Evidence-based policy or policy-based evidence gathering? Biofuels, the EU and the 10% target.

Keywords: biofuels, policy, scientific evidence, Renewable Energy Directive.

ABSTRACT
The 2009 Renewable Energy Directive mandates European Union member-states' road transport fuel to comprise a minimum of 10% renewable content by 2020. This target is expected to be met predominantly from biofuels. However, scientific evidence is increasingly questioning the ability of biofuels to reduce greenhouse gas emissions when factors such as indirect land-use change are taken into consideration. This paper interrogates the 10% target, critically assessing its political motivations, use of scientific evidence and the actions of an individual policy entrepreneur who played a central role in its adoption. It finds that European Union decision-making bodies' commitment to internal guidelines on the use of expertise and the precautionary principle was questionable, despite the scientific uncertainty inherent in the biofuels debate. It concludes that imperatives located in the political space dominated scientific evidence and led to a process of 'policy-based evidence gathering' to justify the policy choice of a 10% renewable energy/biofuels target.

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1. Introduction

Reducing greenhouse gas (GHG) emissions is now widely recognised to be a critical element of any energy policy driven by environmental sustainability motivations (Hardy, 2003). As a signