it proposed the first financial incentive for

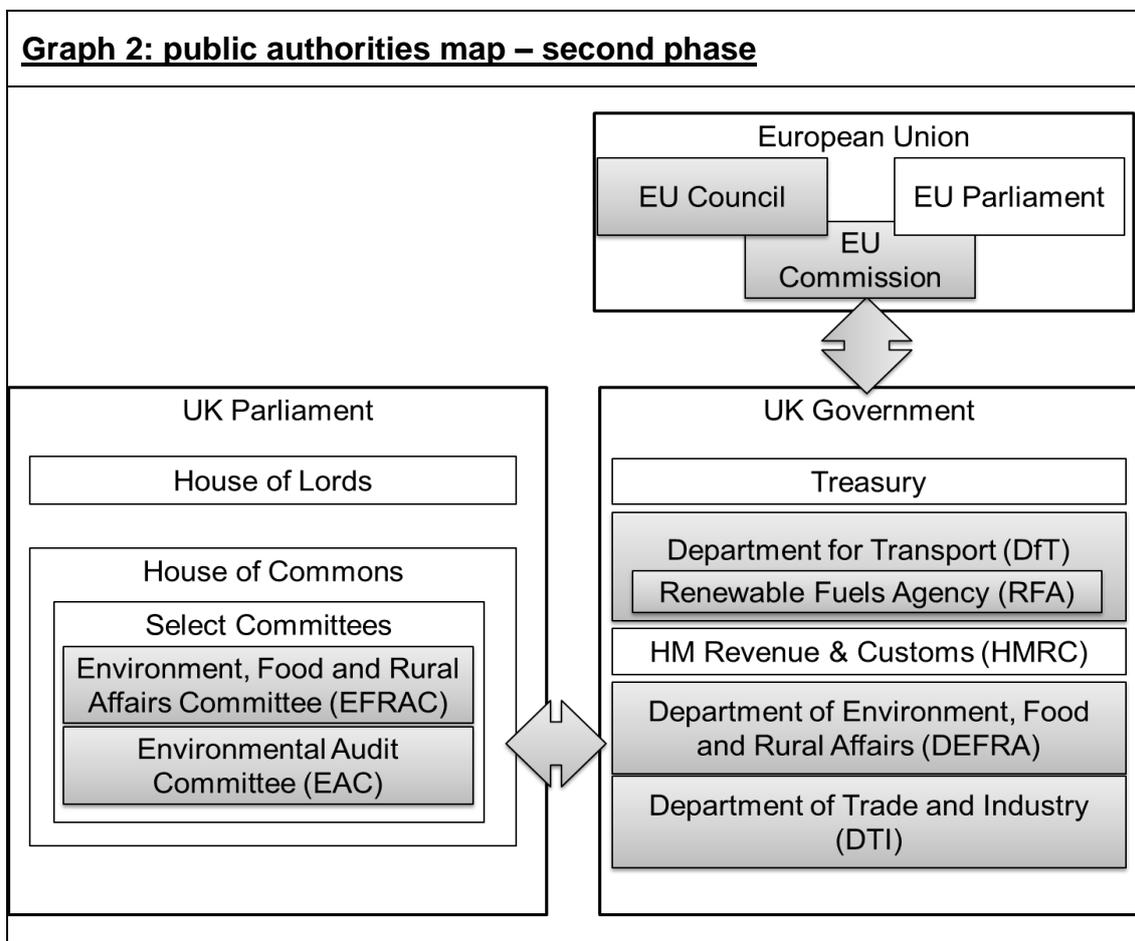
²⁵ The UK Government signed the Kyoto protocol on the 29th of April 1998 and ratified it on the 31st of May 2002 (UNFCCC, n.d.-b).

biodiesel. A turning point was the 2003 EU Directive on Biofuels (EU, 2003). The EU Directive forced the UK Government to include biofuels in its regime vision and to further develop UK biofuel policy. By 2003, biofuels were promoted as a means to mitigate climate change, enhance fuel security in road transport and foster the rural economy. Another turning point was the international controversy over the environmental and socio-economic sustainability of biofuels, which erupted in 2006. Biofuel policies became highly contentious. By 2006, optimism moved from currently used, but controversial “first-generation” or “conventional” biofuels to yet-to-be developed “second-generation” or “advanced” biofuels. Second-generation biofuels were predicted to offer greater carbon saving than first-generation biofuels, while avoiding many of the negative environmental and socio-economic implications attributed to the previous generation. The UK Government disagreed with EFRAC and the EAC on how to envision the future of UK biofuel policy during the whole period.

Extremely transversal, biofuel policy has involved overlapping policy areas as diverse as transport, energy, environmental, food and rural policies, calling on several UK Government Departments (EFRAC, 2003, p. 17; Defra, 2004, p. 1). Between 2001 and 2002, the Department of the Environment, Transport, and the Regions (DETR) was reformed as the Department for Transport, Local Government, and the Regions (DTLR). In the process, the newly instituted Department for Environment, Food and Rural Affairs (Defra) inherited the responsibilities over environmental and rural policies from the DETR, and has been responsible for the environmental, agricultural and rural aspects of UK biofuel policy since then (EFRAC, 2003, p. 17). In 2002, the DTLR was reformed again as the Department for Transport (DfT), its remit narrowed to transport policies. The DfT has been in charge of the practical implementation of all financial incentives for biofuels since then. More specifically, the DfT directly administered the fuel duty discounts on biofuels from their inception – 2002 for biodiesel, and 2005 for bioethanol – to 2007, when it delegated their management to the newly formed Renewable Fuels Agency (RFA). The RFA – an agency created by and financially linked to the DfT – managed the fuel duty discounts and the 2007 Renewable Transport Fuel Obligation (RTFO) from 2007 to 2011. In 2010, all fuel duty discounts on biofuels were withdrawn and, a

year later, the RFA was disbanded. Since 2011, the DfT has retaken direct control of the RTFO. The HM Customs and Excise Department – which after the merger with Inland Revenue in 2005 became the current HM Revenue & Customs (HMRC) – has collaborated with the DfT and RFA in implementing both financial supporting schemes. Meanwhile, the Treasury has been responsible for the fiscal side of all financial incentives since their inception. The Department of Trade and Industry (DTI) had been in charge of energy policy until 2008. In 2007, it was reformed as the Department for Business, Enterprise and Regulatory Reform (BERR) and, a year later, it handed over the energy policy area to the newly formed Department of Energy and Climate Change (DECC), which has led on energy policy since then. These departments have dealt with the energy policy aspects of biofuel policy.

Graph 2: public authorities map – second phase



2.1 UK Government: from marginalisation to inclusion of biofuels in the regime vision

Until the early 2000s, UK public authorities promoted hydrogen as the “fuel of the future” (RCEP, 1997, pp. 34-35; EAC, 2001, Paragraph 86; DfT, 2002, p. 10). Biofuels were instead dismissed as not suitable for the UK for various reasons. The reasons behind such a dismissal varied depending on their more or less pronounced sensibility for the environment and fuel security issues. The RCEP was concerned about the contested findings about the overall energy balance of biofuels and their adverse effect on the local environment (RCEP, 1994, p. 142; 1997, p. 33). The Alternative Fuel Group of the Department of the Environment, Transport and the Regions (DETR) appeared to be also sceptical about the potential of biofuels both in terms of carbon abatement and enhancing fuel security in the UK (DETR, 2000a, p. 29). The DETR ignored biofuels in the 1998’s white paper; then reorganised as Department for Transport (DfT), it ignored biofuels again in the 2002 Powering Future Vehicles Strategy (PFVS) (DETR, 1998b; DfT, 2002, p. 16). Biofuels were also marginalised in all governmental initiatives for research and financial support in alternative fuels (DTI, 1999; DETR, 2000a, p. 29; DTI, 2000; 2001; 2002, p. 23; EST, 2002, p. 11; House of Commons Library [HoC Library] 2002, p. 57).

Nevertheless, by the end of 2001, biofuels started gaining increasing attention. In November 2001, the European Commission formalised rumours²⁶ about an upcoming EU Directive on the promotion of biofuels into a formal proposal (EC, 2001). The same year, the UK Government announced a first financial incentive for biofuels – meant to be enforced by the 2002 Budget. The financial incentive – a duty rate discount of 20 pence per litre compared to the Ultra-Low Sulphur Diesel (ULSD) – was anyhow granted only to biodiesel.²⁷ Proposals from Liberal Democrats to apply a duty rate discount also to bioethanol and to increase both duty discounts up to the greater level granted to road fuel gasses encountered

²⁶ Earlier attempts to introduce a stronger support for biofuels from the European Commission, in the form of duty tax reliefs, can be traced back as early as 1992 (EC, 2001, p. 7).

²⁷ Prior the introduction of the discounted duty rate, biodiesel was charged the same duty rate of ULSD. The financial incentive was meant to offset the higher production cost of biodiesel with respect to ULSD’s price. As the duty reduction was granted also to imports of biofuels, the initiative failed to boost the emergence of a UK-based biodiesel industry (DfT, 2006, p. 3).

the opposition of the UK Government. This latter objected the proposed measure as “premature”. Practical difficulties in ensuring the quality and cost competitiveness of the biofuel supported through the scheme required time to be overcome, implying that a cautious approach would have been preferable. While, concerning the extension of the duty discount to bioethanol, the UK Government objected that currently available bioethanol was deemed as offering few GHG savings on a life-cycle basis (HoC Library, 2002, pp. 23-24). Bioethanol from lignocellulosic feedstocks – i.e. second-generation biofuels – was seen as a solution granting much greater greenhouse gas savings than those obtainable from current bioethanol technologies. However, it was also recognised that those technologies were still at the research and development phase and that any translation of those technologies from the laboratories to commercial plants would be anyhow unlikely at least until 2004 (HoC Library, 2002, pp. 23-24).

The European Commission’s proposal became the first EU Directive on Biofuels in 2003 (EU, 2003). The Directive set non-binding “reference” targets requiring EU Member States to include increasing annual rates of biofuels over the total national consumption of road transport fuels (i.e. diesel and petrol), precisely: 2% by 2005 and 5.75% by 2010 per energy content. Member States had the option to set their own “indicative” targets and choose how to implement them, but were required to justify any divergence from the EU-wide reference targets and report on progress towards the targets chosen. The EU Directive thus forced the UK Government to include biofuels in the regime vision and to further develop its biofuel policy. The UK Government announced the launch of a consultation for the first half of 2004 on the definition of the UK indicative targets for biofuels and design of the relative biofuel policy for the UK (EFRAC, 2003, p. 15). This was the first consultation on biofuel policy and was entitled: *Towards a UK Strategy for Biofuels* (DfT, 2004b).

By 2003, EU and UK public authorities were promoting biofuels through optimistic expectations for future benefits in mitigating climate change and enhancing fuel security in road transport, i.e. in reducing GHG emissions and diversifying transport fuel supplies, as well as in fostering the rural economy, i.e.

in creating new markets for non-food crops and jobs in the biofuel supply-chains (EC, 2001, pp. 31-32; EFRAC, 2003, p. 5; EU, 2003, pp. 42-44). Three months before the 2003's EU Directive, the Department of Trade and Industry (DTI) intervened in the sustainable transport debate through the publication of a White paper on Energy Policy (DTI, 2003). The DTI strengthened the considerations on fuel security and fuel poverty in transport policy, while reconfirmed the urgency of climate change in the landscape and regime visions on sustainable transport. Although hydrogen remained the preferred option for the long term, a novelty was the positive consideration of biofuels as an important option for carbon abatement in transport (DTI, 2003, p. 70). Biofuels were now presented as an "important potential route for achieving the goal of zero-carbon transport, creating new opportunities for agriculture in the UK as well as globally" (DTI, 2003, p. 69). Another novelty was the mention about the opportunities for rural development offered by the production of biofuel feedstocks. The UK Government's optimistic expectations about these opportunities contrasted with the RCEP's previous concerns on the risk of unsustainable practices in biofuel feedstock cultivations (RCEP, 1994, pp. 142-143).

2.2 EFRAC and the UK Government: first official correspondence, 2003

In 2002, the Department of Environment, Food and Rural Affairs (Defra) became responsible for the environmental-agricultural aspects of the newly emerging UK biofuel policy (EFRAC, 2003, p. 17). In 2003, the Environment, Food and Rural Affairs Committee (EFRAC), whose remit is "to examine the expenditure, administration, and policy" of Defra "and its associated bodies" (EFRAC, 2003, p. iv), assessed how UK biofuel policy could contribute to Defra's policy objectives.

In the 2003 *Biofuels* report, EFRAC shared the landscape and regime visions endorsed by the UK Government: "... all sectors should make a contribution towards reducing the United Kingdom's emissions", including transport (EFRAC, 2003, p. 11). Biofuels were an "important" (EFRAC, 2003, p. 3) and "attractive means of doing so for transport", at least "until hydrogen fuel cells

become commercially viable” (EFRAC, 2003, p. 11). Even if EFRAC acknowledged that biofuels were not the most efficient way to reduce emissions, it also reckoned them as capable of substantial carbon savings and, crucially, as the only readily available renewable energy for transport (EFRAC, 2003, pp. 3, 11).

At that time supporting biofuels, EFRAC welcomed the change in policy landscape. However, it lamented that the UK Government appeared as “still testing the waters” concerning its commitment in developing a domestic biofuel industry, with the current level of support reflecting its “ambivalent attitude” (EFRAC, 2003, p. 18). In view of the 2005’s EU target, EFRAC also criticised the UK Government’s decision to launch the public consultation on UK targets in the first half of 2004. That timing would have left “too little time” to the farmers to be able to deliver the extra amount of crops and to the industrials to bring into line extra processing capability required for the 2005’s target (EFRAC, 2003, p. 15).

Notwithstanding its general optimism toward biofuels, EFRAC also acknowledged the lack of clear evidence on both future benefits for the rural economy (EFRAC, 2003, p. 18) and environmental impacts of expanding biofuel production in the UK and elsewhere (EFRAC, 2003, p. 12). On these grounds, it recommended the development of an auditing system on the environmental and socio-economic impacts of biofuels in the countries in which they were produced (EFRAC, 2003, p. 18). Beyond these informational gaps, EFRAC lamented that any evaluation of the UK Government’s commitments in biofuels was de facto hampered by the lack of an explicit prioritisation among the policy objectives to pursue with what defined as a “muddled and unfocussed” biofuel policy (EFRAC, 2003, pp. 9-10, 15-17).

In its response to EFRAC’s 2003 report, the UK Government welcomed EFRAC’s endorsement of its landscape and regime visions (Defra, 2004, pp. 2-4). However, it firmly rejected all EFRAC’s critics of UK biofuel policy. About EFRAC’s comment on its “unfocused and muddled” nature, the UK Government objected that it had always made clear that environmental benefits were at heart

of alternative fuels policies (Defra, 2004, p. 2). The 2003 Pre-Budget Report outlined a “clear [and] systematic set of principles applying to decision in this sector, with environmental, social and economic considerations all taken into account in determining the level of support for these fuels” (Defra, 2004, p. 2). Any road transport policy had to be environmentally, economically and socially sustainable, with environmental gains as “central priority” (Defra, 2004, p. 3). More specifically, any such policy had to “reflect the full environmental impact of the fuel” and its “broader considerations of social impact and fairness” (Defra, 2004, p. 3). It also had to deny support to industries whose survival depended on “excessive levels of subsidy unjustified by environmental benefit”, “provide value for money” for taxpayers and “the necessary stability, confidence and market conditions for investors” (Defra, 2004, p. 3). As for biofuels in particular:

“... capturing the environmental benefits of biofuels is the principal policy reason for Government support with duty incentives. Other considerations such as economic and social factors, though secondary, are also taken into account in the Chancellor’s fiscal decisions.

It is not the Government’s intention to establish industries based on excessive Government subsidy not justified by clear and well-established evidence of environmental, social, and economic benefits. Where fuels fulfil the criteria set, the Government is determined to achieve the best outcome for both the tax-payer and the economy as a whole. Support will therefore be given where it is both cost-effective and affordable.” (Defra, 2004, p. 6)

The UK Government accepted EFRAC’s recommendations to investigate on the impact of a UK-based biofuel industry on rural development and on biodiversity and conservation (Defra, 2004, pp. 4-5). However, it turned down the recommendation about setting up a system of auditing for biofuels in order to ensure their sustainability in the UK and overseas. The UK Government doubted the practical feasibility of an auditing system for biofuels, as “auditing the environmental impact of biofuels in the countries in which they are produced is extremely problematic and it is unlikely that a cost-effective and robust

system of regulation could be introduced” (Defra, 2004, p. 9). It then further anticipated that, “in any case, any attempt to refuse imports on the basis of perceived or measured environmental impacts could be seen as a barrier to free trade and would almost certainly lead to conflict with the World Trade Organisation” (Defra, 2004, p. 9).

Against the critique of its “ambivalent attitude” towards supporting biofuels, the UK Government defended its biofuel policy objecting that it was “too early to judge how far the policy has been a success” (Defra, 2004, p. 8). It pointed out that the duty reduction for biodiesel was introduced only in July 2002 and that the duty incentive for bioethanol was going to be introduced only in January 2005, “when it is hoped that British companies will be ready to produce it for the UK market” (Defra, 2004, p. 9). However, it avoided commenting on the time constraints imposed to the farming and biofuel industries by its decision to set the public consultation on UK targets in 2004 – i.e. only a year before the 2005’s EU biofuel target.

2.3 UK Government: UK biofuel targets set lower than those in the EU Biofuel Directive

Article 4 of the EU Directive on Biofuels forced EU Member States to report annually to the European Commission on the progresses made and, in case, to justify the adoption of different targets from those proposed. In the 2004 report on progress to the European Commission, the UK Government announced a UK indicative target of 0.3% per volume by 2005 – then reconfirmed in November 2005 – as opposed to the much higher²⁸ reference target of 2% per energy content as proposed by the 2003’s EU Biofuel Directive.²⁹ It also opted to delay the announcement of the target for 2010 to 2007 as allowed by the Directive (DfT, 2004c, p. 8).

²⁸ Because of the minor energy content of biofuels with respect to fossil fuels, the translation of the EU reference target from energy content to volume results in a higher percentage per volume, respectively: 2% per energy content is equivalent to 2,5% per volume (RFA, 2008a, p. 90).

²⁹ This confirmed the prediction of EFRAC that the UK Government was “unlikely to set itself very ambitious targets, at least for the first deadline” (EFRAC, 2003, p. 15).

To justify the lower target, the UK Government pointed out that UK biofuel “incentives have only been recently introduced³⁰ and given the UK's low starting point; the considerable growth this target implies; and the limited time between now and the target period, we feel it represents a challenging but realistic target for the UK” (DfT, 2004c, p. 8). Beyond these pragmatic considerations, the UK Government also mentioned other reasons that implicitly justified a cautious approach:

“Industry has called for a higher level of incentive, but the cost of the current incentive already outweighs the monetised carbon benefit, and biofuels are currently an expensive method of carbon abatement ... Our economic analysis suggests that greater incentive levels at this time would largely result in imports, including from outside the EU. This would limit the potential benefits to the UK and broader EU agricultural & rural sectors of a new market. In addition, there is strong concern that greater demand from the EU for biofuel feedstocks could lead to further deforestation in South East Asia and South America - thereby undermining the environmental benefit sought through the measure.” (DfT, 2004c, p. 2)

Thus, the caution of UK Government in increasing support to biofuels seems to relate also to financial, environmental as well as fuels security concerns. An increase of biofuel imports would have not only wasted opportunities for rural development within the UK and the EU, but also undermined the goal of fuels security by making the UK and the EU dependent on foreign biofuels.

After having examined the reasons given by the UK and other EU Member States to justify their delayed implementation of EU biofuel targets, in a joint press release, the European Commission insisted on its targets and objected that “the reasons given lack relevance, seem incorrect, [and] put the desirability of the Directive itself into question” (EC, 2005).

³⁰ At the time, the only financial incentive for biofuels was a fuel duty discount for biodiesel only, operative since July 2002.

Abiding by the 2003's EU Biofuel Directive, in November 2005 the UK Government eventually announced the future introduction of the Renewable Transport Fuel Obligation (RTFO). The RTFO was set to impose a legal obligation on large-scale transport fuel suppliers to blend increasing annual rates of biofuels in the road-transport fuels that they supplied to the UK from 2008 onward (DfT, 2005b, p. 3). Meant to become the main supporting mechanism to promote renewable fuels into the long term, the RTFO was presented as more effective than the fuel duty discount. This latter "proved to be insufficient to stimulate the level of investment in production capacity and infrastructure required to meet the Directive's objectives ... [and] very expensive, potentially placing unsustainable pressures on public finances" (DfT, 2006, p. 3). Nevertheless, that same year, the UK Government extended the duty fuel reduction of 20p per litre, which was previously granted only to biodiesel, also to bioethanol (DfT, 2005b, p. 2). In 2005, the emergent UK biofuel industry saw the first large scale biodiesel plant coming on stream in Scotland (DfT, 2005b, p. 5).

In the 2006's Budget, the UK Government announced the annual rates of the RTFO, respectively: 2.5% for 2008/09, 3.75% for 2009/10 and 5% for 2010/11 all per volume (DfT, 2006, p. 3). Reconfirming earlier caution, even the target set for 2010 was far below³¹ the EU Directive's reference value – i.e. 5.75% per energy content by 2010. In the 2006 report on progress to the European Commission, the UK Government justified the lower target by stating that such decision was taken after "intensive stakeholder discussion and taking into account a number of objective factors" (DfT, 2006, p. 3). Among those factors were concerns over the sustainability of biofuel supply chains, indicated as "potentially undermining the central environmental policy objective". Then, contradicting its previous objections, it announced the intention to develop an

³¹ The UK Government announced UK indicative targets that were significantly lower than the EU reference targets as set by the European Commission in the 2003's Biofuel Directive – i.e. 0.3% per volume against the EU's 2% per energy content for 2005, and 5% per volume against the EU's 5.75% per energy content for 2010. Biofuels have a lower energy content compared to fossil fuels. This means that EU targets translated from energy content into volume results in higher percentages per volume, respectively: 2% per energy content is equivalent to 2,5% per volume (for 2005), and 5,75% per energy content is equivalent to around 7% per volume (for 2010) (RFA, 2008a, p. 90).

“assurance scheme alongside the Obligation to ensure, as far as possible, biofuels are produced from sustainable sources”. Such a scheme was emphasised as fundamental to maintain the support of environmental groups in UK (DfT, 2006, p. 4).

About the timing of the RTFO, the UK Government reported the findings of the DfT’s *Renewable Transport Fuel Obligation (RTFO) feasibility report* (DfT, 2005a), which concluded that the earliest an RTFO could be introduced would be April 2008. According to that report, a minimum period of 18 months was needed to develop both an assurance scheme for ensuring the sustainability of biofuels and for the UK industry to put in line new capacity. More specifically, “stakeholders” were reported sustaining that “it takes at least 18 months, and typically longer, to bring new capacity on stream”. As for sustainability standards, more time was needed “taking into account factors such as setting up an administrator to run the scheme; the complex secondary legislation required; and developing an IT system and putting new business processes in place” (DfT, 2006, p. 4). In addition to that, the UK Government reminded that the EU Fuels Quality Standards still imposed a 5% limit on the amount of biofuels that could be blended into petrol and diesel, making the setting of a legal obligation above that limit “inherently problematic” (DfT, 2006, p. 3).

Thus, despite EU reference targets and biofuel industry’s demands for higher support, the UK Government remained cautious and promised lower support to biofuels. Implementing the RTFO and developing a system of sustainability standards required time; hence implicitly justifying lower biofuel targets. Yet, in contradiction to its earlier pessimism on the feasibility of a sustainability standards system, from 2005, it started presenting such a system as feasible and necessary.

In view of a forthcoming white paper on energy policy (DTI, 2006, p. 10), the DTI published an Energy Review in 2006. The review reconfirmed the landscape vision on sustainable transport (DTI, 2006, pp. 126-127), although adding emphasis on energy security as it acknowledged that the UK would soon become a net importer of oil (DTI, 2006, p. 10). A novelty in the review was the

UK Government's formal announcement about its intention of to increase RTFO rates above 5% after 2010/2011 only provided that three critical factors were met:

“...development of robust sustainability and carbon standards for biofuels to ensure that they are delivering high levels of carbon savings without leading to biodiversity loss or endangering sensitive habitats; development of new fuel quality standards at EU level to ensure existing and new vehicles can run on biofuel blends higher than 5%; and costs to consumers being acceptable.” (DTI, 2006, p. 127)

By 2006-2007, currently used first-generation biofuels were already widely recognised as environmentally and socio-economically problematic (Dunlop, 2010, p. 352; Palmer, 2010, p. 999; Boucher, 2012, p. 150). Techno-optimistic expectations were transferred to second-generation biofuels, foreseen as offering greater environmental and socio-economic benefits. Accordingly, the future development of effective sustainability standards and second-generation biofuels had become crucial expectations to justify current targets. Yet, high uncertainty persisted about when these developments would materialise. UK biofuel policy faced the dilemma of whether UK mandatory targets should await the development of sustainability standards and more sustainable biofuels – or else be preserved as a means to stimulate these developments.

2.4 EFRAC and the UK Government: second official correspondence, 2006

In 2006, EFRAC enquired Defra on bioenergy policy through a formal report – i.e. the *Climate change: the role of bioenergy* report (EFRAC, 2006). Bioenergy policy included policies on biomass for heat and electricity generation as well as biofuels for transport (EFRAC, 2006, p. 3). Only three years after the 2003 *Biofuels* report, EFRAC had turned its initial optimism towards biofuels into pessimism and reversed its judgement on the UK Government's attitude towards biofuels from a lack to an excess of commitment.

In the 2006 report, EFRAC criticised the UK Government for a “disproportionate degree” of support to current transport biofuels to the detriment of other bioenergy forms, which offered greater carbon savings (EFRAC, 2006, p. 3). EFRAC still acknowledged biofuels as one among a limited number of options available to reduce carbon in transport. However, given the reduced land capacity of the UK and the current technological status of biofuels, it concluded that supporting current biofuel technologies did “not present the most effective or efficient way of making a significant difference to the UK’s carbon emissions in the long term” (EFRAC, 2006, p. 5).

Welcoming the UK Government’s announcement about the future development of an assurance scheme for biofuels, EFRAC warned anyhow that the evaluation of any energy use of biomass should include all impacts on land use. Previously land use for energy purposes was associated with environmental risks such as deforestation and loss of biodiversity. A novelty in this report was the inclusion of food security among the issues adversely affected by land use change (EFRAC, 2006, pp. 33-35).

EFRAC was also “extremely disappointed” by the announcement that the auditing of biofuels would not be enforced in the initial phase of the RTFO. Without sustainability standards, the RTFO would effectively favour first-generation biofuels – readily available and cheaper to produce/buy, to the detriment of second-generation biofuels – expected to offer greater GHG emission savings. Thus, it warned that biofuel support as currently set “could ‘lock in’ first generation biofuel technologies and so damage the prospects for development and use of more advanced fuels” (EFRAC, 2006, pp. 45-46).

For EFRAC, second-generation biofuels deserved priority as they could grant much greater carbon abatements and entailed less negative implications, than first-generation biofuels (EFRAC, 2006, p. 5). EFRAC inferred and accepted the UK Government’s reluctance in picking technology “winners and losers” at this early stage. Nevertheless, it was also “vital” that the UK Government engaged in finding and removing barriers to second-generation biofuels as well as in establishing the level of investments needed to accelerate their development

(EFRAC, 2006, p. 24). Second-generation biofuels needed “concerted and sustained investment” in order to become commercially viable. Adapting the RTFO to reward biofuels according to their carbon savings would have facilitated such an investment – i.e. linking the RTFO certification to biofuel performances in reducing life-cycle emissions (EFRAC, 2006, p. 3). As a further measure, fuel duty reductions could also be made exclusive to biofuels generating net carbon savings (EFRAC, 2006, pp. 45-46).

The UK Government welcomed the EFRAC’s 2006 report as a “useful contribution to the policy discourse” (Defra, 2006, p. 2). In agreement with EFRAC, it acknowledged second-generation biofuels as “less likely to have the same impact on world commodity markets as first generation biofuel production, which competes with the food industry for corn and oil feedstocks” (Defra, 2006, p. 9). It then reiterated its commitment in encouraging the development of fuels offering the greatest level of greenhouse gas savings (Defra, 2006, pp. 5-6). Again contradicting its earlier pessimism, the UK Government promoted sustainability standards as feasible and showed confidence on their future realisation. About the issues to include in the system, it said to be “aware that land use may be an increasing issue, not only in the UK, but in other Member States and beyond”. It then reassured that it will “consider the importance of, and the impact of bio-energy developments on land use, biodiversity and commodity markets when determining the future support levels of biofuels and bioenergy, drawing upon the developing research base” (Defra, 2006, pp. 9-10).

Nevertheless, since a system of sustainability standards did not exist yet, the UK Government could neither enforce it from the start of the RTFO nor announce when such system was going to be operational. Consequently, it was also impossible to adapt the RTFO to reward biofuels according to their GHG emissions performances, at least by the time of its launch. Against EFRAC’s concerns on these latter points, the UK Government only opposed pragmatic considerations. Mentioning the DfT’s RTFO feasibility study (DfT, 2005a), “integrating GHG fully into the RTFO was fundamental to ensure the potential of the mechanism to achieve its objectives. However ... the additional complexity, legal uncertainty and short term implications of incentivising GHG savings

directly suggested that a staged approach toward integration was advisable". The UK Government thus endorsed the study's recommendation to enforce "a reporting requirement in the first instance, developing into a hardened carbon incentive over time" (Defra, 2006, pp. 10-11). It then declared itself "keen to move toward direct incentivisation as soon as it becomes feasible to do so" (Defra, 2006, pp. 10-11).

2.5 UK Government: higher UK biofuel targets, but with preconditions

In March 2007, the European Council agreed on a common European strategy for energy security and tackling climate change, setting up several renewable energy targets to be introduced in a cost-efficient way by 2020 (EU Council, 2007, p. 21). Despite the biofuel controversy, the agreement committed all Member States to a binding target by 2020 of 10%³² per energy content of biofuels over the total consumption of petrol and diesel. Although the new biofuel target was higher and mandatory, it set a slower increase in annual rates than the 2003 Directive had done. The new target was also subject to conditions: (1) the production being sustainable, (2) second-generation biofuels becoming commercially available and (3) the Fuel Quality Directive being amended accordingly to allow for adequate levels of blending (EU Council, 2007, p. 21).

As announced in the Energy Review of 2006, in May 2007, the DTI published a second white paper on energy, entitled: *Meeting the Energy Challenge* (DTI, 2006, p. 10; 2007, p. 8). That same month, the DfT published *The Low Carbon Transport Innovation Strategy* (DfT, 2007c, p. 3) and Defra published *The UK Biomass Strategy* (Defra et al., 2007, p. 8). The DTI and the DfT specified that the UK Biomass Strategy specifically addressed the role of biomass in transport and complemented the white paper on energy (DfT, 2007c, p. 40; DTI, 2007, pp. 243, 251). All three documents reiterated the proviso already expressed in the 2006's Energy Review that the increase of the level of the RTFO beyond 5% after 2010/2011 was subject to, among other conditions, the enforcement of

³² A biofuel target of 10% per energy content would be equivalent to 12,5% per volume (RFA, 2008a, p. 90).

sustainability standards (Defra et al., 2007, p. 33; DfT, 2007c, p. 40; DTI, 2007, p. 242).

The UK Biomass Strategy added to the above conditions the European Council's pre-condition of "second generation biofuels becoming commercially available" for the new EU target of 10% biofuels per energy content by 2020 (Defra et al., 2007, p. 8). In that document, the UK Government acknowledged transport biofuels as the least cost-effective way to reduce GHG emissions by converting biomass, but also promoted first-generation biofuels as the only available option to fulfil EU obligations. It sustained that biomass use for energy purposes needs not reflect that hierarchy because "it does not take into account the relative importance of biomass fuel sources in delivering climate change goals and targets"; especially "in the transport sector for which there are few other options in the short to medium term" (Defra et al., 2007, p. 7). To reinforce expectations for future improvements in environmental and socio-economic sustainability, the UK Government emphasised second-generation biofuels as soon coming on stream: "It is likely that by 2020 second generation biofuel technologies will be in place. This should make the production of biofuels from land much more efficient, with a reduced area needed to produce a given volume of biofuels..." (Defra et al., 2007, p. 22).

In June 2007, the UK Government reconfirmed its intention to delay the introduction of a mandatory system of sustainability standards until after launching the RTFO in April 2008. However, it also announced that biofuels would be rewarded according to their GHG savings from April 2010, and become eligible for support only if their feedstocks were certified as sustainable from April 2011 (DfT, 2008e, Section 2).

Thus, expectations for future improved sustainability served to justify rising future targets, especially in response to biofuel critics. Meanwhile the pre-conditions on the availability of second-generation biofuels and sustainability standards sent the biofuel industry an ultimatum to develop the former and implement the latter. In these ways, the EU Council and UK Government seemingly sought to find a future way out from their policy commitments to first-

generation biofuels, especially in case of disappointed expectations on second-generation biofuels and suitability standards.

In its 2008 proposal for a Renewable Energy Directive, however, the European Commission did not include the EU Council's pre-condition on the availability of second-generation biofuels for the 2020 target. It justified the exclusion on the following grounds: "The main purpose of binding targets is to provide certainty for investors. Deferring a decision about whether a target is binding until a future event takes place is thus not appropriate" (EC, 2008, p. 13). Such pre-condition similarly conflicted with industry's demands for higher future targets as prior requirements to bring about technological advance, especially for second-generation biofuels (EAC, 2008a, Evidence195).

Meanwhile, the DfT was implementing the public consultations on UK biofuel policy, which previously announced in the name of the UK Government. In February 2007, the DfT launched the second consultation to seek views on the design of the RTFO (DfT, 2007b). The consultation received 6335 responses of which 6270 from "members of the public" expressing concerns about the environmental impacts of biofuels. The DfT inferred that the quite impressive number of responses was due to an advertising campaign run by a coalition of non-governmental organisations (NGOs) – deemed to have prompted more than 5000 responses (DfT, 2007d, pp. 2-5). In June 2007, the DfT launched a third consultation on the definition of the carbon and sustainability reporting system to enforce through the RTFO (DfT, 2007a). Probably due to the technical nature of the subject, this consultation received only 54 responses in total and all from "stakeholders" (DfT, 2008d).

2.6 The EAC and the UK Government: official correspondence, 2008

By 2008, the UK Government had already started justifying biofuel policy through three optimistic expectations: second-generation biofuels would soon overcome the problems of first-generation biofuels; sustainability standards would soon be effective and implemented; and current first-generation targets would stimulate industry to fulfil the previous two expectations. Especially this

last expectation was questioned by the Environmental Audit Committee (EAC), whose remit is “to consider to what extent the policies and programmes of all government departments and non-departmental public bodies contribute to environmental protection and sustainable development” (EAC, 2008a, p. iv). Reiterating EFRAC’s 2006 report, the EAC’s 2008 report – i.e. *Are biofuels sustainable?* – warned about the risk of a “lock in” of investments in first generation biofuels hampering second generation biofuels, and advocated priority for supporting these latter and developing sustainability standards.

The EAC argued that biofuels are “often not an effective use of bioenergy resources, in terms either of cutting greenhouse gas emissions or value-for-money” (EAC, 2008a, p. 3), and hardly a solution to improve fuel security in the EU (EAC, 2008a, p. 31). Nevertheless, “biofuels *can* reduce greenhouse gas emissions from road transport”³³ and that second-generations biofuel technologies “*might* have a sustainable role in the future”³⁴ (EAC, 2008a, p. 3). This said, current first-generation biofuels have “a detrimental impact on the environment overall”, warranting the enforcement of a system of sustainability standards to contain their “serious environmental consequences” (EAC, 2008a, p. 14).

Yet, the EAC doubted that current sustainability standards could prevent all damage from first-generation biofuels (EAC, 2008a, pp. 14, 19). The EAC recommended revising those standards in order to make them inclusive also of wider impacts such as biodiversity loss, water pollution, fertiliser and pesticide pollution (EAC, 2008a, p. 14), the destruction of carbon sinks internationally (EAC, 2008a, p. 19), and worsening of food security in developing countries (EAC, 2008a, p. 22). Especially concerning this latter point, the EAC questioned whether these biofuels had a long-term role as the long-term demographic and climate change trends were already likely to worryingly compromise food security worldwide (EAC, 2008a, p. 22). That considered, the implementation of an effective sustainability standards system should not be considered just as a priority in biofuel production, but also as an opportunity for regulating all

³³ ‘*can*’ is in italics in the original text.

³⁴ ‘*might*’ is in italics in the original text.

internationally traded commodities (EAC, 2008a, p. 10). Accordingly, the support for first-generation biofuels remained “inappropriate” as long as land management was not made sustainable, even considering the benefits to the rural economy would get from increased agricultural prices and biofuel support mechanisms (EAC, 2008a, p. 30).

It then strongly criticised the missed enforcement of such standards at the start of the RTFO and contended that “In the absence of such standards, the Government and the EU has moved too quickly to stimulate the use of biofuels” (EAC, 2008a, p. 14). On those grounds, it recommended a moratorium on biofuel policy to keep biofuels production on hold “until technology improves, robust mechanisms to prevent damaging land use change are developed, and international sustainability standards are agreed” (EAC, 2008a, pp. 3, 14). It then warned that “it will take considerable courage for the Government and the EU to admit that the current policy arrangements for biofuels are inappropriate” (EAC, 2008a, p. 3). As the term “courage” implied, a policy retreat on higher targets could undermine the EU’s and UK Government’s credibility towards the biofuel industry, unlike the EAC, which had no responsibility towards it.

In its response to the EAC’s report, the UK Government acknowledged that the environmental performances of first-generation biofuels vary considerably according to such factors as where and how the feedstocks are grown. Depending on those factors, the best biofuels could offer consistent carbon savings, while the worst biofuels could offer no carbon savings at all or even cause negative social and environmental impacts (DfT, 2008b, p. 6). On the contrary, second-generation biofuels have “the potential to reduce pressure on land because they can use a wider range of feedstocks, including waste” (DfT, 2008b, pp. 10-11). However, it contended that:

“The RTFO starts off at an appropriately cautious level, with a 2.5% biofuel target (by volume) in 2008/09 rising to 5% in 2010/11. A moratorium on policies such as the RTFO would mean missing an opportunity to make carbon savings that we believe biofuels can deliver now. It would also mean renegeing on earlier commitments. Investment

decisions by biofuel producers and fuel suppliers have been made on the back of those commitments.” (DfT, 2008b, pp. 7-8)

Thus, besides claiming that the RTFO was already set at a “cautious level”, the UK Government expressed its concern about biofuel producers and fuel suppliers, as their investment decisions had been made on the back of its earlier commitments (DfT, 2008b, p. 7). Yet, it also reassured that that it “will not support any increase beyond current targets without being satisfied that the conditions set by the March 2007 European Council are met” – among which was the availability of second-generation biofuels (DfT, 2008b, p. 7).

Furthermore, for the UK Government, “It is by encouraging the first generation of biofuels that we can expect to move towards second generation technology” (DfT, 2008b, p. 14). In the view of the UK Government, “there needs to be a market in biofuels if industry is to have any incentive to make technological developments leading to cheaper biofuels with better greenhouse gas savings” (DfT, 2008b, pp. 11-12). More specifically:

“In the longer term, second generation biofuel technologies have the potential to reduce pressure on land because they can use a wider range of feedstocks, including waste. However, the Government does not believe it is feasible to wait for technological improvements before utilising biofuels. It is through stimulating a market for biofuels that we will encourage investment and the development of advanced technology.” (DfT, 2008b, p. 11)

In other words, to encourage investors to invest into techno-scientific advancement in biofuels, it was necessary to continue stimulating the current first-generation biofuel market – i.e. preserving support to biofuels.

The UK Government defined the development of a mandatory system of sustainability standard for biofuels as “essential” (DfT, 2008b, p. 6). It also agreed with the EAC that such development could lead to similar assurance systems in other agricultural commodities markets. Yet, it acknowledged the

difficulties involved in applying such systems to wider markets such as the one of the food industry (DfT, 2008b, p. 6). About the range of issues addressed by sustainability standards, the UK Government stated to “believe” that biofuel policy should be progressed “provided that it is accompanied by strong sustainability standards in conjunction with wider action for the protection of forests and other carbon sinks” (DfT, 2008b, p. 8). It then reassured that it was taking the issue of the food security issue seriously (DfT, 2008b, pp. 10-11). As a proof to its commitment on the matter, the UK Government reminded about its commissioning of the Renewable Fuels Agency to produce a review on “the wider economic and environmental impacts, particularly indirect impacts such as land use change, of different forms of biofuel production” (DfT, 2008b, p. 7). The UK Government ensured that “The results of the study will be relevant to the development of both the UK’s and the EU’s policies in this area” (DfT, 2008b, pp. 7, 10-11). In relation to this issue, the UK Government mentioned that the recent proposal for a forthcoming EU Renewable Energy Directive was considering the introduction of a mandatory system for biofuels. It then declared that, in the negotiations on the Directive, it wished those standards being broadened and made as robust as possible in respect of global environmental impacts (DfT, 2008b, pp. 10-11).

About the missed enforcement of sustainability standards in the initial phase of the RTFO, the UK Government pointed out that the RTFO was already requiring obligated suppliers to produce relevant information on the carbon savings and sustainability characteristics of their biofuels “as a first important step” (DfT, 2008b, p. 6). Such a reporting mechanism was supposed to “help to improve data gathering among suppliers and assist in the development of these standards”, before the actual introduction of a mandatory sustainability standards system (DfT, 2008b, pp. 10-11). Thus, the UK Government promised the enforcement of sustainability standards and the redirection of support to second-generation biofuels only for the future, while insisted that the RTFO should proceed as planned and without the immediate enforcement of mandatory sustainability standards.

In its counter-response, the EAC welcomed the UK Government's recognition that biofuels needed to be cost-effective and sustainable and the relative announcement about the upcoming RFA's review on the wider economic and environmental impacts of biofuels. However, it remained "significantly concerned" about the UK Government's continued dismissal of a policy moratorium (EAC, 2008b, p. 3). The EAC refused to accept any of the arguments provided by the UK Government to justify such dismissal (EAC, 2008b, p. 3).

The EAC strongly objected that RTFO targets were set at an "appropriately cautious level". It reiterated that the development of biofuels should continue conditionally to the enforcement of sustainability standards and wider actions to prevent damages from land use change. As neither of these conditions would be in place before the start of the RTFO, the EAC warned that pushing forward with this policy would be "dangerous" (EAC, 2008b, p. 5). The EAC acknowledged the UK Government's concern on its earlier policy commitments to the biofuel industry – i.e. "the concern for those that might have already invested in biofuels" (EAC, 2008b, p. 4). Nevertheless, such "concern is outweighed by concerns about the potential harm that could arise if the development of biofuels continues without the necessary safeguards" (EAC, 2008b, p. 4). Moreover, "It will be much harder to take decisions about biofuels once an industry has fully established itself on a basis that may not be fully sustainable" (EAC, 2008b, p. 4). Then, citing the Royal Society, the EAC pointed out that current policy was "inadequate" as will direct investment into "more established near term options... and little to the more promising long-term options", i.e. into first-generation at the expense of second-generation biofuels (EAC, 2008b, p. 4). The EAC thus concluded reiterating its call for a moratorium and "urged the Government to resist attempts to increase EU biofuel targets" (EAC, 2008b, p. 5).

In the response to the EAC counter-response, the UK Government reconfirmed its previous arguments and maintained its position unaltered (DfT, 2008c). The RTFO came into effect on the 15th April 2008, with blending targets unchanged at 2.5% for 2008-09, rising to 3.5% per 2009-10, and to 5% per 2010-11 per

volume. Sustainability standards were only set as indicative and not mandatory – i.e. obligated suppliers were only required to report on the sustainability of their biofuels, but not compelled to respect the indicative sustainability standards (DfT, 2008e, Section 1).

2.7 UK Government: UK biofuel targets slow-down

In 2008, a global food crisis sparked, mobilising calls for a change in biofuel policies. The World Bank issued an internal report (Mitchell, 2008) – which then was leaked (Chakraborty, 2008a) – where biofuels were indicated as responsible for the recent food prices increases, and the consequential food crisis. Reframed as “food versus fuel” (Boucher, 2012, p. 150), the international controversy on the sustainability of biofuels gained prominence, catching the attention of the media (British Broadcasting Company - News [BBC News], Chakraborty, 2008b; Holmes, 2008; 2008a; 2008b). Biofuel policy was increasingly blamed to worsen deforestation, food security, and socio-economic conditions in developing countries, as well as to contradict its original policy aim – i.e. reducing GHG emissions.

Prompted by the wider public controversy and disagreements with Parliamentary Select Committees (Palmer, 2010, pp. 993, 1003-1004; Pilgrim & Harvey, 2010, Paragraphs 4.17-4.18), on the 21st February 2008, the UK Government announced the commissioning of a review on the “emerging evidence” on the indirect impacts of biofuel production on food prices, deforestation and on biofuel performances in overall carbon abatement. Led by Professor Ed Gallagher of the DfT’s Renewable Fuels Agency (RFA), the review was produced in only four months and published on the 7th July 2008 (RFA, 2008a). Known as the Gallagher Review, the study reconfirmed the UK Government’s rationale³⁵ that a moratorium would “reduce the ability of the

³⁵ As Dunlop pointed out: “Of course, the fact that the body conducting the review—the RFA—had been created to implement the RTFO made it unlikely that such drastic action [a policy moratorium] would be recommended” (Dunlop, 2010, p. 353). Thus, independently of the validity of those arguments, it was anyhow unlikely to expect from the public body (RFA) in charge of the administration of the RTFO a drastic recommendation such as a moratorium. A moratorium would have implied not only the abrogation of the RTFO, but also the dissolution of the RFA itself.

biofuel industry to invest in new technologies or transform the sourcing of its feedstock to the more sustainable supplies necessary to create a truly sustainable industry” (RFA, 2008a, p. 66). About the future availability of advanced biofuels, “a market share of 1-2% by energy of transport fuels by 2020 seems feasible” (RFA, 2008a, pp. 13, 44), likewise reinforcing techno-optimistic expectations.

However, the Gallagher Review also concluded that “there is a significant risk the current policy will not deliver its intended objective of significant net GHG emissions savings” (RFA, 2008a, p. 65). The review acknowledged the controversial drawbacks of available biofuels. An uncontrolled large-scale application could lead to direct and indirect land-use-changes (dLUC and iLUC), which would eventually result in net increases in greenhouse-gasses as well as unsustainable impacts on the local environment and socio-economic conditions of developing countries. In particular, the displacement of existing agricultural land, due to biofuel demand, would lead to carbon sink destructions (e.g. deforestation), biodiversity losses, human rights’ abuses and food insecurity in developing countries (RFA, 2008a, pp. 8, 18-19). On those grounds, it advised the UK Government to slow down the introduction of biofuels “until adequate controls to address [land] displacement effects are implemented and are demonstrated to be effective” (RFA, 2008a, p. 8).

During 2007-2009, the UK Government also accommodated biofuel critics, the biofuel industry, and the EU by increasing R&D funds for second-generation biofuels. Such funds have been allocated through Research Councils, mainly the Engineering and Physical Sciences Research Council (EPSRC) and the Biotechnology and Biological Sciences Research Council (BBSRC), whose budgets have increased greatly since 2007-09 (UK Energy Research Centre [UKERC], 2009, May 15). As part of its wider programme on Sustainable Power Generation and Supply (Supergen), the EPSRC set up the Supergen Biomass and Bioenergy Consortium, researching also advanced biofuels – its total budget increased from £2.9m during 2003-07 to £6.4m during 2007-11. As its main conduit for bioenergy R&D funds, the BBSRC set up the Sustainable Bioenergy Centre (BSBEC) in 2009 – with an initial funding of £27m. The

BSBEC was promoted as a “key contribution which will target research on the development of advanced bioenergy and biofuels” (DECC, 2009a, p. 148), and “support the build-up of research capacity into how bioenergy can help replace fossil fuels with renewable, low-carbon alternatives” (Defra et al., 2007, p. 35). As a rationale for such R&D priorities, second-generation biofuels would use natural resources more efficiently and sustainably, i.e. by minimising land requirements and avoiding food crops.

On the 15th October 2008, the UK Government delegated the DfT to launch a fourth consultation on UK biofuel policy to seek views on the UK Government proposal to amend the UK biofuel policy in line with the Gallagher Review’s recommendations (DfT, 2008a). After the review of the consultation responses, the UK Government decided to proceed with the amendments. The RTFO (Amendment) Order 2009 was approved by Parliament and enforced in April 2009 (UK Parliament, 2009). The targets of the RTFO were lowered and delayed respectively at 3.25% for 2009/2010, 3.5% for 2010/2011, 4% for 2011/2012, 4.5% for 2012/2013, 5% for 2013/2014 and subsequent years³⁶ (DfT, 2009a, p. 2). Meanwhile, biodiesel and bioethanol duty discounts, as previously announced, were set to be phased out by March 2010³⁷ (DfT, 2009e, Section 1).

By endorsing the Gallagher Review and expanding R&D funds for second-generation biofuels, the UK Government sought to enhance the credibility of its policy rationale and expectations against calls for a total policy moratorium. Nevertheless, as it argued in the 2008 report on progress to the European Commission, “a more cautious approach to biofuel production is necessary”

³⁶ The UK indicative targets as previously announced by the UK Government were already significantly lower than the EU reference targets as set in the 2003 Biofuel Directive: i.e. 0.3% for 2005 and 5% for 2010 calculated per volume, against the EU reference targets of 2% for 2005 and 5.75% for 2010 calculated per energy content. The UK slow-down further reduced the UK indicative targets as compared to EU reference targets – i.e. 4% for 2010/2011 and 5% for 2013/2014 calculated per volume, against the EU’s 5% for 2010 and 10 % for 2020 calculated per energy content. Due to the minor energy content of biofuels with respect to fossil fuels, the translation of EU reference targets from energy content to volume results in higher percentages per volume. More in detail, 2% per energy content is equivalent to 2,5% per volume, 5,75% per energy content is equivalent to around 7% per volume, and 10% per energy content is equivalent to 12.5% per volume (RFA, 2008a, p. 90).

³⁷ As exception, the duty incentive for biodiesel from used cooking oil was later announced to remain in place until the 31st of March 2012.

(DfT, 2008e, Section 2), thus justifying a slowdown in biofuel targets and the withdrawal of fuel duty discounts. In the 2009 report on progress to the European Commission, the UK Government further sustained that, although reduced, RTFO's biofuel targets, combined with the higher EU target, "should still give incentive to the biofuel industry to invest in new technology and domestic capacity" (DfT, 2009e, Section 1).

Thus, the UK Government opted for an explicitly cautious approach in supporting first-generation biofuels, partially accommodating biofuel critics. Yet, this solution also met the interests of the first-generation biofuel industry, by dismissing a total moratorium on support. A slowdown in support would not solve the problems concerning the unsustainability of biofuels, but would buy time to develop sustainability standards and second-generation biofuels. At the same time, the incumbent UK first-generation biofuel industry would not go out of business, even though the slowdown would heighten its costs and uncertainty.³⁸

2.8 Recent developments: expectations on biofuels slowed down

On the 23rd April 2009 – i.e. the same month of the enforcement of the UK slowdown, the European Commission (EC) received formal approval from the EU Council and Parliament to issue the new Fuel Quality Directive (FQD) and Renewable Energy Directive (RED) (EU, 2009FQ; 2009RED). These Directives repealed previous Directives on the respective subjects, among which the EU Directive on Biofuels of 2003 (EU, 2003). The FQD required fuel suppliers to deliver a 6% reduction in life cycle GHG emissions of petrol and diesel by 2020. To make reaching that target possible, it invited the European Committee of Standardisation (CEN) to adequate the current 5% limit on biofuel blending on petrol and diesel in line with the new higher target in transport (EU, 2009FQ, p. 92). The RED amended the binding target for biofuels that the EU Council proposed in March 2007 – i.e. 10% per energy content by 2020 (EU Council, 2007, p. 21). The target was not anymore referred exclusively to biofuels, but to

³⁸ According to Palmer, extending the targets from 2010/11 to 2013/14 was effectively extending the lifespan of the RTFO by an additional 3 years (Palmer, 2010, p. 1004).

“energy from renewable sources in transport” in general. As the EC specified in the RED:

“The need for energy efficiency in the transport sector is imperative because a mandatory percentage target for energy from renewable sources is likely to become increasingly difficult to achieve sustainably if overall demand for energy for transport continues to rise. The mandatory 10% target for transport to be achieved by all Member States should therefore be defined as that share of final energy consumed in transport which is to be achieved from renewable sources as a whole, and not from biofuels alone.” (EU, 2009RED, p. 18)

Despite this change in reference, the target was anyhow expected implicitly (EU, 2009RED, p. 18) or explicitly (DECC, 2009a, p. 47; DfT, 2010, p. 2) to be met mostly through biofuels. The RED also introduced mandatory sustainability requirements for biofuels, which had to be enforced from December 2010 (EC, 2010). The sustainability requirements aimed at covering GHG savings, biodiversity, land with high carbon stock value and agro-environmental practices (EC, 2011). The EC will review the feasibility of reaching the 10% transport sub-target whilst ensuring sustainability by the end of 2014 (DECC, 2009a, p. 47).

In 2007 the EU Council stated that the 10% by 2020 binding target would depend on the availability of second-generation biofuels (EU Council, 2007, p. 21). Nevertheless, the EC did not include that pre-condition in the 2009 RED, with the target becoming subject only to sustainability standards; future reviews would evaluate the environmental and social consequences of the production and consumption of biofuels (EU, 2009RED, pp. 17, 43). Such a pre-condition also disappeared from UK policy documents.

Since then, techno-scientific advance towards second-generation biofuels has disappointed earlier expectations. Nevertheless, the UK Government and the EC continue to promote it to justify their biofuel targets. Meanwhile the controversy has narrowed around GHG emissions from indirect land-use-changes, somewhat losing its initial prominence (Boucher, 2012, p. 151).

In the 2012 *UK Bioenergy Strategy*, the UK Government stated that “It is important that future policies and incentives are aligned to incentivise low risk areas that minimise technology and investment lock in to pathways that may become undesirable and minimise lock out of potential vital pathways” (DfT et al., 2012, p. 57). Although “low-risk areas” included second-generation biofuels, earlier techno-expectations for them were slowed down: “Advanced biofuels could start playing an increasing role in reducing road transport emissions in the 2020s” (DfT et al., 2012, p. 52). Meanwhile, “So long as the sustainability can be assured ... some conventional biofuels can offer a cost effective contribution to reducing carbon emissions from road transport” (DfT et al., 2012, p. 41).

On the 17th October 2012, the EC issued a proposal to amend the FQD and the RED (EU, 2009FQ; 2009RED). In view of the “significant” contribution of biofuels in meeting the targets of both Directives, the EC admitted that:

“Whilst both Directives include sustainability criteria including minimum greenhouse gas saving thresholds, the greenhouse gas emissions associated with changes in the carbon stock of land resulting from indirect changes in land use (ILUC) are not subject to reporting requirements under the current legislation.” (EC, 2012b, p. 2)

It also acknowledged that:

“Scientific work indicates that emissions from indirect land-use change can vary substantially between feedstocks and can negate some or all of the greenhouse gas savings of individual biofuels relative to the fossil fuels they replace.” (EC, 2012b, p. 2)

The proposal advanced a series of policy amendments supposed to address those concerns (EC, 2012b, p. 3; 2012a). Among the most relevant, the EC proposed to cap the contribution of first-generation biofuels from food crops – or “conventional” biofuels (with a risk of iLUC) emissions – to the EU Directives’ targets. More specifically, it capped their contribution “to the current

consumption level, 5% up to 2020,³⁹ while keeping overall renewable energy and carbon intensity reduction targets” (EC, 2012b, p. 3). The EC also proposed to improve market incentives to encourage innovation in biofuel production processes in order to reduce the associated emissions and favour the market penetration of second-generation – or “advanced (low-iLUC)” biofuels. Finally, the EC proposed to improve “reporting of greenhouse gas emissions by obliging Member States and fuel suppliers to report the estimated indirect land-use change emissions of biofuels” (EC, 2012b, p. 3).

The EC stated that “The aim of the current proposal is to start the transition to biofuels that deliver substantial greenhouse gas savings when also estimated indirect land-use change emissions are reported” (EC, 2012b, p. 2) – i.e. “to promote biofuels that help achieving substantial emission cuts, do not directly compete with food and are more sustainable at the same time” (EC, 2012a). Yet, the EC contended that “existing investments should be protected”. Hence, “The proposal also aims at protecting existing investments until 2020” (EC, 2012b, p. 3). That said:

“The proposal does not take a position on the actual need for financial support to biofuels before 2020. However, the Commission is of the view that in the period after 2020 biofuels which do not lead to substantial greenhouse gas savings (when emissions from indirect land-use change are included) and are produced from crops used for food and feed should not be subsidised.” (EC, 2012b, p. 3)

In the related press release, the EC further specified that:

“While the current proposal does not affect the possibility for Member States to provide financial incentives for biofuels, the Commission considers that in the period after 2020 biofuels should only receive financial support if they lead to substantial greenhouse gas savings and are not produced from crops used for food and feed.” (EC, 2012a)

³⁹ Equivalent to the estimated consumption level at the end of 2011 per energy content (EC, 2012b, p. 14).

Therefore, like the UK's biofuel targets slow-down four years before, the EC's proposal somewhat accommodated controversy over first-generation biofuels' unsustainable feedstocks, while still ensuring them short-term support.

Chapter 4 – Policy-promise lock-in

Introduction

This chapter analyses how the UK Government's vision on biofuel policy has evolved over time and how the UK Government's responsibilities in technology policy have affected that evolution. It then reflects on how previous policy-promises made to technology innovators can influence executive public authorities in the construction of their visions of the future.

This chapter has two main sections. Section 1 relates the historical analysis to relevant analyses from the sociology of expectations and the UK biofuel policy literature. It then reinterprets the historical analysis through the sociology of expectations integrated with insights borrowed from the multi-level perspective (MLP) on socio-technical transitions. Finally, it reinterprets UK biofuel policy in terms of a policy-promise lock-in. Section 2 discusses relevant insights from the sociology of expectations on public authorities and reputation. By means of a simplified analytical model, it then shows how executive public authorities' reputational stakes, through their policy-promises, may be linked to techno-scientific advancement. Finally, it comments on how policy-promises may be conceptualised as simultaneously performative, promises on future commitments and strategic resources.

1. The evolution of the UK Government's vision on biofuel policy

Within the sociology of expectations, two analyses in particular have looked at the UK Government, although in other policy contexts. The few academic analyses that specifically focused on UK biofuel policy deployed other theoretical frameworks to investigate that case. In what follows, I relate insights from these analyses to those derived from my analysis.

1.1 Insights from the sociology of expectations

Within the sociology of expectations, two analyses in particular relate to mine as they looked at the UK Government – although in other policy contexts. Beynon-Jones and Brown analysed xenotransplantation policy in the UK. In their analysis, they observed that the UK Government accommodated its policy to industry promises of techno-scientific advance – which were ultimately unfulfilled. To explain this observation, the authors argued that the UK Government may have deferred to industry claims because of its short-term perspective (Beynon-Jones & Brown, 2011, p. 647). Eames, McDowall, Hodson and Marvin explored the “hydrogen economy” as a guiding vision in the UK. In their analysis, they observed that information on hydrogen technologies “is frequently left vague or open in the highest-level documents and arguments” of policy actors (Eames et al., 2006, p. 367). In explaining this, the authors argued that policy actors in particular may avoid in-detail discussion of the technologies they support as this would expose the disagreements which usually surround their expected developments and thus undermine their efforts to build support (Eames et al., 2006, p. 367). Furthermore, in doing so, policy actors “are left with nothing concrete to communicate outside the immediate sphere of hydrogen enthusiasts” – i.e. they tend to defer to these latter arguments (Eames et al., 2006, p. 368). Van Lente also noted the phenomenon of policy actors deferring to technology innovators’ arguments. He mentioned that the “spokespersons” or “promise champions” that defend the mandate of “technologists” may also come from “within the government, which becomes more and more involved in technological developments” (Van Lente, 1993, p. 160). This phenomenon seems also to have occurred in the present case, with the UK Government endorsing a vision of biofuel policy rather similar to those supported by the biofuel industry.

In my analysis, I relate the similarity between the UK Government’s vision and the visions of the biofuel industry to the policy commitments of the former toward the latter. In a minor adaptation of the sociology of expectations, I analytically distinguish “technological promises” from “policy-promises” – i.e. the promises that public authorities make regarding their future policy commitments,

such as in the provision of political and financial support to a specific industry (see Chapter 1).

1.2 Insights from UK biofuel policy literature

A few academic analyses have specifically investigated UK biofuel policy (Dunlop, 2010; Palmer, 2010; Pilgrim & Harvey, 2010; Upham et al., 2011; Boucher, 2012). Complementing those analyses, mine looks at UK biofuel policy from a distinctive perspective focused on expectations, and investigates its evolution from an earlier period (see also Berti & Levidow, 2014).

Palmer analysed the development of the Renewable Transport Fuel Obligation (RTFO) from a “discursive-institutionalist perspective”. To explain the similarity between the arguments supported by the UK Government and the biofuel industry before the publication of the Gallagher Review in 2008, Palmer argued that biofuel advocates “successfully transplanted their ecomodernist discourse into policy makers’ consciousness and vocabularies”, because of its “superior appeal” to that of biofuel critics. Besides, the biofuel industry and the policymaking community had become economically interdependent, as “the former depended upon significant public sector investment and the latter viewed the development of ‘advanced’ biofuels as critical to Britain’s future economic competitiveness” (Palmer, 2010, pp. 1002-1005). Not excluding a role for the “superior appeal” of the biofuel industry’s argument, my analysis shows, however, that behind the similarity of arguments between the UK Government and the biofuel industry there were different concerns.

Upham, Tomei and Dendler analysed the opinions held by UK stakeholders at the time the biofuel controversy gained prominence. The authors inferred that, despite non-governmental organisations (NGOs) turning against biofuel targets between 2006 and 2007, “RTFO carbon and sustainability policy has latterly reflected the interests of the DfT [Department for Transport] and organisations with an interest in motor vehicle-based mobility, interests that biofuels readily mesh with” (Upham et al., 2011, p. 2673).

Pilgrim and Harvey specifically analysed NGOs' post-2007 opposition to biofuels. They inferred that this opposition was one driver prompting the UK Government's decisions to launch the Gallagher Review in 2008 and eventually to slow down UK biofuel targets in 2009 (Pilgrim & Harvey, 2010, Paragraphs 4.17-4.18). Reconciling the analyses above, mine reinterprets these decisions as UK Government's efforts to preserve its credibility and legitimacy not only in the eyes of technology innovators, but also of biofuel critics.

Despite acknowledging the harmful impacts of biofuel policy, in 2009 the UK Government only slowed down its biofuel targets, while rejecting calls for a policy moratorium. Regarding this decision, Dunlop – who investigated the temporal tensions between policy and knowledge developments in UK biofuel policy – inferred broader considerations taken by the DfT about “sunk costs, in both economic and reputational terms”. Industry had invested on the assumption that biofuel targets would rise, hence “any radical re-thinking of policy would not only have been legally and economically questionable but would also have fatally undermined the DfT's credibility in the fuel sector” (Dunlop, 2010, p. 354). Building on and furthering Dunlop's inference, my analysis emphasises how the “reputational sunk costs” of the UK Government have also been linked to techno-scientific advance in emerging biofuels.

Boucher investigated interactions between the UK biofuel controversy and regulatory development. He noticed that, between 2007 and 2011, “a potentially important shift is observed in regulatory discourse. Just as the framing of the technology in the controversy was increasingly reduced to GHG emissions with peripheral reference to social and environmental sustainability, government documents also increasingly eschewed reference to improving energy security and rural economies” (Boucher, 2012, p. 152). My analysis confirms such a trend.

Unlike previous analyses of UK biofuel policy, mine emphasises the UK Government's cautious approach in promising lower support for first-generation biofuels, relative to EU targets and industry demands. Complementing insights from previous analyses, it then shows how the UK Government's “reputational

sunk costs” were linked to the argument justifying biofuel targets for first-generation biofuels as necessary for techno-scientific advance in the second generation.

1.3 Reinterpreting UK biofuel policy: a policy-promise lock-in

This section reinterprets the historical analysis through the lens of the sociology of expectations integrated with insights borrowed from the MLP on socio-technical transitions.

1.3.1 First phase: the 1990s, landscape and regime visions on road transport policy

During the 1990s, the UK Government resisted the inclusion in the policy agenda of emerging negative expectations of the environmental impacts of its road transport policy, which demanded radical policy revisions. Endorsing a neoliberal economic ideology, the UK Government, at the time led by the Conservatives, promoted liberalisation and privatisation as means to restore cost efficiency and dynamism in the public sectors. Having promised and enforced deregulation in the transport sector, the Conservative Government was responsible for the policy-promises made to the industry called to administer the liberalised parts of public transport.

For the Conservative Government, accepting intervention in transport with environmentally minded regulations would have meant betraying the policy-promises made to the industry previously involved in the liberalisation and privatisation processes. These responsibilities partly account for the UK Government ignoring the RCEP’s repeated calls to reply to its 1994 report and to adopt different landscape and regime visions. The election of the new Labour Government in 1997 was a turning point. Not liable for the policy-promises made by its predecessor, the Labour Government intervened in transport policy with environmentally minded regulations (DETR, 1998b). Endorsing similar landscape and regime visions to those proposed by the RCEP (DETR, 1998a,

Foreword; Ferguson & Skinner, 2002), the UK Government started designing a role for alternative fuels and vehicles technologies within them.

The landscape vision was framed into a series of key policy drivers, notably: improving air quality, mitigating noise pollution, tackling congestion, mitigating climate change and ensuring energy security (RCEP, 1994, p. 36; 1997, p. 19). Among these, the large and growing weight of road transport in endangering human health with air pollution, aggravating climate change with GHG emissions and compromising energy security through increasing oil consumption gained dominance (RCEP, 1994, p. 239; 1997, pp. 25-26). In this context, road transport had to play its part (RCEP, 1994, p. 239). The landscape vision provided a space for the regime vision.

The regime vision balanced expectations on the transition to sustainable transport in the short, medium and long term. In the short term, emission reductions could be attained by reducing the need for movement, best achieved by a gradual shift away from lifestyles depending on high mobility and especially in the intensive use of cars (RCEP, 1994, p. 233). In the medium term, further emissions reductions could be expected from technological advances in the internal combustion engine, with overall performance improvements in reducing emissions and fossil fuel consumption. For the long term, the eventual solution would have to be found into new vehicle and/or fuels technologies (RCEP, 1994, p. 142; 1997, p. 33).

1.3.2. Second phase: the 2000s, biofuels in the regime vision on road transport policy

Biofuels were marginalised in the UK Government's regime vision on sustainable transport at least until 2002, when it introduced a first duty discount for biodiesel. From that initial marginalisation, the UK Government was then forced by the 2003 EU Directive to insert biofuels into its regime vision and promise higher support to biofuel technology innovators (EU, 2003). By 2003, EU and UK public authorities were promoting biofuels through optimistic expectations for future benefits in mitigating climate change and enhancing fuel

security in road transport, as well as in fostering the rural economy – i.e. in reducing GHG emissions, diversifying transport fuel supplies, as well as stimulating markets for non-food crops and creating new jobs in biofuel supply-chains (EC, 2001, pp. 31-32; DTI, 2003, p. 69; EFRAC, 2003, p. 5; EU, 2003, pp. 42-44).

The UK Government started endorsing very similar expectations to those of the biofuel industry – as observed in other policy contexts, where the UK Government seemingly endorsed technology innovators' arguments (Eames et al., 2006, pp. 367-368; Beynon-Jones & Brown, 2011, p. 647). This apparent “transplantation” of arguments has been partially explained in cognitive terms as resulting from the “superior appeal” of the biofuel industry's arguments (Palmer, 2010, pp. 1002-1005). Yet the UK Government acknowledged the drawbacks of first-generation biofuels and defended support for the biofuel industry primarily as a means to stimulate biofuel innovators to fulfil future EU obligations with second-generation biofuels. Furthermore, it promised and delivered lower support with respect to EU targets and the biofuel industry's demands.⁴⁰ By 2008, UK biofuel targets were also explicitly referred to as “cautious”, and were eventually delayed in 2009 (DfT, 2004c, p. 2; 2008e, Section 2; 2008b, p. 7). This caution⁴¹ seems to relate to a concern about getting further locked in to the first-generation biofuel industry, which the UK Government initially presented as environmentally and socio-economically risky and excessively expensive (Defra, 2004, p. 6; DfT, 2004c, p. 2). Therefore, the “superior appeal” of the

⁴⁰ In 2004, the UK Government announced a UK indicative target of 0.3% per volume for 2005 – then reconfirmed in November 2005 – as opposed to the 2% per energy content for 2005 as set by the 2003 EU Biofuel Directive. It also opted to delay the announcement of the target for 2010 to 2007 as allowed by the Directive. In 2006, the UK Government announced that the annual rates of the RTFO would be set at 2.5% for 2008/09, 3.75% for 2009/10 and 5% for 2010/11, all calculated per volume. Thus the UK indicative target for 2010 was also below the EU Directive's reference value of 5.75% per energy content for 2010. Because of the lesser energy content of biofuels in respect to fossil fuels, the translation of the EU targets from energy content to volume results into higher percentages per volume: 2% per energy content is equivalent to 2.5% per volume (for 2005); 5.75% per energy content is equivalent to around 7% per volume (for 2010) (RFA, 2008a, p. 90).

⁴¹ Of course, such targets may be seen as ‘incautious’ from an environmental and socio-economic perspective, as argued by NGOs and Parliamentary Select Committees. But they were certainly “cautious” in relation to EU targets and the biofuel industry's demands, and were explicitly justified as such by the UK Government in 2008 – both when responding to the EAC and when reporting on progress to the European Commission (DfT, 2008b, p. 7; 2008e, Section 2).

biofuel industry's arguments for the UK Government offers at best a partial explanation for the similarity of their arguments (Palmer, 2010, pp. 1002-1005).

By the time of the 2006-2007 controversy over the unsustainability of first-generation biofuels, the UK Government had started linking optimistic expectations for future sustainability standards, future second-generation biofuels and their dependence on current targets for first-generation biofuels. This last expectation in particular stirred up disagreements between the UK Government and two Parliamentary Select Committees: the Environment, Food and Rural Affairs Committee (EFRAC) and the Environmental Audit Committee (EAC).

In theoretical terms, EFRAC and EAC disagreed with the UK Government about whether supporting first-generation biofuels was a stimulus or an obstacle for a “promise-requirement cycle” on second-generation biofuels. Considered as mature technologies, incumbent first-generation biofuels had become controversial due to their unsustainable biomass inputs. Meanwhile second-generation biofuels depended on emerging technologies gaining “collective expectations” (Konrad, 2006, p. 431) – or at least widespread public endorsement among public authorities – as means to avoid negative effects of first-generation biofuels. The UK Government in particular promoted “second-generation” biofuels as if they were “self-justifying” because of their greater environmental and socio-economic benefits, and appeal to technological progress (Van Lente & Rip, 1998a, pp. 222, 223).

Reversing its earlier optimism concerning biofuels (EFRAC, 2003, p. 18), EFRAC, joined by the EAC two years later, argued that the UK Government should divert support from incumbent first-generation biofuels to the emerging second generation (EFRAC, 2006, p. 6; EAC, 2008a, pp. 3, 14). This diversion would prevent biofuel technology innovators from locking-in further investments in incumbent first-generation biofuels, and thus consolidating a socio-technical regime pre-empting a promise-requirement cycle on second-generation biofuels (EFRAC, 2006, pp. 45-46; EAC, 2008b, p. 4). By contrast, the UK Government presented its support for first-generation biofuels as still necessary to stimulate

biofuel innovators not only to fulfil future EU targets, but also to generate a promise-requirement cycle on emerging second-generation biofuels (DfT, 2008b, pp. 7, 10-12, 14).

Underlying the latter stance is an implicit rationale, which appears to be specific to public authorities with executive roles in technology-policy (see section 2): fulfilling previous policy-promises of support towards incumbent technological niches is a requirement to maintain credibility in the eyes of current and prospective technology innovators in emerging technological niches. At stake is the effectiveness of future technology policy in mobilising current and prospective technology innovators. Linking these reputational stakes to techno-scientific advancement, executive public authorities may delay a complete redirection of support from incumbent to preferable emerging technologies, and present such a delay as instrumental for stimulating techno-scientific advancement towards the latter. This linkage can be theorised as a policy-promise lock-in when previous policy-commitments towards technology innovators of incumbent technologies have become controversial. Potentially driven by several imperatives, these controversial policy-commitments are officially justified as necessary for the development of preferable, emerging technologies.

The UK Government was constrained by several imperatives: its EU obligations, its dependence on the new-born UK biofuel industry necessary for fulfilling them and its need to establish credible incentives for its technology policy. Given its EU obligations, the UK Government's dependence on first-generation biofuel suppliers drove policy-promises to that industry, thus imposing "reputational sunk costs" on the DfT (Dunlop, 2010, p. 354). These reputational stakes were linked to techno-scientific advance through expectations for second-generation biofuels. For the UK Government, the endorsement and promotion of these expectations justified short-term support for incumbent biofuels, but potentially resulted in a lock-in (Van Lente & Rip, 1998a, p. 217).

Such links between reputational stakes and policy-promises seem in any case neither unmovable nor permanent. When the biofuel controversy gained prominence in 2007-2008, the EU Council and UK Government subjected their 2020 target to a pre-condition on the future availability of second-generation biofuels (Defra et al., 2007, p. 8; EU Council, 2007, p. 21). The EU Council and UK Government seemingly sought thus a future way out of their policy commitments to first-generation biofuels, especially in case of disappointed expectations on second-generation biofuels and sustainability standards. By making their policy-promises of support to first-generation biofuels conditional upon prior fulfilment of technological expectations for second-generation biofuels by technology innovators, they were effectively delegating responsibility for any possible disappointed expectations on second-generation biofuels to technology innovators. Beyond minimising reputational damage, these conditional targets were also providing a reason to withdraw policy-promises of support to first-generation biofuels, in case of failed expectations for second-generation biofuels. In theoretical terms, they made their policy-promises conditional upon technology innovators fulfilling those technological expectations – i.e. they set temporal limits to their policy-promises.

Prompted by the wider public controversy and disagreements with Parliamentary Select Committees (Palmer, 2010, pp. 993, 1003-1004; Pilgrim & Harvey, 2010, Paragraphs 4.17-4.18), in 2008 the UK Government commissioned the Gallagher Review. The review recommended slowing down support while waiting for technological advancements and sustainability standards to be realised (RFA, 2008a, p. 8). However, it also reconfirmed the UK Government's rationale that a degree of support to current biofuels was necessary to stimulate industry to invest in new technologies (RFA, 2008a, p. 66). Endorsing the Gallagher Review, the UK Government slowed down UK biofuel targets in 2009. This decision partially reversed its prior commitments to the EU and biofuel industry, but effectively preserved current financial support to biofuels against prominent calls for a moratorium – e.g. from NGOs and Parliamentary Select Committees. Therefore, through such endorsement and partial policy reversal, the UK Government not only sought wider legitimacy among biofuel critics (Pilgrim & Harvey, 2010, Paragraphs 4.17-4.18), but also

sought to appease biofuel technology innovators (Upham et al., 2011, p. 2673) – see also Chapter 6.

The partial policy reversal of the UK Government anticipated by four years a proposal for a similar initiative by the European Commission. Although the 2009 Directives omitted any pre-condition for the availability of second-generation biofuels (EC, 2008, p. 13; EU, 2009FQ; 2009RED), in 2012 the European Commission proposed to cap support for first-generation biofuels produced from food crops at current levels⁴² (EC, 2012b, pp. 3, 8, 14). Like the UK Government's slow down, the European Commission's proposal, which is still under negotiation, somewhat accommodates the controversy over first-generation biofuels' unsustainable feedstocks, while still ensuring them short-term support.

Since 2007-2008, however, the controversy has narrowed to focus on GHG emissions from indirect land-use-changes, somewhat losing its initial prominence (Boucher, 2012, p. 151).

1.4 Reflections on the integration of the sociology of expectations with the multi-level perspective and on the contributions of the analysis

The integration of the sociology of expectations and insights from the MLP has proved to be an extremely valuable theoretical framework for this analysis. Through this framework, I managed to reconstruct the evolution of the UK Government's vision on biofuel policy since its origins in the sustainable road transport debate. It helped me to analyse how the landscape and regime visions on sustainable road transport were initially negotiated, and eventually endorsed among UK public authorities, thus opening a space for biofuel policy to emerge. It also helped me discover how executive public authorities in biofuel policy

⁴² The 2009 EU Directives introduced a target of 10% per energy content for 2020. Referred to "renewable fuels" rather than biofuels specifically, the target is widely expected to be mostly met by biofuels – 10% per energy content is equivalent to 12.5% per volume of biofuels (RFA, 2008a, p. 90). The 2012 proposal of the European Commission aims at limiting the contribution of first-generation biofuels from food crops to 5% per energy content until 2020 – i.e. half the target of the 2009 EU Directives and equivalent to the estimated consumption level at the end of 2011 per energy content (EC, 2012b, p. 14).

have linked their reputational stakes, via their policy-promises, to techno-scientific advancement in biofuel technologies.

UK biofuel policy in particular may be explained in terms of a policy-promise lock-in, whereby the UK Government's "reputational sunk costs" towards first-generation biofuel suppliers were linked to future techno-scientific advance in second-generation biofuels (see also Berti & Levidow, 2014). Firmly rejected by Parliamentary Select Committees, that linkage was instead endorsed and promoted by the UK Government and the biofuel industry – as in other policy contexts, the UK Government seemingly deferred to technology innovators' arguments (Eames et al., 2006, pp. 367-368; Beynon-Jones & Brown, 2011, p. 647). This finding refines previous academic analyses of UK biofuel policy (Dunlop, 2010; Palmer, 2010; Pilgrim & Harvey, 2010; Upham et al., 2011; Boucher, 2012).

More generally, executive public authorities can face a policy dilemma about whether preserving support for controversial incumbent technological niches should be considered a transitional requirement – or a counterproductive measure – for promoting development in emergent, preferable technological niches. Whenever executive public authorities publicly endorse the first view, they may be said to be in a policy-promise lock-in. In this situation, executive public authorities may delay a full redirection of support from incumbent technologies to preferable, emerging technologies, despite the fact that support for the former has become controversial. This may appear either to contradict or be in line with the logics of promise-requirement cycles – whereby support ought to be redirected from "old" and "obsolete", to "new" and emerging technologies, especially when incumbent technologies have disappointed their initial expectations (Van Lente, 1993, p. 167; Van Lente & Rip, 1998a, pp. 216, 222-223; Van Lente, 2000, p. 60; 2006, p. 215). This ultimately depends on the outcome expected from delaying a full redirection of support from incumbent to emerging technologies. Such a delay would appear to be in line with the logics of promise-requirement cycles if intended as a transitional requirement for executive public authorities to preserve their reputation in the eyes of current and prospective technology innovators. By preserving their credibility among

these latter, executive public authorities would preserve the effectiveness of their technology policies in stimulating techno-scientific advancement in emerging technologies. By contrast, the logics of promise-requirement cycles would appear to be contradicted if such a delay is only expected to consolidate a socio-technical regime of incumbent technologies locking-out emerging technologies.

2. Public authorities, policy-promises and reputational stakes

This section discusses how public authorities' reputational stakes may be linked, through their policy-promises, to techno-scientific advancement. Within the sociology of expectations, the way in which public authorities relate their reputational stakes to their policy-promises is an overlooked issue. In the next section, I briefly summarise the insights on reputation provided by the sociology of expectations.

2.1 Insights from the sociology of expectations

In a promise-requirement cycle, when technological expectations have become increasingly shared, technology innovators are held responsible for their practical fulfilment by "others" willing to give political-financial support, such as public authorities. Conversely, these latter are called to provide support. If technological expectations are fulfilled, the promise-requirement cycle keeps mobilising resources towards techno-scientific advances. If technological expectations are unfulfilled, however, technology innovators are blamed for their practical failure, and the "others" may redirect support (Van Lente, 1993, p. 167; Van Lente & Rip, 1998a, p. 216; Van Lente, 2000, p. 60).

Especially in the early stages of technological development, it is important for technology innovators to induce relevant actors, such as investors or public authorities, to invest resources in their technology. However, in doing so, they tend to optimistically inflate their statements of expectations (Borup et al., 2006, p. 289). Hype is not always the result of involuntary and genuine over-optimism.

Technology innovators may also voluntarily hype their statements for strategic reasons – e.g. to catch the attention of “(financial) sponsors” (Geels & Smit, 2000, p. 881).

The optimistic “noise” created by technology innovators poses threats. By involuntarily or voluntarily hyping statements, technology innovators may cause disappointments as a result of an excessive mismatch between past expectations and ex-post perceptions of actual developments. Overoptimistic “expectations and the frequent disappointments to which they lead are accompanied by serious costs in terms of reputations, misallocated resources and investment” (Borup et al., 2006, p. 289). These costs concern both the technology innovators who make such statements (Brown, 2003, p. 6; Brown & Michael, 2003, p. 9) and the public authorities that endorse them: “... in the context of large governmental programs and initiatives, while both public and private sectors have an obligation to justify decisions and investments, this is far more pressing for public sector legitimacy” (Borup et al., 2006, p. 295).

Within the sociology of expectations, reputation appears then to be conceptualised as a sort of deterrent for the enunciation and/or endorsement of strategically hyped and/or genuinely overoptimistic expectations as these may lead to misallocations of resources and reputational damage. By extension, public authorities should be adverse to the risk of endorsing overoptimistic expectations because they are worried about the negative implications of disappointments.

In the next section, I relate the different deployment of expectations of UK public authorities to their reputational stakes in UK biofuel policy. Drawing on my observations, I analytically distinguish public authorities with executive roles in technology policy from those with other policy remits, as their reputational stakes in promise-requirement cycles differ accordingly.

2.2 Reinterpreting public authorities’ disagreements in UK biofuel policy

Disagreements between the RCEP, EFRAC, the EAC and the UK Government can be related to their different reputational stakes in promise-requirement cycles.

Acting as policy advisers/monitors, the reputation of the RCEP, EFRAC and the EAC were dependent on pursuing ultimate policy goals (e.g. sustainability) and holding other public authorities accountable for doing so – in this case, the UK Government's responsibility towards Parliament and taxpayers – at least in principle (House of Commons Information Office [HoC IO], 2009). By contrast, the UK Government – as a public authority in charge of executive roles in technology-policy – had multiple reputational stakes relating to the biofuel industry, the EU, the UK Parliament and UK taxpayers – at least in principle. Thus, while the Royal Commission and Parliamentary Select Committees could not commit themselves to policy-promises of support, the UK Government did and was held directly responsible for them.

Those different responsibilities partly explain the sharp disagreements between the UK Government and the RCEP over sustainable transport policies and between the UK Government and EFRAC and the EAC over biofuel policy. The RCEP insisted on an environmentally minded intervention in road transport policy, regardless of the implications for the industry and the UK Government. EFRAC and the EAC were not worried about the implications of a policy-moratorium on the incumbent first-generation biofuel industry and on the UK Government, to the point that they would let that industry collapse. By contrast, the UK Government always maintained a cautious and pragmatic approach, mindful of the consequences for its reputation of not fulfilling its policy-promises of support, especially those towards technology innovators.

Summing up, not all public authorities relate their reputational stakes to promise-requirement cycles in the same way. Through their policy-promises, public authorities with executive roles link their reputational stakes not only to taxpayers as a whole, but also and in particular to technology innovators. By contrast, public authorities with other remits appear less concerned about reversals of policy-promises and the related consequences for technology

innovators. In the next section, I propose a conceptualisation of how executive public authorities relate their policy-promises to their reputational stakes when dealing with a policy-promise lock-in, by means of a simplified analytical model.

2.3 Executive public authorities: policy-promise lock-in

Executive public authorities may be conceptualised as managing a double identity of selector of expectations and stakeholder in technologies. Such a double identity implies two forms of reputation: as selector – among all taxpayers, and as stakeholder – among technology innovators.

<u>Graph 3: executive public authorities in technology policy: double identity</u>	
executive public authorities as <i>selectors</i>	executive public authorities as <i>stakeholders</i>
reputation among taxpayers as a whole	reputation among technology innovators in particular

Executive public authorities need to safeguard a reputation as a competent selector of expectations to convince all taxpayers of the legitimacy of their policy-promises – at least in principle (Modernisation Committee, 2006, pp. 5, 11, 12, 17). Intuitively, their responsibility as selectors would further increase whenever they promised support in the form of direct investments of public resources. In such a case, executive public authorities would become answerable to taxpayers about whether public resources have been directed to appropriate techno-scientific developments.

Executive public authorities also need to safeguard a reputation as a reliable stakeholder in the eyes of technology innovators in order to preserve the effectiveness of their technology policies in mobilising them. This linkage

between reputational stakes and technology policy effectiveness thus prompts and/or provides justifications for executive public authorities to maintain their previous policy-promises to technology innovators. The underlying rationale predicts that if executive public authorities withdraw the support they have promised with their previous policies – without first offering technology innovators a way to recover their initial investments – these latter may withdraw investments from current technology policies, as well as refuse to engage in future technology policies.

In a policy-promise lock-in, the reputation as stakeholder is related to technological advancement across technological niches. More specifically, the credibility of executive public authorities among technology innovators of incumbent and controversial technological niches, is linked to the effectiveness of future technology policies in mobilising current and prospective technology innovators into niches of preferable, emerging technologies.

The UK Government in particular argued that if it withdrew support from incumbent technology innovators in first-generation biofuels, current and prospective investors would have been discouraged from investing in emerging second-generation biofuels.

When dealing with a policy-promise lock-in, executive public authorities may struggle to balance their double reputation. Having become controversial, previous policy-promises made to incumbent technologies place executive public authorities in a dilemma about whether to risk their reputation as selector or their reputation as stakeholder (see Graph 4). By immediately implementing changes to controversial policy-promises, executive public authorities would secure their reputation as a selector among taxpayers as a whole. However, by doing so, they would risk compromising their credibility among technology innovators. By delaying changes to controversial policy-promises, executive public authorities would preserve their reputation as stakeholders, and thus their ability to mobilise technology innovators towards – revised – future technology policies. However, by doing so, executive public authorities would risk losing legitimacy among the rest of the taxpayers. Which course of action is

considered right in the future will depend on whether expectations for emerging, preferable technologies are eventually perceived as fulfilled or failed.

The UK Government opted to delay changes to previous policy-promises to incumbent biofuel suppliers, despite the controversy over first-generation biofuels. By doing so, it preserved its reputation as a stakeholder, but risked its reputation as a selector by relying on the future fulfilment of expectations on second-generation biofuels.

Graph 4: policy dilemma: controversial, incumbent technologies versus preferable, emerging technologies

<p>previous policy-promises to incumbent technology innovators have become controversial: possible courses of action</p>	<p>executive public authorities as selector</p>	<p>executive public authorities as stakeholder</p>
<p>immediately implementing changes to previous policy-promises?</p>	<p>reputation maintained</p>	<p>risk of losing CREDIBILITY among technology innovators → technology policy ineffective in the future</p>
<p>delaying changes to previous policy-promises? [policy-promise lock-in]</p>	<p>risk of losing LEGITIMACY among the rest of taxpayers → electoral downturn</p>	<p>reputation maintained</p>

2.4. Reflections on policy-promises

The distinction between “technological promises” and “policy-promises” helps better understand how executive public authorities relate their policy commitments to their reputational stakes in technology policy. As technology promises, policy-promises may be viewed as simultaneously performative, promises on future commitments and strategic resources.

When viewed as *performative*, previous policy-promises may shape executive public authorities’ beliefs about their own responsibilities and funding priorities towards techno-scientific advancement; for instance, by inducing them to believe that they are in a policy-promise lock-in. When this is the case, previous policy-promises would induce executive public authorities to preserve policies regarding incumbent technologies, even when these have become controversial, in order to allow the fulfilment of techno-expectations on preferable emerging technologies. In terms of temporal dynamics then, techno-expectations may combine with policy-promises and create patterns into which not only technology innovators, but also public authorities “may be locked” (Van Lente & Rip, 1998a, p. 217).

When viewed as *promises on future commitments*, policy-promises generate accountability, especially for public authorities with executive roles in technology policy. These are those primarily held responsible for missing or misallocated policy-promises of support based on what are perceived as mistaken or biased choices of expectations. By contrast, public authorities with different policy remits seem less concerned about reversing their previous endorsements of expectations, and about the consequences that policy-promise reversals may entail for technology innovators. In terms of spatial dynamics then, policy-promises generate more accountability for public authorities with executive roles than those with different policy remits. Arguably, “policy-promises of support” generate more accountability than other types of policy-promise – e.g. promises not to change or introduce regulations – as they directly affect public finances. The accountability of public authorities, as generated by their policy-promises, also differs from that of technology innovators, which are instead directly

affected by and held responsible for the practical fulfilment of the techno-expectations they promote (Van Lente, 1993, p. 167; Van Lente & Rip, 1998a, p. 216; Van Lente, 2000, p. 60).

When viewed as *strategic resources*, controversial previous policy-promises may be strategically linked to techno-scientific advancement as a means to preserve their credibility in the eyes of technology innovators, and the legitimacy of their policy-promises in the eyes of the rest of taxpayers – i.e. a policy-promise lock-in may be simply a strategic creation. Executive public authorities dealing with a policy-promise lock-in may endorse and promote expectations for emerging technologies accordingly. A policy-promise lock-in would then be one possible situation in which executive public authorities appear to act as “promise champions” for a technological field – as previously observed in other technology policy contexts (Van Lente, 1993, p. 160; Van Lente & Rip, 1998b, pp. 231-232). However, in deploying expectations and policy-promises, their primary imperatives seem to be protecting their reputation in technology policy, avoiding responsibility for any disappointment about technological development and promoting technology development per se. This use differs from that of technology innovators, who usually promote techno-optimistic expectations primarily to attract resources and/or policy support for the technologies on whose development they depend (Van Lente, 1993, pp. 185, 190; Geels & Smit, 2000, p. 882).

PART 2

Chapter 5 – Cross-sectional Analysis

Introduction

This is the empirical chapter of the cross-sectional analysis. This analysis focuses on the invitation document, participants' responses and summaries of responses of the consultation on amending the 2009 Order on the Renewable Transport Fuel Obligation (RTFO) launched by the Department for Transport (DfT) on the 15th October 2008 in the name of the UK Government.

Evidence from the invitation document, participants' responses and summaries of responses is reported in separate sections to compare the UK Government's expectations ex-ante and ex-post consultation. Evidence from consultation responses is further subdivided into actor categories to emphasise the contrast between the visions and views of the different types of actor participating in the consultation. Section 1 reports evidence from the invitation document. Section 2 reports evidence from the participants' responses. Section 3 reports evidence from the summaries of responses.

1. The UK Government: the invitation document

In the invitation document, the UK Government outlined the proposals under consultation, and the arguments against and in favour of each proposal. It also provided a definition of its own responsibilities in biofuel policy, as the next section reports.

1.1 The UK Government's responsibilities in technology policy

The UK Government justified its own intervention in biofuel policy as a correction of a market failure. A market failure occurs whenever "the free market acts in a way which does not maximise society's welfare" – e.g. when it

generates negative externalities such as GHG emissions, which are causing climate change (DfT, 2008a, p. 45). Whenever “there is no incentive for the free market to rectify [such negative externalities] ... it may be appropriate for public policy to do so through government intervention in the market” (DfT, 2008a, p. 45).

Endorsing the Stern Review, the UK Government agreed on the importance of taking action on three fronts, namely: (i) creating a common carbon price to reflect the marginal damage of greenhouse gas emissions; (ii) promoting a shift towards low-carbon technologies; and (iii) removing barriers to behaviour change. As specified by the UK Government, the RTFO fit the second front, given its aim to incentivise innovation and the development of lower-cost, low-carbon technology in transport.

Emerging technologies, in general, “take considerable time to develop in terms of their functionality, efficiency and affordability as well as their public acceptability” (DfT, 2008a, p. 45), thereby requiring the policy intervention of the government. In particular:

“One reason for the delay in such technologies entering the market can be unease over the level of risk in investment decisions with uncertain outcomes and payback periods. If the government can intervene in the market to reduce these uncertainties, possibly through regulations which create a minimum level of demand, then it would be reasonable to expect investment to increase.” (DfT, 2008a, p. 45)

According to the UK Government, its own responsibility in biofuel policy would then be “maximising society’s welfare” by providing a protected space to emerging biofuel technologies – i.e. a policy intervention meant to correct the failure of the market in creating the right conditions for investments in emerging biofuels to increase.

1.2 The consultation proposals

The consultation consisted of two parts. The first proposed policy changes directly affecting short-term support for producers of incumbent first-generation biofuels. The second part contemplated policy changes affecting long-term support to potential investors in second-generation biofuels and related to the future transposition of two upcoming European Directives in UK law. In the following sections, I report the arguments against and in favour of each proposal as provided by the UK Government in the invitation document of the consultation.

1.1.1 Part 1 – Future levels under the RTFO

The first part of the consultation sought views on the UK Government's proposal to slow down support to currently available first-generation biofuels – i.e. the annual rates of the RTFO – in line with the Gallagher Review's recommendations⁴³ (DfT, 2008a, p. 5). In the introduction of the invitation document, the UK Government explained that:

“New scientific evidence has emerged ... which suggests that the greenhouse gas savings of biofuels may have been overestimated and there is a risk that their production could in some cases lead to increases in emissions rather than reducing them. Concerns have also been expressed about some of the wider environmental and social impacts of biofuels, including their impact on food prices. These concerns led the Government to commission a major review of the indirect effects of biofuel production in February 2008. The review was led by Professor Gallagher, Chair of the Renewable Fuels Agency.” (DfT, 2008a, pp. 7-8)

The UK Government – via the then Secretary of State for Transport (BBC News, 2008b) – addressed the UK Parliament on the 7th July 2008 to report on the findings of the Gallagher Review. Endorsing the review's conclusions, the

⁴³ The Gallagher Review recommended the UK Government to slow down the RTFO rates to a lower annual increase rate of 0.5% per annum to reach 5% in 2013/14, instead of 2010/11, as originally planned. Such a slowdown was proposed to prevent a large-scale development of biofuels before assurance mechanisms were enforced and demonstrated to be effective in directing biofuel production on marginal or idle land (DfT, 2008e, Section 2; RFA, 2008a, p. 64).

UK Government stated “that there was a need for the Government’s support for biofuels to proceed with caution until the evidence is clearer about the wider environmental and social effects of biofuels” (DfT, 2008a, pp. 7-8). It also announced the future launch of a public consultation on slowing down the rate of increase in the RTFO, as recommended by the review. The first part of the consultation here analysed is the fulfilment of that commitment (DfT, 2008a, pp. 7-8).

Mirroring the options analysed in the Gallagher Review, part 1 of the consultation allowed participants to choose among: leaving the RTFO’s rates unchanged (Option 1), “freezing” the RTFO at the current level of 2.5% biofuel inclusion (Option 2), or slowing down the RTFO’s rates in line with the recommendations of the Gallagher Review (Option 3). The UK Government excluded a priori a total moratorium on biofuel policy, again in line with the Gallagher Review’s recommendations.

The invitation document listed the main arguments pro and against each of the above options. Having contemplated “both sides of the argument”, the UK Government reconfirmed previous announcements about its intention to slow down the RTFO’s targets “because it best meets both the sustainability concerns and the need for a future framework for producers and to encourage investment” (DfT, 2008a, p. 14). Such a “cautious approach strikes the right balance between the need to address these risks and the need for a sustainable biofuel industry” (DfT, 2008a, p. 13).

The arguments against a freezing or a slowdown of the RTFO focused on the damages such measures would cause to the biofuel industry’s ability to innovate. Either freezing or slowing down the RTFO would mean altering it only one year after its launch, thus contradicting one of its primary purposes, that is, “to give long-term certainty to the oil and biofuel industries” (DfT, 2008a, p. 10). In line with the conclusions of the Gallagher Review, freezing or, worse, withdrawing the RTFO “could reduce the ability of the biofuel industry to invest in new technologies or transform the sourcing of its feedstock to the more sustainable supplies necessary to create a truly sustainable industry. [A

moratorium or freezing could, therefore,] ... make it significantly more difficult for the potential of biofuels to be realised ... [by increasing the] risk [of having an] industry ... less prepared to invest in new technologies or source feedstock that does not cause land-use change” (DfT, 2008a, p. 12). That said, in view of the upcoming EU Directives, “It could ... be argued that it is better to defer any major changes to obligation levels to incorporate them with other major changes that will be required anyway in order to implement the Directive” (DfT, 2008a, p. 10). This would reduce uncertainty for the industry, while leaving open the possibility of “slowing down the target in 2010/11 in the light of any future emerging evidence about the environmental effects of biofuel production” (DfT, 2008a, p. 10).

The arguments in favour of a freezing or a slowdown of the RTFO focused on the “risk ... [of] possible adverse environmental outcomes of uncontrolled biofuel production [as] identified in the Gallagher review” (DfT, 2008a, p. 11). The current design of the RTFO may “lead to uncontrolled expansion and unsustainable changes in land use, such as the destruction of the rainforest to make way for the production of crops, which could increase emissions and impact upon biodiversity” (DfT, 2008a, p. 11). As currently set, RTFO levels may “put too much strain on available land and feedstock supply and have adverse effects including, in the absence of appropriate, agreed and enforceable sustainability criteria, a risk of perversely increasing greenhouse gas emissions” (DfT, 2008a, p. 11). Therefore, “The existing obligation levels do not adequately reflect the possible risks of biofuel production and in particular the indirect impacts” (DfT, 2008a, p. 11). This considered, and in line with the recommendations of the Gallagher Review, “a slower rate of increase [of obligation levels – at least,] until the evidence is clearer about the wider environmental and social effects of biofuels [–] ... will allow more time to develop adequate controls to address displacement effects and to reduce these risks” (DfT, 2008a, p. 11). Furthermore, “proceeding from 2.5% to 5% in only three years could lead to locking in more investment into unsustainable production”, as opposed to a slower increase (DfT, 2008a, p. 14). Whereas, the risk that “a slower increase in obligation levels might lead to a reduction in investment in advanced biofuel production processes ... may in part be offset

by proposals under the draft Renewable Energy Directive to give double reward for biofuels from wastes and non food material etc.” (DfT, 2008a, pp. 10-14).

1.1.2 Part 2 – Longer-term issues related to transposition of the European Directives

The second part of the consultation sought views on how to improve support for second-generation biofuels and on the proposal of the European Commission (EC) to double reward second-generation biofuels to favour their development.

At the time of the consultation, the drafts of the Renewable Energy Directive (RED) and the Fuel Quality Directive (FQD) were under negotiation (EC, 2007; 2008). In those two drafts, the EC proposed new, higher targets⁴⁴ requiring Member States to increase the share of biofuels or other renewable fuels over the total of transport fuels consumed by 2020 (EC, 2007, p. 8; 2008, p. 2). Both Directives were expected to be agreed by the end of 2008, thus requiring Member States to transpose them into national law by spring 2010 (DfT, 2008a, p. 9). As explained by the UK Government:

“Part Two of this consultation document aims to help gather stakeholders’ views on issues that may need to be addressed when considering transposition of the European Directives into UK legislation. [However, i]t should be noted that the European Directives are currently being negotiated and, until they are adopted, it will be uncertain what

⁴⁴ The drafts of the FQD and the RED were set to repeal the currently enforced 2003 EU Directive on Biofuels – once approved by the European Council and Parliament. The EC issued the FQD draft in January 2007, proposing the adoption of a binding target of 10% reduction in the life-cycle GHG emissions of road transport fuels between 2010 and 2020 (EC, 2007, p. 8). In March 2007, the EU Council gave instructions to the EC to produce a draft Directive including a new biofuel target of 10% per energy content by 2020 of the total consumption of transport fuels. This target was proposed as binding, and subject to pre-conditions, among them the sustainability of biofuels submitted and the availability of second-generation biofuels (EU Council, 2007, p. 21). Abiding by the indications of the EU Council, the EC issued the RED draft in January 2008, which included the new target (EC, 2008, p. 2). Unlike the EU Council’s proposal, the European Commission’s proposal did not include the pre-condition on the availability of second-generation biofuels (EC, 2008, p. 13). The RED Directive further deviated from the EU Council’s proposal by referring the target to “energy from renewable sources in transport” in general, and not biofuels alone (EU, 2009RED, p. 18). Despite this change in reference, the target was expected implicitly (EU, 2009RED, p. 18) or explicitly (DECC, 2009a, p. 47; DfT, 2010, p. 2) to be met mostly through biofuels.

flexibility Member States will have in implementing them. It is possible that not all of the matters raised in Part Two will be matters for the discretion of the Government. Nevertheless it seems appropriate to consult at this stage, before we know the final text of the Directives, because there will be very little time to develop the implementation measures for April 2010.” (DfT, 2008a, pp. 8-9)

In the introduction of the invitation document, the UK Government pointed out that the RED’s and FQD’s renewable fuel targets were most likely going to be met entirely by biofuels as “Other renewables, such as hydrogen and renewable electricity in electric cars ... are likely to only make a relatively small contribution in the foreseeable future” (DfT, 2008a, p. 9). Therefore, the two proposed EU Directives⁴⁵ “will have critical implications for the future levels of biofuels” (DfT, 2008a, p. 8).

Reconfirming the statement to Parliament of the 7th July 2008 – from the then Secretary of State for Transport (BBC News, 2008b), the UK Government stated that the EU target of 10% renewable transport fuels by 2020 could remain an overall objective, although subject to clear conditions – i.e. that “the EU-level [biofuels] sustainability criteria currently being negotiated must address indirect, as well as direct, effects on land use”; and that “the 10 per cent target must be subject to rigorous review in the light of emerging evidence [on the wider environmental and social impacts of biofuels], so that we can make an informed decision at EU level” (DfT, 2008a, p. 20).

⁴⁵ The draft of the RED initially proposed a target of 10% per energy content by 2020 for biofuels – equivalent to 13% per volume (DfT, 2008a, p. 9). The draft of the FQD initially proposed a 10% reduction in the lifecycle greenhouse gas emissions of road transport fuels between 2010 and 2020. This target would have been equivalent to about a 20% inclusion of biofuels on total transport road supply – assuming that only biofuels were used to meet the target and those biofuels delivering around 50% GHG savings on average (DfT, 2008a, p. 9). Therefore, this target would have required an even bigger biofuel inclusion than the one proposed in the draft of the RED. The target in the draft of the FQD was eventually reduced from 10% to 6% by the 2009 Fuel Quality Directive (EU, 2009FQ). In this way, it has been realigned with the target of the draft of the RED, which eventually referred to all renewable transport fuels (i.e. not only to biofuels) and reconfirmed at 10% per energy content by the 2009 Renewable Energy Directive (EU, 2009RED).

The draft of the RED included a proposal to double reward biofuels from non-food sources in order to promote their development. When commenting on this proposal, the UK Government declared itself “keen to encourage the development of renewable transport fuels which offer high level of carbon savings with minimum adverse environmental impacts” (DfT, 2008a, p. 22). Accordingly, it agreed on the aim “to target support on the development of lower carbon and other so called ‘second generation’ biofuels” (DfT, 2008a, p. 22) though “the majority of these advanced processes have not yet reached a commercial scale” (DfT, 2008a, p. 22). The UK Government associated such a delay with “the large capital costs that may be required [to develop second-generation biofuels] and which could take considerable time to recoup in comparison with cheaper ‘first’ generation alternatives” (DfT, 2008a, p. 22). That said, it maintained that, with the “right incentives, it is possible that the development of second generation biofuels will be encouraged” (DfT, 2008a, p. 22).

The UK Government then recalled its announcement of the 21st June 2007 about its two aims to reward biofuels under the RTFO “in accordance with the carbon saving that they offer from April 2010”⁴⁶ and “only if the feedstocks from which they are produced meet appropriate sustainability standards from April 2011” (DfT, 2008a, p. 25). It reconfirmed that rewarding biofuels according to their carbon savings was “still” its aim and that it would advance this option in the ongoing negotiations at the EU level. Nevertheless, it specified that the enforcement of these measures was subject to compatibility with the World Trade Organisation (WTO) rules, EU Technical Standards requirements and the European Commission’s future reviews of EU biofuel policy. Then, mentioning the Gallagher Review, it also pointed out that “current methodologies do not adequately take into account the indirect greenhouse gas consequences” (DfT, 2008a, p. 25). Nevertheless, the proposal of the forthcoming RED “will help to meet the first aim” by imposing minimum sustainability standards (DfT, 2008a, p. 25). Meanwhile, the proposal of the forthcoming FQD “will provide another

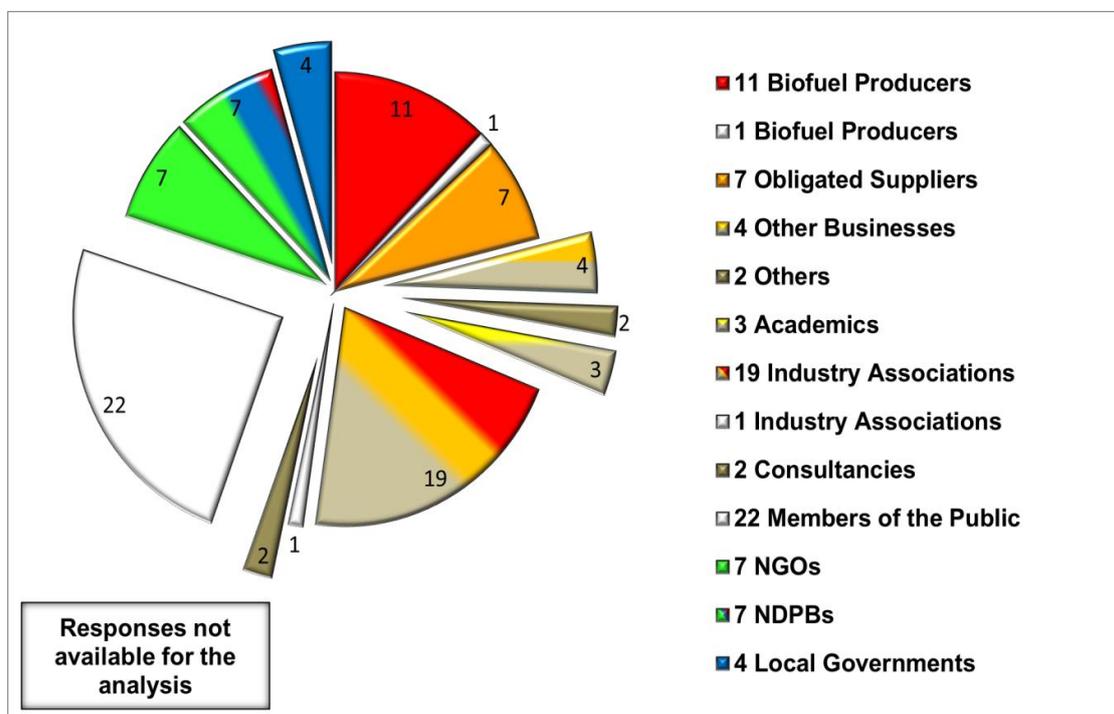
⁴⁶ By rewarding biofuels according to their GHG emission saving performances, second-generation biofuels – expected to generate greater GHG emission savings – would be automatically advantaged over first-generation biofuels.

mechanism for rewarding biofuels in accordance with their greenhouse gas savings” (DfT, 2008a, p. 25). On rewarding biofuels only produced from certified feedstock from April 2011, the UK Government explained that the matter “has now been overtaken by proposals in the RED for minimum sustainability standards”, defining the situation as “an example of an issue where we are constrained by the requirements of the Renewable Energy Directive” (DfT, 2008a, p. 25).

2. Consultation participants: the responses

This section reports the statements of expectations of the consultation participants as extracted from their responses. Participants are subdivided per type into ten subsections (Graph 5) – according to the classification explained in Chapter 2 (Table 1).

Graph 5: consultation participants by type



Legend:

Proximity to the centre emphasises the degree of involvement of the types of participant with biofuel technologies and biofuel policy. “Industry associations” are portrayed with colour gradations reflecting their links with the industries represented. “Non-departmental public bodies (NDPBs)” are portrayed with colour gradations reflecting their focus on different environmental, administrative, market issues.

Note that my classification includes 90 respondents (not 89):

According to the summaries of responses, this consultation collected 89 responses in total, among which 22 from “members of the public” (see also Chapter 2 – Table 1). In their annexes, the summaries of responses list the names of 68 organisations as respondents. There must therefore be a mistake in the DfT’s classification as these numbers do not add up (DfT, 2009c, Annex A; 2009d, Annex A).

Responses not available for analysis:

The DfT omitted the response of a biofuel producer – Good Fuel Cooperative & Golden Fuels – and the response of an industry association representing the bus, coach and light rail industries – the Confederation of Passenger Transport. Also unavailable for this research are the twenty-two responses from the “members of the public” who participated in the consultation. However, according to the summaries of responses, the members of the public submitted responses of identical content or very similar to those submitted by some NGOs.

1. Biofuel producers

“Biofuel producers” varied in size and type of biofuel produced. In the 2008/2009 obligation year, 38 biofuel-only producers submitted their biofuels under the RTFO (RFA, 2010, p. 24). Five⁴⁷ of these participated in the consultation (Argent, 2008; Convert2Green, 2008; Gasrec Ltd, 2008; Good Fuel Co-operative & Golden Fuels, 2008; Verdant Fuel Ltd, 2008). Besides these, seven other biofuel producers participated. Two were investing on large-scale bioethanol plants in the UK (Ensus, 2008; Vireol, 2008). Two were foreign producers of biodiesel (Daka Biodiesel, 2008; Neste Oil, 2008). One was a sugar producer (British Sugar, 2008), owning the only operational bioethanol plant in the UK at that time. One was a producer of electricity from biomass (Helius Energy, 2008). One was a prospective producer of second-generation biofuels (Energexia, 2008).

All biofuel producers were disappointed about current biofuel policy and all, except one (Verdant Fuel Ltd, 2008), strongly criticised the slowdown proposal. In the legal text of the RTFO, there was a drafting error in the definition of transport fossil fuels used to calculate the amount of biofuels that obligated suppliers had to supply in order to satisfy obligation levels (RFA, 2010, pp. 6, 12). A number of biofuel producers believed that this error had substantially reduced the demand of biofuels from obligated suppliers (British Sugar, 2008, p. 1; Convert2Green, 2008, p. 1; Ensus, 2008, p. 6). Some even blamed it responsible for the collapse of the certification market in the first obligation year (Argent, 2008, p. 2; Convert2Green, 2008, p. 4). Defining it as “by far the gravest threat to the continued existence of the industry in UK of all”, a biofuel producer pointed out that the drafting error was affecting biofuel producers far more than any other part of the supply chain (Argent, 2008, pp. 2, 4).

Biofuel producers were crucially dependent on UK biofuel policy for their own survival. That fact was reflected in their responses. A number of them warned

⁴⁷ The DfT did not provide a response from the biofuel producer – Good Fuel Cooperative & Golden Fuels

the UK Government about the serious consequences for the UK based industry if actions to improve financial support were not taken in time (Argent, 2008, p. 4; Convert2Green, 2008, p. 2; Energexia, 2008, p. 1). The collapse of the RTFO certificate market, the competition with cheaper and subsidised biofuels from abroad and the financial crisis were already straining this small sized industry (Convert2Green, 2008, p. 1; Ensus, 2008, p. 7; RFA, 2010, pp. 6, 45, 46). Considering the situation, further uncertainty in future financial support was particularly unwelcome. Therefore, as one biofuel producer emphasised, it was “absolutely vital that the RTFO ...[was made] an un-wavering and reliable Order” (Argent, 2008, p. 1).

The majority of biofuel producers rejected both the slowdown and freezing options (Argent, 2008, p. 5; British Sugar, 2008, p. 2; Convert2Green, 2008, p. 2; Ensus, 2008, p. 7; Gasrec Ltd, 2008, p. 1; Helius Energy, 2008, p. 2; Neste Oil, 2008, p. 1; Vireol, 2008, p. 12). For one of these, “a contraction of the UK biofuel market could have wider implications negative for investor confidence in renewable technologies and this Government’s commitment to its own 2020 and [2]050 targets for renewable energy and climate change mitigation” (Helius Energy, 2008, p. 2). Furthermore, “reducing short-term demand for biofuels is likely to prevent investment in UK biofuel production, resulting in a policy which is dependent on imported fuels which may have different carbon reduction properties and which reduces UK fuel security in this area” (Helius Energy, 2008, p. 2). Another biofuel producer explained that any reduction of the RTFO would, “in turn, send signals to investors in biofuels that the UK is not a suitable place to invest in” (Vireol, 2008, p. 2). More specifically, a “slowdown will cause the UK to export its ability to meet the new Renewable Energy Directive (RED) targets on a sustainable basis, to third country producers” (Vireol, 2008, p. 2). Such a “perverse outcome” would occur “at the very time when the UK is in the grip of a recession and ‘green collar’ jobs are touted as part of the solution” (Vireol, 2008, p. 2).

Instead of slowing down or freezing the RTFO, the majority of biofuel producers sustained that UK domestic targets should be harmonised with the RED’s 10% target by 2020 (British Sugar, 2008, p. 2; Gasrec Ltd, 2008, p. 1; Helius Energy,

2008, p. 2; Neste Oil, 2008, p. 2; Vireol, 2008, p. 2). Harmonising the RTFO with EU targets – as a biofuel producer stressed – was particularly relevant considering that the vast majority of the target would have to be met with biofuels (Vireol, 2008, p. 6). By contrast, any reduction in targets would reduce “the UK’s ability to meet the longer term 10 percent RED energy target”, as there would be “insufficient time to invest in [production] plant[s] to meet the volumes required” (Vireol, 2008, p. 12). Furthermore, it would make farmers “less able to drive the yield improvements that can deliver sustainable feedstocks” (Vireol, 2008, p. 12). Another biofuel producer explained that “to encourage investment, and to maximise the emissions reduction in the transport sector, it is important that the **trajectory is linear between 2010 and 2020**”⁴⁸ (British Sugar, 2008, p. 3). As pointed out by another biofuel producer, a reduction in targets “would [instead] give the UK one of the lowest biofuel targets in the EU in 2010 ... undermining the UK’s ability to inform and lead on sustainability issues in the EU and globally” (Ensus, 2008, p. 5).

Many biofuel producers casted doubt on the Gallagher Review’s conclusions (British Sugar, 2008, p. 2; Ensus, 2008, pp. 5, 8; Helius Energy, 2008, p. 2; Verdant Fuel Ltd, 2008, p. 4). One of these objected that “subsequent events have shown the food concerns to be inconsequential and the risk of unsustainable biofuels in UK to be somewhat overstated” (Argent, 2008, p. 2). Another one observed that “much of the science and debate about indirect land use change is uncertain, with a number of respected academics criticising the key studies by Searchinger et al. and Fargione et al.,⁴⁹ as well as expressing fundamental concerns with assumptions made in the Gallagher Review” (Helius Energy, 2008, p. 2). Another one pointed out that “many of the issues that provoked the Gallagher report have now abated”, since “biofuel production worldwide has continued to rise while food commodity prices have fallen substantially demonstrating that the primary impact on food production costs is energy not biofuel demand” (Verdant Fuel Ltd, 2008, p. 4). This biofuel producer also optimistically sustained that “indirect land use issues can be managed within the existing policy framework by taking a much stricter approach to

⁴⁸ Bold from original text.

⁴⁹ Academic studies raising the issue of the indirect effect of first generation biofuels.

unknown sourcing of feedstocks” (Verdant Fuel Ltd, 2008, p. 4). Another biofuel producer contended that “significant falls in food commodity prices since July make it clear that rising biofuel production did not contribute significantly to recent food price increases. In addition, evidence provided to the Gallagher review, together with initial results of the RTFO’s carbon and sustainability reporting demonstrate that UK-supplied biofuels currently offer better greenhouse gas savings and meet a higher proportion of the environmental and/or social criteria (as defined under the RTFO) than other sources of biofuel” (Ensus, 2008, p. 5). Consequently “a target slowdown will adversely affect UK investment in such ‘Good biofuels’ [i.e. UK domestic biofuels] - both in the short term due to lower target levels, and in the longer term due to the perception of policy risk in this area” (Ensus, 2008, p. 5).

A case in point was a producer of pure plant oil from rapeseed. Producing a bio-oil, which required engine modifications in vehicles and could not be directly blended into petrol and diesel, this biofuel producer was the only one backing the slowdown proposal. It sustained that “blending biofuels is not the only way to use existing biofuel feedstocks” (Verdant Fuel Ltd, 2008, p. 2), and that by using its rapeseed “Pure Plant Oil” instead of common biodiesel, it could be possible to achieve the same carbon abatements as originally planned, with a reduced need for land for feedstock production as compared to conventional biodiesel. This would provide time to solve the sustainability and land-use-change issues, while attaining the same results in carbon abatement. Thus, the UK Government should promote the conversion of engines to its bio-oil rather than going ahead by blending biodiesel in transport diesel (Verdant Fuel Ltd, 2008, p. 2). Another case in point was a producer of biodiesel, which only replied to one consultation question about the proposal to exclude animal fat (tallow) from the list of sustainable feedstocks for biofuels – i.e. question 19 (Daka Biodiesel, 2008). This biofuel producer “strongly disagree[d] with this course proposed by the UK Government, which looks like a strong discrimination of tallow as a feedstock for biofuel production” (Daka Biodiesel, 2008, p. 1). It contended instead that “discriminating action towards animal fat for biofuel production, will harm the whole agricultural sector” (Daka Biodiesel, 2008, p. 1).

Biofuel producers tended to stress the importance of introducing a rigorous and mandatory system of sustainability standards. Such a system would have made their biofuels more attractive to obligated suppliers – since the feedstock used by the most of them automatically met sustainability standards. In favour of measures supporting advanced biofuel technologies, this group expressed anyhow concerns over the unconditional preference of the EU and the UK Government for second-generation biofuels. Some biofuel producers reminded that the feedstocks they used for their biofuels (mostly organic wastes) ensured substantial GHG savings, even though their technologies were considered as first generation. Blamed as “undefined and misleading” by one of them (Argent, 2008, p. 7), the label second-generation was feared as threatening future support to their first-generation biofuels. Besides, as pointed out by another biofuel producer, “it is not entirely clear that versus some current technologies that the promotion of ‘second generation’ will deliver the policy outcomes expected. The Gallagher Review points out that, depending on where the feedstocks are grown for ‘second generation’, can have a significant impact of the GHG savings of that fuel. All of this needs to be properly evaluated before real encouragement to ‘second generation’ can and should take place” (Vireol, 2008, p. 18).

On the issue of how to improve support second-generation biofuels, biofuel producers agreed on avoiding discriminating biofuels on the basis unclear classifications of technologies into generations. The rewarding system should instead ensure neutrality by rewarding biofuels according to their performances in reducing GHG emissions (Argent, 2008, p. 7; British Sugar, 2008, p. 8; Energexia, 2008, p. 4; Ensus, 2008, p. 6; Gasrec Ltd, 2008, p. 2; Neste Oil, 2008, p. 5; Vireol, 2008, p. 18). Furthermore, the double reward is “a very blunt policy instrument” – as a biofuel producer pointed out (Vireol, 2008, p. 18). As specified by another biofuel producer, double rewarding second-generation biofuels would be acceptable **“as long as it is in a level technology playing field, with technology- and feedstock-neutral support measures in the**

form of GHG incentives that fully account for ILUC effects and recognise the contribution to other sectors through co-products”⁵⁰ (Ensus, 2008, p. 6).

A case in point was a biofuel producer planning “to introduce a 2nd Generation Biofuels process into the UK that will convert biomass into renewable diesel” (Energexia, 2008, p. 1). This prospective producer of second-generation biofuels stated that the double reward, “whilst crude”, approximately reflected the GHG savings provided by its process compared to most first-generation technologies. However, it further specified that it could not say “if the same can be said of all 2nd Generation processes and therefore a rewards mechanism based on GHG savings would be fairer” (Energexia, 2008, p. 4).

2. Obligated suppliers

For the 2008/2009 obligation year, the RFA identified a total of fourteen obligated suppliers (RFA, 2010, pp. 18-24), seven of which participated in the consultation (British Petroleum [BP], 2008; Chevron, 2008; Conoco Phillips, 2008; Greenergy, 2008; Ineos, 2008; Mabanafit, 2008; Shell, 2008).

Three obligated suppliers opposed both the slowdown and the freezing options, and advocated maintaining UK biofuel policy as previously set (BP, 2008; Greenergy, 2008; Mabanafit, 2008). One of these three owned two operating large scale biodiesel plants in the UK and declared to supply “over a third of the [UK] biofuel market” (Greenergy, 2008, p. 1). Because of its “wide-ranging position in the market”, this obligated supplier considered itself “uniquely placed to be able to access the impact of the issues raised in the ... consultation throughout the biofuel industry and UK transport fuel market” (Greenergy, 2008, p. 2). For this obligated supplier, “the RTFO has already been successful in delivering lower carbon emissions, promoting sustainable biofuels and increasing awareness of what is required to deliver further benefits within the supply chain” (Greenergy, 2008, p. 2). However, such “success is being undermined by the threat to lower the scheme’s obligation levels so early in its

⁵⁰ Bold in original text.

development, particularly coming after the RTFO drafting error which has already reduced the requirement for biofuels” (Greenergy, 2008, p. 2). Therefore, “a clear priority is that the drafting error in the RTFO Order is put right” (Greenergy, 2008, p. 1). This obligated supplier further contended that either a freezing or a slowdown “would be imprudent and damaging to the UK’s ability to deliver sustainable low-carbon biofuels now and in the future” (Greenergy, 2008, p. 8). By implementing those measures, the UK Government would “risk damaging the credibility of the RTFO and future UK initiatives and diluting the positive impacts” (Greenergy, 2008, p. 8). As “biofuels have a vital role to play in helping the UK to meet its greenhouse gas (GHG) and renewable energy targets ... the Government must maintain a stable regulatory and fiscal framework to encourage the necessary investment throughout the supply chain” (Greenergy, 2008, p. 2). The current financial crisis and the drafting error were already fuelling uncertainty in the market. Hence, “the only prudent route forward is to minimise the changes to the RTFO until the implementation of the Renewable Energy Directive (RED) and Fuel Quality Directive (FQD)” (Greenergy, 2008, p. 2).

On the issue of sustainability standards, this obligated supplier endorsed “the UK Government’s concern about Indirect Land Use Change (iLUC) and in particular the potential impact that the reported carbon benefits of biofuels supplied may not be achieved in reality” (Greenergy, 2008, p. 3). Nevertheless, biofuels remained “an important tool for alleviating some of the structural challenges facing the world today”, while it was “important that the UK Government does not damage this important national and international resource through decisions taken on out of date or incomplete evidence” (Greenergy, 2008, p. 11). This obligated supplier emphasised its record as “the first company to have biofuels sustainability criteria approved by the Renewable Fuels Agency (RFA)” to reinforce its claim that the introduction of its standards had “already led to improvements in the sustainability of the entire supply chain, [with] ... a disproportionately positive impact not only on bioethanol supplied into the UK market but also, importantly on the sustainability of bioethanol, and indeed sugar, for non UK supply” (Greenergy, 2008, p. 1). After such premises, it casted doubt on the reliability of the evidence gathered by the Gallagher

Review. In particular, it recommended “caution against over reliance on early academic thinking, which in some cases has already been shown to be of limited worth” (Greenergy, 2008, p. 3). Furthermore, it pointed out that “the Gallagher Review was produced in a very short time, to meet a specific and limited brief in a ‘hot house’ politically charged period where there was general fear of commodity inflation” – which were no longer the case (Greenergy, 2008, p. 4).

A second obligated supplier – at the time building a large scale bioethanol plant in the UK – declared to agree with the Gallagher Review’s conclusion that freezing the obligation is “not justified and indeed would be a counterproductive measure in terms of tackling road transport GHG emissions and improving supply diversification” (BP, 2008, p. 3). A freezing “would likely result in the deferment and cancellation of existing and future UK’s biofuels investments due to the resulting impact on investor confidence” (BP, 2008, p. 3). A number of “detrimental consequences” would follow. Firstly, the first-generation biofuel industry would fall and consequently with it an important “technological bridge to facilitate the development and introduction of advanced biofuels”. Secondly, R&D on biofuels would expatriate, with the UK losing technological competitiveness in such an emerging sector. Thirdly, a “perceived withdrawal of the UK from the biofuel policy space would significantly weaken the UK’s future influence both at the European and global level”. Therefore, the current UK leadership role in setting up sustainability standards would be also lost. In addition to that, a biofuel policy freezing in the UK would only marginally reduce the international production of biofuels, while compromising the chance of the UK to positively influence the EU Directive on Renewable Energy (BP, 2008, p. 3). Even a slowdown of biofuel targets was “felt” as an ineffective measure to mitigate biofuel indirect effects, particularly “at a European and Global level”. By contrast, it would have risked both damaging investor confidence, the future evolution of the UK biofuel sector and the eventual attainment of the 2020 10% target under the Renewable Energy Directive (BP, 2008, p. 2).

The third obligated supplier complained that both a freezing and a slowdown would “penalise those companies that have made efforts to adopt the original

RTFO targets and provide uncertainty to the UK industry” (Mabanaft, 2008, p. 1). Whereas, “the focus now should be on the adoption of the RED and adapting our current systems to accommodate it” (Mabanaft, 2008, p. 1).

By contrast, the other four obligated suppliers endorsed the UK Government’s argument that a slowdown of biofuel targets was striking the right balance in between ensuring the survival of a sustainable industry, while addressing sustainability concerns (Chevron, 2008; Conoco Phillips, 2008; Ineos, 2008; Shell, 2008). Among these four, one in particular emphasised that it was supporting “existing and planned mandates on the condition that they recognise GHG performance, social and environmental criteria as well as supply feasibility factors” (Shell, 2008, p. 1). This obligated supplier also mentioned its work with “its suppliers to incorporate clauses in supply contracts that will seek to ensure that bio-components are not knowingly linked to: violation of human rights (including child/forced labour), and recent clearing of areas of high biodiversity value as defined by feedstock specific multi-stakeholder initiatives and national regulations” (Shell, 2008, p. 2).

All obligated suppliers acknowledged second-generation biofuels as potentially better performing than first-generation biofuels. An obligated supplier in particular sustained that, beyond “delivering significant GHG reductions, while avoiding/minimising indirect effects”, advanced biofuels have “significant potential ...[for] providing future road transport fuels requirements” (BP, 2008, p. 3). This obligated supplier mentioned the Gallagher Review’s conclusion that “there is sufficient land for food, feed and biofuels, provided that there is timely development and introduction of advanced biofuels” to reinforce its own estimation that “there exists the potential from advanced biofuels using non-food crop feedstock to provide in future up to 30% of road transport fuel requirements” (BP, 2008, p. 2). On the issue of how to better support second-generation biofuels, there was almost an unanimous agreement on promoting biofuels according to their GHG abatements performances – as opposed to unclear definitions of biofuel generations (BP, 2008, p. 9; Conoco Phillips, 2008, p. 6; Greenergy, 2008, p. 12; Mabanaft, 2008, p. 4; Shell, 2008, p. 6). In the view of obligated suppliers, the choice of which technology to apply, under the

constraints imposed by the RTFO, should have been left to the market – i.e. to them. According to an obligated supplier, the RTFO should limit itself to “drive behaviour by setting out the clear objective of sustainably reducing carbon emission”, and refrain from defining “specific company behaviour” (Mabanaft, 2008, p. 4). Another obligated supplier added that the double reward as proposed by the RED, although “useful in concept”, contained a number of “flaws” (BP, 2008, p. 9). As currently set, the double reward would not “accurately reflect the true additional costs gaps that currently exist between advanced biofuel technologies and existing technologies”, nor would differentiate support according to the different stage of development of these advanced technologies (BP, 2008, p. 9). The “definition of advanced technologies eligible for this additional reward is too narrow and purely feedstock based”, failing to identify those technologies that might overcome non-economic barriers better than others (BP, 2008, p. 9).

A case in point was a large foreign oil refiner and producer (Ineos, 2008) that incorporated an advanced biofuel business unit and responded on behalf of a UK obligated supplier (Morgan Stanley) (RFA, 2010, p. 28). This respondent favoured the introduction of a double reward system, since it “is simpler to administer, and provides a higher degree of certainty for investors than a system based on linking certificates to greenhouse gas savings, which introduces a whole new set of assumptions around the alternative fates of the biomass wastes used to make the biofuel” (Ineos, 2008, p. 10).

3. Other businesses

The “other businesses” that participated in the consultation were two electricity suppliers (Energy ON [E.ON], 2008; Electricité de France [EDF], 2008), and two carmakers (Bentley, 2008; General Motors [GM], 2008). The two electricity suppliers referred to environmental concerns as reasons to support the slowdown option (E.ON, 2008; EDF, 2008). These industrial actors also contended that priority should be given to the development of electric vehicles. The two carmakers participating in the consultation opposed the slowdown and

were favourable to leave the RTFO unchanged (Bentley, 2008; GM, 2008). The specific environmental/business strategy of these two carmakers focused on adapting their models to greater use of biofuels.

4. Others

The category “others” only includes two private clubs, among which one representing owners of historic vehicles in the UK (Federation of British Historic Vehicle Clubs [FBHVC], 2008), and the other representing car owners in general (Royal Automobile Club Foundation [RAC Foundation], 2008). These private clubs were mostly concerned about the risk of biofuel blending compromising fuel quality – thus threatening the viability of older vehicles – and supported the slowdown option.

5. Academic

Three “academic” groups participated in the consultation (ESRC Centre for Business Relationships, Accountability, Sustainability and Society [BRASS], 2008; Royal Academy of Engineering [RAE], 2008; Sussex Energy Group, 2008). Two of these accepted the recommendation of the Gallagher Review to slowdown biofuel policy (RAE, 2008; Sussex Energy Group, 2008). These two presented a slowdown in biofuel targets as the option striking the right balance between the need to preserve a UK domestic biofuel industry and containing the negative implications of biofuel production on the environment. One of these also stressed that decision-making in UK biofuel policy needed greater legitimacy. Since the RTFO would increase imports of biofuels from developing countries, affected stakeholders in those countries should also be included in policymaking appraisals (Sussex Energy Group, 2008). Both academics indicated the promotion of further research on second-generation biofuels as a requirement for and a responsibility of the UK Government. By contrast, the third academic advocated the inclusion of renewable electricity as road transport fuel supported by the RTFO (BRASS, 2008). This academic sustained

that leaving the RTFO targets as originally planned would send the right signal to promote the adoption of electric vehicles.

6. Industry associations

The industry associations that participated in the consultation defined themselves as organisations whose activities focused on information dissemination, political representation, and networking promotion on behalf of their sponsor industrial members. Among these, seven represented “biofuel producers”, two represented “obligated suppliers” and eleven represented “other businesses”.

6.1 Industry associations of “biofuel producers”

Seven industry associations variously represented small-medium scale biofuel producers. Two represented renewable energy industries in general (Environmental Industries Commission [EIC], 2008; Renewable Energy Association [REA], 2008). Two represented a specific territorial cluster of biofuel producers in the UK (North East Process Industry Cluster [NEPIC], 2008; North East Biofuels, 2008). Three represented producers of specific biofuels (Biopower, 2008; European Biodiesel Board [EBB], 2008; Lyondell Basell & EFOA, 2008). All these industry associations declared to reflect the specific interests of their sponsor industries and to respond on behalf of all their members – i.e. also of those that did not participate in the consultation.

The two industry associations representing renewable energy industries advocated the interest of small-scale UK biofuel producers – regardless of the type of biofuel produced. One of the two defined itself as “the largest renewable industry body in the UK, with over 530 member companies”, of which “some 50 members with direct and indirect interests in biofuels for transport” (REA, 2008, p. 1). Reiterating biofuel producers’ critiques, this industry association casted doubt on the validity of the evidence gathered by the Gallagher Review. It contended that “the danger of making assumptions without evidence to support

them is highlighted by the behaviour of global food prices. Some estimates blamed biofuels for most of this year's food price peaks, but recent events have demonstrated this is not the case" (REA, 2008, p. 5). Even if "an increase in demand for biofuels is likely to have some impact on [food] prices ... [it is however] clear that those impacts have been grossly exaggerated" (REA, 2008, p. 5). Furthermore, "the main cause for ... [food price] fluctuations is a combination of volatility in the oil price, speculators looking for new markets to invest in and poor harvests around the world followed by farmers responding to higher prices by planting more crops" (REA, 2008, p. 5). "For the avoidance of doubt", it then specified that its "members support the carbon and sustainability reporting under the RTFO, which we regard as a world-leading scheme and a model for others to follow" (REA, 2008, p. 2). Against the "clear" risk of "an unmanaged expansion of biofuels", this industry association optimistically sustained that future initiatives of the EU on tackling indirect effects and the "mandatory standards contained in the RED will address this" (REA, 2008, p. 3).

This industry association advocated the arguments of biofuel producers against the proposed slowdown in biofuel targets. Mentioning a survey conducted among its members, "the decision to reduce targets has had and will have a serious effect on investor confidence and there is now a real risk that there will be no further investment in the UK" (REA, 2008, p. 6). The economic crisis and the drafting error had already "considerably" worsened investors' confidence. Meanwhile, the new EU target was requiring "higher levels of biofuel use than are currently planned" (REA, 2008, p. 1). In this context, a slowdown of RTFO targets would "significantly harm the development of a sustainable domestic biofuel industry ... undermine ... the UK's acknowledged leadership on biofuel sustainability [and] make it harder to meet the UK's overall targets for the RED" (REA, 2008, p. 8). Meanwhile, it "would have negligible impacts on the global sustainability concerns" (REA, 2008, p. 8). Furthermore, "the risks to investment of slowing down the targets apply to an even greater degree for investment in new technologies – which carries an inherently higher risk of failure" (REA, 2008, p. 17). This considered, "If the industry is to make this investment, it will need ... Binding, long-term targets – and certainty on the policy mechanism to reach them ... [and] ... Sufficient certainty on sustainability/GHG requirements to

be able to implement them through global supply chains ... If these are not present, there is a significant risk that the policy will fail” (REA, 2008, p. 3). This is because “delivering sustainable biofuels requires substantial capital expenditure and a long operational life if this investment is to be recouped” (REA, 2008, p. 3). Thus, the UK Government should leave the RTFO targets unchanged, especially in consideration of the fact that “the science required to underpin such a policy change does not yet exist” (REA, 2008, p. 8).

Reiterating biofuel producers’ arguments, second-generation biofuels “are not necessarily better than current technologies in land-use terms once co-products are taken into account ... [and] unlikely ... to be available in quantity before 2020” (REA, 2008, p. 16). About the proposed double reward, the measure was seen as “not ... sufficient ... to encourage ‘second generation’ biofuels” (REA, 2008, p. 16). This “very blunt instrument” would not distinguish between cost-competitive technologies and others requiring more support (REA, 2008, p. 16). As opposed to a double reward, “a more focused approach, possibly based around specific incentives or with tapered, time-limited support under a GHG-linked RTFO is more likely to succeed” (REA, 2008, p. 16).

The other renewable industry association defined itself as “the largest trade association in Europe for the environmental technology and services (ETS) industry ... [and] enjoying ... [the] “support of leading politicians from all three major UK political parties as well as trade union leaders, environmentalists and academics” (EIC, 2008, p. 1). This industry association claimed to represent “over 330 member companies [of which] ... over 70 organisations from small biofuel producers to multinational commodity companies and has actively participated in policy development and practical implementation of biofuels in the UK and the EU” (EIC, 2008, p. 1). This industry association advocated the arguments of biofuel producers in favour of leaving the RTFO unchanged, rewarding second-generation biofuels on the base of GHG performances, and maintaining the reward system technology neutral. About the supposed link between first and second-generation biofuels, this industry association sustained that “the pursuit of second generation biofuel is too often used as an excuse to avoid engagement with first generation technology. The ‘wait and

see' mentality that it encourages, adds to the policy uncertainty demonstrated in the Gallagher review, and will turn the UK into a transient import market. Government intervention in technology should be restricted to focused R&D support. Commercial rewards should be delivered via the encouragement of a vibrant carbon market, and the differential award of certificates to superior technologies for carbon reduction" (EIC, 2008, p. 5).

The two industry associations representing the same industry cluster were joint into a partnership (NEPIC, 2008, p. 1; North East Biofuels, 2008, p. 5). In their responses, both industry associations reflected the specific interests of the industrial members of that cluster – which included several biofuel producers. As specified by one of the two, the industry cluster had “a gross domestic product nearing £8bn”, and was set to become “a key driver of the regional economy over the next decade and beyond” (NEPIC, 2008, p. 1). Representing “the whole supply chain”, the other industry association said that its members were a “collection of companies and organisations ... uniquely well placed to offer a perspective on the current RTFO consultation” (North East Biofuels, 2008, p. 1). Deploying the same exact text in their responses, both industry associations warned the UK Government that “the importance to prospective investors of stability and the ability to make reasonable predictions about the marketplace should not be underestimated” (NEPIC, 2008, p. 2; North East Biofuels, 2008, p. 1). With its decision to slowdown the RTFO, the UK Government was about to create “a very serious issue with trust”⁵¹, as a slowdown would leave “investors wondering if they can rely on any Government target in making an investment decision” (NEPIC, 2008, p. 2; North East Biofuels, 2008, p. 1). The RTFO should instead be left unchanged as that was “the basis on which the fuel industry and biofuel investors have laid their plans” (NEPIC, 2008, p. 3; North East Biofuels, 2008, p. 2). In their view, even by maintaining these levels, the UK would “still fall significantly short of the leaders in Europe at a time when the UK should be setting out to seize the European and international biofuel growth opportunity” (NEPIC, 2008, p. 3; North East Biofuels, 2008, p. 2). These two industry associations further contended that

⁵¹ Underlined in original text (in both responses).

“those who seek to portray a slowdown as exercise of the ‘precautionary principle’ should remember that climate change will not slow down while we engage in protracted intellectual debate – and there is nothing ‘precautionary’ about delaying CO₂ emissions reduction” (NEPIC, 2008, p. 3; North East Biofuels, 2008, p. 2).

About second-generation biofuels, one of the two industry associations stressed that “prior to talk of second generation biofuels, the UK ... must have a productive, profitable and sustainable first generation industry” (NEPIC, 2008, p. 4). Using the same exact text in their responses, both industry associations sustained that “the UK should aspire ... to be a hub of international development in biofuel technology into the long-term future, building on a successful introduction of first generation biofuels” (NEPIC, 2008, p. 4; North East Biofuels, 2008, p. 4). Whereas, the double reward was “welcome but not adequate” (NEPIC, 2008, p. 4; North East Biofuels, 2008, p. 4). A better strategy would involve direct R&D funding, while the reward system ought to take into account “both the carbon saving delivered and the difficulty penetrating the market sector (which reflects in part the differences in how we tax fuels in different sectors)” of any specific technology (NEPIC, 2008, p. 4; North East Biofuels, 2008, p. 4).

Among the three industry associations representing producers of specific types of biofuels, two represented the interests of biodiesel producers (Biopower, 2008; EBB, 2008), while one represented producers of fuels oxygenates (Lyondell Basell & EFOA, 2008). One of the two industry associations representing biodiesel producers claimed that its “members account for around 85% of the biodiesel produced in Europe and two thirds of global production” and declared to respond “on behalf of our UK members and companies concerned with the development of the UK biodiesel market” (EBB, 2008, p. 1). Reiterating biodiesel producers’ critiques, this industry association rejected the conclusions of the Gallagher Review since “the erroneous argument that biofuels development was the cause for food price increases in late 2007/ early 2008 can be observed to be untrue by the 50% decrease in food prices since May 2008, despite increasing biofuel production and adoption of a higher

biofuel target” (EBB, 2008, p. 3). On the contrary, the industry association contended that “sustainable biofuels present the potential to bring essential investment to agricultural productivity in developing nations which could improve food security” (EBB, 2008, p. 3). Furthermore, “the Gallagher review findings and subsequent recommendations are not representative of the biofuels produced by UK and European biodiesel producers who would supply the majority of any increased level of biofuels when strict sustainability criteria are applied” (EBB, 2008, p. 3). The “UK and European producers are already particularly sustainable. They deliver consistently and significantly high greenhouse gas emission savings compared to fossil fuels. In some cases (especially UK producers) current greenhouse gas savings reach as high as 86.8% according to RTFO calculation method for recycled vegetable oil” (EBB, 2008, p. 3). This industry association was also “confident that early implementation of RED sustainability criteria combined with higher levels of obligation will lead to the use of only the most sustainable feedstocks and as an attractive market could lead to even stronger implementation of sustainable management for ... all ... feedstocks” (EBB, 2008, p. 3). In addition, “the RTFO has already proven its ability to monitor and increase the level of sustainability control from biofuels, and European and UK suppliers are particularly successful in this regard” (EBB, 2008, p. 4).

This industry association underlined the “severe challenges facing the UK biodiesel industry under the Renewable Transport Fuels mechanism, amid unfair competition from heavily subsidised biodiesel from the United States of America ... and the coming implementation of the EU Renewable Energy Directive and biofuels sustainability criteria” (EBB, 2008, p. 1). In addition, the drafting error “effectively halved the volume of expected biofuels required for 2008/09 ... [causing the industry to lose] expected revenue in the order of many millions of pounds” (EBB, 2008, p. 1). This considered, “it is ... fair to say ... that without more certainty around target-driven demand, there is an increasing chance that there will be no indigenous UK production to deliver the RTFO in the near future” (EBB, 2008, p. 2). In this context, “any suggestion to delay or reduce obligation levels would be devastating to the UK ambitions to develop an increasingly sustainable biofuel industry, bringing greenhouse gas emissions

reductions, fuel security and sustainable employment. Most importantly, a freezing or a slowdown of biofuel targets would be at variance with the ambitious 10% binding EU objective for renewables in transport” (EBB, 2008, p. 2). This “hesitation in obligation levels in the UK would ... [ultimately] result in the retarded development of the UK industry and require the importation of less sustainable biofuels to meet the obligated market in 2010” (EBB, 2008, p. 2). On the basis of these arguments, this industry association recommended **“an increased level of obligation to meet the EU Biofuels Directive 2003/30 target of 5.75% biofuels by 2010, or at least maintenance of the 3.75% by 2010 level as intended, but with immediate correction of the obligation level for 2008/09** to preserve the value of [RTFO certificates] this year and in the future”⁵² (EBB, 2008, p. 3). For this industry association, “it would be unconceivable that national objectives would prevent producers from meeting the EU objectives” (EBB, 2008, p. 2).

About second-generation biofuels, this industry association claimed that they will be viable, provided “considerable private and public investment[,] ... no sooner than 20 to 50 years in development” (EBB, 2008, p. 4). Besides being still “completely economically and technically unviable”, second-generation technologies “also provide little environmental benefit” (EBB, 2008, p. 4). As opposed to second-generation biofuels, “[first-generation] biofuels represent the most practical option for delivering greenhouse gas emission reductions from the UK transport sector in the short and medium term” (EBB, 2008, p. 4). About double rewarding second-generation biofuels, the industry association sustained that such a rewarding system “does not fully account for the long term investment in research and development required for the commercialisation of these types of fuels nor their environmental advantages beyond those mentioned, including services of waste disposal, desertification prevention, and land remediation” (EBB, 2008, p. 7). Besides, “reliance on this method alone may encourage these fuels to be developed solely by international mineral oil suppliers with the research and development capacity to invest years in advance of commercialisation and double rewarding” (EBB, 2008, p. 7). This

⁵² Bold in original text.

industry association also lamented that the definition of second-generation biofuels in the RED was “not ... suitable” as it would exclude from the reward “existing biofuels [that] can already produce verifiable lifecycle greenhouse gas savings of up to 86.8% ... compared to as yet unproven technologies regarded as second generation” (EBB, 2008, p. 7). Greater research funding should instead be extended “to biodiesel producers to upgrade their greenhouse gas efficiencies and develop more sustainable feedstock options such as waste oils, algae, and jatropha”, while avoiding “second generation terminology” (EBB, 2008, p. 7). Such funding would also reach “UK producers [currently] pioneering development of biodiesel feedstocks from degraded and contaminated land by the use of jatropha and algae biomass” (EBB, 2008, p. 4).

The other industry association represented small-scale UK producers of biodiesel derived from used cooking oil (UCO) (Biopower, 2008, p. 2). Sustaining rather radical positions, this industry association questioned the overarching approach of the UK Government in biofuel policy, while did not respond in detail to the consultation questions. For this industry association, the UK “should not be seen as a nation that is simply trying to meet minimal targets ... [It should rather be seen] “setting an outstanding example of radical environmental policy that will shame other nations like the USA” (Biopower, 2008, p. 1). Meanwhile, “the RTFO should be abandoned completely, and much more assertive and effective measures used to directly encourage and promote the public use of alternatives to mineral hydrocarbon fuels”, for instance by freeing of Excise Duty “all non mineral, non-fossil derived hydrocarbon materials” (Biopower, 2008, p. 1). Furthermore, the UK Government should “ensure that all new vehicles can run on simple bio-fuels (Straight Vegetable Oil or SVO), and existing vehicles can be converted to run on SVO” (Biopower, 2008, p. 1). In this respect, the UK Government should avoid being “fooled ... by reports created by the motor industry designed to show that engines will fail if SVO is used as a fuel” (Biopower, 2008, p. 4). In the opinion of this industry association, those reports just reflected that “to a large extent ... the motor industry is steered by the interests of the petrochemical industry” (Biopower, 2008, p. 4). The industry association concluded that “***the RTFO should be***

scrapped⁵³ and substituted with courageous policies whose “primary aim must be to reduce our national use of fossil derived hydrocarbons ... [and] secondary aim must be to dramatically reduce the need for so much transport” (Biopower, 2008, p. 5). These “two aims can only be achieved by providing real alternatives to fossil carbons, and by educating people on how to use them. Also, by making major changes to the way we work and meet our needs” (Biopower, 2008, p. 5). Implicit was that among those “real” alternatives were the biofuels produced by the industry association’s members. Biofuels locally produced from waste materials should get the priority and only when all available waste materials (such as UCO) are converted, then “**local** production of alternative non-food grade bio-energy feedstock” should be encouraged (Biopower, 2008, p. 7). The UK Government “should be acting far more assertively to force the greater use of [these kinds of] bio-fuels, and reduce the use of fossil fuels” (Biopower, 2008, p. 7). The RTFO should be then scrapped as it “does not achieve this ... [and] simply creates a huge burden of extra administrative work that can be carried by large companies but is daunting for smaller companies” (Biopower, 2008, p. 7). As an alternative, “by using existing legislation to increase the levels of Excise Duty on fossil derived fuels, and remove totally the Excise Duty on all non-fossil derived materials”, the localised production of bio-fuel in the UK would become economically viable (Biopower, 2008, p. 7). Nevertheless, this industry association also stated that it did “not agree ... in any reduction in the very necessary swing from the use of fossil fuels to bio-fuels”, thus supporting leaving the RTFO unchanged as a second best solution (Biopower, 2008, p. 7).

A case in point was also an industry association that represented producers of bio-ethers and advocated the inclusion of those fuels in the RTFO scheme. In particular, it sought “support from DfT in seeking the proper and specific recognition of bio-ethers, and bio-ETBE in particular, in relation to U.K. policy and regulation, especially the RTFO” (Lyondell Basell & EFOA, 2008, p. 1). This industry association presented these fuels as biochemical derivatives of bioethanol “with substantially superior blending and environmental performance

⁵³ Bold in original text.

compared to the direct blending of bioethanol” (Lyondell Basell & EFOA, 2008, p. 1).

6.2 Industry associations of “obligated suppliers”

Two industry associations declared to represent the specific interests and respond on behalf of all large-scale producers/refiners/suppliers of transport fuels – i.e. also of those that did not participate in the consultation (Association of the United Kingdom Oil Independents [AUKOI], 2008; United Kingdom Petroleum Industry Association [UKPIA], 2008). In particular, one declared that, even though some of its members sent their individual responses, the organisation was responding “on behalf of all its members” (AUKOI, 2008, p. 1). Similarly the other one specified that its response reflected “the industry’s view on the best way forward” (UKPIA, 2008, p. 1). However, the two industry associations disagreed on the policy option to recommend, reflecting the split in opinions observed among obligated suppliers.

One industry association represented the obligated suppliers⁵⁴ that supported the option to leave the RTFO unchanged. Reiterating their arguments, this industry association invited the UK Government to reassess the Gallagher Review’s recommendations. These recommendations “were taken at a time when there was huge concern about rising oil and food prices and therefore, its recommendations to urge caution by cutting back on the rate of inclusion of biofuels was perhaps understandable. However, market changes in recent months have demonstrated that there is really no simple linkage between oil pricing and food prices ... [which] ... have now fallen back ... The recommendations should therefore be reviewed in the light of recent unprecedented price volatility in these markets and the overall drive to reduce GHG’s/carbon should be reset as a government priority to meet internationally agreed targets” (AUKOI, 2008, p. 2). For this industry association, “the way in which industry is setting about the process of sourcing its biofuels is already having a marked and positive effect in terms of sustainability and land use

⁵⁴ AUKOI representing: Greenergy, and Mabanaft.

criteria at source. This process, led by the industry, should be monitored certainly but importantly, it must be trusted and encouraged” (AUKOI, 2008, p. 1). It further contended that “If this is done positively and cooperatively ... the concerns expressed in the Gallagher Report would be addressed and the original targets contained in RTFO could be preserved to ensure the required contribution to carbon saving is made from the transport sector”⁵⁵ (AUKOI, 2008, p. 1). In view of the higher EU targets, “Any further changes in the interim will detract from market confidence and so represent a serious risk to the successful introduction of the Renewable Energy Directive” (AUKOI, 2008, p. 1), thus warranting leaving the RTFO unchanged.

The other industry association represented the obligated suppliers⁵⁶ that supported the option to slowdown targets. Reiterating their arguments, this industry association acknowledged that “Indirect land use change poses a potential threat to the sustainability of biofuels so it appears prudent to adopt a more cautious approach to the use of biofuels in line with that proposed by Professor Gallagher” (UKPIA, 2008, p. 4). Nevertheless, “Investment by the oil industry in biofuels and other new fuels ... requires consistent, stable policy by HMG [the UK Government]. We therefore encourage HMG to develop a robust strategy for sustainable biofuels/biomass with a much longer horizon than the current three years (say to 2020). This should be possible as the RTFO does not depend on duty incentives post April 2010. This will provide a basis for investment by obligated companies and biofuel suppliers to meet future targets” (UKPIA, 2008, p. 4).

About second-generation biofuels, both industry associations reflected the general agreement among obligated suppliers that biofuels should be rewarded in a technology neutral way – i.e. not by discriminating biofuels on the base of uncertain definitions of generations – and that the industry should be left free to decide which technology to apply (AUKOI, 2008, p. 3; UKPIA, 2008, p. 8).

⁵⁵ Underlined in the original text.

⁵⁶ UKPIA representing: Shell, Ineos, BP.

6.3 Industry associations of “other businesses”

Ten⁵⁷ industry associations of “other businesses” participated in the consultation (Agricultural Industries Confederation [AIC], 2008; Confederation of Passenger Transport [CPT], 2008; Croda et al., 2008; European Association for the Animal Fats and Animal By-Product Processing Industry (EFPRA), 2008; Food and Drink Federation [FDF], 2008; Federation of Petroleum Suppliers [FPS], 2008; National Farmers Union [NFU], 2008; Rail Safety and Standards Board [RSSB], 2008; Seed Crushers and Oil Processors Association [SCOPA], 2008; Society of Motor Manufacturers and Traders [SMMT], 2008; United Kingdom Renderers Association [UKRA], 2008).

One industry association represented “the majority of distributors in the UK from the small family business, which forms the greater part, to the distribution arms of some of the major oil companies” – none of which obligated suppliers. This industry association reflected the concerns of its members about the risk involved in transporting biofuels (FPS, 2008, p. 1). It mentioned both environmental and distribution problems caused by the transport of biofuels as reasons to support a freezing of the RTFO. Three industry associations represented respectively the food (FDF, 2008), agricultural products (AIC, 2008), and chemical (Croda et al., 2008) industries. These industry associations mentioned environmental concerns as reasons to slow down RTFO targets, substantially reiterating the arguments listed in the invitation document to the consultation. One industry association represented the rail industry (RSSB, 2008). This industry association mentioned environmental concerns as reasons to slow down RTFO targets and indicated the electrification of transport as a better option whenever applicable. One industry association represented the motor/engine industry (SMMT, 2008). This industry association reported the concerns of its members about the deterioration of transport fuels’ quality due to increasing biofuel blending, as another reason – beside environmental concerns – to slow down RTFO targets. It also indicated second-generation biofuels as

⁵⁷ The DfT did not provide the response of an industry association – Confederation of Passenger Transport (CPT)

preferred technologies given their expected superior fuel quality. Two industry associations represented respectively the farming (NFU, 2008) and vegetable oil (SCOPA, 2008) industries and advocated to leave the RTFO unchanged. These industry associations lamented that a slowdown of biofuel targets would be a missed opportunity for the industries they represented. The industry association of the farming industry also casted doubt on the validity of the Gallagher Review's recommendations. In particular, "a lack of understanding of agriculture and commodity markets in both the main report document and supporting documents of the Gallagher review led to misconceptions in assumptions and misunderstanding of how production and markets operate. The result led to the weak conclusions and misinformed recommendations, on which this current consultation is based" (NFU, 2008, p. 4). Concerning the double reward for second-generation biofuels, both industry associations sustained that the support to biofuels should be technology neutral and linked to GHG abatement performances, as opposed to unclear definitions of biofuel generations. Cases in point were two industry associations representing the rendering industry (EFPRA, 2008; UKRA, 2008). These industry associations only replied to one consultation question about the proposal to exclude animal fat (tallow) from the list of sustainable feedstocks for biofuels – i.e. question 19. They criticised the UK Government's proposal to remove biodiesel from tallow as qualifying fuel for the RTFO as based on "flawed" scientific assessments (EFPRA, 2008, p. 1; UKRA, 2008, p. 1). Rather, the UK Government "should continue with its present proposals to include tallow within the ROCs scheme and to define tallow based biodiesel as a qualifying fuel within the RTFO" (UKRA, 2008, p. 4).

7. Consultancies

Two "consultancies" participated in the consultation. One explicitly defined itself as a "specialist consultancy" working "at the heart of the UK's energy, environment and water sectors ... [and providing] a range of services to Government departments, regulators, trade associations and market participants" (Gemserv, n.d.). The other one did not provide a self-definition in

the consultation response. However, in its website, it defined itself as an adviser – whose grant-providers included biofuel operators – possessing “specialist knowledge of both UK and global vehicle markets with particular emphasis on developing Biofuels, LPG and Natural Gas in the UK” (Joulevert, n.d.).

The first consultancy declared to be “operating independently at the market level and not as a representative organisation” (Germerv Ltd, 2008). This consultancy substantially reiterated the arguments supporting a slowdown of biofuel policy. At the same time, it warned that, even though right in principle, supporting second-generation biofuels might lead to some technologies being wrongly excluded if done with blunt instruments as double rewards based on unclear definitions of biofuels’ generations (Germerv Ltd, 2008). The adviser failed to specify whether it was responding on behalf of third parties and advocated to leave the RTFO unchanged (JouleVert, 2008, p. 1). Essentially reiterating the main arguments of biofuel producers, this adviser contended that a reward system should be based on GHG performances so as to reward both best performing first-generation and second-generation biofuels (JouleVert, 2008, p. 6).

8. Non-governmental organisations (NGOs)

Seven NGOs participated in the consultation (Catholic Agency For Overseas Development [CAFOD], 2008; Econexus, 2008; Friends of the Earth [FoE], 2008; Greenpeace, 2008; Oxfam GB, 2008; Royal Society for the Protection of Birds [RSPB], 2008; World Wide Fund for Nature [WWF], 2008).

NGOs stressed the gravity of the short-medium term damages produced by current biofuel policy in terms of increases in food prices, land grabbing, deforestation and net GHG emissions due to direct and indirect land use changes in developing countries. One NGO explained that an uncontrolled large-scale development of biofuels from food crops would lead to “inflationary impacts on agricultural commodity prices”. Higher commodity prices would hit “those living in poverty the hardest” as these “tend to buy more unprocessed

and unpackaged foods” – whose prices are closely associated with commodity prices – and “may typically spend between half and three quarters of their income on food” (Oxfam GB, 2008, p. 1). A large expansion of biofuels would also increase the demand for agricultural land, thus worsening the phenomenon of land grabbing in developing countries. Searching for land, biofuel crop growers would displace “vulnerable communities and indigenous peoples”, while creating the conditions for “other associated human rights abuses” (Oxfam GB, 2008, p. 1). “Alarmed” by such prospects, another NGO said to be “anxious that efforts to avoid land-use change by moving agrofuel production to ‘marginal land’ will have a significant impact on those communities who rely upon marginal land for their subsistence” (CAFOD, 2008, p. 2). Another NGO noted “with concern but little surprise that no formal attempt appears to have been made to consult with organisations or communities from the global south about those impacts” (Econexus, 2008, p. 1). The higher demand for land would also create the conditions for further direct and indirect land use changes to occur, thus potentially offsetting the GHG emissions savings of biofuels – as emphasised by one NGO (Oxfam GB, 2008, p. 1). All looking for new land, biofuel crop growers, food growers, and displaced communities might end up clearing forests and other carbon sinks, thus destroying biodiversity and perversely increasing the net GHG emissions associated to a large-scale biofuel crop production. Another NGO explained that in a world “already witnessing massive loss of natural habitats ... due to rapid agricultural expansion ... the large volumes of liquid biofuels required to fulfil even a small percentage of the world’s transport needs have the potential to drive further losses, including the loss of carbon rich forests, savannahs, grasslands and wetlands, in some of the most sensitive ecosystems in the world” (RSPB, 2008, p. 2).

About sustainability standards, many NGOs dismissed the mandatory system proposed by the RED as inadequate and incomplete for containing those negative outcomes. One NGO contended that the proposed sustainability criteria and GHG thresholds “will do nothing to address this situation – partly because they are the flawed product of political compromise in order to keep the 10% target at all costs, but also because of limitations in global, regional

and local systems to implement, monitor and enforce them” (RSPB, 2008, p. 2). This NGO went further by alleging that the “European Commission and the Council of Ministers have failed to respond to sound scientific evidence and logic on this issue, and have pushed blindly ahead with an energy-based target at an unsustainable level. In this, they have clearly bowed to powerful industry and sector lobby groups and to Member States and producer countries with clear vested interests” (RSPB, 2008, p. 7). Another NGO agreed that there was “no guarantee that the sustainability standards introduced in 2011 will be strong enough to alleviate current concerns” (Greenpeace, 2008, p. 1). Independently of whether the sustainability standards and GHG emissions thresholds proposed by the RED will prove to be effective in the future, it remained a fact that current biofuels were produced out of any mandatory assurance system. As reminded by one NGO, the same Gallagher Review pointed out that the current RTFO was “unable to protect against these unintended impacts”. Hence – it continued, “the RTFO presents a significant cost to the UK taxpayer whilst offering no assurances of net GHG reductions, and potentially exacerbating global poverty through its indirect impacts on global poverty and land-use” (Oxfam GB, 2008, p. 1). As pointed out by another NGO, “whilst it is expected that the Government will introduce some level of sustainability standards in 2011, this will mean that billions of litres of biofuels will have been sold in the UK which could well have caused significant environmental damage and social harm” (Greenpeace, 2008, p. 1). Another NGO similarly sustained that “it would be irresponsible to plough ahead with a policy that will swallow billions of pounds while delivering uncertain climate benefits and at the same time leading to proven disastrous impacts on biodiversity and the World’s poor”, as well as potentially generating land-use-changes, which might “completely subvert or indeed inverse the rational of the RTFO to save ghg emissions” (FoE, 2008, p. 1). Also endorsing those views, another NGO warned that, “as ... currently produced, biofuels can be worse of the climate than the fossil fuels they replace” (Greenpeace, 2008, p. 1).

Six NGOs out of seven agreed that biofuel targets should be ideally withdrawn, or at least frozen, until the sustainability of biofuels can be guaranteed. Four of these criticised the slowdown option as an ineffective remedy to contain the

risks and damages produced by the current biofuel policy (CAFOD, 2008, p. 4; FoE, 2008, p. 3; Greenpeace, 2008, p. 2; RSPB, 2008, p. 6). According to one of these four, such a measure would “only save a small amount of biofuels during the decreased rate”, as “the overall target will still be the same” (FoE, 2008, p. 3). Making no “significant difference”, a slowdown “can not be regarded as a serious way to address the catastrophic impacts of biofuels” (FoE, 2008, p. 3). By enforcing such a measure, “the UK will still continue to be an accomplice in land grabs, violent conflicts, deforestation, slave-like working conditions, food shortages, biodiversity loss, water shortages and potentially increased ghg emissions globally” (FoE, 2008, p. 3). A case in point was the only NGO agreeing with the UK Government proposal to slowdown the biofuel policy according to the Gallagher Review’s recommendations. According to this NGO, “The biofuel industry at this early point in its development does need a level of clarity about its long term prospects. However it also needs greater clarity about what performance standards are expected of it. The RTFO ought to include genuinely mandatory sustainability standards covering both direct and indirect impacts” (WWF, 2008, p. 1).

Several NGOs contested some of the arguments advocated by the Gallagher Review, especially those in relation to the rationale justifying current support to first-generation biofuels as necessary to have second-generation biofuels. A NGO rejected the Gallagher Review’s argument that a moratorium could reduce the ability of the biofuel industry to invest into new technologies (Oxfam GB, 2008, p. 2). This NGO objected that, even though the distribution and blending infrastructure could be shared, the production processes of first-generation biofuels were completely different from those of second-generation biofuels. The emergence of these latter would make obsolete the former – first-generation biodiesel in particular. “Therefore continued support for the current generation of biofuels risks technological lock-in, and [also] the creation of dependent special interest groups within agriculture which may resist moves towards more sustainable second generation feedstocks” (Oxfam GB, 2008, p. 5). This NGO implicitly alluded to a likely resistance by the first-generation industry to the adoption of new technologies once it had established with previous technologies. It finally concluded that “a more appropriate policy on the

part of Government would be to eliminate support for the current generation of expensive and ineffective biofuels, and with some of the savings, invest in R&D into more promising second generation technologies” (Oxfam GB, 2008, p. 5). Seeing it as “a problem of Government policy”, the industry should be then supported “to invest in new technologies with the money that would be saved by setting the obligation level to 0 per cent” (Oxfam GB, 2008, p. 2). As stated by another NGO, “In regards to the argument that high targets for current biofuels are needed in order to stimulate investment into future technologies it has to be said that the opposite is true as it is already evident that targets fuel investment into current first-generation biofuel from crops, particularly into acquisition and clearing of large amounts of land; money that is diverted away from research into energy technologies that are environmentally and socially safer and that deliver far better ghg savings” (FoE, 2008, p. 3).

An NGO contested the Gallagher Review’s argument that a moratorium would reduce the ability of the biofuel industry to transform the sourcing of its feedstock to the more sustainable supplies (Oxfam GB, 2008, p. 2). As this NGO pointed out, the argument “presupposes that first generation biofuels, if sourced sustainably, are a desirable way to reduce greenhouse gas emissions. However this fails to take account of their poor economic performance in this regard – a pound spent on carbon abatement through biofuels for transport achieves far less than a pound spent on alternative activities. Far greater greenhouse gas savings could be achieved by directing public money towards alternative uses of biomass, such as combined heat and power, or investing in improved vehicle efficiency” (Oxfam GB, 2008, p. 2). Another NGO objected the Gallagher Review’s argument that a moratorium is likely to lead to a stagnant, and unprofitable industry (FoE, 2008, p. 3). For this NGO, such an argument appeared “extremely weak ... given that according to RFA figures (August 2008) only 8% of biofuels consumed in the UK are from UK feedstock” (FoE, 2008, p. 3). Only the relatively small UK industry depended on UK biofuel targets, while these were hardly essential for the survival of the larger Brazilian and US biofuel industries. Hence, “weighing up of profits for a small UK industry against the huge negative environmental and social impacts from biofuels appears completely skewed at a time in that climate change is the greatest threat facing

humanity” (FoE, 2008, p. 3). Another NGO went further, dismissing the Gallagher Review’s recommendations as “insufficient and out of step with the comprehensive analysis of evidence included within the review itself”, and concluding that they “could therefore only have arisen as a result of political compromise” (RSPB, 2008, p. 6). The UK Government should instead “take the lead in developing and implementing sustainable land use planning policies, and assisting other countries to follow suit” (RSPB, 2008, p. 3).

About how to support second-generation biofuels, the NGOs that addressed the issue maintained that the rewarding system should be linked to GHG abatement performances, while taking into account the overall sustainability of the technologies (Greenpeace, 2008; RSPB, 2008; WWF, 2008). Mentioning the findings of the Gallagher Review, two of these NGOs warned that some second-generation biofuels risked being less sustainable than first-generation biofuels (Greenpeace, 2008; RSPB, 2008). One in particular explained that “rewarding anything which can be labelled ‘second generation biofuels’, -which is a broad and disputed term including a wide range of feedstocks and processing technologies, with varying and even unknown sustainability and carbon implications -, will not deliver the best biofuels in terms of carbon savings and environmental protection” (RSPB, 2008, p. 15). This considered, the most sensible approach would be rewarding biofuels on the basis of life cycle assessments of GHG emissions coupled with additional measures such as mandatory minimum standards to prevent unwanted indirect effects on food production and working conditions in developing countries.

9. Local governments

Four local government authorities participated in the consultation: a statutory regional transport partnership (Highlands and Islands Strategic Transport Partnership [HITRANS], 2008); a regional development agency (Highlands and Islands Enterprise [HIE], 2008); a local council (Highland Council, 2008) – all representing local communities in the same territory; and a regional development agency – representing an industry cluster in another territory (North East Regional Strategy Board [North East RSB], 2008).

The three local government authorities representing local communities in the same territory asked the UK Government to take into consideration the possible problems created by the introduction of biofuels within their communities. As explained by one of them, in that area of the country “people ... have to travel further to access basic services and employment than normal and, due to the sparsity of population and relatively low levels of public transport, the reliance on movement using private cars and its related costs is more acute in this region than elsewhere in the UK” (HITRANS, 2008, p. 1). Consequently, “unless some means of supplying non-bio gasoline can be found without imposing additional cost to consumers ... there is the potential for this region uniquely to face significant increased costs for fuel compared with that elsewhere as a result of the introduction of RTFO” (HITRANS, 2008, p. 1). That considered, these three local government authorities backed “the proposed amendment to RTFO, as this will delay introduction of Bioethanol and give breathing space to allow possible solutions to the inherent problems of introducing this fuel in low volume areas of consumption to be found” (HITRANS, 2008, p. 1). Major sources of concern for these local government authorities were the technical difficulties in distributing and storing bioethanol as well as the consequential additional cost on consumers. Acting in the interests of their communities, they saw a freezing the RTFO as a preferable solution to buy more time to find solutions to those difficulties (HIE, 2008; Highland Council, 2008, p. 2; HITRANS, 2008, p. 2). Only one of these local government authorities addressed the issue of second-generation biofuels. In its view, “the development of Second Generation biofuels should proceed as quickly as possible, given the limitations of first generation biofuels. It is however important that due consideration is given before approval of any such products for supply in the UK, as to whether such fuels can be distributed to, and retailed in, all part of the country without creating constraints that could adversely impact on local communities” (HITRANS, 2008, p. 3).

By contrast, the regional development agency representing the industrial cluster in the other territory advocated leaving the RTFO unchanged. The industrial cluster was hosting several biofuel suppliers whose number was expected to

rise provided further support (North East RSB, 2008, p. 2). The response of this local government authority largely shared the same exact text of the responses of the two industry associations representing the same industrial cluster. In their responses, they warned that “the importance to prospective investors of stability and the ability to make reasonable predictions about the marketplace should not be underestimated” (NEPIC, 2008, p. 2; North East Biofuels, 2008, p. 1; North East RSB, 2008, p. 2). By slowing down the targets, the UK Government would “create a very serious issue with trust”⁵⁸, as would “leave existing and potential investors wondering if they can rely on any Government target in making an investment decision” (NEPIC, 2008, p. 2; North East Biofuels, 2008, p. 1; North East RSB, 2008, p. 2). Therefore, the RTFO should be left unchanged because that was “the basis on which the fuel industry and biofuel investors have laid their plans” (NEPIC, 2008, p. 2; North East Biofuels, 2008, p. 1; North East RSB, 2008, p. 3). Then, they lamented that “those who seek to portray a slowdown as exercise of the ‘precautionary principle’ should remember that climate change will not slow down while we engage in protracted intellectual debate, and there is nothing ‘precautionary’ about delaying CO₂ emissions reduction” (NEPIC, 2008, p. 2; North East Biofuels, 2008, p. 1; North East RSB, 2008, p. 3). About second-generation biofuels, this local government authority and the two industry associations representing members in the same industrial cluster sustained that “prior to talk of second generation biofuels, the UK ... must have a productive, profitable and sustainable first generation industry” (NEPIC, 2008, p. 4; North East Biofuels, 2008, p. 4; North East RSB, 2008, p. 4). In their view, “the UK should aspire ... to be a hub of international development in biofuels technology into the long-term future, building on a successful introduction of first generation biofuels” (NEPIC, 2008, p. 4; North East Biofuels, 2008, p. 4; North East RSB, 2008, p. 4). Concerning second-generation biofuels, the double rewards were “welcome but not adequate”, as “the levels of support should be adjusted accordingly to the level of development of the technology, to give more support to those less developed” (NEPIC, 2008, p. 4; North East Biofuels, 2008, p. 4; North East RSB, 2008, p. 4).

⁵⁸ Text underlined in the original response.

10. Non-departmental public bodies (NDPBs)

Seven NDPBs participated in the consultation. Four were environmental protection agencies (Environmental Agency [EA], 2008; Natural England [NE], 2008; Scottish Environment Protection Agency [SEPA], 2008; Scottish Natural Heritage [SNH], 2008), one was dedicated to the promotion of energy saving solutions (Energy Saving Trust [EST], 2008), one was dedicated to the promotion of industrial non-food crop uses, including the production of biofuels for transport (National Non-Food Crops Centre [NNFCC], 2008b), and one was the RTFO administrator and author of the Gallagher Review (Renewable Fuels Agency [RFA], 2008b).

The four environmental NDPBs supported the UK Government's decision to follow the Gallagher Review's recommendation to slowdown biofuel targets and agreed with the arguments sustaining it. One of them agreed that "if a moratorium was imposed on the UK biofuel industry at this stage, this would seriously undermine the potential for future investment in this area and would not address the risk of further increasing emissions from the transport sector" (NE, 2008, p. 3). Furthermore, as another one explained, "while there could be immediate environmental benefits to a freeze, we came to the conclusion that in the medium term freezing the obligation level at 2.5 per cent could be counterproductive. On the one hand, even though the UK is potentially an important market, a freeze is unlikely to have a significant impact on the expansion of the biofuel industry globally. On the other hand, the UK and the EU have led on developing policies for biofuels that integrate sustainability requirements, and this leverage should not be lost. To maintain commitment from the industry in the development and production of sustainable biofuels and create a momentum for the adoption of sustainability criteria across producer countries, we believe it is important that the UK and EU markets offer opportunities for continued growth and profitability" (SNH, 2008, p. 3). However, a review on the environmental implications of the policy and the imposition of a mandatory sustainability standard system were seen as necessary requirements for justifying biofuel policy. As explained by one environmental

NDPB, “it is clear that there are significant risks even at this level of support. This recommendation should, therefore, only be pursued on condition that sustainability standards in the Renewable Energy Directive (RED) are strengthened, sustainability and greenhouse gas emission reporting is made mandatory, and a review is conducted to investigate the impacts of biofuel policy on the wider bioenergy sector” (EA, 2008, p. 1). As stressed by another environmental NDPB, “with many biofuels there are associated serious risks to increasing greenhouse gas emissions, air pollution, land use change, loss of biodiversity, habitat loss, desertification, landslides and other environmental damage from use of pesticides, or increased acidification and/or eutrophication from increased use of fertilisers” (SEPA, 2008, p. 1). That considered, “slowing the rate of increase of obligation levels will allow time for [developing] controls to protect against unsustainable direct or indirect land use change resulting from an increased use of biofuels in the UK” (SEPA, 2008, p. 1).

The two environmental NDPBs that replied to the questions about how to support second-generation biofuels warned that these were not all necessarily sustainable and advocated a rewarding system discriminating technologies according to their GHG abatement performances (EA, 2008; SNH, 2008). One of them sustained that a “key policy objective ... should be to facilitate/incentivise the industry to invest in new technologies or transform the sourcing of its feedstock to more sustainable supplies to create a sustainable industry” (SNH, 2008, p. 8). To that objective, “the development of second generation biofuels, which rely on a wider feedstocks base and achieve greater greenhouse gas savings, should be encouraged” (SNH, 2008, p. 8). This said, “second generation biofuels should not be presumed sustainable”, as the production of dedicated feedstocks for second-generation biofuels, although enabling a “more efficient use of the land than for first generation biofuels, it could still displace other land uses” (SNH, 2008, p. 8). Therefore, “sustainability criteria and minimum greenhouse gas savings performance should remain the only discriminating factors”, with support given to the “most carbon- and resource-efficient uses, noting sustainability criteria” (SNH, 2008, p. 8). Sharing the same views, the other environmental NDPB similarly pointed out that “the objective should be to encourage biofuels that deliver higher GHG emission

savings than current biofuels, either through increased efficiency or through minimising the risk of direct and indirect land use change. Second generation biofuels may or may not deliver this objective. Failing to define this term may therefore result in poor performing biofuels being incentivised simply because they employ a new technology in their production or processing. The term should therefore be clearly defined as a biofuel that delivers a GHG emission saving above a certain percentage (e.g. 90%), or that comes from a feedstock that is grown on marginal land or sea” (EA, 2008, p. 3).

The NDPB focused on the promotion of energy savings solutions recommended a freezing of the RTFO. Mentioning the Gallagher Review, this NDPB reminded that “existing policy could lead to destruction of environmentally sensitive lands with a detrimental impact for biodiversity and a perverse increase in greenhouse gas emissions” (EST, 2008, p. 2). Therefore, any increase in support to biofuels should be subjected to the contemporaneous enforcement of a sustainability standards system capable to prevent the negative environmental and socio-economic implications of biofuels. Only once such a system will be operative and no evidence about environmental concerns is found, biofuel policy could proceed cautiously as recommended by the Gallagher Review (EST, 2008, p. 2). This NDPB acknowledged that “changing the level of the obligation (to that originally planned) risks undermining the signal set to industry for medium term business planning”. However, “the urgency of climate change makes this a risk worth taking” (EST, 2008, p. 3). According to this NDPB, “the main priority should be to improve efficiency of the transport sector through: consumers choosing ‘best in class’, tighter vehicle standards, smarter driving techniques, and low carbon alternatives to the car” (EST, 2008, p. 1). About second-generation biofuels, this NDPB agreed on a rewarding system based on GHG abatement performances being a preferable option in principle (EST, 2008, p. 5).

The NDPB administrating the RTFO and author of the Gallagher Review reconfirmed “the view [as previously expressed in the review] that a reduction from the targeted use of biofuels is appropriate given the considerable uncertainties on the overall impacts of biofuels”, and agreed “with the intent of

the Government's proposals to reduce the increase in targets" (RFA, 2008b, p. 1). This NDPB also reconfirmed that "global biofuels targets should be reined in whilst adequate controls are put in place to address both direct and indirect impacts of production. However ... the industry should be allowed to grow, albeit more slowly, to ensure continued investment" (RFA, 2008b, p. 4). Again reiterating its Gallagher Review, this NDPB pointed out that advanced biofuels "are currently immature, expensive and will require specific incentives to accelerate their market penetrations" (RFA, 2008b, p. 9). About how to stimulate their development, this NDPB reckoned that, in principle, a rewarding system should be based on the sustainability of the feedstocks, rather than the particular technology employed (RFA, 2008b, p. 9). However, it also objected that rewarding biofuels according to their carbon savings would require solving several difficulties. More specifically, legal and technical problems may arise in enforcing a complex system of standards based on several measures, as well as, in ensuring its monitoring by the 2010 deadline imposed by the EU Directives (RFA, 2008b, p. 10).

The NDPB promoting industrial uses of non-food crops was the only NDPB backing the option to leave the RTFO unchanged. Jointly funded by the UK Government, an industrial sponsor and a subscriber base, this NDPB has been "established to help realise the potential of renewable fuels, energy and materials by supporting and promoting the delivery of sustainable non-food crop products and technologies" (NNFCC, 2008b, p. 1). While agreeing with the UK Government that "policies should address possible adverse consequences of production of the wrong biofuels", this NDPB sustained that "it is also vital to remember that biofuels can offer substantial greenhouse gas savings, reduce dependence on foreign oil and provide economic benefits" (NNFCC, 2008b, p. 4). Accordingly, "the priority needs to be to get UK targets in line with the Renewable Energy Directive and the RTFO Order should therefore be left unchanged in respect of obligation levels until there is a complete plan for the implementation of the Renewable Energy Directive" (NNFCC, 2008b, p. 4). By contrast, "reducing the obligation level for 2009/10 is clearly likely to be a further blow to the confidence of the industry and to potential investors (at a time when investor confidence is very low across the economy)" (NNFCC, 2008b, p. 4).

Besides, “it would be seen as casting official doubt on the 10% target which is set out in the Renewable Energy Directive” (NNFCC, 2008b, p. 4). Even a slowdown as recommended by the Gallagher Review was seen as not striking the “appropriate balance, particularly in the light of recent economic developments” (NNFCC, 2008b, p. 4). This NDPB contested that there was “no analysis - in the Gallagher Review, the Impact Assessment included in the present consultation or elsewhere – that provides persuasive evidence that this change would bring a real benefit. Indeed it seems likely that there will be no appreciable impact on the volumes of biofuels produced outside the UK or on the methods of production or choice of feedstock. The only impact is likely to be on UK production, which the RFA’s initial monitoring confirms is far more likely clearly to meet sustainability standards than is production in other parts of the world” (NNFCC, 2008b, p. 5).

About second-generation biofuels, this NDPB reckoned that “it was perfectly possible that advanced technologies could have a real presence in the market by 2020” (NNFCC, 2008b, p. 11). Nevertheless, “formidable obstacles” needed to be overcome. In particular, “many of the technologies have capital costs well in excess of those for current bioethanol and biodiesel technologies. They are also, by definition, new and developmental. This would present a challenge in obtaining finance even in the most favourable circumstances” (NNFCC, 2008b, p. 11). In such a scenario, “to obtain the necessary financial support at this time of credit constraint and in the face of apparent Government cooling towards renewable fuels will be a much greater obstacle” (NNFCC, 2008b, p. 11). Furthermore, in order to make sure that investment in advanced technologies would take place in the UK and the EU – rather than elsewhere in the world, incentives should be made as much as possible substantial and credible. For that aim, “the double rewards proposed in the RED are not the most appropriate or effective means to widen the available range of biofuel technologies” (NNFCC, 2008b, p. 11). Since the main purposes of the RED and the RTFO are to deliver “environmental benefits by bringing the right renewable fuels to the market in the greatest possible volumes”, it would be more “appropriate that the rewards attracted by a biofuel relate to the extent to which it delivers the desired benefits, not to whether it carries a ‘second generation’ label” (NNFCC, 2008b,

p. 11). For that purpose, “it would be more useful to reward increased greenhouse gas savings on a sliding scale [and] ... where possible ... [taking into account] the extent to which different technologies and products require support”, so as to ensure support also to more innovative technologies (NNFCC, 2008b, p. 11). Especially for these latter, “double rewards are unlikely to be sufficient to leverage the required investment” (NNFCC, 2008b, p. 11). As currently proposed, double rewards would be then an “insufficiently precise instrument”, as they would set “the level of reward unnecessarily high for some current technologies and too low for developing, capital intensive technologies” (NNFCC, 2008b, p. 11).

3. The UK Government: the summaries of responses

In the summaries of responses (DfT, 2009c; 2009d), the UK Government substantially reconfirmed its previous positions: (1) that preserving current biofuel targets was a requirement to have better biofuels in the future; and (2) that slowing down such targets was striking the best solution between industry interests and environmental concerns.

The UK Government rejected a freezing or a total moratorium of the RTFO as they would “hinder the development of a sustainable industry and deter investment required to meet future renewable energy targets for transport” (DfT, 2009c, p. 6). Such options “would not be in the longer term environmental interest given the potential for good biofuels to develop and play a role in reducing greenhouse gas emissions” (DfT, 2009c, p. 6). Furthermore, an on-going RTFO scheme coupled with a carbon and sustainability reporting mechanism would allow gathering “better data about the origin and environmental characteristics of biofuels” (DfT, 2009c, p. 7). Through such an improved data gathering, the UK could “play a key role and influence the development of a methodology to address indirect impacts” (DfT, 2009c, p. 7).

Nevertheless, the UK Government acknowledged the risk that the overall impact of current biofuel policy could turn out to be negative. Therefore, “a

cautious approach is of most benefit to the longer term development of a sustainable biofuel industry to help us meet ... [EU] targets” (DfT, 2009c, p. 6). It then reaffirmed its proposal to slow down the increases of the RTFO in line with the Gallagher Review’s recommendations – although in the awareness that doing so would mean posing a further “challenge” for the UK’s biofuel industry called “helping the UK to meet the 10% renewable energy targets for transport by 2020” (DfT, 2009c, p. 6).

Facing an almost unanimous agreement over rewarding biofuels according to their performances in reducing GHG emissions, the UK Government somewhat retreated from its initial agreement on that point. More specifically, it pointed at the constraints imposed by EU biofuel policy as an implicit justification for not taking a clear commitment in this regard. The UK Government acknowledged second-generation biofuels as capable to avoid the indirect impacts associated with some first-generation biofuels. However, it reminded that the issue of how to support these technologies is a matter where the UK has to abide by EU regulations. In particular, the introduction of a double reward for second-generation biofuels was a requirement imposed by the EU Directive on Renewable Energy. However, it announced that the issue was subject to further future consultation (DfT, 2009d, pp. 5-6).

Chapter 6 – Stakeholders’ visions on UK biofuel policy

Introduction

This chapter identifies and compares the visions on biofuel policy that were competing at the time when the UK Government adopted its current vision on biofuel policy. It then reflects on how the UK Government’s responsibilities in technology policy have affected its choice of which visions to select and marginalise within that vision.

The chapter has five sections. Section 1 briefly reviews the literature on public engagement mechanisms and, more specifically, on stakeholders’ opinions on UK biofuel policy. Section 2 summarises the main policy proposals of the biofuel policy consultation under analysis. Section 3 illustrates consultation participants’ visions on UK biofuel policy. Section 4 compares the UK Government’s vision with those of the consultation participants to determine which visions the UK Government selected and/or marginalised in the consultation. Section 5 relates disagreements on how to envision UK biofuel policy to disagreements on what the UK Government’s policymaking responsibilities in technology policy ought to be.

1. Literature on public engagement mechanisms

Over the last 20 years academic as well as policymaking circles have extensively discussed the benefits and challenges of public engagement with science (Irwin, 2014, p. 71; Stilgoe et al., 2014, pp. 4-5). Within the literature on public engagement with science (PES), analysts have confronted the limits of public consultation initiatives in terms of issue framing, over-short deadlines, as well the tendency of experts to dismiss inputs from the public because they show knowledge deficits (Irwin, 2014, pp. 71-73). A core discussion within this literature concerns the limits, challenges and solutions to overcome the “deficit

model” – i.e. a widely held belief that presumes the public is not in possession of the appropriate expertise/knowledge to make policy decisions, and that narrows down public engagement in terms of unidirectional transfers of information between expert and the non-expert public (Irwin, 2014, pp. 71-73; Sturgis, 2014, p. 38). In an effort to move “from deficit to democracy”, a “two way dialogue” between science experts and the public should be sought instead (Irwin, 2014, pp. 71-73; Sturgis, 2014, p. 38). This stance is grounded in the “recognition that publics possess important local knowledge and the capacity to understand technical information sufficiently to participate in policy decisions” (Burgess, 2014, p. 48). Nevertheless, moving “from high theory to complex and messy practice” remains an “awkward transition”, hampered by several difficulties (Sturgis, 2014, p. 38). More focused on those practical difficulties is an emerging literature that aims at evaluating public engagement methods in terms of procedural as well as substantive effectiveness – i.e. in terms of the fairness and efficiency of the process/mechanism in achieving its intended purpose (Rowe & Frewer, 2000, p. 10; 2004, pp. 517-541; 2005, p. 262; Rowe et al., 2005, p. 332; Rowe et al., 2008, p. 420). Identifying appropriate sets of criteria through which to evaluate public engagement mechanisms is the core aim of this literature (Rowe & Frewer, 2000, p. 10; 2004, p. 513; 2005, p. 253).

Engaging in a theoretical discussion on the benefits and challenges of public engagement, and/or in a comprehensive evaluation of biofuel consultations as public engagement mechanisms is beyond the scope of my research. I analyse the fourth consultation on UK biofuel policy to investigate which visions the UK Government marginalised and selected around the time when it endorsed its current vision on UK biofuels policy. For my cross-sectional analysis, two investigations are particularly relevant as they specifically looked at stakeholders’ opinions on UK biofuel policy. These analyses are reported in the next section.

1.1 Literature on stakeholders’ opinions on UK biofuel policy

Not much literature can be found on stakeholders’ opinions on UK biofuel policy. As pointed out by the investigators of one of the two analyses discussed

here: “As of early 2010, there remains little research on biofuel stakeholder opinion per se, outside of the grey literature” (Upham et al., 2011, p. 2670) – i.e. “there is little literature, academic or otherwise, on stakeholder opinion differences with respect to biofuels” (Upham & Tomei, 2010, p. 9) – and this remains so in early 2014.

Particularly relevant for my analysis is an investigation of the second and third consultations on UK biofuel policy – i.e. the two consultations preceding the one analysed here (Upham & Tomei, 2010, pp. 3-4; Upham et al., 2011, p. 2670). The second consultation sought views on the design of the Renewable Transport Fuel Obligation (RTFO), while the third consulted on the system of sustainability standards accompanying the RTFO. The investigators found that “NGO [non-governmental organisation] voices have been given little weight in the design of the RTFO” (Upham & Tomei, 2010, pp. 3-5, 11). In particular, “the RTFO development process had marginalised most of the environment and development NGOs” (Upham & Tomei, 2010, p. 10). They further contended that “it is clear that, despite initial and early support by NGOs for biofuels pre-2007, RTFO carbon and sustainability policy has latterly reflected the interests of the DfT [Department for Transport] and organisations with an interest in motor vehicle-based mobility, interests that biofuels readily mesh with” (Upham et al., 2011, p. 2673). Relevant for my cross-sectional analysis is also an investigation of a consortium of non-governmental organisations (NGOs) that lobbied for restricting the use of biofuels after 2007. The investigators inferred that NGOs’ opposition was successful in driving the UK Government to launch the Gallagher Review in 2008 and eventually slow down UK biofuel targets in 2009 (Pilgrim & Harvey, 2010, Paragraphs 4.17-4.18). This conclusion seems then to partially contradict that of the previous investigation, which instead noticed a marginalisation of NGOs’ views.

The UK Government – via the DfT – launched the fourth consultation on biofuel policy on the 15th October 2008. The fourth consultation sought views on the UK Government’s proposal to slow down UK biofuel targets in 2009. Through a distinctive perspective focused on statements of expectations on technologies and policies, my analysis reveals that the UK Government partially marginalised

NGOs' views in the fourth consultation too. As I will argue, the UK Government's decisions to marginalise NGOs' views and enforce a slowdown in UK biofuel targets can be related to a policy-promise lock-in.

2. The fourth consultation on UK biofuel policy

The fourth consultation on UK biofuel policy consisted of two parts: *Part 1 – Future levels under the RTFO*; and *Part 2 – Longer-term issues related to transposition of the European Directives*.

The first part of the consultation proposed changes affecting short-term support for producers of first-generation biofuels. Mirroring the options analysed in the Gallagher Review, the UK Government structured Part 1 of the consultation as a choice between leaving the RTFO's rates unchanged (Option 1), "freezing" the RTFO at the initial rate of 2.5% (Option 2), or slowing down the RTFO's rates as recommended by the Gallagher Review (Option 3). In line with the recommendations of the Gallagher Review, the UK Government promoted the slowdown option, excluding a priori the option of a total moratorium on UK biofuel policy. To be accepted, the slowdown option required consensus on the three expectations at the core of the UK Government's vision on biofuel policy: (1) the expectation that second-generation biofuels would overcome the problems of first-generation biofuels; (2) the expectation of sustainability standards being effective and efficient in ensuring the sustainability of biofuels; and (3) the expectation of continued support for first-generation biofuel industry as a requirement for second-generation biofuels. This last expectation in particular stirred up disagreements among consultation participants.

The second part of the consultation contemplated future changes in EU biofuel policy intended to encourage investors to invest in second-generation biofuels. The UK Government invited participants to comment on how to improve support for second-generation biofuels and, in particular, on the European Commission's proposal to double-reward second-generation biofuels to favour their development. To be accepted, this proposal required a consensus

primarily on the expectation of second-generation biofuels being environmentally superior to first-generation biofuels. Furthermore, to work in practice, the proposal needed clear and undisputed definitions of what was meant by “first generation” and “second generation” biofuels. Not all participants agreed that second-generation biofuels were or would be unquestionably superior to first-generation biofuels, while the classification of biofuels into generations was a highly contested issue. By contrast, there was general agreement with rewarding biofuels according to their performance in reducing GHG emissions. Within such a reward system, if second-generation biofuels proved to be superior to first-generation biofuels – however their classification was defined – the former would be automatically advantaged over the latter. Furthermore, as financial support would be calibrated to the environmental performance of any biofuel – independently of its technological classification – such a rewarding system would effectively eliminate the need to classify biofuels as first- and second-generation. The general consensus on a technology-neutral reward system was, however, driven by very different reasons.

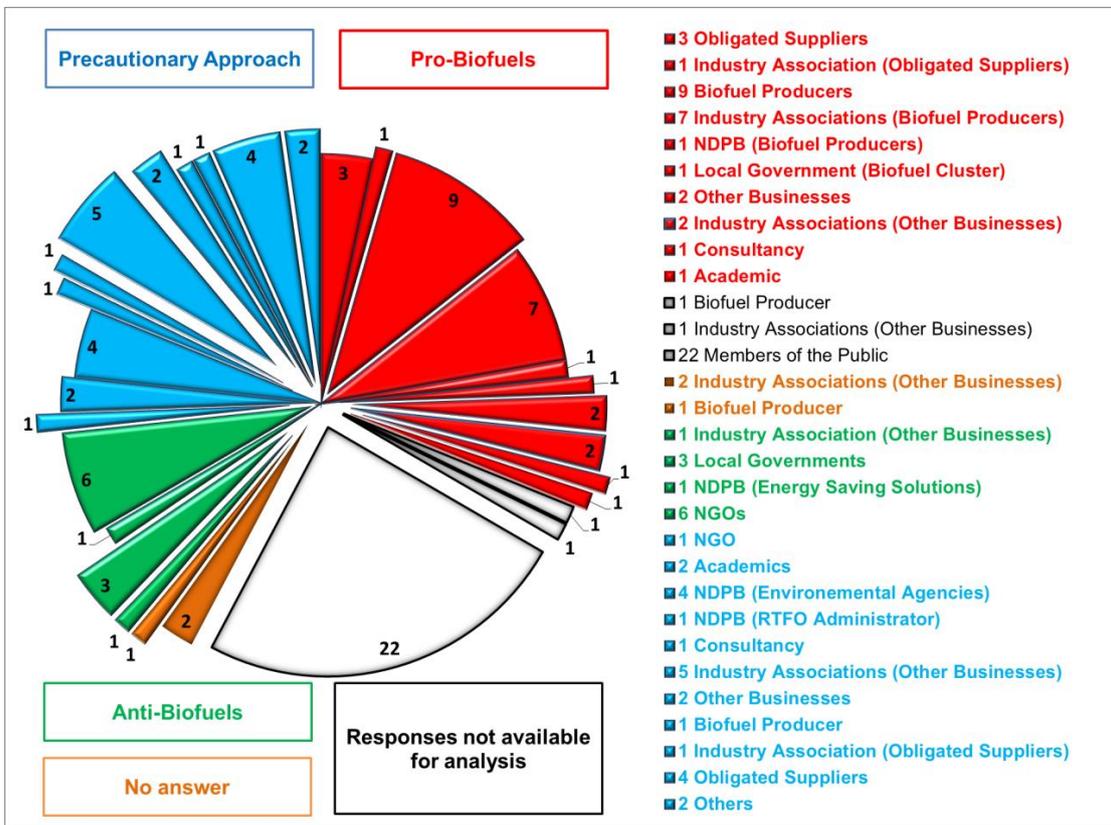
Variouly affected by the proposals under consultation, the participants attempted to influence the UK Government by advocating their own visions on UK biofuel policy, as illustrated in the next section.

3. Visions on UK biofuel policy: UK stakeholders and the UK Government

The UK Government proposed three alternative options for biofuel support: maintaining it as previously set, freezing it at current levels, or slowing it down. Participants opted for the policy option more aligned with their own visions on UK biofuel policy. In the following, I subdivide participants according to the policy option they supported and summarise their visions as expressed in their responses. The resulting three groups of participants are named in relation to the policy option they supported: *pro-biofuels* are those recommending to maintain support as currently set, *anti-biofuels* are those recommending to freeze biofuel support and *precautionary approach* are those recommending to

slow down biofuel policy (see Graph 6). At the end of this section, I summarise the stance taken by the UK Government after the consultation.

Graph 6: consultation participants by option supported



Legend:

Proximity to the centre emphasises how well participants described their own vision on UK biofuel policy in their response, the participants closer to the centre providing the most comprehensive descriptions.

Responses not available for analysis:

The DfT omitted the response of a biofuel producer – Good Fuel Cooperative & Golden Fuels – and the response of an industry association representing the bus, coach and light rail industries – the Confederation of Passenger Transport. Also unavailable for this research are the twenty-two responses from the “members of the public” who participated in the consultation. However, according to the summaries of responses, the members of the

public submitted responses of identical content or very similar to those submitted by some NGOs.

Responses not aligned with any policy option:

A biofuel producer (Daka Biodiesel, 2008) and two industry associations representing the rendering industry (EFPRA, 2008; UKRA, 2008) only replied to one consultation question about the proposal to exclude animal fat (tallow) from the list of sustainable feedstocks for biofuels (question 19). These respondents did not comment on the other policy proposals.

3.1 Pro-biofuels

Advocating to leave the RTFO unchanged – or rather to increase its rates, the twenty-eight participants of this group strongly rejected the slowdown option and, even more so, the freezing option (see also Graph 6):

- eight biofuel producers (Argent, 2008; British Sugar, 2008; Convert2Green, 2008; Ensus, 2008; Gasrec Ltd, 2008; Heliuss Energy, 2008; Neste Oil, 2008; Vireol, 2008)
- one prospective producer of second-generation biofuels (Energexia, 2008)
- seven industry associations representing biofuel producers (Biopower, 2008; EBB, 2008; EIC, 2008; Lyondell Basell & EFOA, 2008; NEPIC, 2008; North East Biofuels, 2008; REA, 2008)
- three obligated suppliers (BP, 2008; Greenergy, 2008; Mabanaf, 2008)
- one industry association representing the above obligated suppliers (AUKOI, 2008)
- one non-departmental public body (NDPB) with the policy remit of promoting industrial uses of non-food crops, and many biofuel producers as members (NNFCC, 2008b)
- two industrialists in other industries (Bentley, 2008; GM, 2008)
- two industry associations of other businesses (NFU, 2008; SCOPA, 2008)
- one local government representing a biofuel industrial cluster in the UK (North East RSB, 2008)
- one consultancy/adviser whose grant-providers are biofuel market operators (JouleVert, 2008)

- one academic (BRASS, 2008)

More than others within this group, biofuel producers, obligated suppliers and their respective industry associations casted doubt on the evidence gathered and arguments supported by the Gallagher Review. Not dismissing environmental concerns, these participants maintained nevertheless that the Gallagher Review's argument that first-generation biofuels may have caused the food crisis at the beginning of the year was an overstatement disproved by facts – i.e. by the eventual recovery from that crisis and by recent research findings indicating that other factors were involved.

Biofuel producers, obligated suppliers and their respective industry associations in particular promoted the expectation foreseeing current support for first-generation biofuels as stimulating the UK biofuel industry to meet EU biofuel targets and to undertake future investments in technological innovation. They warned the UK Government about the negative impacts on its credibility and on investors' confidence following such an unwelcome change in policy. Altering the RTFO only one year after its launch would undermine the long-term certainty demanded by the UK biofuel industry to invest in improvements to first-generation biofuels and eventually in the development of second-generation biofuels. Thus, as implicit rationale for that expectation, the UK Government had to maintain the trust of the industry to preserve technology policy effective in stimulating techno-scientific advancement. The current financial crisis, the fierce competition with biofuels from abroad and a drafting error in the RTFO were mentioned as issues already putting strain on the UK domestic biofuel market, which therefore did not need further uncertainty fuelled by an unpredictable policy. Added to that, future EU biofuel targets were set high and not very far in the future, thus urging a harmonisation between higher EU and lower UK targets. By contrast, a freezing or, to a lesser extent, a slowdown of UK biofuel targets would have detrimental effects on the UK biofuel industry, which would be discouraged from investing in new technologies and/or in converting the sourcing of biofuel feedstock to more sustainable supplies, thus compromising the creation of a sustainable biofuel market. The domestic industry of first-generation biofuels would fall and with it an important technological bridge for

facilitating the development and introduction of second-generation biofuels. Meanwhile, R&D of biofuels would migrate to other countries. As a result, the UK would lose its leadership in setting sustainability standards internationally and its influence on EU biofuel policy. Least but not last, while severely affecting the still emerging UK biofuel industry, such measures would have hardly any impact on the global scale.

First-generation biofuels were promoted as capable of substantial GHG savings and as the only sustainable alternative to transport fossil fuels available in the short-medium term – and, thus, for fulfilling EU targets. Meanwhile, future sustainability standards were optimistically foreseen as effective in addressing the environmental concerns related to their production. Therefore, any reduction in support would be inappropriate, since it would have meant losing the opportunity for important carbon savings.

By contrast, second-generation biofuels were not promoted as necessarily superior to first-generation biofuels in either environmental or socio-economic terms. As opposed to already viable first generation, second-generation biofuels were instead downplayed as needing a long time to become commercially viable and not necessarily performing better than the previous generation, even in environmental terms. Particularly concerned about the prospect of a shift in support from first-generation to second-generation biofuels, biofuel producers and obligated suppliers within this group insisted that the decision about which biofuel technologies to develop should have been left to their discretion by enforcing a technology-neutral approach in policy.

3.2 Anti-biofuels

Advocating to freeze the RTFO – or rather a total moratorium on biofuel policy, the ten participants of this group rejected the slowdown option and even more so the option to leave the RTFO unchanged (see also Graph 6):

- six NGOs (CAFOD, 2008; Econexus, 2008; FoE, 2008; Greenpeace, 2008; Oxfam GB, 2008; RSPB, 2008)

- one NDPB with the promotion of energy saving solutions as policy remit (EST, 2008)
- three local government authorities (HIE, 2008; Highland Council, 2008; HITRANS, 2008)

Within this group, NGOs stressed that in the absence of effective sustainability standards, biofuel expansion would increase the amount of carbon released into the atmosphere, thus contradicting the core aim of biofuel policy. Furthermore, it would compromise living standards in developing countries and negatively affect wildlife. Uncontrolled large-scale production of biofuels would result in adverse effects such as increasing direct and indirect changes in land use leading to increased deforestation, biodiversity losses and ultimately increased carbon emissions, as well as worsening of food crises, land grabbing and human rights abuses in developing countries.

Two NGOs in particular objected to the Gallagher Review's argument that a moratorium on biofuel policy would reduce the ability of the industry to invest in new technologies and/or to transform the sourcing of its feedstock into more sustainable supplies. For these NGOs, the implicit rationale sustaining that expectation – i.e. maintaining the trust of the industry as a requirement to keep technology policy effective in stimulating techno-scientific advancement – risked instead producing an adverse outcome. Although the distribution and blending infrastructure could be shared, the production processes of first-generation biofuels were completely different from those of second-generation biofuels. Furthermore, the emergence of second-generation biofuels would render the previous generation obsolete. In arguing this, these NGOs implicitly alluded to the likely resistance of the first-generation industry to the adoption of new technologies once it had established previous technologies. In such a context, preserving biofuel targets as currently set could lead to a technological lock-in to first-generation technologies, by creating special interest groups, even within agriculture, that may become dependent on first-generation biofuels and then resist the introduction of the second generation. Furthermore, withdrawing the RTFO would have hardly affected multinationals in biofuel production. At the same time, it would have been senseless to keep the RTFO only to protect the

profit of a small-scale UK-based industry, considering the huge negative environmental and social impacts of biofuels. Policy support should have been redirected instead to cheaper and more effective emission abatement alternatives and directly to R&D into newer technologies. Thus, maintaining the promises made to the first-generation biofuel industry was not a requirement for the UK Government to avoid discouraging any potential investor in undertaking investments in second-generation biofuels. It was rather an unjustified and risky policy.

NGOs strongly downplayed the expectation of sustainability standards being able to contain the negative implications of the production of both first- and second-generation biofuels. Present and future sustainability standards – i.e. those in the RTFO and those announced in the EU Directives – were deemed insufficient and ineffective in containing both the environmental and the socio-economic drawbacks of biofuel production. Limitations at the global, regional and even local levels impeded an effective implementation, monitoring and enforcing of any system of sustainability standards. Independently of the effectiveness of such systems, it remained a fact that current biofuels were produced outside of any mandatory system of sustainability standard. Thus, as currently set, the RTFO would be harming, without any guarantee of carbon savings.

NGOs also downplayed the expectation that second-generation biofuels were superior to first-generation biofuels in both environmental and socio-economic terms. Although preferring second-generation to first-generation biofuels, NGOs warned that they should not be presumed to be sustainable, given that they could still displace land. To ensure sustainability, the rewarding system should have been linked to GHG abatement performance, while taking into account the overall impacts of the technologies. Such a technology neutral rewarding system – coupled with additional measures such as mandatory minimum standards to prevent unwanted indirect effects on food production and working conditions in developing countries – would have avoided the problems of discriminating between first- and second-generation biofuels.

3.3 Precautionary approach

Advocating to slow down the RTFO, the twenty-five participants of this group agreed with the Gallagher Review that this option would strike the right balance between environmental concerns and industry needs (see also Graph 6):

- one NDPB administering the RTFO and author of the Gallagher Review (RFA, 2008b)
- four NDPBs with environmental policy remits (EA, 2008; NE, 2008; SEPA, 2008; SNH, 2008)
- four obligated suppliers (Chevron, 2008; Conoco Phillips, 2008; Ineos, 2008; Shell, 2008)
- one industry association representing two of the above obligated suppliers (UKPIA, 2008)
- one consultancy (Germerv Ltd, 2008)
- two academics (RAE, 2008; Sussex Energy Group, 2008)
- one industry association representing fuel distributors in the transport sector – not obligated suppliers (FPS, 2008)
- two industrialists of other businesses (E.ON, 2008; EDF, 2008)
- five industry associations of other businesses (AIC, 2008; Croda et al., 2008; FDF, 2008; RSSB, 2008; SMMT, 2008)
- one NGO (WWF, 2008).
- one producer of pure plant oil from rapeseed – a type of biofuel not currently supported by the RTFO, and different from those of the other biofuel producers (Verdant Fuel Ltd, 2008).
- two private clubs representing vehicle owners (FBHVC, 2008; RAC Foudation, 2008)

More than others within this group, obligated suppliers and their industry associations supported the expectation that current support for first-generation biofuels would stimulate potential investors to invest in technological innovation – especially in second-generation biofuels. UK and EU markets should keep offering opportunities for continued growth and profitability in the biofuel market in order to maintain the industry's commitment to developing and producing sustainable biofuels and to create momentum for the adoption of sustainability criteria across producer countries. Thus, as implicit rationale for that expectation, the UK Government had to maintain the trust of the industry as a requirement to preserve a technology policy effective in stimulating the techno-

scientific advancement. By contrast, a freezing or, worse, a moratorium at this early stage of biofuel policy would seriously undermine the potential for future investment in this area, and not address the risk of further increasing emissions from the transport sector. In addition, a freezing or a moratorium would reduce the UK's influence in promoting biofuel policies that integrate sustainability requirements at the international level, which would have an insignificant impact on the expansion of the biofuel industry globally.

Within this group, NDPBs in particular acknowledged that there were significant risks at the current level of support. Many biofuels would risk increasing greenhouse gas emissions, air pollution, land-use-change, biodiversity losses, desertification, landslides and other environmental damages, such as acidification and/or eutrophication of waters. All these environmental drawbacks warranted the enforcement of a mandatory system of sustainability standards and future reviews of the environmental implications of biofuel policy. Notwithstanding the complexity and uncertainty involved, sustainability standards were nevertheless optimistically promoted as effective and efficient in containing the negative implications of first- and second-generation biofuels.

More than others within this group, NDPBs remained cautious about the expectation that second-generation biofuels were superior to first-generation biofuels in both environmental and socio-economic terms. Second-generation should not be presumed to be sustainable since they could still displace land and then cause indirect effects. That taken into consideration, biofuel policy should aim to redirect investments towards innovation in advanced technologies as a matter of priority. For this aim, sustainability criteria and minimum GHG savings should be the discriminating factors when deciding the amount of support to give to a specific technology as opposed to unclear definitions of biofuel generations. As such, a rewarding mechanism linked to sustainability standards and GHG emission performance should be preferred to the double reward, which is a blunt and ineffective instrument. Only one NDPB pointed out that such a rewarding system would require first overcoming several difficulties. As NDPBs, obligated suppliers advocated a technology-neutral approach in

policy, although they emphasised that the decision on whether and when to invest in newer generations of biofuels should be left to their discretion.

3.4 The UK Government

In the invitation document, the UK Government supported the slowdown option, while excluding a priori a moratorium on biofuel policy as an option (DfT, 2008a). In the aftermath of the consultation, the UK Government reconfirmed its previous stance (DfT, 2009c; 2009d). Preserving the first-generation biofuel industry remained a requirement for the UK Government to ensure the fulfilment of current EU obligations. Furthermore, the UK Government justified continued support for the industry as a requirement for ensuring techno-scientific advancement in future generations of biofuels. A freezing or, worse, a moratorium in biofuel targets would have been counterproductive, as they would have reduced the ability of the industry to shift from first-generation biofuels to second-generation biofuels. The UK Government continued to support a slowdown as a solution that would buy some time to produce and enforce effective sustainability standards, while alleviating the negative impacts caused by a rapidly expanding first-generation biofuel industry. Even if going against the EU's higher targets and not welcomed by the most of the UK biofuel, this solution still ensured a future for first-generation biofuels, while softening environmental concerns as raised by biofuel critics. The UK Government agreed with consultation participants that biofuels should be rewarded according to their environmental performance. Nevertheless, it reiterated that the matter of how to promote second-generation biofuels was subject to EU regulation – i.e. not under its direct responsibility.

4. Which voices did the UK Government select and/or marginalise in the consultation?

The similarity between the UK Government's vision and those of biofuel technology innovators and their industry associations is remarkable. The RTFO placed responsibility for the implementation of sustainability standards on

biofuel technology innovators. For these latter, supporting the expectation on sustainability standards as efficient and effective in tackling the negative drawbacks of biofuel production was de-facto to show self-confidence in their ability to implement them. By promoting that same expectation, the UK Government endorsed biofuel technology innovators' self-confidence. They also shared the implicit rationale maintaining the expectation of continued support as a prerequisite to promote the implementation of sustainability standards and techno-scientific advancement in biofuel technologies. Yet they had different priorities about which technologies to favour. Against pressing calls for a moratorium, the UK Government relied on the prospect of second-generation biofuels as the main justification for its current policy and presented current support to first-generation biofuels as primarily aimed to stimulate techno-scientific advancement into newer biofuel generations. By contrast, biofuel technology innovators presented current support to first-generation biofuels as worthwhile per se – not only as a transitional measure to favour the emergence of second-generation biofuels. Furthermore, they insisted that the decision about which technologies to adopt should have been left to their discretion, and advocated a technology-neutral approach in rewarding biofuels. Biofuel producers in particular saw second-generation biofuels as a possible threat to their support. They tended to present second-generation biofuels as not necessarily superior to the first generation and far from coming into stream.⁵⁹ By contrast, the majority of obligated suppliers tended to share the expectations that second-generation biofuels were environmentally superior and the current market of first-generation biofuels were a necessary technological bridge to techno-scientific advancement towards second-generation biofuels. Amidst these diverging views, the UK Government opted to share similar expectations to this latter group of biofuel technology innovators.

Notable also is the similarity between the visions of NGOs and the Parliamentary Select Committees scrutinised in the historical analysis. Both believed that biofuel policy as currently set would risk offsetting any potential

⁵⁹ These technology innovators objected that such definitions could have excluded highly sustainable technologies from support simply because they were defined as “first generation” – e.g. biodiesel from used cooked oils (UCO), and/or provided support to second-generation technologies whose environmental performances had yet to be fully proved.

benefit from second-generation biofuels – which they acknowledged as potentially superior – by aggravating damage from the first generation. NGOs and Parliamentary Select Committees strongly rejected as counterproductive the implicit rationale prescribing continued support for first-generation biofuels to favour the development of the second generation. By consolidating first-generation biofuels into a socio-technical regime, this rationale – they argued – could lead to a technological lock-in to first-generation biofuels, thus preventing second-generation biofuels from coming on stream. Biofuel policy needed instead to redirect support to second-generation biofuels and to be immediately integrated with efficient and effective sustainability standards. NGOs and Parliamentary Select Committees also agreed on sustainability standards, strongly criticising the delay in their enforcement, and doubting their supposed enhanced effectiveness in the future.

By contrast, NDPBs advocated the rationale justifying current support and showed optimism regarding both second-generation biofuels and sustainability standards. Although stressing the importance of preserving the environmental objectives of biofuel policy as the main priority, NDPBs shared the UK Government's view about a biofuel policy slowdown as a sufficiently precautionary measure to tackle current negative issues. The NDPBs' vision was more optimistic than the NGOs' about finding solutions to the environmental concerns in the short-medium term, while marginalising the socio-economic implications of biofuels in developing countries. The vision of NDPBs thus appears more concerned with domestic than international issues – as opposed to that of the NGOs. Like the NDPBs, the UK Government failed to comment explicitly on the argument about first-generation biofuels consolidating into a socio-technical regime preventing the development of the second generation, and marginalised this concern in its vision on UK biofuel policy.

To conclude, participants – or “stakeholders” – disagreed substantially on UK biofuel policy, not just between groups (e.g. biofuel producers and NGOs), but also within groups (e.g. obligated suppliers). Various affected by the three policy options proposed in the consultation, participants opted for the one most aligned with their own visions on UK biofuel policy. Between the extremes of

leaving the RTFO unchanged and freezing it, slowing it down looked like a measure to conciliate biofuel supporters and critics. By endorsing this option, the UK Government appeared to be a “consensus seeker” between two opposing sides. Nevertheless, by limiting the choice to only three options, the UK Government effectively marginalised the visions of the participants that advocated more extreme alternatives – e.g. the visions of the NGOs that demanded a biofuel policy moratorium or the biofuel technology innovators that demanded further increases in biofuel support. These extreme policy options and related visions were effectively reduced and linked to two opposing, milder policy options – i.e. freezing the RTFO or leaving it unchanged. These latter then ensured that the slowdown option and related vision would “fall near the middle” and so appear to be a reasonable compromise. This seems to suggest that the UK Government most likely sought the appearance of a consensus seeker, and perhaps even used it in an attempt to justify its decision to enforce a slowdown as initially proposed in the invitation document. That said, if one looks at the content of its official vision, the UK Government seems, moreover, to have given more weight to the visions of biofuel technology innovators than those of NGOs. This observation seemingly confirms past trends as observed by other investigators in the second and third consultations on biofuel policy, in which the UK Government appears to have privileged the interests of the biofuel industry over the concerns of NGOs (Upham & Tomei, 2010, pp. 3-5, 10-11; Upham et al., 2011, p. 2673). However, it contradicts the conclusions of other investigators who have inferred a greater influence for NGOs in the UK Government’s decision to slowdown UK biofuel targets (Pilgrim & Harvey, 2010, Paragraphs 4.17-4.18). As I will argue in the next section, in the fourth consultation on UK biofuel policy, the marginalisation of NGOs’ arguments and the UK Government’s decision to enforce a slowdown of the RFTO can be related to a policy-promise lock-in.

5. Discussion: the UK Government’s policy-promise lock-in

Disagreements among consultation participants on how to envision UK biofuel policy can be interpreted in relation to technology innovators’ and public

authorities' responsibilities in promise-requirement cycles. In promise-requirement cycles, when technology innovators' technological expectations become increasingly shared, they are held responsible for their practical fulfilment by "others" willing to give political-financial support, such as public authorities. Conversely, the latter are called to provide support. If technological expectations are fulfilled, the promise-requirement cycle keeps mobilising various resources towards techno-scientific advance. If technological expectations are unfulfilled, however, technology innovators are blamed for their practical failure, and the "others" may redirect support (Van Lente, 1993, p. 167; Van Lente & Rip, 1998a, p. 216; Van Lente, 2000, p. 60).

Participants disagreed in particular about whether supporting first-generation biofuels was necessary or counterproductive for the development of the second generation. Considered mature technologies, their unsustainable biomass inputs had made incumbent first-generation biofuels controversial. Second-generation biofuels, on the other hand, were emerging technologies gaining collective expectations that they could avoid those negative effects.

For the pro-biofuels group, the passage to a promise-requirement on second-generation biofuels was not presented as a priority, but as a matter that should be left to the discretion of biofuel technology innovators. The market of incumbent first-generation biofuels was a protected space worthy of support independently of its supposed role in opening up an incubation room or niche for second-generation biofuels. Executive public authorities were those in charge of the provision/maintenance of protected spaces; hence, they were urged to preserve or, better, increase support for incumbent technologies. Technology innovators were those in charge of taking care of the future cycle of promise and requirement on emerging preferable technologies. Thus, biofuel technology innovators needed to be left free to decide whether and when to engage in the future cycle of promise and requirement on second-generation biofuels. A neutral approach in rewarding technologies was deemed necessary to granting that independence. The future socio-technical transition to more sustainable first-generation biofuels and possibly, but not necessarily, second-generation biofuels, was conditional on the maintenance of current targets as

previously promised – or, better, increased. This group did not mention the argument about incumbent first-generation biofuels consolidating into a socio-technical regime locking out emerging second-generation biofuels.

The anti-biofuels group presented the passage to a promise-requirement cycle on second-generation biofuels as the priority, and as a matter that should not be left to the discretion of biofuel technology innovators. The market of incumbent first-generation biofuels was a protected space currently unsustainable, and likely to lead to a technological lock-in to first-generation biofuels preventing the start of a promise-requirement cycle for second-generation biofuels. Executive public authorities were those in charge of the provision/maintenance of protected spaces; hence, they were warned to reshape the protected space to minimise the risk of incumbent technology innovators resisting change, and to stimulate prospective technology innovators to invest in techno-scientific advancement in emerging preferable technologies. For that aim, a neutral approach in rewarding technologies, but primarily discriminating on the basis of environmental and socio-economic performances, would favour emerging preferable technologies over harmful incumbent technologies. The future socio-technical transition to second-generation biofuels was deemed highly unlikely, especially if support was maintained as previously promised.

The precautionary approach group presented the passage to a promise-requirement cycle on second-generation biofuels as a priority, and as a matter that required appropriate incentives for biofuel technology innovators. The market of incumbent first-generation biofuels was a protected space in which to implant the niche of second-generation biofuels. The executive public authorities were those in charge of the provision/maintenance of protected spaces; hence, they were required to maintain sufficient support for incumbent technologies in order to preserve incentives for incumbent and prospective technology innovators to invest in techno-scientific advancement in preferable technologies. A neutral approach to rewarding technologies would better drive technology innovators to adopt preferable technologies. The future socio-technical transition to more sustainable first-generation biofuels and eventually second-generation biofuels was conditional on the maintenance of support –

although not necessarily as much as previously promised. The precautionary approach group did not mention the argument about incumbent first-generation biofuels consolidating into a socio-technical regime locking out emerging second-generation biofuels.

The UK Government initially proposed and then endorsed a similar vision to this latter group. These visions are based upon an underlying rationale – advocated by some biofuel technology innovators, but strongly rejected by NGOs and Parliamentary Select Committees – that is specific to executive public authorities in technology-policy – i.e. fulfilling previous policy-promises of support for incumbent technological niches is a requirement to maintain credibility among current and prospective technology innovators in emerging technological niches. This would ensure the effectiveness of future technology policy by mobilising current and prospective technology innovators. On the basis of this rationale, the UK Government officially justified previous policy-commitments towards technology innovators of incumbent first generation biofuels – although controversial and also driven by EU targets – as necessary for the development of preferable emerging second generation biofuels. This finding reconfirms the conclusion of the historical analysis that the UK Government’s vision on UK biofuel policy can be interpreted in relation to a policy-promise lock-in (see Chapter 4).

Executive public authorities may truly believe themselves to be in a policy-promise lock-in and/or use one as a strategic creation to preserve their credibility among technology innovators and the legitimacy of their previous policy-promises towards the rest of taxpayers. Linking reputational stakes to techno-scientific advancement, a policy-promise lock-in may then induce – when truly believed – and/or serve as a justification for – when strategically used – executive public authorities to delay a complete redirection of support from incumbent to preferable emerging technologies. By endorsing a policy-promise lock-in – either as a genuine belief, or as a strategic creation – the UK Government marginalised the argument of NGOs (and Parliamentary Select Committees) about first-generation biofuels consolidating into a socio-technical regime preventing second-generation biofuels. This marginalisation seems to

reconfirm past trends as observed in the second and third consultations on UK biofuel policy, in which the UK Government seemingly privileged the interests of the biofuel industry over NGOs' concerns (Upham & Tomei, 2010, pp. 3-5, 10-11; Upham et al., 2011, p. 2673). Nevertheless, by implementing a slowdown of RTFO targets, the UK Government also partially reversed its prior commitments to the EU and the biofuel industry. As emerged in the historical analysis, the UK Government had already promised and delivered lower support than the EU's targets and biofuel industry's demands (see Chapter 4). By 2008, the UK Government explicitly called for a more "cautious approach" to biofuel support, eventually slowing down RTFO targets (DfT, 2004c, p. 2; 2008e, Section 2; 2008b, p. 7). Probably concerned about getting further locked into what it initially presented as a risky, both environmentally and socio-economically, and excessively expensive industry (Defra, 2004, p. 6; DfT, 2004c, p. 2), the UK Government did not completely dismiss NGOs' concerns and/or policy opposition to first-generation biofuels – as also previously suggested by other investigators of the case (Pilgrim & Harvey, 2010, Paragraphs 4.17-4.18). Reconciling previous analyses on UK stakeholders' opinions, my analysis reinterprets the UK Government's decisions to marginalise NGOs' arguments and slow down UK biofuel targets as efforts to balance its credibility and legitimacy between technology innovators and biofuel critics.

Chapter 7 – Intermediaries of promise

Introduction

This chapter analyses how public authorities, industry associations, consultancies and non-governmental organisations (NGOs) individually diffuse expectations. It then reflects on how these actors could be interpreted through the lens of the sociology of expectations.

The chapter has four sections. Section 1 shows that the technology innovators that participated in the consultation behaved in similar ways as observed in previous analyses in the sociology of expectations. Section 2 introduces the work of Pollock and Williams on promissory organisations. Section 3 describes how industry associations, consultancies, NGOs and public authorities mediate expectations among different parties, and then compares these actors with promissory organisations. Section 4 proposes broad definitions of public and private intermediaries of promise.

1. Technology innovators and beyond

Technology innovators deploy expectations for diverse strategic purposes, notably to legitimise decisions, communicate strategic intentions and catch the attention of other actors considered as having an important role in technology development (Van Lente, 1993, p. 185). Concerning this latter use, their ultimate goal is to foster the development of their technology by reinforcing their protected space (Geels & Smit, 2000, p. 881). Technology innovators could then promote their own technology with the purpose of enhancing their chances of market survival, by inducing relevant actors, such as investors or public authorities, to invest resources in their technology.

Extending the above theoretical insights and assumptions to my case study, biofuel technology innovators should thus attempt to influence the UK Government whenever they have the opportunity to do so, and especially in public consultations. Winning consent in public consultations entails an obvious return for technology innovators: the UK Government's endorsement of their expectations, and consequent provision of political support according to their interests. The amount of resources that the UK Government is capable of mobilising with its policies is undoubtedly relevant. The UK Government's direct investments in technological development often represent a large share of the overall resources spent on technologies, particularly for emerging technologies. Even when the UK Government does not directly support technologies with investments of public resources, its policies still greatly affect their development.

My analysis seems to confirm the validity of the above theoretical insights and assumptions on the behaviour of technology innovators. Here interpreted as technology innovators in biofuel technologies, obligated suppliers and biofuel producers were among the largest groups of participants in the fourth consultation. The analysis of their responses clearly showed that they attempted to influence the UK Government to adopt a vision of the future that ensured them a protected space in the market. Technology innovators of other industries also participated, but in much smaller numbers and mostly through their industry associations. The futures presented by these were apparently oriented towards their market interests in the policy. Thus, technology innovators seemingly attempt to secure their market survival by strategically promoting and diffusing technological and policy expectations favouring their respective technologies wherever they have a chance to – as previous analyses in the sociology of expectations have observed.

Beyond technology innovators, other types of actor were involved in the consultation and played specific roles in the diffusion of expectations on technologies and policies. Among these were the UK Government (as organiser), and several industry associations, consultancies, NGOs and other public authorities (as respondents). How these types of actor influence the diffusion of expectations appears to be a neglected issue in the sociology of

expectations. This framework has been primarily concerned with investigating the content and dynamics of expectations, and has mostly been applied to analysing the expectations of technology innovators. There has been less attention on how and on behalf of whom these types of actor diffuse expectations among different parties. A partial exception is Pollock and Williams' analysis of industry analysts as "promissory organisations". The next section summarises the relevant insights from that analysis.

2. Insights from Pollock and Williams' analysis of promissory organisations

Pollock and Williams investigated the roles that industry analysts on IT technologies play in the "markets of expectations" where they operate (Pollock & Williams, 2010, pp. 7-8). As pointed out by the authors,

"... whilst there has been extensive research on the efforts of scientists and technology developers to mobilize *particular expectations* around proposed technical advances, much less attention has been given to intermediary organizations devoted to the production, communication and selling of expectations-based products and services." (Pollock & Williams, 2010, p. 18)

Pollock and Williams analysed industry analysts on IT technologies and conceptualised them as "promissory organisations" (Pollock & Williams, 2010, p. 2). A promissory organisation is "defined as an intermediary that routinely and prodigiously produces future-oriented knowledge claims" (Pollock & Williams, 2010, p. 8) and whose activity focuses on the mobilisation of promises and expectations from suppliers to user communities (Pollock & Williams, 2010, p. 2). These intermediaries enact a "market" populated by at least three categories of actors interacting with each other, i.e. "users", "intermediaries" and "vendors" of expectations. Promissory organisations represent an influential class of knowledge producers that proliferate in and, at the same time, enact a

lucrative and prosperous market for future-oriented knowledge claims (Pollock & Williams, 2010, pp. 7-8):

“The *business of technological expectations* is increasingly commercial in orientation, product-minded in ambition and potent in influence.” (Pollock & Williams, 2010, p. 18)

Thus, two distinctive characteristics of promissory organisations are their “business orientation” in mediating expectations between different parties and, consequently, their intermediate position between different parties.

Promissory organisations investigate the evolution of emerging technological fields and the related business contexts (Pollock & Williams, 2010, p. 7) and “both articulate generic visions of the evolution of a technical field and subject the promissory work of innovators to scrutiny” (Pollock & Williams, 2010, p. 8). This “influential class of knowledge producer[s]” critically assesses other actors’ claims by “heralding a much more elaborate system of consultancy and advice that attempts to subject vendor statements about new offerings to a more systemized and formalized evaluation” (Pollock & Williams, 2010, p. 7). Their activity might also “include articulating and mobilizing support for generic technological visions (with some analysts aligning themselves with specific vendor visions)” (Pollock & Williams, 2010, p. 7). Pollock and Williams observe that:

“... a large number of these analysts try to subject the promissory work of specific innovation players to a certain level of scrutiny and accountability. Their work does not aim to generate specific promises, but to circulate different promises and expectations mobilized by others. It includes the production of expectations based on – and often critically oriented to – assessments about vendors and their offerings.” (Pollock & Williams, 2010, p. 7)

Promissory organisations also reduce the complexity of claims about current and projected performances of complex products that otherwise would be

extremely difficult for other interested parties to assess (Pollock & Williams, 2010, p. 18). As Pollock and Williams state,

“In a context of growing competition between diverse technology suppliers, articulating claims about the current performance and further development of their highly complex products, which are extremely difficult for potential adopters to assess, promissory organizations’ serve to regulate and systematize that competition.” (Pollock & Williams, 2010, p. 18)

Thus, as distinctive features of their activity, promissory organisations can critically subject other actors’ claims to scrutiny and accountability, and/or articulate and mobilise support for other actors’ claims, while simplifying the complexity of those claims.

Pollock and Williams looked at the specialisation of resources as a source of power. As specialised actors, promissory organisations benefit from that power and – as Pollock and Williams argue – exert an “increasing influence ... [by] changing the nature and dynamics of the promissory space” (Pollock & Williams, 2010, p. 18). More specifically,

“Promissory organizations create themselves as centres of power by building a wide and variegated range of expectations and assembling the organizational machinery for disseminating them. This includes mechanisms and networks for developing and communicating ‘successful’ claims, but also those needed for dealing with more contentious, problematic, and ‘failing’ claims. One of the most interesting things about industry analysts is that they produce prodigious amounts of research. Many of the larger firms make dozens of claims on a daily basis about a vast range of innovations.” (Pollock & Williams, 2010, p. 8)

Another distinctive feature of promissory organisations, therefore, is their resource specialisation in disseminating expectations (Pollock & Williams, 2010, p. 8).

Pollock and Williams reach an interesting conclusion concerning the different levels of accountability of specific claims on the future:

“... promissory organizations sometimes produce and communicate a kind of knowledge with which they never attempt to do anything. The performative reading of this is that some types of expectations based on knowledge have limited or ‘temporary’ effects. These expectations are simply launched into the ether: they are *visions let loose*.” (Pollock & Williams, 2010, p. 14)

The point being made here is that not all expectations are equally relevant and influential in affecting reputations. Indeed, “Contrary to what some have argued (for example Brown, 2003), we found that mistaken predictions could be openly discussed in some public venues!” (Pollock & Williams, 2010, p. 20). However, Pollock and Williams also noted that not all promissory work is treated in the same way. More specifically:

“At one end is promissory work that is researched and defended robustly, and which appears to ‘matter’ to promissory organizations and others who use it. At the other end are kinds of promissory work that seem more like ‘provocations’ that attempt to capture interest. Intriguingly, it did not seem very important when provocations failed, perhaps because such failures do not explicitly damage reputations.” (Pollock & Williams, 2010, p. 20)

Thus, even if not all claims have the same impact on the reputation of a promissory organisation, Pollock and Williams seem to imply that intermediaries, like any other actor, remain concerned about building and maintaining a positive reputation among their audiences.

Pollock and Williams aimed to unveil how these intermediaries shape innovation and how their claims are performative (Pollock & Williams, 2010, p. 18). Departing from that aim – but building upon their insights – I investigate how

and on whose behalf industry associations, consultancies, NGOs and public authorities mediate expectations. In doing so, I narrow the focus to their functional roles and interrelations in diffusing expectations among different parties. On the basis of this investigation, I then reflect on how these types of actor may be defined through the lens of the sociology of expectations. In the following sections, I describe how these types of actor mediate information and compare them with promissory organisations.

3. Mediation of expectations

Mediating expectations in similar ways to promissory organisations – and thus potentially interpretable as intermediaries – are industry associations, consultancies, NGOs and – to a broader extent – public authorities. In the following, I highlight similarities and/or differences in the way in which these types of actor mediate expectations on behalf of other parties. To that end, I relate their funding structures to the informational services that these actors provide in their standard business/activity and in public consultations in particular.

3.1 *Industry associations*

Industry associations mostly rely on a continuous flow of financial subscriptions from industrial sponsors. Thus, at least in principle, their business consists of trading a service of diffusion of statements of expectations in exchange for subscriptions. This implies that their market survival depends on the satisfaction of their industrial sponsors with their informational services. The fact that industry associations participated in large numbers in this and the previous three consultations on biofuel policy suggests that consultations are part of their business area.

The industry associations participating in the consultation declared themselves to be responding as “representatives” and tended to reflect the futures of their respective sponsor industries. The two industry associations sponsored by

obligated suppliers reflected their split in opinion about which options to support in the consultation. One represented obligated suppliers opposing the slowdown and freezing options, and reiterated their arguments against those measures. The other represented obligated suppliers in favour of a slowdown, and advocated their arguments. Industry associations of biofuel producers supported their arguments for leaving biofuel policy unchanged and reflected their disappointment and alarmism about the uncertainty created by the proposals under consultation. All the industry associations of obligated suppliers and biofuel producers reflected their consensus on how to deal with second-generation biofuels. As for the industry associations of other industries, it is not possible to establish whether they reflected the visions of their respective industries. The majority of the technology innovators from other industries preferred not to participate directly, and to delegate their policy representation to their industry associations. Therefore, the terms of comparisons are missing. However, the futures presented by these industry associations were seemingly oriented towards the specific interests of their respective sponsor industries. As general trends emerging from the consultation, the participation rates of technology innovators and their industry associations seem to be correlated to their organisational scale and level of involvement in biofuel policy. More specifically, technology innovators of larger dimensions and those relatively more exposed to the issues under consultation tended to participate independently from their industry associations. On the other hand, technology innovators of smaller dimensions and of industries relatively less affected by the issues under consultation tended to delegate their representation to their industry associations and not to participate. Obligated suppliers were the largest technology innovators participating to the consultation and among the most financially involved in biofuel policy. In 2008, the Renewable Transport Fuel Obligation (RTFO) identified fourteen transport fuel companies as obligated suppliers. Among these, seven participated together with their two industry associations (see Annex 4 for further information). Biofuel producers varied from medium to small scale and were the technology innovators most financially dependent on biofuel policy. In 2008, the RFA certified biofuels from a large number of biofuel producers. Among these, only twelve participated in the consultation (see Annex 4 for further information). However, seven industry

associations represented their industry. Four large technology innovators of other industries – two carmakers, two electricity generation/distribution companies – also participated, but not their industry associations. Eleven industry associations of other industries participated, but none of the technology innovators that they represented.

To conclude, the mere existence of industry associations implies that technology innovators often prefer to delegate their own policy representation to specialised actors, rather than to specialise their own resources and directly engage in that activity. The main activity of industry associations is providing assistance to technology innovators in their policy representation. This seems to be particularly true for technology innovators of smaller scale – i.e. those likely to have resource constraints, and thus limited capacity to specialise resources for policy representation. These seem to find convenient pooling resources with other technology innovators and to engage specialised actors such as industry associations for political representation, at least in policy arenas such as consultations. The functional role of industry associations is thus to provide policy representational support to specific industries, by diffusing statements of expectations on their behalf.

3.2 Consultancies

Consultancies rely on grants from grant-providers who seek informational advice. Thus, at least in principle, their business consists of trading an advisory service on statements of expectations in exchange for grants. This implies that consultancies' market survival depends on their grant-providers' satisfaction with their provision of reliable and expert information. In this particular consultation, the consultancies participating as respondents supposedly did so disconnected from any grant-provider. This seems at odds with their standard business. Nevertheless, only two consultancies participated in this consultation, and only three or four consultancies on average participated in the previous three consultations on biofuel policy. Such low rates of participation seem to confirm that participation in consultations as respondents is not part of consultancies' standard business.

One of the two consultancies participating in the consultation under analysis defined itself as a specialist consultancy in the energy, environment and water sectors, providing a range of services to government departments, regulators, trade associations and market participants. In its response, it explicitly stated that it was acting independently and that its response represented only its own voice. As for the content of the response, it reflected the vision of the UK Government as reported in the invitation document of the consultation. The other consultancy defined itself as an adviser possessing specialist knowledge of both UK and global vehicle markets with particular emphasis on developing biofuels, LPG and natural gas – its grant-providers thus included biofuel operators. In its response, it failed to state whether it was acting independently and whether its response represented only its own voice. The content of its response reflected the visions of small-scale biofuel producers. Participation in this consultation was on a voluntary basis and did not entail any form of financial compensation – i.e. the UK Government did not “hire” any participant. Therefore, both consultancies supposedly participated on a voluntary basis and independently from any grant-provider – which also means that it is not possible to look at the rate of participation between these consultancies and their grant-providers. Behind their participation, there might have been a public-spirited intention to advise and/or, perhaps, to advertise themselves to the UK Government.

To conclude, the mere existence of consultancies implies that there are individuals and organisations that prefer to rely on specialised actors to be informed. In their standard business, consultancies serve specific grant-providers through the provision of an advisory service in exchange for grants. Consultancies tend to get involved in consultations primarily when specifically hired for the preparation of informative reports and related consultation documents, as was the case for the Gallagher Review, whose production involved eight consultancies. Their functional role would then be to provide advisory services to specific grant-providers by screening statements of expectations on their behalf.

3.3 Non-governmental organisations

NGOs rely on a continuous flow of subscriptions and donations from specific groups of individuals and organisations that are or want to be seen as particularly sensitive to specific socio-political issues. Thus, their business consists of trading informational services in exchange for subscriptions and donations from their affiliates/subscribers – at least in principle. This implies that their market survival depends on whether their affiliates/subscribers are satisfied with their informational services – among them advising and policy representation in consultations. The fact that NGOs participated in all the consultations on biofuel policy suggests that consultations are part of their business areas. Yet it often remains unclear on whose behalf NGOs mediate information. NGOs tend to define themselves in connection to political activism around specific socio-political issues, not specific groups of actors.

The NGOs participating in the consultation declared themselves to be representing the interests of the “environment”, “biodiversity” and/or the “poor”, and proposed visions centred on the impacts of biofuel technologies on those undefined categories of referents. All NGOs except one advocated the freezing option as a second best option to a moratorium – which was not included among the policy options in the invitation document of the consultation. In their view, the environmental and socio-economic damages caused by biofuel policy in developing countries in the short term would outweigh its potential benefits for the long term, thus warranting a moratorium on biofuel targets. In this consultation and in two of the previous three, NGOs also prompted single individuals to make their voice heard. The responses of the “members of the public” could not be made available for this research. Therefore, it is not possible to establish the related rate of participation in the consultation between NGOs and their affiliates/subscribers –i.e. to verify whether there were NGOs’ affiliates/subscribers among the members of the public. However, according to the first summary of responses of the fourth consultation, the twenty-two participants who declared themselves as replying as individuals raised substantially the same concerns and solutions proposed by NGOs (DfT, 2009c, p. 6). NGOs also participated in the previous three biofuel consultations and

seemingly mobilised members of the public to participate in two of these. As the Department for Transport (DfT) inferred from the analysis of previous consultations, NGOs induced members of the public to respond to the first and second biofuel consultations. In the first, all twenty-nine members of the public who participated raised similar concerns to those raised by the NGOs. In particular, twenty-one responses were identical (DfT, 2004a, Private Individuals). In the second biofuel consultation, NGOs mobilised, via a press advertising campaign, more than 5,000 members of the public to participate – out of 6,270 members of the public in total and out of 6,335 total participants (DfT, 2007d, p. 5). By contrast, in the third biofuel consultation, there were no members of the public among the participants. This was probably due to the highly technical nature of the issues covered in that consultation. Nevertheless, a few NGOs participated (DfT, 2008d).

To conclude, the mere existence of NGOs implies that there are individuals and organisations that prefer to rely on specialised actors to be informed about and politically represented in specific socio-political issues. The functional role of NGOs is thus to provide a mix of informative and representational services, by producing and diffusing statements of expectations on behalf of their affiliates/subscribers – at least in principle.

3.4 Public authorities

A public authority is here generally defined as an institution funded by public revenue (e.g. taxes) and supposed to perform its roles in the public interest (i.e. common well-being or general welfare). By publishing official documents, public authorities provide a mix of informative, representational and simplification services. Their provision of informational services is not linked to a trade, but to democratic obligations (Modernisation Committee, 2006, pp. 5, 11, 12, 17, 18). Funded by public revenue, they are supposed to provide these services on behalf of all taxpayers. The rate of participation between public authorities and those they represent is thus directly reflected by the composition of this consultation as all participants were, in principle, represented by them. Nevertheless, as shown by the disagreements here analysed, public authorities

may differ in the way they fulfil their democratic obligation by representing information in different ways. Such differences partially relate to the specific remit public authorities assume towards specific audiences and appear to be connected to the degree of involvement with technology innovators.

3.4.1 Local government authorities and non-departmental public bodies

Four local government authorities and seven non-departmental public bodies (NDPBs) participated in the consultation as respondents. All but one of these public authorities were fully funded by the UK Government. The exception is an NDPB whose policy remit is the promotion of non-food crops' industrial uses. This NDPB was funded by both the UK Government and industrial actors' subscriptions.

The four local government authorities provided self-definitions clearly indicating which groups of taxpayers they were representing. Among these, three represented local communities that could be negatively affected by a large-scale adoption of biofuels, while one represented a biofuel industry cluster in another territory. The three local government authorities representing the same territory advocated the freezing option, limiting their considerations to the negative implications of biofuels in their communities and instrumentally using environmental concerns to reinforce their position. By contrast, the authority representing a biofuel industry cluster in another territory advocated leaving biofuel targets unchanged – or, better, increasing their targets. This local government authority submitted a response identical in content to those of two industry associations of biofuel producers in the same territory. This alliance advocated the interests of its cluster of biofuel producers.

The seven NDPBs provided self-definitions connected to specific policy remits. Four defined themselves as environmental protection agencies. One defined itself as an NDPB dedicated to the promotion of energy saving solutions. One defined itself as an NDPB dedicated to the promotion of industrial uses of non-food crops for energy purposes. One defined itself as the NDPB administering the RTFO. The four environmental NDPBs and the NDPB administrator of the

RTFO agreed with the slowdown option and the arguments supporting it. The NDPB dedicated to the promotion of energy saving solutions advocated a freezing of biofuel targets and redirecting policy support to energy saving policies. The NDPB dedicated to the promotion of non-food crops' industrial uses was the only one advocating leaving the biofuel targets unchanged – or, better, increasing them. Apart from this last NDPB, which represented small-scale biofuel producers and advocated their interests, the other NDPBs provided self-definitions and responses that did not clarify which audiences they aimed to represent.

3.4.2 The UK Government

The UK Government did not participate as a respondent, but as organiser of the consultation, and responded to the consultation questions via its summaries of responses. In the invitation document to the consultation, the UK Government defined itself as the public authority responsible for correcting a market failure in transport policy on behalf of the well-being of the whole society – i.e. reducing GHG emissions in transport via technology policy intervention (DfT, 2008a, p. 45). It seems that, for the UK Government, this correction implied – in practice – balancing the general interests of taxpayers with the specific interests of biofuel technology innovators.

In the aftermath of the consultation, the UK Government continued to advocate a slowdown as the solution striking the right balance between the industry's interests and environmental concerns. By doing so, it acted as a mediator between diverging parties. Even if going against the EU's higher targets and not welcomed by the most of the biofuel industry, this solution still ensured a future for first-generation biofuels, while softening the pressure created by the other actors lobbying for environmental concerns.

To conclude, in principle the functional roles of public authorities include the provision of a mix of advice and political representation to their taxpayers. However, it often remains unclear whether this role is carried out on behalf of all taxpayers or specific subgroups of taxpayers only. The future they support

cannot always be explicitly associated with the interests of defined interested parties. The UK Government in particular balanced diverging interests between technology innovators and the rest of taxpayers. This observation confirms the validity of the analytical distinction between executive public authorities and public authorities with other policy remits (see Chapter 4).

In the next section, I compare industry associations, consultancies, NGOs and public authorities with “promissory organisations” as described by Pollock and Williams. In this comparison, public authorities with executive roles in policymaking (e.g. the government) are distinguished from those with different remits (e.g. local governments, NDPBs, etc.)

3.5 A broader definition than promissory organisations

Promissory organisations are specialised intermediaries devoted to the production, communication and sale of expectations-based products and services (Pollock & Williams, 2010, pp. 8, 18), which set up a lucrative and prosperous market for future-oriented knowledge claims (Pollock & Williams, 2010, pp. 7-8). Some tend to, at times, subject the promissory work of innovators to scrutiny (Pollock & Williams, 2010, p. 8), and, at times, articulate and mobilise support for generic technological visions, aligning themselves to specific vendors of visions (Pollock & Williams, 2010, p. 7). In operating such mixed informational services, they also reduce the complexity of claims about current and projected performances of complex products that would otherwise be extremely difficult for other interested parties to assess (Pollock & Williams, 2010, p. 18).

On the basis of the observations made in my analysis, the description of promissory organisations appears too narrow to be applied to all categories of actors that could be interpreted as intermediaries; at the same time, it is also too broad to be applied to one specific category of intermediary. The description matches more actors, such as industry associations, consultancies and NGOs, as opposed to public authorities – i.e. private organisations that trade expectations-based products and services and set up a lucrative and

prosperous market for future-oriented knowledge claims (Pollock & Williams, 2010, pp. 7-8). Nevertheless, some of the features of promissory organisations are also present in public authorities with and without executive roles in technology policy (see Table 2 – parts 1 and 2).

My suggestion is to define intermediaries primarily in relation to their mediation of expectations between different parties. In that way, their definition would become more inclusive and flexible – i.e. inclusive of all actors that perform mediations of expectations. In the next section, I propose *intermediaries of promise* as one possible definition.

Table 2 – part 1 – promissory organisations vs industry associations, consultancies, public authorities					
promissory organisations	industry associations	consultancies	NGOs	public authorities with different policy remits (e.g. local governments, NDPBs, etc.)	executive public authorities (e.g. government)
Specialised actors devoted to the production, communication and sale of expectations-based products and services (Pollock & Williams, 2010, pp. 8, 18)	YES	YES	YES	YES especially those with advisory and monitoring remits	YES through departments with specialised subdivisions devoted to informational services
Set up a lucrative and prosperous market for future-oriented knowledge claims (Pollock & Williams, 2010, pp. 7-8)	YES trade statements of expectations in exchange for subscriptions	YES trade statements of expectations in exchange for grants	YES trade statements of expectations in exchange for subscriptions and donations	NO release statements of expectations to abide by their democratic obligations	NO release statements of expectations to abide by their democratic obligations
Reduce the complexity of claims about current and projected performances of complex products that otherwise would be extremely difficult for other interested parties to assess (Pollock & Williams, 2010, p. 18)	YES	YES	YES	YES	YES

Table 2 – part 2 – promissory organisations vs industry associations, consultancies, public authorities					
promissory organisations	industry associations	consultancies	NGOs	public authorities with different policy remits (e.g. local governments, NDPBs, etc.	executive public authorities (e.g. government)
May articulate and mobilise support for generic technological visions (Pollock & Williams, 2010, p. 7)	YES act as political representatives of sponsors	NO act as informers for grant providers	YES act both as policy representatives, and informers for members. In doing so, they also help mobilise the voices of other interested parties	YES act as policy representatives, in principle for all taxpayers, although with special regards for often unclearly defined audiences	YES act as policy representatives, in principle for all taxpayers, which in practice often means also considering the specific interests of technology innovators
May align themselves with specific vendors' visions (Pollock & Williams, 2010, p. 7)	YES align themselves to the visions of the technology innovators that sponsor them	NO appear not to align themselves with any specific vision	NO seem to bring forward their own vision	UNCLEAR	AT TIMES align itself with the visions of the technology innovators supported by previous policies
May subject the promissory work of innovators to scrutiny (Pollock & Williams, 2010, p. 8)	NO	YES	YES	YES	YES

4. Intermediaries of promise

Intermediaries of promise may be generally defined as organisations that collect, reformulate and re-present expectations on technologies and policies on behalf of specific third parties. Their activities consist of bringing together and synthesising statements of expectation – often taken from several sources – and tailoring the resulting syntheses to the level of expertise and specific informational requirements of targeted interested parties. Through such informational mediation, they remain linked to the logic of building and maintaining reputation. Intermediaries specialised in serving specific actors display a tendency to link their reputation to the satisfaction of these latter, on which they depend. Depending on the parties on whose behalf they operate, these organisations may then serve different interests when diffusing statements of expectations.

All these features are shared by industry associations, consultancies, NGOs as well as public authorities with or without executive roles in policymaking. Nevertheless, the former three types of actor trade and diffuse statements of expectations on behalf of specific “clients” in very different ways. The latter two mediate statements of expectations on behalf of all “taxpayers” – at least in principle – because of their democratic obligations. In consideration of these differences, the former and the latter could be respectively conceptualised as *private* and *public* intermediaries of promise.

5. Reflections on intermediaries of promise

My definition of intermediaries underlines the importance of paying attention to their endowments and specialisation of resources when analysing their roles in diffusing expectations. As also pointed out by Pollock and Williams, it is “By assembling the organizational machinery” for disseminating successful claims and for dealing with those more “problematic”, that “promissory organisations create themselves as centres of power” (Pollock & Williams, 2010, p. 8). My definition of intermediaries also acknowledges that expectations may be “traded” in “markets of expectations” (Pollock & Williams, 2010, pp. 7-8) – not

only used as tools to legitimise decisions, reduce uncertainty by fostering cooperation or promote technologies (Van Lente, 1993, p. 185; Geels & Smit, 2000, p. 882). This acknowledgement prompts one to distinguish public from private intermediaries and to investigate the incentives behind their informational mediation when analysing how they diffuse expectations. Looking at their human and physical capital, funding structure and relationship with third parties helps understand how these types of actor affect the dynamics of expectations.

Intermediaries not only diffuse expectations on behalf of third parties, but also contribute to their production. In the present case, NGOs in particular appear to have publicly advocated their own visions. Nevertheless, in the process of selecting, reformulating and re-presenting expectations, all intermediaries shape expectations' production, and impact on their dynamics. In terms of temporal dynamics, intermediaries affect the temporal evolution of expectations. This may be towards either optimism or pessimism – i.e. towards hype or disappointment. In the present case, biofuel industry associations and the UK Government boosted optimistic expectations on UK biofuel policy, against pessimistic expectations from NGOs (see Chapter 6). In terms of spatial dynamics, intermediaries affect the spatial distribution of expectations. This may be towards either the general or the particular – i.e. towards the collectivisation or individualisation of expectations. In the present case, industry associations, NGOs, the UK Government and the other public authorities publicly advocated “standardised” statements of expectations meant to represent specific third parties in their totality. These standardised statements of expectations were disseminated in an attempt to generate consensus. By contrast, consultancies tailor “customised” statements of expectations for and specifically and uniquely addressed to specific grant-providers. Very few consultancies participated in the biofuel consultation, against several industry associations, NGOs and public authorities. This may be taken as an indication of their disinterest in promoting consensus.

Intermediaries of promise constitute an influential class of actor. By selecting expectations on behalf of specific parties or promoting expectations of specific

parties, they profoundly affect the visibility of expectations – thus acting as catalysers of the above dynamics. This may be purposefully sought or an indirect result of different purposes – i.e. it is purposeful when intermediaries act as policy representatives, and indirectly when they act as advisers. The extent to which intermediaries can influence the dynamics and visibility of expectations crucially depends not only on their specialisation of resources, but also on the reputation they enjoy among the third parties they represent and the audiences they target. As I argue in the next chapter, reputation, understood as encompassing expectations on the expertise and reliability of specific information sources, plays a crucial role in the diffusion of expectations.

Chapter 8 – A space for intermediaries of information on technologies: some insights from economics

Introduction

This chapter follows parts 1 and 2 of the dissertation. Within this separate chapter, I wish to further discuss how I have come to conceptualise the roles of intermediaries of promise in mediating information on technologies among different parties. My conceptualisation has been greatly influenced by both the sociology of expectations as well as by my previous background in economics, which I believe is strongly complementary to the sociological approach and very useful when reflecting on the overall findings of my research. In what follows, I thus make reference to some insights taken from the economics literature – mostly information economics – as well as the scholarship on the sociology of expectations. Reflections and insights from these literatures are organised and presented as an analytical model, which helps illustrate the roles of specialisation of resources, expertise and reputation in the diffusion of expectations on technologies and policies. The intermediaries of promise observed in my case studies are then reinterpreted through that analytical model.

The chapter has two main sections. Section 1 introduces the analytical model through which to conceptualise the roles of specialisation of resources, expertise and reputation in the diffusion of expectations on technologies and policies. Section 2 reinterprets the intermediaries of promise that I analysed through that model.

1. An analytical model to conceptualise specialisation of resources, expertise and reputation

Economics provides some useful insights with which to interpret the roles played by specialisation of resources, expertise and reputation in the diffusion of expectations on technologies and policies (Stigler, 1961; Akerlof, 1970; Spence, 1973; Klein, B. & Leffler, 1981; Salop & Stiglitz, 1982; Shapiro, 1982; 1983; Stiglitz, 2000; Spence, 2002). This literature deals extensively with information and the dynamics underlining its *exchange* – or *mediation*, as I prefer to call it – but adopts a different perspective and terminology and is applied to different cases with respect to the sociology of expectations. My background in economics has silently accompanied me through my PhD. Its presence did not particularly affect the way I set up and conducted the empirical analyses, or how I interpreted and applied the sociology of expectations to my findings in previous chapters. However, it is influential in my interpretation of the roles of intermediaries of promise in mediating information on technologies among different parties, which I intend to discuss in this chapter. Thus, before explaining my interpretation of these roles, I believe it is appropriate to discuss the insights from economics that influence it.

I think that a good way to illustrate these insights to the reader is to present them by means of an analytical model that simplifies and abstracts reality. Hence, I now invite the reader to temporarily set aside the framework of the sociology of expectations, and engage with a simplified analytical model, which, although compatible with that framework, is based upon a particular perspective and internalises insights from economics.

To start with, I invite the reader to think in terms of *mediations of expectations at the micro level of individual actors*. In its most elementary form, a mediation of information is here meant to occur whenever an actor accepts a statement from another actor as expert and reliable – independently of their respective interpretations of the same statement. These statements might concern expectations on technologies and policies as well as other information. In the following, expectations on technologies and policies – such as potential and expected environmental and socio-economic impacts of technologies and their respective policies – are included in the broader category of information on technologies.

1.1 Information sources and counterparts: expertise and reliability

Knowledge is never given to any actor in its totality (Hayek, 1945, p. 520). All actors have physiological and psychological limits with respect to their computational and predictive ability, which undermine their ability to analyse information in their attempt to reduce uncertainty (Alchian, 1950, p. 212; Simon, 1955, p. 101). “Knowledge *is* power”, but remains costly to raise (Stigler, 1961, p. 213). Raising information is often costly to search and asymmetric in its distribution among actors (Stiglitz, 2000, p. 1441). Thus, it is impossible to obtain all the relevant information at the right time – or, in economic terms, “perfect information” is impossible to achieve (Stiglitz, 1985, pp. 23, 36; 2000, p. 2; 2002, p. 461).

My analytical model functions on the view that all actors have limited capacities to process information and an imperfect access to it. This implies that no actor will ever be able to eliminate all uncertainties. Nevertheless, actors still gather what they believe is *key information* in an attempt to reduce that imperfection and the resulting uncertainties. By key information, I mean information that actors view as relevant given their subjective informational needs. Based on that general observation, I assume that all actors share the belief that specialising more resources into developing expertise increases the chances of successfully finding key information. Resources are here meant in a broad sense: not only in terms of differentials in amount of time, physical and human capitals, skills, experiences and so on, but also in terms of favourable conditions, such as specific situational advantages that some actors have or believe they have in comparison with others. This does not mean that actors who specialise resources into developing expertise have access to the “truth” (Collins & Evans, 2002, pp. 236, 242-243). I simply assume that actors believe that specialising resources into developing expertise increases their capability to reduce uncertainties. In other words, developing *expertise* is *believed* to grant better access to *key information* and, at the same time, to require *specialisation of resources*.

Yet resources are limited and unequally distributed. Thus, actors are constrained in their choice of whether to specialise resources and for what kind of expertise. An alternative is to look for other actors who may possess the pertinent expertise and then negotiate the mediation of key information with them. Arguably, the choice of whether to self-produce key information or to look for other actors that may possess it and then negotiate its mediation is conditional on the possibility and related convenience of developing expertise with respect to the other actors. Directly producing key information may become attractive whenever that information is not available or not accessible through mediations from other actors, and, at the same time, is considered of high value and achievable given the resources available. For instance, an actor who believes him/herself to be relatively well placed in terms of resources to produce key information compared to other actors may choose to develop expertise and, possibly, negotiate the mediation of such information with other interested actors. Conversely, an actor who considers him/herself to be relatively badly placed in terms of resources compared to other actors may prefer to negotiate its mediation with these latter. Ultimately, specialisation of resources accentuates the unequal distribution of resources among actors and extends the asymmetries in their access to key information. At the same time, it improves the conditions for mediations of key information to take place by creating *expert* and *non-expert* actors potentially interested in mediating it.

My analytical model then further assumes that actors receiving and accepting key information from other actors implicitly recognise themselves as lacking expertise with respect to those from whom they decide to acquire information – at least concerning the specific information mediated. More specifically, actors are assumed to formulate judgements about their differentials in expertise as based on their subjective estimations of their differentials in resource endowments and levels of specialisation of resources. Accordingly, actors possessing and specialising more resources than others into producing or searching key information are then likely to believe themselves, and be believed by other actors, to be more successful in researching it.

Economists of information assume that actors are opportunists, rationally limited and strategically exploiting asymmetries of information (Akerlof, 1970; Spence, 1973; Stiglitz, 1975; Salop, 1977; Stiglitz, 2000; 2002; 2003; 2004). The asymmetric distribution of information among actors creates spaces for strategic behaviours where more informed actors can exploit their informational advantage to the detriment of less informed actors (Salop, 1977, p. 393; Stiglitz, 2000, p. 1456; 2003, p. 16). The observation of sociologists of expectations about technology innovators optimistically distorting their statements of expectations to catch the attention of other interested parties seemingly validates the above assumptions (Van Lente, 1993, p. 185; Geels & Smit, 2000, p. 882). When disclosing information on technologies, technology innovators may voluntarily distort their statements towards optimism with respect to what they actually believe in order to influence the perceptions of other actors in line with their strategic interests.

My analytical model shares the above view. Thus, it further assumes that all actors as opportunists, rationally limited and strategically exploiting asymmetries of information as well as aware of their own nature. This implies that actors receiving and accepting key information from other actors are also implicitly recognising these latter as reliable – at least concerning the specific information mediated. More specifically, actors are here assumed to formulate judgements about the reliability of their information sources based on their subjective estimations of the incentives of these latter to voluntarily distort information for strategic reasons.

Independently from the kind of information mediated, when the actors recognised as *experts* and *reliable* have an incentive to disclose key information and those self-identifying as *non-experts* are interested in acquiring that information, a mediation of key information might take place. Any such mediation implies a mutual recognition between *information sources* and other interested *counterparts*.

1.2 Counterparts seeking additional information on their information sources

Any mediation of key information, which entails non-expert counterparts identifying and selecting specific expert and reliable information sources, also entails a mediation of additional information on the information sources from these latter to their counterparts.

Counterparts need and seek additional information on their information sources to inform their subjective judgements on the expertise and reliability of these latter. By definition, counterparts self-identify as non-experts in relation to what they identify as their expert information sources. Hence, they need and seek information on the level of expertise of their information sources so as to determine whether these have the pertinent expertise for the information sought. All actors are also assumed to be aware of their opportunistic and strategic nature. Hence, counterparts also need and seek information on the reliability of their information sources so as to determine whether these disclose key information according to their actual thinking and not distorted for strategic reasons.

In this view, information on technologies remains the key information sought by counterparts. Meanwhile, additional information on the expertise and reliability of information sources is instrumental to allow the mutual recognition between information sources and counterparts and, consequently, the mediation of key information.

Aware of this demand for additional information from counterparts, information sources, which intend to be identified as such, strategically release information about their expertise and reliability to allow such mutual identification.

1.2.1 Information sources advertising themselves to counterparts: key and collateral information

Evidence of the strategic use of information to signal expertise and reliability can easily be found everywhere in the real world. As stated by Joseph Stiglitz:

“... we see banks signalling their trustworthiness by the size of their edifices, guarantees signalling a firm’s confidence in the quality of its products, owner-managers of firms signalling their confidence that the firm is not overvalued by restricting the number of their own shares they sell.” (Stiglitz, 2000, pp. 1452-1453)

All the additional information that information sources disclose to induce any potential counterpart to formulate speculations on their expertise and reliability is here generally referred to as *collateral information*.⁶⁰ This might include information signalling the information source’s expertise, such as information on its level of investments in physical and human capital, as well as reliability, such as information on previous performances or experiences, on its reputation, and so on. The following example helps clarify what I mean by collateral information.

The Intergovernmental Panel on Climate Change (IPCC) is widely considered the leading institution among the information sources on climate change. In its website and documents, the institution highlights the large number of scientists participating in its assessments and the authority of the funding institutions and users of its assessments (IPCC). The “organisation” webpage of the institution’s website states that:

⁶⁰ This terminology refers to the term “collaterals” used in economics to indicate the information on assets and future revenues of a debtor or insured, which is used to assess their debt solvability or insurance risk. Creditors or insurers usually require their debtors or insured to provide information on their assets or future revenues in order to assess their future solvability or risk. A mortgage is an example of collateral for a loan. A debtor contracting a mortgage on his/her house in order to get a loan is expected to behave responsibly as failing to repay back the debt would entail losing the house. By contracting a mortgage, the debtor is signalling his/her good future intentions and capability to repay the debt (or solvability) to his/her creditor. Other examples are franchise contracts in car insurance. A debtor who accepts to pay up to a threshold of the potential damage caused in case of accident is expected to behave responsibly as he/she would be forced to pay part of the damage caused in case of accident. The insurance premiums for franchise contracts tend to be lower in absolute terms than those covering 100% of damage. However, the franchise contracts tend to be more expensive than those covering 100% of damage in relative terms. This means that franchise contracts are convenient only for those with a low-risk profile. Analogously to the debtor case, the insured in this way is signalling his/her good future intentions to maintain low-risk behaviour to the insurer (Spence & Zeckhauser, 1971; Spence, 1973).

“Because of its scientific and intergovernmental nature, the IPCC embodies a unique opportunity to provide rigorous and balanced scientific information to decision makers. By endorsing the IPCC reports, governments acknowledge the authority of their scientific content. The work of the organization is therefore policy-relevant and yet policy-neutral, never policy-prescriptive.” (IPCC)

The information about the number of scientists involved, the structure of the funding system, the authority of the users – in this case, governments – provides indications about the expertise and reliability of the institution as an authoritative information source on climate change. That information does not refer to any projection on climate change, but signals the expertise embedded in and reliability of the assessments provided by the institution. According to the definition given above, that information is collateral information – i.e. information that the institution uses in order to inspire trust in itself as an expert and reliable source of key information and ultimately in the validity of its projections on climate change. Information on climate change remains the key information sought by the institution’s counterparts. Meanwhile, collateral information is instrumental to induce counterparts to identify the institution as an expert and reliable information source on climate change assessments.

1.3 Counterparts selecting information sources: the role of reputation

Economists argue that, whenever in an exchange the *quality* of the goods exchanged is not directly observable before purchase, the *reputation* of the seller might become an alternative criterion of selection to direct quality assessments of the goods exchanged (Shapiro, 1982, pp. 21-22; 1983, pp. 659-660; Stiglitz, 2000, pp. 1448-1449). Examples of markets where reputation matters abound in the real world. “Virtually all services are impossible to evaluate until they are used” (Shapiro, 1982, p. 21): for instance, medical and legal services, but also vehicle repair, plumbing, electrical works as well as informational services such as advising and political representation. The impossibility of evaluating these services before purchase implies other forms of

ex-ante evaluation, among them the reputation of the seller. This also applies to the “purchase” of information as a special “commodity”, as Joseph Stiglitz explains:

“Information [is] ... fundamentally different from other “commodities”[:] ... its consumption is nonrivalrous [i.e. not affected by problems of scarcity – the same piece of information can be equally ‘consumed’ by any user at the same time], and so, even if it is possible to exclude others from enjoying the benefits of some piece of knowledge, it is socially inefficient to do so; and it is often difficult to exclude individuals from enjoying the benefits. The issue of *appropriating* the returns to investments in information and knowledge is thus central. Moreover, each piece of information is different from others. A piece of information cannot be purchased like a chair. An individual can look at a chair and ascertain its properties before purchasing it. But if the seller of information tells the information that he wishes to sell to the buyer (before he has bought it), there is no reason that the individual will pay for it. And while an individual may repeatedly buy, say, the same product from some store, each piece of information, by definition, has to be different from other pieces of information (otherwise, it is not *new* information – the buyer already knows the information). In this sense, markets for information are inherently characterized by imperfections of information concerning what is being purchased; and mechanisms like *reputation* ... are central.”
(Stiglitz, 2000, pp. 1448-1449)

The above applies even more to the “purchase” of expectations on technologies and policies – i.e. information on the potential of technologies and expected environmental and socio-economic impacts of related technology policies. By definition, expectations refer to projected outcomes that do not yet exist, thus they are even more difficult to verify at the time of their mediation. Their quality assessment would entail preliminary assessments of their predictive value, which are inherently difficult.

From my case studies, industry associations, consultancies and non-governmental organisations (NGOs) are all actors “trading” informational services on technologies, thus facing problems in appropriating the investments made in researching and diffusing expectations on technologies and policies. Industry associations trade their service of expectation diffusion in exchange for financial subscriptions from their industrial sponsors. NGOs trade their service of expectation research and diffusion in exchange for financial subscriptions/donations from individuals and organisations that are or want to be seen as sensitive about specific issues. In both cases, the subscription/donation is a pre-condition to getting full access to their informational services. Consultancies trade their service of expectation research in exchange for grants that their grant-providers usually award before the actual delivery of their informational services. These temporal lags between ex-ante “purchase” and ex-post “delivery” of expectations confirm the presence of problems in appropriating returns on investments in developing expertise. These temporal lags also imply a role for reputation as a signal on quality in these markets of expectations.

Arguably, reputation matters even when the “exchange” of key information occurs at a “zero price”. Counterparts may accept key information on technologies from industry associations, consultancies and NGOs as well as directly from biofuel producers, scientists, public authorities and so on, even if they have not paid a price for it. Yet, these counterparts are likely to speculate on the possible strategic interests behind any “free” disclosure of costly key information and decide whether and how much to trust it also depending on the reputation they attribute to its sources.

For instance, as observed by sociologists of expectations, technology innovators often publicly release expectations on technologies to promote them (Van Lente, 1993, p. 185; Geels & Smit, 2000, p. 882). The reputation of technology innovators as information sources matters even in this case – i.e. when expectations on technologies are used as a sort of freely available “advertisement”. As observed in other technological contexts, technology innovators can lose their reputation when releasing expectations excessively

biased towards optimism (Brown, 2003, p. 6; Brown & Michael, 2003, p. 9; Borup et al., 2006, p. 289). In general, all actors seem to care about reputation, although not all expectations are considered as having the same impact on it (Pollock & Williams, 2010, pp. 14, 20). These observations suggest that the reputation of the information source plays an important role even when expectations are simply mediated and/or used as an advertisement, and not only when they are exchanged via a formal purchase.

Summing up, the reputation of the information source always matters since the “quality” of key information is rarely observable. Even among “peers”, who may be said to be experts in the same field, the trust and reputation of colleagues matter when they assess the validity of each other’s work (Smith, R., 2006). This applies when key information is released for free or as a sort of advertisement – e.g. technology innovators – but even more when it is exchanged against financial transactions – e.g. industry associations, consultancies and NGOs. In this latter case, problems in appropriating returns on investments in expertise force information sources demanding ex-ante payments for an ex-post delivery of informational services. Trust in the information source thus becomes the main criterion of selection, and consequently reputation acquires central importance. This would be even more true for free mediations or paid exchanges of expectations, because of problems created by the future orientation of these latter.

The reputation of information sources consists of the counterparts’ subjective estimations of the information sources’ expertise and reliability. Aware of the importance of reputation, information sources attempt to influence the inferences made by their counterparts through a strategic use of signals on their expertise and reliability.

1.3.1 Collateral Information as signals to build reputation

Economists think of reputation formation as a type of signalling activity, where signals on the expertise and reliability of a seller are also confirmed or rejected on the basis of their observable past performance (Shapiro, 1983, pp. 659-660).

Economists then implicitly assume the existence of a learning process wherein the buyer learns from observable past performances of the seller and a shared conceptualisation between seller and buyer of past performances as signals on quality. As Stiglitz has pointed out, market participants care about how their actions will be interpreted by others (Stiglitz, 2000, pp. 1452-1453), since “actions (including choices) convey information, market participants know this, and this affects their behaviour” (Stiglitz, 2003, p. 13).

Interpreting successful past performances as signals on expertise and reliability relies on a widely shared assumption, which is implicit in economic literature. The assumption is that actors that have been successful in the past are more likely to be so in the future. The widespread use of past performance as a signal on expertise and reliability confirms that this assumption is widely shared in society – e.g. a resumé or curriculum vitae is essentially a collection of past performances used to convince about the expertise and reliability of an individual in undertaking future work commitments. Thus, signals on expertise and reliability include not only information on resources’ endowments and specialisations, but also on previous actions and performances.

Translating the above insights into the context of mediations of information on technologies, information sources and counterparts would both conceptualise every release of key information on technologies of the former as signals on their quality in terms of reliability and expertise. Accordingly, information sources would signal their expertise and reliability to their counterparts not only with information on their resources’ endowments and specialisations – such as information on physical and human capitals, skills, experiences and so on – but also with information on their past performances as expert and reliable information sources.

Examples of the use of information on past performance as a signal on expertise and reliability can also be drawn from my case study. Industry associations tend to highlight their large membership as a means to convince about their professionalism in policy representation. Consultancies tend to advertise their previous work with authoritative institutions, such as public

authorities or international organisations, as a means to inspire trust in their value as advisers and, ultimately, in their selections of expectations on technologies and policies. NGOs tend to emphasise their successes in their campaigns to convince about their involvement in the issues concerned and professionalism in policy representation. Biofuel producers tend to boast about the level of investments in developing facilities and past successes in developing biofuels as a means to inspire trust in their professionalism as technology developers and, indirectly, as technological forecasters. Scientists list their previous publications, industrial patents and current network of connections to inspire trust in their qualities as professional researchers and, ultimately, in their statements of expectations.

As previously noted, both information sources and counterparts are here assumed to be aware of the importance of signals in inspiring trust. This implies that they think of collateral information as another form of relevant information sought by counterparts and strategically used by information sources.

1.4 A space for intermediaries

As previously argued, any mediation of key information that entails non-expert counterparts identifying and selecting specific expert and reliable information sources also entails a mediation of collateral information on the information sources. In particular, counterparts need and seek collateral information on their information sources to inform their subjective judgements on the expertise and reliability of these latter.

Counterparts can look for collateral information on the level of resources that information sources have invested and specialised in developing expertise. This should provide them with some indications about the performances of those information sources in producing key information with more embedded expertise than other sources. However, the asymmetries in expertise between information sources and counterparts complicate such an assessment. Counterparts, as non-experts, lack the expertise of their expert information sources. Therefore, they may be unable to assess the level of expertise

possessed by specific sources or embedded in their statements. In the worst-case scenario, they may not even know what kind of expertise is required for researching the key information they seek. Additionally, specific expertise may be required to understand experts' language (Collins & Evans, 2002, p. 254). Problems of communication may also arise if the experts' statements have not been properly tailored to the specific level of expertise and informational requirements of their non-expert addressees.

Counterparts can also look for collateral information on the strategic interests that information sources may have in distorting key information. However, searching for this type of collateral information is not straightforward. A first and obvious obstacle is the likely misleading attitude of the information source itself. An information source may be reasonably expected to try its best to keep this information undisclosed. Furthermore, a satisfying estimation of the reliability of an information source is likely to require a considerable amount of resources and possibly dedicated expertise.

As can be observed in the real world, counterparts still look for key information on technologies tailored to their specific informational requirements, and for collateral information on their information sources, despite all the difficulties involved. Meanwhile, information sources continue to release information about their expertise and reliability in order to be identified as such.

This demand and offer for key and collateral information opens a space for intermediaries – i.e. for actors that choose to specialise resources and develop expertise in mediating key information and collateral information between information sources and counterparts.

2. Intermediaries of promise

Within the analytical subdivision so far discussed – i.e. between information sources and counterparts – intermediaries would be counterparts of the information sources from which they get information and information sources for

the counterparts they inform. Their functional role would be to facilitate the mutual recognition between information sources and counterparts, as the next section explains.

2.1 The functional role of intermediaries: reducing the cost of searching and advertising

Economists argue that, in a world characterised by imperfect information, sellers are forced to “advertise” themselves in order to be identified by their buyers, while buyers are forced to “search for information” in order to identify the best sellers – and thus get the best deals. However, both advertising and searching information involve costs (Stigler, 1961, p. 216). Taking the second-hand cars market as an example, there are sellers who need to find buyers and buyers looking for good second-hand cars. In the absence of car dealers, sellers would be forced to advertise their car in the market, while buyers would be forced to search for information on the market. Both activities involve costs. Car dealers offer a service, which reduces both costs. By easing the mutual recognition between sellers and buyers, intermediaries such as car dealers reduce the buyer’s costs of searching and the seller’s costs of advertising (Stigler, 1961, p. 216). Similarly, in the mediation of information on technologies, counterparts struggle to find information sources and information sources struggle to be recognised as such by their counterparts – because they all live in a world characterised by imperfect information.

Applying the above view to the mediation of information on technologies, intermediaries of promise could be then interpreted as specialised “dealers” of key and collateral information. In Chapter 7, I proposed a general definition of intermediaries of promise as organisations that collect, reformulate and re-present expectations on technologies and policies on behalf of specific third parties. The activities of these intermediaries consist of bringing together and synthesising accounts of expectations on technologies and policies – often taken from several sources – and tailoring the resulting syntheses to the level of expertise and specific informational requirements of targeted interested parties. Through such informational mediation, intermediaries remain linked to the logic

of building and maintaining reputation. When they specialise in serving specific third parties, they display a tendency to link their reputation to the satisfaction of the latter – on which they depend. Depending on the parties on whose behalf they operate, these organisations may then serve different interests when diffusing expectations.

When producing accounts on expectations on technologies and policies, intermediaries not only provide specific counterparts with tailored accounts of key information on technologies, but also explicit or implicit indications about which information sources should be trusted – for instance, they often explicitly rank information sources, or do so implicitly by referencing them in their accounts. In other words, intermediaries of promise may also be seen as providers of (explicit or implicit) assessments of collateral information on information sources.

According to this interpretation, a functional role played by intermediaries of promise is to ease the mutual recognition between information sources and counterparts. Indeed, intermediaries help information sources in their “advertising” efforts – i.e. diffusing their key and collateral information – and counterparts in their “search for information” – i.e. finding their key and collateral information. In economic terms, easing the mutual recognition between information sources and counterparts would be explained as lowering the advertising costs for information sources and searching costs for counterparts.

Summing up, the demand for and offer of key and collateral information open up a space for intermediaries that choose to specialise resources and develop expertise in mediating key information and collateral information between information sources and counterparts. Private intermediaries of promise, such as industry associations, consultancies and NGOs, enter into this space to enact their markets of expectations. Public intermediaries of promise, such as public authorities, enter into this space to fulfil their democratic obligation to inform their audiences about their policy interventions (see also Chapter 7).

In the following section, I reinterpret industry associations, consultancies, non-governmental organisations and public authorities through the above conceptualisations.

2.2 Intermediaries of promise as political representatives and as advisers

Industry associations are private intermediaries of promise acting as *political representatives*. Industry associations serve industrial sponsors who are interested in promoting their technologies and in boosting the chances of their accounts of key information on technologies having an impact. In the biofuel consultation, industry associations released accounts of expectations that tended to favour the technologies of their industrial sponsors. Thus, their sponsors would commission them to produce accounts of key information on technologies for promotional purposes. In line with what I have previously argued, these sponsors can be reasonably assumed to be interested in making their accounts of key information on technologies as visible and accessible as possible to targeted counterparts. Therefore, the satisfaction of the sponsors and, consequently, the reputation of the intermediaries depend on the performance of the latter in providing higher visibility to their sponsors' accounts. Thus, industry associations can be reinterpreted as intermediaries specialising resources in advertising information – or political representation – on behalf of specific sponsors promoting themselves as information sources.

Consultancies are private intermediaries of promise acting as advisers. Their grant-providers commission them to produce accounts of key information on technologies for informative purposes. For instance, the RFA hired eight consultancies to produce reports synthesising the latest accounts of the issues fuelling the controversy on biofuel production, which were then used to inform the Gallagher Review. In line with what previously argued, these grant-providers can be reasonably assumed to be interested in getting access to the most reliable expert key information on technologies available – i.e. not strategically distorted by information sources. The satisfaction of these grant-providers and, consequently, the reputation of these intermediaries thus depend on the performance of the latter in screening information sources per expertise and

reliability. Consultancies can therefore be reinterpreted as intermediaries specialising resources in searching for information – or advising – on behalf of specific grant-providers self-identifying as non-experts counterparts.

NGOs are private intermediaries of promise acting simultaneously as political representatives and advisers. Yet, it is often unclear on whose behalf they are operating. For their market survival, NGOs rely on financial subscriptions and donations from individuals and/or organisations that are or want to be seen as particularly sensitive to specific socio-political issues and to increase the chances of their voices to be heard. In the consultation, NGOs released accounts of key information on technologies that tended to advocate socio-political issues about which their affiliates/subscribers seemingly cared. Thus, NGOs serve non-expert affiliates who seek advice and at the same time want to be represented, at least in principle. Their service is both informative and representative. The satisfaction of these affiliates/subscribers and, consequently, the reputation of these intermediaries depend on the performances of the latter in both screening information sources per expertise and reliability and providing higher visibility to accounts reflecting the interests of their affiliates/subscribers. NGOs can thus be reinterpreted as intermediaries specialising resources in providing hybrid informational services – integrating advice with political representation – on behalf of affiliates/subscribers that simultaneously seek advice and want to be represented, at least in principle.

Public authorities – both with and without executive roles in policymaking – are public intermediaries of promise, and act simultaneously as political representatives and advisers. Public authorities collect key information on technologies from various information sources to reformulate and propose it to their audiences via their official publications. In principle, public authorities operate their informational mediation on behalf of all taxpayers; that is, to fulfil their democratic obligation to legitimise their opinions or interventions in technology policy. Their service is both informative and representative. Therefore, the satisfaction of taxpayers and, consequently, the reputation of public authorities depend on the performances of the latter in both screening information sources per expertise and reliability, and representing and

protecting the interests of taxpayers as a whole – at least, in principle. Public authorities can thus be broadly reinterpreted as intermediaries specialising a part of their resources to the provision of hybrid informational services. These services integrate advice with political representation and are operated on behalf of all taxpayers in compliance with democratic obligations, at least in principle.

3. Conclusion of the chapter

In a world where searching information is believed to reduce uncertainties, actors that possess and specialise more resources than others in producing or searching key information on technologies are likely to believe themselves, and be believed by other actors, to be more successful in finding it. However, resources are asymmetrically distributed. This drives actors to specialise their resources in different ways, further accentuating these asymmetries. The asymmetries in distribution and specialisation of resources create counterparts and information sources that seek each other. Reputation plays a crucial role in their mutual identification by providing counterparts with an imperfect criterion by which to select information sources. In their attempt to bypass the problems of assessing the expertise embedded in and reliability of the key information sought, counterparts screen information sources on the basis of their reputation. Information sources know this and seek to build and maintain their reputation by signalling collateral information on their expertise and reliability. Within such a world, intermediaries of promise specialise in mediating key and collateral information. Through this informational mediation, intermediaries reduce the costs of advertising and searching for information sources and counterparts respectively, thus improving the visibility of the former and their statements. These “dealers of visibility” also abide by the logic of reputation, and depend on it for their own visibility. The significance of this analytical model will be made evident in the next and final chapter.

Chapter 9 – Conclusions

Introduction

In this final chapter, I wish to further discuss the phenomenon of technology innovators hyping their statements of expectations. While doing so, I will emphasise the main conceptualisations that I have proposed in this dissertation. The chapter concludes by inviting scholars to consider some of the findings and insights presented in this dissertation and to undertake further research on issues yet to be explored by the sociology of expectations.

1. Technology innovators: voluntary hype

Hyped statements of expectations are not always the involuntary result of genuine over-optimism. Another reason explaining why expectations are often too optimistic relates to their use as resources to catch attention (Geels & Smit, 2000, pp. 881-882). Especially in the early stages of technology development, the promotion of expectations is a determinant in catching the attention of investors and other relevant actors (Borup et al., 2006, p. 289). However, as frequently observed, this promotional effort often goes further, into overoptimistic exaggerations – i.e. in voluntary and/or involuntary hype, with negative implications in terms of disappointment and related damages to investments and reputations (Brown, 2003, p. 6; Brown & Michael, 2003, p. 9; Borup et al., 2006, p. 289).

This framework has typically been applied to investigate the expectations of technology innovators. Thus, technology innovators in particular may voluntarily create early surges of hype to catch attention and mobilise interests. Arguably, this phenomenon can be related to a *technological lock-in*,⁶¹ which locks

⁶¹ A technological lock-in is a phenomenon in which technologies appear to follow specific paths that are difficult to escape because of the costs involved in shifting to an alternative technology. Because of those shifting costs, technologies tend to persist over time (Arthur, 1989, p. 129;

technology innovators in to the successful development of their respective technologies, as the next section explains.

1.1 Technology innovators: technological lock-in

Technology innovators invest and specialise the majority of their resources into specific technologies. Their market survival is consequently intrinsically related to the development of their technologies, as this will determine the future value of their investments. For instance, in the case of a rival technology gaining predominance, their market survival is threatened, as the resources invested in their technologies decrease in value. Conversely, if their technology gains predominance, their market survival is secured as the resources invested into their technologies increase in value. Moved by this logic, technology innovators – when acting as information sources – attempt to promote their technologies at their best in order to secure their market survival. Intuitively, this phenomenon is more likely to occur when the competition among technologies intensifies.

Here interpreted as technology innovators in biofuel technologies, obligated suppliers and biofuel producers were the largest groups of participants and those most exposed in financial terms to the issues covered in the fourth consultation. From the analysis of their responses, it clearly emerged that they advocated maintaining support to their technologies in an attempt to secure the value of their previous and planned investments in biofuel development. To that end, they promoted optimistic expectations on their technologies and on the related supporting policies – at least, compared to the expectations of the other participants (see Chapter 5 and 6). That said, on the basis of the evidence analysed in this dissertation, it is not possible to determine whether the optimistic confidence of technology innovators in their own technologies was

Foxon, 2002, p. 2). Even the presence of potentially superior substitutes may not ensure a lock out from a dominant technology. The notorious dominance of fossil fuel technologies over renewable energy technologies provides an example of a technological lock-in in the energy system – or a “carbon lock-in” (Unruh, 2000, p. 827; 2002, p. 317; Unruh & Carrillo-Hermosilla, 2006, p. 1185). In my dissertation, I apply this concept to the individual level of technology innovators – i.e. the actors who have most of their investments locked-in to an incumbent technology and, consequently, are particularly exposed to the costs involved in shifting to emerging technologies.

involuntary or instead hid voluntary hype.⁶² Nevertheless, given the stakes of biofuel technology innovators in biofuel policy, the possible presence of voluntary hype in their statements is a risk that should not be dismissed. This adds to the risk of involuntary hype as genuine over-optimism, which is constant.

Summing up, technology innovators can be reasonably expected to be concerned about the values of the resources that they have invested in their technology and thus promote it no matter what they know/believe about it. Thus, while problems of involuntary hype should never be excluded, problems of voluntary hype may increase whenever technology innovators are identified as sources of expectations.

Beyond technology innovators, this dissertation also looked at other types of actor. Among these, my investigation focused on the UK Government in particular, but also on other public authorities as well as several industry associations, consultancies and non-governmental organisations (NGOs). Within this dissertation, all these actors have been conceptualised as “intermediaries of promise” (see Chapter 7). Intermediaries of promise play an important role in mediating and diffusing statements of expectations, and thus also in influencing the diffusion of hype.

2. Intermediaries of promise

Intermediaries of promise may be seen as actors specialising their resources in offering informational services – ranging from political representation to advice – on behalf of third parties. By mediating information among different parties, this influential class of actor affects the visibility of expectations, at times by

⁶² The analysis of their consultation responses and websites alone is insufficient to identify the possible presence of hype in their statements. One would need “confessions” from technology innovators about the extent to which their statements were intentionally skewed towards optimism. It is difficult to obtain such confessions, even in interview – the sources of statements may be expected to prefer not to reveal any distortion or bias. Besides, hype may also be involuntary, the sources of statements being carried away in their optimism without being aware of it.

promoting expectations of specific parties, at others by scrutinising expectations on behalf of specific parties. Intermediaries whose core business is “trading” such informational mediation are here identified as private intermediaries of promise. Intermediaries enacting such informational mediation in compliance with democratic obligations are here identified as public intermediaries of promise.

2.1 Private intermediaries of promise: reputational lock-in

Private intermediaries of promise, such as industry associations, consultancies and NGOs, all operate in different “markets of expectations” (Pollock & Williams, 2010, pp. 7-8). They trade different informational services, ranging from political representation to advice, and specialise in serving different categories of clients on whose satisfaction they depend for their own market survival. Private intermediaries are likely to be seen as more technology neutral than technology innovators given the lower extent to which they have resources invested in technological development. Yet they are constrained by the logic of building/maintaining reputation and may eventually fall into a situation that may be called *reputational lock-in*. Intermediaries affected by a reputational lock-in may reflect the interests of the actors on whose satisfaction they depend and therefore mediate their voluntary (as well as involuntary) hype accordingly.

Industry associations are private intermediaries of promise acting as *political representatives* on behalf of specific sponsors promoting themselves as information sources. Their industrial sponsors are interested in promoting their technologies and in boosting the chances of their statements of expectations having an impact. The satisfaction of the sponsors and, consequently, the reputation of the intermediaries, thus depend on the performances of the latter in providing higher visibility to their clients’ statements.

Consultancies are private intermediaries of promise acting as advisers on behalf of specific grant-providers looking for expert and reliable statements of expectations. Their grant-providers commission them to produce tailored syntheses of statements of expectations for informative purposes. The

satisfaction of the grant-providers and, consequently, the reputation of the intermediaries thus depend on the performances of the latter in screening information sources per expertise and reliability.

NGOs are private intermediaries of promise acting simultaneously as political representatives and advisers. Yet it is often unclear on whose behalf they operate. For their market survival, NGOs rely on financial subscriptions and donations from affiliates who seek advice and at the same time want to be represented; hence, they should operate on behalf of their affiliates/subscribers, at least in principle. The satisfaction of the affiliates/subscribers and, consequently, the reputation of the intermediaries thus depend on the performance of the latter in both screening information sources per expertise and reliability and providing higher visibility to statements of expectations reflecting the interests of their affiliates/subscribers.

Arguably, the risk of a reputational lock-in inducing intermediaries to reflect the hype of their clients appears more likely to occur among industry associations, rather than consultancies or NGOs. However, none of these intermediaries should be presumed immune to the problem.

2.2 Public intermediaries of promise: policy-promise lock-in

Public authorities – both with and without executive roles in policymaking – can be broadly seen as public intermediaries of promise that specialise a part of their resources in the provision of hybrid informational services combining political representation and advice. They do so in compliance with democratic obligations, and thus on behalf of all taxpayers, at least in principle. The satisfaction of taxpayers and, consequently, the reputation of public authorities thus depend on the performance of the latter in both screening information sources per expertise and reliability and representing and protecting the interests of taxpayers as a whole – in principle at least.

Preserving their reputation as a selector is even more important for executive public authorities. More than public authorities with different policy remits,

executive public authorities are directly held to account for their policy-promises towards what may be perceived as appropriate or inappropriate choices of expectations – especially when entailing investments of public resources. In addition to their reputation as a selector of expectations, executive public authorities in particular also respond to technology innovators as reliable stakeholders. The satisfaction of technology innovators, and consequently the reputation of executive public authorities as stakeholders, depends on the fulfilment of previous policy-promises of support. Particularly when dealing with a policy-promise lock-in, executive public authorities may struggle to balance these multiple reputations (see Chapter 4).

A possible risk in terms of hype diffusion is that public intermediaries may defer to overoptimistic expectations of technology innovators when endorsing technological expectations. In deferring in this way, public intermediaries may inadvertently contribute to the diffusion of hyped statements of expectations.

In sum, the risk of voluntary hype should increase whenever the sources of statements of expectations are technology innovators, or intermediaries whose reputation is locked to technology innovators. That said, involuntary hype remains a permanent problem as any actor may fail to appropriately identify hype and thus inadvertently diffuse it. The next section further argues that the risk of dealing with voluntary hype should increase whenever the expectations sought are believed to require information sources with *techno-specific expertise in the technologies*.

3. Techno-specific expertise in the technologies: a higher risk of voluntary hype

Arguably, technology-specific expertise entails the specialisation of resources in that technology. Information sources that invest their resources into developing such expertise are thus technology innovators. As argued before, technology innovators are more prone to voluntarily hype their statements of expectations. Distortions in the form of voluntary hype should thus be more likely in

expectations believed to require information sources mastering *techno-specific expertise in the technologies*. This would implicitly relate to the belief that developing *expertise* grants better access to *key information* and, at the same time, requires the *specialisation of resources* (see Chapter 8).

An example related to biofuels may clarify what I mean by *technology-specific expertise*. Biofuels' potential as a sustainable solution to mitigating climate change by substituting oil in transport is the subject of debate. Such debate involves both expectations on technical issues as well as on the environmental and socio-economic impacts of biofuel technologies. For expectations concerning technology-specific issues, such as projections of cost abatements in biofuel production and/or research outcomes in the newest biofuel technologies, counterparts seek information sources with *technology-specific expertise*. In other words, dealing with that kind of information on technologies is associated with technical knowledge about biofuel innovations and processes. Instead, for expectations concerning environmental and socio-economic impacts of the technologies – such as deforestation, food prices increases or land use changes – counterparts seek information sources with different sorts of expertise – technology-specific expertise being relatively less of a critical requirement. In other words, highly specialised technical expertise on biofuel innovations or production processes is not seen as the primary requirement to estimate the impacts of biofuel feedstock production on food prices, deforestation or land use changes. The next section illustrates the argument developed in this section by means of an example taken from my case study.

3.1 Technology-specific expertise in biofuels and voluntary hype: an example

Take for instance the following statement of expectations:

“In the longer term, second generation biofuel technologies have the potential to reduce pressure on land because they can use a wider range of feedstocks, including waste. However, the Government does not

believe it is feasible to wait for technological improvements before utilising biofuels. It is through stimulating a market for biofuels that we will encourage investment and the development of advanced technology.” (DfT, 2008b, p. 11)

Endorsing this statement implies confidence in the capacity and incentives of current biofuel scientists and industrialists to translate second-generation biofuel technologies from their laboratories to industrial facilities and to replace first-generation biofuels some time in the future. The UK Government has publicly endorsed this statement, while biofuel scientists and industrialists support very similar statements.

Let us now assume that the UK Government, when endorsing the above statement, was driven by the belief that developing *expertise* grants better access to *key information* and, at the same time, requires the *specialisation of resources* (see Chapter 8). The UK Government is then likely to have identified biofuel scientists and industrialists as *key information sources* for its statement because of their specialisation of resources in biofuel technologies. In other words, if assessing the predictive value of the above statement is believed to require expertise in biofuel technologies and their technological performances, biofuel scientists and industrialists are more likely to have been identified as the actors possessing the appropriate techno-specific expertise to conjecture whether that translation is feasible.

However, biofuel scientists and industrialists are technology innovators. Their experience and expertise required investments of considerable resources into biofuel technologies. The value of those investments is likely to maintain value conditional on the successful development of the technology. Such a technological lock-in thus connects the future market survival of biofuel scientists and industrialists to that of their technologies and thus provides them an incentive to promote their technologies for strategic reasons. As argued before, that incentive may eventually induce biofuel scientists and industrialists to promote expectations voluntarily distorted towards optimism in order to seek strategic advantages.

Thus, there is a risk that the statement taken as an example above contains voluntary (and/or involuntary) hype, given its resemblance to the statements supported by the biofuel industry. Whether the benefits of second-generation biofuels would offset all the damage caused by the first generation and whether it is necessary to support first-generation biofuels to favour the transition to second-generation biofuels are still controversial issues. That said, the UK Government has endorsed the statement. By doing so, it has shared what technology innovators have said about the future of their technologies, and thus has endorsed that risk.

More generally, whenever technology innovators are identified as *key information sources* of expectations believed to require technology-specific expertise, *surges of voluntary hype* should be more likely, as the next section argues.

3.2 Technology-specific expectations and surges of voluntary hype

Technology innovators can hire intermediaries specialising in policy representation to extend the range and effectiveness of their promotional effort. These intermediaries specialise in translating statements of expectations into forms more accessible for targeted groups of counterparts on behalf of the technology innovators that sponsor them. Industry associations are an example of such intermediaries. As seen in the consultation, biofuel industrialists hired industry associations as political representatives to target the UK Government.

Industry associations link their own reputation to the successful promotion of statements of expectations on behalf of their clients. Depending on their degree of dependence on their clients, these intermediaries may find themselves directly linked to the market survival of the same class of actor they are representing. If their clients are technology innovators, these intermediaries may eventually become indirectly dependent on the market survival of the technology supported by their clients. In general, the greater the strength of their reputational lock-in with technology innovators, the stronger the link

between the future market survival of these intermediaries and that of the latter and their technology. Thus, besides direct investments in technology development or in developing technology-specific expertise, another factor that can affect an actor's tendency to voluntarily distort statements of expectations is the possible presence of direct or indirect reputational links to the technology. Industry associations are examples of intermediaries closely linked to specific technology innovators. Accordingly, they are likely to share the concerns of their sponsor industries about the future development of specific technologies. In the consultation, the industry associations linked to the first-generation biofuel industry advocated preserving support to currently available first-generation biofuels, attempting to ensure the market survival of their sponsor industry's technology.

The joint effort of technology innovators and their political representatives can eventually inflate bubbles of optimistically distorted statements of expectations, increasing the risk of loss of resources and reputation following their possible burst. As previously mentioned, sociologists of expectations argue that alternating "cycles of hype and disappointments" appear innate in the way in which expectations operate in science and technology (Borup et al., 2006, p. 290). Actors may intentionally create surges of hype to get a hearing and mobilise the interest of other actors (Geels & Smit, 2000, pp. 881-882). As argued above, when doing so, technology innovators may hire political representatives to extend their reach and further inflate hype.

Public authorities are among the actors that technology innovators and their political representatives prefer to target. Executive public authorities in particular can mobilise substantial resources for technological development as well as provide great visibility to the statements they endorse through their publications. All public authorities act as selectors of statements of expectations by technology innovators. At the same time, they act as information sources for taxpayers when providing justifications for their technology policies via official documents. Thus, they effectively operate as public intermediaries between information sources and taxpayers, supposedly on behalf of all taxpayers, at least in principle.

Public authorities may defer to the overoptimistic expectations of technology innovators when endorsing expectations for emerging technologies. Through such deferral, they may eventually amplify optimism about certain technologies and thus increase the risk of future reputational damages and misallocation of resources. This risk is greater for executive public authorities in technology policy, which are held directly responsible for investment of public resources via their policy-promises of support. Given the reputational stakes, all public authorities may be expected to care about the expertise and reliability embedded in statements of expectations to prevent possible ex-post disappointments. To filter – and protect their reputation from – the “noise” created by technology innovators and their policy representatives, public authorities often hire specialist advisory intermediaries. Consultancies are an example of such intermediaries.

Consultancies specialise in screening information sources and producing tailored accounts of statements of expectations matching the informational requirements of clients who look for expert and reliable information on technologies. In the case study analysed, the Renewable Fuels Agency (RFA) commissioned eight consultancies to produce the Gallagher Review. They screened several information sources to come up with reports synthesising the main points of the ongoing debate on biofuels, among which whether second-generation biofuels would solve the problems of first-generation biofuels and whether supporting first-generation biofuels is necessary or counterproductive in favouring the transition to second-generation biofuels.

Taxpayers may not only want to be informed, but also wish to have their voice heard through intermediaries other than public authorities. In order to acquire knowledge and visibility, many individuals and organisations prefer to rely on intermediaries specialising in providing hybrid services, which range from advice to political representation. Examples of these hybrid intermediaries are NGOs, which act as both advisers and political representatives seemingly on behalf of specific groups of clients that are or want to be seen as particularly sensitive to specific issues. In the consultation, NGOs informed and then politically represented their clients concerning specific issues affected by the

continued support for first-generation biofuels, such as deforestation, food price increases and worsening socio-economic conditions in developing countries.

Summing up, actors whose resources and reputations are locked into a technology may voluntarily inflate bubbles of optimistically distorted statements and cause ex-post damages in terms of resources' misallocation and reputation losses. The risk of surges of hype then increases whenever *technology innovators* are seen as *key information sources*. Technology innovators enjoy a privileged position whenever counterparts seek expectations that are believed to require *techno-specific expertise* in their technologies. In that case, technology innovators are likely to be considered experts and, consequently, primary information sources by all other actors. Technology innovators as information sources may then exploit the asymmetries in expertise in their favour and attempt to “lock-in” other actors to their technology via their statements. Catching public authorities and advisers provides technology innovators with greater access to resources, higher visibility and a certain degree of protection from sudden policy changes. When technology innovators have successfully convinced advisers and public authorities to endorse their projections, these latter groups may find it hard to change position in the immediate future as their reputation is linked to those projections. This is especially true for executive public authorities. Their endorsement of the techno-expectations of incumbent technology innovators – and subsequent translation into policy-promises of support – may eventually result in a policy-promise lock-in. This policy-promise lock-in may then induce and/or be used as justification to preserve support for incumbent technologies – even when these have become controversial – supposedly to favour techno-scientific advancement in preferable emerging technologies. This situation would benefit – and is likely to be sought by – incumbent technology innovators, at least in the short term.

4. Final remarks and recommendations for further research

In the introduction to this dissertation, I stated that a key empirical contribution of my research is an explanation of how the UK Government's responsibilities towards technology policies have affected the construction of its vision of the future. Through the lens of the sociology of expectations, my analysis highlighted the linkage made between the UK Government's "reputational sunk costs" in first-generation biofuel suppliers and future techno-scientific advance in second-generation biofuels (see also Berti & Levidow, 2014). More specifically, the UK Government was constrained by several imperatives: its EU obligations, its dependence on a new-born UK biofuel industry necessary for fulfilling them and its need to establish credible incentives for its technology policy. Given its EU obligations, the UK Government's dependence on first-generation biofuel suppliers drove policy-promises to that industry, thus imposing "reputational sunk costs" on the Department for Transport (DfT) (Dunlop, 2010, p. 354). Those reputational stakes were linked to techno-scientific advance through expectations for second-generation biofuels. The UK Government's endorsement and promotion of those expectations justified short-term support for incumbent biofuels, but potentially resulted in a lock-in (Van Lente & Rip, 1998a, p. 217). Such linkage complements insights from previous analyses of UK biofuel policy (Dunlop, 2010; Palmer, 2010; Boucher, 2012).

Contributing more broadly to the literatures on technology policies, this investigation unveiled how executive public authorities may find themselves facing a policy dilemma over distributing support across technological niches. More specifically, a dilemma may emerge over whether preserving support to controversial, incumbent niches should be considered a transitional requirement – or a counterproductive measure – to promoting development in preferable, emergent niches.

I have shown how the first view above relates to an underlying rationale specific to executive public authorities in technology policy – i.e. fulfilling previous policy-promises of support to incumbent technological niches is a requirement to maintain credibility in the eyes of current and prospective technology innovators in emerging technological niches. Such credibility is essential to ensure the effectiveness of future technology policy in mobilising current and prospective

technology innovators. This linkage between reputational stakes and technoscientific advancement has been theorised here as a policy-promise lock-in when previous policy-commitments to technology innovators of incumbent technologies have become controversial. Potentially driven by several imperatives, these controversial policy commitments are officially justified as necessary for the development of preferable emerging technologies.

When dealing with a policy-promise lock-in, executive public authorities may delay a full redirection of support from incumbent to emergent technologies, despite the fact that support for the former has become controversial. This may be interpreted as contradicting or in line with the logics of promise-requirement cycles whereby support ought to be redirected from “old” and “obsolete” to “new” and emerging technologies, especially when incumbent technologies have failed to fulfil their initial expectations (Van Lente, 1993, p. 167; Van Lente & Rip, 1998a, pp. 216, 222-223; Van Lente, 2000, p. 60; 2006, p. 215). When seen as a transitional requirement, such a delay would appear to be in line with the logics of promise-requirement cycles. When seen as leading to a socio-technical regime in which incumbent technologies prevent the development of emerging technologies, such a delay would appear instead to contradict those logics.

Executive public authorities dealing with a policy-promise lock-in may endorse and promote expectations for emerging technologies accordingly. A policy-promise lock-in would then be one possible situation in which executive public authorities appear to act as “promise champions” for a technological field – as previously observed in other technology policy contexts (Van Lente, 1993, p. 160; Van Lente & Rip, 1998b, pp. 231-232). However, in deploying expectations, their primary imperatives seem to be protecting their reputation in technology policy, avoiding responsibility for any disappointment regarding technological development and promoting technology development per se. When endorsing expectations on biofuel technologies and policies, the UK Government seemingly deferred to the expectations of the incumbent biofuel industry – as in other policy contexts in which the UK Government appears to have deferred to industrialists’ arguments (Eames et al., 2006, pp. 367-368;

Beynon-Jones & Brown, 2011, p. 647). Given the kind of evidence analysed, my analysis cannot reveal whether and how much voluntary and/or involuntary hype is hidden in those expectations. However, on the basis of all the observations and considerations made, this risk that should not be dismissed. Against the risk of endorsing hyped expectations, executive public authorities may benefit from interacting with other public authorities that act uniquely as selectors of expectations – i.e. those that monitor policymaking on behalf of taxpayers as a whole and are less involved with incumbent industries. These selectors of expectations would set a benchmark for executive public authorities to calibrate their double nature as selectors and stakeholders. This would eventually increase their chances of striking the right balance between the interests of technology innovators and those of the rest of taxpayers. According to this view, the decision of the current UK Government to close down the Royal Commission on Environmental Pollution in March 2011 has perhaps helped improve public finances in a time of economic crisis, but has hardly improved the balance of interests in any debate on sustainability in the UK.

The UK Government's vision on biofuel policy has stirred up disagreements. These disagreements concern the three expectations sustaining it: (1) that emerging second-generation biofuels will overcome the drawbacks of incumbent first-generation biofuels; (2) that future sustainability standards will be effectively implemented and capable of containing the damages of both first- and second-generation biofuels; and (3) that current support for first-generation biofuels will stimulate current and prospective investors to develop second-generation biofuels. As has been seen, this last expectation has been the most controversial, with stakeholders strongly disagreeing with the underlying rationale interlinking the UK Government's reputational stakes on first-generation biofuel industry with techno-scientific advancement in second-generation biofuels. The UK Government is still supporting these expectations and rationale. The first-generation biofuel industry has promoted this rationale and most of the above expectations. NGOs and Parliamentary Select Committees have instead firmly rejected the rationale, though partially endorsing the other expectations. These observations seem to partially confirm past trends as observed by other analysts in the second and third consultations

on biofuel policy, in which the UK Government seemingly privileged the interests of the biofuel industry over the concerns of NGOs (Upham & Tomei, 2010, pp. 3-5, 10-11; Upham et al., 2011, p. 2673). Yet the UK Government promised and delivered support for first-generation biofuels below EU targets and the biofuel industry's demands. By 2008, UK biofuel targets were also explicitly referred to as "cautious", and were eventually delayed in 2009 (DfT, 2004c, p. 2; 2008e, Section 2; 2008b, p. 7). This seems to suggest that the UK Government did not completely dismiss NGOs' concerns and policy opposition to first-generation biofuels, as previously suggested by other investigators of the case (Pilgrim & Harvey, 2010, Paragraphs 4.17-4.18). Following previous analyses of stakeholders' opinions on UK biofuel policy, my analysis investigates the fourth consultation on UK biofuel policy using a distinctive perspective focused on expectations, and reconciles previous interpretations of the UK Government's decisions to partially marginalise NGOs' views and enforce a slowdown of the Renewable Transport Fuel Obligation (RTFO). Those decisions are here interpreted as efforts to preserve the government's credibility and legitimacy in the eyes of both technology innovators (Upham & Tomei, 2010, pp. 3-5, 10-11; Upham et al., 2011, p. 2673) – since current support was effectively preserved against calls for a policy moratorium – and biofuel critics (Pilgrim & Harvey, 2010, Paragraphs 4.17-4.18) – as current support was further reduced and justified primarily in relation to the development of second-generation biofuels.

The research method I deployed in my research could be applied to conduct similar analyses of other EU Member States or to scale up the analysis at the EU level. Though not appropriate for producing statistical generalisations, case studies remain a powerful research method to draw context-contingent generalisations with a high degree of explanatory power in relation to the specific case under analysis (Hartley, 2004, pp. 323-336; George & Bennett, 2005, pp. 19-23; Gerring, 2006, pp. 39-43; Yin, 2013, pp. 5-15). In my investigation, the case study method proved to be the appropriate choice for exploring, describing and deriving explanatory concepts from a single case study – i.e. the UK Government's endorsement of its current vision on UK biofuel policy (Yin, 2003, pp. 5-6; 2013, pp. 7-8). Thanks to the flexibility of this

research method (George & Bennett, 2005, pp. 19-22; Gerring, 2006, pp. 39-43), my research derived insights into the case that refined previous explanations of UK biofuel policy, and the theoretical framework deployed in the analysis. As a follow up to my analysis, case studies on other EU Member states would provide a base upon which to conduct comparative studies and shed light on cross-national differences in biofuel policy developments within the EU. With such a base, it would also be possible to test the generalisability of the context-contingent generalisations I drew from my analysis (Yin, 2013, pp. 53, 61). The case study method could also be applied to European policymaking institutions. This would help confirm whether EU biofuel policy is also affected by a policy-promise lock-in. More generally, the research design deployed in my investigation could be applied to other technological contexts to verify whether policy dilemmas over distributing support between controversial and incumbent versus preferable and emergent technological niches are general phenomena or peculiar to UK biofuel policy.

In the introduction to this dissertation, I also stated that a key theoretical contribution of my research was expansion of the relatively narrow focus of the sociology of expectations on technology innovators. My analysis focused on types of actor that have mostly been neglected in that literature, such as, notably, the government, but also other public authorities as well as industry associations, consultancies and NGOs. Complementing previous analyses in the sociology of expectations, my analysis investigated these types of actor through a distinctive analytical perspective that looks at their functional roles and interrelations when diffusing expectations among different parties. To emphasise their roles in mediating expectations on behalf of third parties, I defined these types of actor as private and public intermediaries of promise. The definitions of private and public intermediaries of promise only provide a starting point for a deeper analysis of the role played by the various types of actor that mediate expectations where technology policies are debated. Such definitions nevertheless prompt one to consider the importance of a number of issues that are still marginal within the literature of the sociology of expectations. More specifically: (1) how specialisation of resources influences the diffusion of expectations, (2) the performative role of intermediaries of

promise in providing visibility to expectations and, (3) the role played by reputation as collective expectations in reinforcing the performativity of expectations on technologies and policies. All these issues are grounded in the acknowledgement that visibility is an essential element for statements of expectations to become performative.

In a world in which it is impossible to obtain all the relevant information at the right time – or, in economic terms, where access to information is imperfect – visibility is power. In such a world, intermediaries specialise in the provision of informational services that reduce the costs of searching and advertising for information sources and counterparts. Through these services, intermediaries increase the visibility of specific information sources and their statements of expectations. Industry associations specialise their resources in increasing the visibility of specific statements on behalf of their industrial sponsors. Consultancies specialise in screening statements from different sources on behalf of grant-providers that mostly look for expert and reliable information. NGOs specialise their resources in informing about and increasing the visibility of statements related to specific socio-political issues and do so on behalf of their affiliates/subscribers – in principle at least. Public authorities select statements from various sources and use them to legitimise their opinions on policies, on behalf of all taxpayers, at least in principle. Through their activities, all these intermediaries eventually increase the visibility of the statements of expectations that they select, reformulate and re-present to interested parties. In a way, intermediaries – although in different ways, to different audiences and on behalf of different actors – may all be interpreted as dealers of visibility. By making specific statements more visible, intermediaries increase the chances of those statements becoming widely accepted and shared, and thus becoming influential and performative.

In the words of Pollock and Williams, “By assembling the organizational machinery” for disseminating successful statements and for dealing with those that are more “problematic”, “promissory organisations create themselves as centres of power” (Pollock & Williams, 2010, p. 8). In light of what previously discussed, Pollock and Williams’ claim may be reinterpreted and rephrased as:

“by specialising resources and expertise in collecting, reformulating, and re-presenting statements of expectations, intermediaries create themselves as centres of power, and manage it by influencing the visibility of those statements” – i.e. by making their diffusion more successful. Like promissory organisations, intermediaries such as industry associations, consultancies, NGOs and public authorities can all be seen as playing an important role in increasing the performativity of selected statements of expectations by making them more visible.

In providing these informational services, intermediaries of promise abide by the logic of building and maintaining reputation. Reputation, understood as encompassing expectations on the expertise and reliability of specific information sources, plays a crucial role in the mutual identification between information sources and counterparts. A positive reputation makes information sources and their statements more visible and more likely to be trusted by counterparts. Like any other information source, intermediaries themselves depend on reputation for their own visibility and rely on it to exert their power. Reputation may then be interpreted as another set of expectations, which combine with and reinforce the performativity of statements of expectations on technologies and policies, by providing more visibility to their information sources. Interestingly, within the sociology of expectations, reputation seems to have no explicit role in the mutual recognition between technologists and the rest of society – or among different types of actor, let alone in driving actors to strategic behaviours aimed at building or maintaining it. From the few insights on reputation currently available in the literature, reputation still appears to be primarily conceptualised as a sort of deterrent for the enunciation and/or endorsement of strategically hyped or genuinely overoptimistic expectations as these may lead to misallocations of resources and reputation damages.

The observations and reflections I have made during my research open up future research avenues. At the theoretical level, sociologists of expectations may engage in a deeper reflection on the importance of gaining visibility in a world characterised by imperfect information. Future analyses could further extend the investigation of the interrelations between expectations on

technologies and policies and expectations on the expertise and reliability of their sources – e.g. how these latter affect the visibility of the former, thus catalysing their dynamics and performativity. At the empirical level, the investigation may then combine analyses of expectations on technologies and policies with analyses of the signals that their sources send on their expertise and reliability. This would help refine the theoretical insights here discussed into the roles played by reputation and intermediaries of promise in providing visibility to expectations on technologies and policies and, thus, further increase the interpretative power of the framework of the sociology of expectations. My contention is that these issues should not be neglected by scholars interested in studying the social dynamics underlying the dissemination of expectations. Rather, I see these issues as crucial to the future development not only of the sociology of expectations, but of science and technology studies as a whole.

Appendix 1

This appendix provides further details on how the UK Government publishes official documents and launches public consultations via its departments. It also describes the formal procedures that characterise the official correspondence among the Royal Commission on Environmental Pollution (RCEP), the Environment, Food and Rural Affairs Committee (EFRAC), the Environmental Audit Committee (EAC) and the UK Government.

1. The UK Government and its official documents

UK Government departments issue “Departmental Papers” and “Command Papers” with the formula “by Command of Her Majesty” (House of Commons Information Office [HoC IO], 2010, p. 3; The Stationery Office [TSO], n.d.). These official documents are generally referred to as “green papers” or “white papers” and usually include detailed accounts explaining the reasons and justifications for specific policy proposals or statements of policy.

Green papers and white papers are labels lacking a clear and formal definition. However, over the years, it has become accepted that green papers are proposals published with the intent of initiating a public debate, while white papers are announcements of more definite statements of policy (HoC IO, 2010; TSO, n.d.). More specifically, a green paper would be an invitation for stakeholders to take part in a consultation. The purpose of a consultation would be to provide the UK Government with useful insights on its own policies. Those insights are supposed to help the UK Government produce an effective set of statements of policy. After the revision of the responses to the green paper, a white paper may follow. A white paper consists of a more defined set of statements of policy, which are made public to allow a further stage of pre-legislative scrutiny. Therefore, green papers are released with the intention of gathering knowledge from stakeholders in relation to the announcement of

specific policy proposals, while white papers are released with the intention of testing reactions to more definite statements of policy. That said, the publication of a green paper is not a prerequisite to issuing a white paper, which can be published in isolation and need not be preceded or followed by an open consultation (HoC IO, 2010, pp. 10-11).

The decision about whether to conduct a formal consultation or adopt other methods to seek inputs from interested parties is at the discretion of government departments. When it has been decided to run a formal, written, public consultation exercise, government departments should abide by the *Code of Practice on Consultation*. Introduced in 2000, the code is not legally binding and cannot prevail over statutory or mandatory requirements (Department for Business Enterprise and Regulatory Reform [BERR], 2008, p. 5). If government departments choose not to proceed with a formal consultation or to deviate from the code, they are encouraged to clarify the reasons for their decision (BERR, 2008, pp. 5-6).

At some stage, the policy proposals set out in green and/or white papers are translated into primary legislation with the submission of a draft bill to Parliament. Following the instructions of the government department concerned, a team of lawyers in the Parliamentary Counsel Office (within the Cabinet Office) proceeds with the drafting of the bill. Bills may also be published beforehand in draft form to allow further parliamentary scrutiny (House of Commons Library [HoC Library], 2010, pp. 10-11). The practice of publishing draft bills for pre-parliamentary scrutiny is relatively new. Conservative administrations first introduced the pre-legislative scrutiny of draft bills in the late 1980s. However, it became an established practice after the election of the Labour Government in 1997 (HoC Library, 2010). Once a bill passes through both Houses of Parliament, it receives royal assent and becomes an Act (HoC Library, 2010, p. 11). The choice of whether to submit a proposed bill to pre-legislative scrutiny by publishing beforehand a green paper (i.e. consultative) and/or a white paper (i.e. statement of policy) on the same subject remains at the discretion of the UK Government. It can even choose to present a bill to Parliament without any prior public announcement (HoC IO, 2008, p. 3).

2. The Royal Commission on Environmental Pollution

Established in 1970 “to advise the Queen, Government, Parliament, the devolved administrations and the public”, the RCEP was an independent standing body funded by the Department of Environment, Food and Rural Affairs (Defra) (RCEP, 2011, March 22). Defra was responsible for selecting the members of the RCEP, who were drawn from a variety of backgrounds, ranging from academia to industry to public life. Members’ expertise and experiences covered disciplines such as science, medicine, engineering, law, economics and business. The initial term for a newly elected member was three years. Every member was selected through an open competition and could serve up to three terms. Every member was required to declare whether there might be any interests that could conflict with their role as commission members (RCEP, 2011, March 22). The current UK Government formally closed the RCEP in March 2011 (Vaughan, 2010; RCEP, 2011, March 22).

Reports of the RCEP were “virtually” considered “Command Papers” (HoC IO, 2010, p. 4). The UK Government was neither obliged to accept the RCEP’s recommendations, nor to act upon them. However, it was an established practice for the UK Government to respond formally and explicitly to the RCEP’s reports. The formality of the response process reflects the importance the UK Government gave to the RCEP’s advisory role (Ferguson & Skinner, 2002, p. 48).

3. The Environment, Food and Rural Affairs Committee, and the Environmental Audit Committee

The Environment, Food and Rural Affairs Committee (EFRAC) and the Environmental Audit Committee (EAC) are Select Committees of the House of Commons. EFRAC examines the expenditure, administration and policy of Defra and its affiliated public bodies (EFRAC, n.d.). Established in 1997, the

EAC scrutinises policies and programmes across all government departments and non-departmental public bodies (NDPBs) regarding their contribution to environmental protection and sustainable development. It also audits their performance against sustainable development and environmental protection targets (EAC, n.d.). In 2005, the EAC decided to focus on climate change in recognition of the urgency of the threat (HoC IO, 2009, p. 6).

Select Committees decide upon their own subject of inquiry within the scope of their remits. Inquiries may focus on several areas, including topical issues, departmental spending and the scrutiny of draft bills. Once the subject of inquiry has been chosen, Select Committees announce a forthcoming report via press notices and launch a call for evidence (HoC IO, 2009, p. 4). Once the evidence-gathering phase is concluded and the final draft of the report is agreed by members, Select Committees publish their report and make them publicly available in their websites. The government departments addressed by the reports of Select Committees are expected to reply formally within 60 days. Select Committees normally publish the responses received from the UK Government as *Special Reports*. In their responses, government departments respond in name of “the Government”. They may also decide to respond to a Select Committee report by publishing a white paper. In Special Reports, Select Committees may include their counter-response to the UK Government’s response or white paper (HoC IO, 2009, p. 5). Noteworthy features of Select Committees are their members’ composition and their consensus-based approach in conducting inquiries. Members of Selects Committees are drawn from the governing and opposition parties to reflect the composition of Parliament and tend to adopt decisions unanimously (HoC IO, 2009, pp. 2, 3, 5). In the aftermath of the national election of 6th May 2010, the EAC and EFRAC were reappointed with new members reflecting the composition of the newly elected House of Commons.

Appendix 2

This appendix compares the lists of stakeholders that the Department for Transport (DfT) declared it had invited directly to participate in all four biofuels consultations. More specifically, it compares the lists for all four consultations as published in the invitation documents (DfT, 2004b, Annex E; 2007b, Annex D; 2007a, Annex J; 2008a, Annex C) with those published in the following summaries of responses (DfT, 2004a, Introduction; 2007d, p. 3; 2008d, Introduction; 2009c, p. 1).

1. Comparison of the DfT's lists of stakeholders

According to the summary of responses of the first consultation, a list of “nearly 100 stakeholders” (DfT, 2004a, Introduction) was used to directly invite specific organisations. In this consultation, the DfT received a total of 129 responses (DfT, 2004a, Introduction), 79 of which from organisations (DfT, 2004a, Annex A). However, the “Stakeholder Consultee List” published in the invitation document of the consultation contains only 60 organisations (DfT, 2004b, Annex E).

According to the summary of responses of the second consultation, the invitation document was “sent electronically to about 400 stakeholders” (DfT, 2007d, p. 3). In this consultation, the DfT received 85 responses from organisations (DfT, 2007d, Annex A) and 6,270⁶³ responses from members of the public⁶⁴ (DfT, 2007d, p. 3). The list of directly invited stakeholders published in the invitation document contains only 235 organisations (DfT, 2007b, Annex

⁶³ As reported by the DfT: “The 6,270 replies from members of the public focused on their concerns about the environmental impacts of the feedstock production that would be required to meet the biofuel demand created by the RTFO. In particular, more than 5,000 of these were prompted by the press advertising campaign run by a coalition of NGOs highlighting the dangers of uncontrolled biofuel cultivation in sensitive environmental habitats in SE Asia” (DfT, 2007d).

⁶⁴ There is a drafting error here as the number of total answers reported in the Summary of Responses is 6,335. The 6,270 members of the public added to the 85 organisations makes a total of 6,355.

D). This latter list includes most of the organisations listed in the invitation document of the previous consultation.

According to the summary of responses of the third consultation, the invitation document was “sent electronically to approximately 400 stakeholders” (DfT, 2008d, Introduction). In this consultation, the DfT received 54⁶⁵ responses in total. The summary of responses of this consultation does not include a list of respondents. The list of directly invited stakeholders published in the invitation document contains only 244 organisations (DfT, 2007a, Annex J). This latter list almost coincides with the one published in the invitation document of the previous consultation.

According to one of the two summaries of responses for the fourth consultation, the invitation document was, again, “sent electronically to about 400 stakeholders” (DfT, 2009c, p. 1). In this consultation, the DfT received a total of 89 responses, among them 68⁶⁶ from organisations (DfT, 2009c, Annex A; 2009d, Annex A). The list of directly invited stakeholders published in the invitation document contains 241 organisations (DfT, 2008a, Annex C), and almost coincides with the list published in the invitation documents of the two previous consultations.

Thus, according to the total numbers of organisations that the DfT declared it had directly invited, a list of circa 100 organisations was used in the first consultation, while lists of circa 400 organisations were used in the following consultations.

⁶⁵ I reconstructed a list of respondents through the analysis of the original responses. The original responses I received from the DfT numbered 50 (not 54), all from organisations.

⁶⁶ There is a drafting error in the Summary of Responses: the total responses is 89, the number of “members of the public” is 22, and the total organisations listed by name in the Annex A is 68. These numbers do not add up.

Table 3: biofuel consultations – stakeholders directly invited				
Biofuel Consultations	1 st : 26/04/2004	2 nd : 22/02/2007	3 rd : 21/06/2007	4 th : 15/10/2008
Stakeholders directly invited according to:				
- invitation document (listed name by name)	60	235	244	241
- summary of response(s) (only declared as total indicative number)	circa 100	circa 400	circa 400	circa 400
- Number of responses received:				
- in total	129	6,335 (a)	54	89
- from organisations	79	85	54	68
(a): There is a drafting error as the number of total answers reported in the Summary of Responses is 6,335. The total of 6,270 members of the public added to the 85 organisations is 6,355.				

Appendix 3

This appendix reports the questions of the consultation under analysis – i.e. Renewable Transport Fuel Obligation (Amendment) Order 2009 (DfT, 2008a)

1. Part One – Future Levels under the RTFO

Question 1: Do you agree or disagree that if the obligation levels were left unchanged at 3.75 per cent for 2009/10 this would only have a marginal impact on the amounts of bioethanol used by obligated suppliers to meet their obligation in that period?

Question 2: Do you agree or disagree that the obligation levels should be left unchanged?

Question 3: Do you agree or disagree with freezing the obligation level at 2.5 per cent?

Question 4: Do you agree or disagree that the rate of increase in the RTFO should be adjusted in line with Professor Gallagher's recommendations?

Question 5: Do you agree or disagree that agreed mandatory sustainability criteria would benefit both bioethanol and biodiesel producers in the UK?

Question 6: Do you agree with the costs as set out in the Impact Assessment?

Question 7: Do you agree or disagree that the definitions in the draft amending order at Annex B for biobutanol and renewable diesel are appropriate?

Question 8: If HPRD is made an eligible fuel, do you agree or disagree that a minimum proportion of it should be attributable to renewable sources? If you agree, what would be a suitable level, for example, 5 per cent?

Question 9: Do you agree or disagree that the volume of biomass fed into the processing unit is the appropriate way to measure the volume of HPRD which is attributable to biomass?

Question 10: Do you have views as to whether it is technically possible and practical to identify accurately the part of HPRD which is derived from biomass? If so, would this represent a better way forward than designating HPRD as a

whole as a renewable transport fuel and issuing certificates only for that proportion of it which is attributable to biomass?

Question 11: Do you agree or disagree that if it is possible to legislate in order to add HPRD (or a part of HPRD) to the list of eligible fuels under the RTFO during the 2009/10 obligation period, this would be preferable to waiting until the revision of the RTFO order to implement the RED?

Question 12: Do you have views about how the production of these new fuels might encourage the use of certain feedstocks, and are there additional sustainability issues that arise?

Question 13: Do you have any other comments on the draft order at Annex B?

2. Part Two – Longer term issues related to transposition of the European Directives

Question 14: Do you agree or disagree that an amended RTFO scheme should be the principal mechanism to deliver biofuels to help meet the requirements of the Renewable Energy Directive?

Question 15: What would be an appropriate mechanism to address other renewables for transport, eg electricity?

Question 16: What would be a suitable mechanism to implement the requirements to reduce greenhouse gas emissions in transport in the FQD, bearing in mind that such a mechanism might need to encompass not only the contribution made from renewable fuels but also other ways of reducing emissions such as reduced flaring, carbon capture etc?

Question 17: Would the double rewards proposed under the RED be adequate to encourage second generation biofuels?

Question 18: What other mechanisms could better encourage the development of second generation biofuels?

Question 19: – Do you agree or disagree that this is the right course of action with regards to tallow?

Question 20: Taking into account the requirements of both draft Directives, are there any other issues which need consideration when we transpose these into UK legislation?

Appendix 4

This appendix provides a synthetic account of the biofuel industrial contexts of the consultation under analysis.

1. Biofuel industry context in the UK

The Renewable Transport Fuel Obligation (RTFO) came into effect on the 15th April 2008. The RTFO identified refiners and importers of fossil fuels for transport supplying at least 450,000 litres per obligation year as “obligated suppliers” (RFA, 2010, p. 8). Obligated suppliers were required to supply increasing annual rates of biofuels calculated on the total of transport fossil fuels they had supplied in each obligation year. Under the 2007 Order (UK Parliament, 2007), the obligation levels were set at 2.5% for 2008/09, 3.75% for 2009/10 and 5% for 2010/11 – all calculated on volume basis (DfT, 2006, p. 3). The RTFO also enforced a reporting scheme with carbon and sustainability targets to benchmark the level of performance that the UK Government expected from obligated suppliers over the obligations years – also in view of the forthcoming EU mandatory system of sustainability standards. However, obligated suppliers were only required to report on, not certify the sustainability of, the biofuels used. Furthermore, the carbon and sustainability targets were not mandatory and there was no penalty for failing to meet them (RFA, 2010, p. 20).

The Renewable Fuels Agency (RFA), a small non-departmental public body funded by the Department for Transport (DfT), was created to administer the RTFO. The RFA was in charge of verifying and awarding RTFO certificates to the biofuels supplied by both biofuel producers and obligated suppliers. Obligated suppliers were obliged to accumulate enough certificates to match the obligation levels as prescribed by the increasing annual rates of the RTFO. They could do so by self-producing biofuels, buying biofuels domestically or

abroad, buying biofuel certificates from biofuel producers or other obligated suppliers, or paying a buyout price as set by the RTFO.

One of the aims of the RTFO was to promote the development of a UK-based biofuel industry. Before the introduction of the RTFO, financial support for biofuels was granted through fuel duty discounts, since 2002 for biodiesel and 2005 for bioethanol. These discounts proved insufficient to upgrade the small-scale UK biofuel industry to a larger scale, driving multinational suppliers of transport fossil fuels to import cheaper biofuels from international markets. The RTFO was supposed to overcome the drawbacks of fuels duty discounts. The creation of a certificate market was meant to provide small-sized UK biofuel producers with a secure demand (from obligated suppliers) to trade out the certificates they could obtain by submitting their biofuels to the RFA (DfT, 2006, p. 3).

Nevertheless, in the first year of the RTFO – obligation year 2008/2009 – the market of certificates collapsed. Multinational suppliers of transport fossil fuels – now obligated suppliers – continued to self-produce or outsource their biofuels internationally (see Tables 2 and 3). Of over 1,250 million certificates awarded in total, only 164 million certificates were traded, 155 of them among obligated suppliers only. Biofuel-only producers were able to trade away just over 9 million certificates only – mostly to obligated suppliers (RFA, 2010, pp. 18-19). According to the RFA's report on the 2008/09 obligation year,

“The scarcity of small trades indicates that most of the biofuel-only suppliers did not access the 2008/2009 certificate market, and therefore did not, to October 2009, realise any financial benefit from reporting under the RTFO.” (RFA, 2010, p. 19)

In the first obligation year, the RTFO thus failed to set up a certificate trading system capable of supporting small-scale UK biofuel producers, as these latter could not sell their certificates and only survived thanks to the still-enforced fuel duty discounts on biofuels.

Obligated suppliers were the most legally compelled by UK biofuel policy. They were obliged by the RTFO to blend increasing amounts of biofuels into their transport fossil fuel supplies and to report on the sustainability of the biofuels used to fulfil the obligation. Their core business was producing-refining and/or trading transport fossil fuels on a large scale. Although some were also large-scale producers of biofuels, their involvement with UK biofuel policy was mostly related to the investments previously made and currently planned to respond to the RTFO requirements. Belonging to a marginal business compared to their core, these investments were nonetheless rather consistent.

Biofuel-only producers were the most financially dependent on UK biofuel policy. Their economic viability crucially depended on the financial support provided by the UK Government. Their core business was the production of biofuels. The majority of UK biofuel-only producers were small- to medium-sized producers of biodiesel from used cooking oils (UCO). Among the 38 biofuel-only companies that submitted biofuels to the RFA in the obligation year 2008/2009, 32 submitted biodiesel only or mostly produced from UCO, making up 85% of the biofuel supplied by UK domestic suppliers. Biofuels from UCO automatically met the Qualifying Standards Level of sustainability since it was classified as a by-product (waste) and, therefore, was considered to deliver high GHG savings while not causing direct or indirect land-use-change (RFA, 2010, p. 25).

The above considerations support the case to consider obligated suppliers as a distinctive group with respect to biofuel producers. They differ not only in their business core, but also in their approach to biofuel trading/production, with biofuels produced from different technologies and feedstocks. Besides, in the obligation year of the fourth consultation, obligated suppliers did not undertake any relevant commercial transactions with biofuel producers.

In the obligation year 2008/09, there were seven medium-large plants in operation in the UK, two more under construction and another seven planned (NNFCC, 2009) (see also Tables 5 and 6). The biofuel producers participating in the consultation and owning-constructing-planning the construction of biofuel plants were:

- a first biofuel producer (Argent), which owned one medium-large biodiesel plant in operation;
- a second biofuel producer (Ensus), which owned a large bioethanol plant under construction;
- a third biofuel producer (Vireol), which was planning the construction of two large-scale bioethanol plants; and
- a fourth biofuel producer (British Sugar), which owned the only bioethanol plant in operation and whose the core business was the production of sugar (included among biofuel producers because it not an obligated supplier).

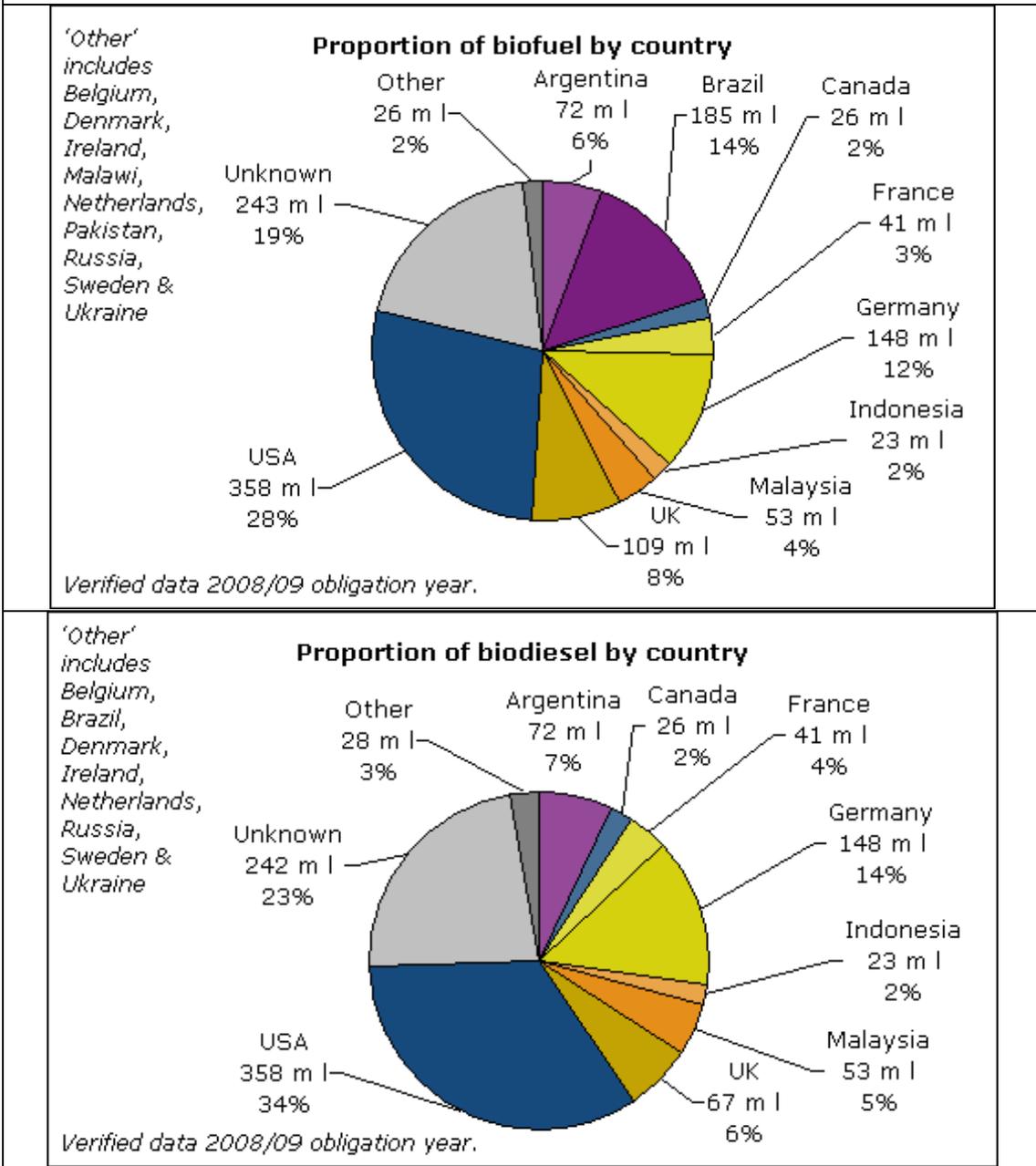
The obligated suppliers participating in the consultation and owning-constructing-planning the construction of biofuel plants were:

- an obligated supplier (British Petroleum), which was collaborating with the sugar supplier above on the construction of another large-scale bioethanol plant; and
- an obligated supplier (Greenergy), which owned two large-scale biodiesel plants in operation.

Graph 7: biofuels used to fulfil the RTFO in the UK: country of origin

I retrieved the graphs below from the Renewable Fuels Agency website.

Source: RFA verified data set for Year One of the RTFO (RFA, 2011, April 10)



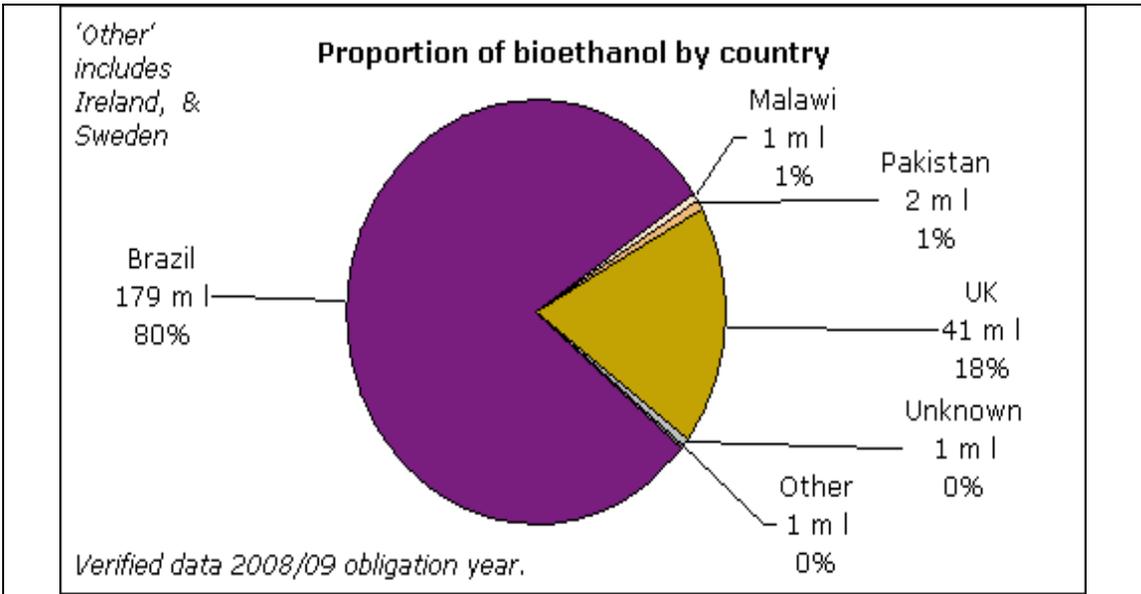


Table 4: biofuel supplies to the UK from 1999/2000 to 2008/2009

I constructed the table below using data taken from the Hydrocarbon Oils Bulletin of August 2009 provided by HM Revenues & Customs. The biodiesel supply has outstripped the bioethanol supply both because biodiesel was granted a fuels discount from July 2002, while bioethanol waited until January 2005, and because in general the biodiesel supply can be more easily integrated into the existing infrastructure (RFA, 2010, p. 16). The table below shows biofuel clearances since they began in 2002.

Unit: Million Litres	Petrol		Diesel		Total		Biofuels as % Total Petrol and Diesel (ii)
	Bioethanol Total Petrol	Bioethanol s % Petrol share	Biodiesel and Bioblended (i)	Total Diesel	Biodiesel as % Diesel Share	Total Petrol and Diesel	
Financial Year							
1999/00	0	28,640	0.00%	0	18,295	0.00%	0.00%
2000/01	0	27,532	0.00%	0	18,493	0.00%	0.00%
2001/02	0	28,229	0.00%	0	19,113	0.00%	0.00%
2002/03	0	27,837	0.00%	5	20,102	0.02%	0.01%
2003/04	0	27,407	0.00%	22	21,230	0.10%	0.04%
2004/05	14	26,555	0.05%	21	22,395	0.10%	0.07%
2005/06	90	25,541	0.35%	49	23,499	0.21%	0.28%
2006/07	107	24,530	0.44%	220	24,545	0.90%	0.67%
2007/08	170	23,897	0.71%	365	25,844	1.41%	1.08%
2008/09	208	22,312	0.93%	1,026	25,335	4.05%	2.59%
notes:	(i)	Data show only the proportion of the fuel liable at the biodiesel duty rate					
	(ii)	Not including Road Fuel Gases (Natural Gas/LPG)					
Source: HM Revenue & Customs – Hydrocarbon Oils Bulletin – August 2009							

Table 5: obligated suppliers participating in the consultation

I constructed the table below using data taken from a variety of sources. Unfortunately, official sources do not contain exhaustive and precise information. Sources: consultation responses; organisations' websites; (BERR, 2003; NNFCC, 2006; BERR, 2007; NNFCC, 2008c; 2008a; DECC, 2009b; NNFCC, 2009; 2010)

	Nationality	Biofuel Type submitted to RTFO	Biofuels Plants Number	Biofuel Type	Stage	Capacity	Location	Research 2nd Gen biofuels
7 Obligated Suppliers								
4 ONLY Traders and Distributors of Transport Fossil Fuels & Biofuels NOT biofuels producers								
Mabanaft	Germany	BD+BE	0	N/A	N/A	N/A	N/A	N/I
Shell UK	UK/NL	BD	1	2nd Gen - BE	demonstrational	1 MLPY	Canada	Yes
			1	Biogasoline	demonstrational	0.038 MLPY	USA	
Chevron	USA	BD	0	N/A	N/A	N/A	N/A	Yes
ConocoPhillips	USA	BD	1	BD	demonstrational	N/I	Ireland	Yes
			1	BD	demonstrational	N/I	USA	
3 ALSO Biofuels Producers current or prospective								
Greenenergy	UK	BD+BE	1	BD	operational	100,000 TPA	UK	Yes
			1	BD	operational	100,000 TPA	UK	
Ineos (on behalf of Morgan Stanley Capital Group)	UK	BD	1	BD	operational	110,000 N/I	France	Yes
			1	BD	planned	500,000 TPA	UK	
British Petroleum	UK	BD+BE	1	BE	under construction	320,000 TPA	UK	Yes
			1	BE	operational	435 MLPY	Brazil	
LEGEND:								
BE - bioethanol	TPA - tonnes per annum							
BD - biodiesel	MLPY - million litres per year							
N/A - not applicable	MW - megawatt							
N/I - no information found either in consultation response or websites								

Table 6: biofuel producers participating in the consultation

I constructed the table below using data taken from a variety of sources. Unfortunately, official sources do not contain exhaustive and precise information. Sources: consultation responses; organisations' websites; (BERR, 2003; NNFCC, 2006; BERR, 2007; NNFCC, 2008c; 2008a; DECC, 2009b; NNFCC, 2009; 2010)

12 Biofuels Producers	Nationality	Biofuel Type submitted	Biofuels Plants Number	Biofuel Type	Stage	Capacity	Location	Research 2nd Gen biofuels
9 Biofuels-only Producers biofuels prod. =core business								
Argent	UK	BD	1	BD	operational	44,000 TPA	UK	N/I
Convert2Green	UK	BD	N/I	BD	N/I	N/I	UK	N/I
Daka Biodiesel	Denmark	BD	1	BD	operational	55 MPLY	Denmark	N/I
			1	2nd Gen - BD	under construction	56 MPLY	Denmark	
Ensus	UK	BE	1	BE	under construction	315,000 TPA	UK	N/I
Vireol	UK	BE	1	BE	planned	150,000 TPA	UK	N/I
			1	BE	planned	150,000 TPA	UK	
4 Producing other than biodiesel or bioethanol								
Verdant Fuels	UK	Pure Plant Oil	N/I	Pure Plant Oil	N/I	N/I	N/I	N/I
Helius Energy	UK	None	1	Electricity	operational	65 Mwe	UK	N/I
			1	Electricity	planned	100 MW	UK	
Gasrec	UK	Biomethane	N/I	Biomethane	N/I	N/I	UK	N/I
Energexia	UK	None	1	2nd Gen - BD	planned	N/I	N/I	Yes
2 Biofuels Producers biofuels prod. = NOT core business								
British Sugar	UK	BE	1	BE	operational	55,000 TPA	UK	N/I
			1	BE	planned	320,000 TPA	UK	
Neste Oil	Finland	None	1	BD - NExBTL	operational	190,000 TPA	Finland	N/I
			1	BD - NExBTL	under construction	190,000 TPA	Finland	
			1	BD - NExBTL	planned	800,000 TPA	NL	
			1	BD - NExBTL	planned	800,000 TPA	Singapore	
1 Biofuels Producers - Unknown - website and consultation response MISSING								
Goldenfuels	N/I	BD	N/I	N/I	N/I	N/I	N/I	N/I
LEGEND:								
BE - bioethanol	TPA - tonnes per annum							
BD - biodiesel	MLPY - million litres per year							
N/A - not applicable	MW - megawatt							
N/I - no information found either in consultation response or websites								

Glossary:

AIC – Agricultural Industries Confederation

APAG – European Oleo-chemical and Allied Products Group

AUKOI – Association of United Kingdom Oil Independents (now Downstream Fuel Association)

BACS – British Association for Chemical Specialities

BBC – British Broadcasting Company

BBSRC – Biotechnology and Biological Sciences Research Council

BERR – Department for Business Enterprise and Regulatory Reform

BP – British Petroleum

BRASS – ESRC Centre for Business Relationships Accountability Sustainability and Society

BSBEC – BBSRC Supergen Biomass and Bioenergy Consortium

CAFOD – Catholic Agency for Overseas Development

CEN – European Committee of Standardisation

CPT – Confederation of Passenger Transport

DECC – Department of Energy and Climate Change

Defra – Department for Environment Food and Rural Affairs

DETR – Department of Environment Transport and the Regions

DfT – Department for Transport

dLUC – Direct Land Use Changes

DoT – Department of Transport

DTI – Department of Trade and Industry

DTLR – Department of Transport Local Government and Regions

E.ON – Energy ON

EA – Environment Agency

EAC – Environmental Audit Committee

EBB – European Biodiesel Board

EC – European Commission

EDF – Electricité de France

EFPPA – European Association for the Animal Fats and Animal By-Products Processing Industry

EFrac – Environment Food and Rural Affairs Committee
EIC – Environment Industries Commission
EPSRC – Engineering and Physical Sciences Research Council
ESRC – Economic Social Research Council
EST – Energy Savings Trust
EU – European Union
FAO – Food and Agriculture Organization of the United Nations
FBHVC – Federation of British Historic Vehicle Clubs
FDF – Food and Drink Federation
FoE – Friends of the Earth
FPS – Federation of Petroleum Suppliers
FQD – Fuel Quality Directive
GHG – Green House Gasses
GM – General Motors
HIE – Highlands and Islands Enterprise
HITRANS – Highlands and Islands Strategic Transport Partnership
HoC IO – House of Commons Information Office
HoC Library – House of Commons Library
IEA – International Energy Agency
IEEP – Institute for European Environmental Policy
IFAD – International Fund for Agricultural Development
IFPRI – International Food Policy Research Institute
iLUC – Indirect Land Use Changes
IMF – International Monetary Fund
IPCC – Intergovernmental Panel on Climate Change
LCA – Life Cycle Assessment
MLP – Multi-Level Perspective
NC – Nuffield Council
NDPB – Non-Departmental Public Body
NE – Natural England
NEPIC – North East Process Industry Cluster
NFU – National Farmers Union
NGO – Non-Governmental Organisation
NNFCC – National Non-Food Crops Centre

North East RSB – North East Regional Strategy Board for Transport Biofuels
OECD – Organisation for Economic Co-operation and Development
PIU – Performance Innovation Unit of the Cabinet Office
RAC Foundation – Royal Automobile Club Foundation
RAE – Royal Academy of Engineering
RCEP – Royal Commission on Environmental Pollution
REA – Renewable Energy Association
RED – Renewable Energy Directive
RFA – Renewable Fuels Agency
RS – Royal Society
RSPB – Royal Society for the Protection of Birds
RSSB – Rail Safety and Standards Board
RTFO – Renewable Transport Fuels Obligation
SCOPA – Seed Crushers and Oil Processors Association
SEPA – Scottish Environment Protection Agency
SMMT – The Society of Motor Manufacturers and Traders Ltd
SNH – Scottish Natural Heritage
STS – Science Technology and Society
Supergen – Sustainable Power Generation and Supply
TSO – The Stationary Office
UCO – Used Cooking Oils
UKCPI – United Kingdom Cleaning Products Industry Association
UKERC – United Kingdom Energy Research Centre
UKPIA – United Kingdom Petroleum Industry Association
UKRA – United Kingdom Renderers Association
ULSD – Ultra-Low Sulphur Diesel
UN – United Nations
UN HLTF – High Level Task Force of the United Nations
UNCTAD – United Nations Conference on Trade and Development
UNEP – United Nations Environment Programme
UNFCCC – United Nations Framework Convention on Climate Change
WEP – World Food Programme
WTO – World Trade Organisation
WWF – World Wide Fund for Nature

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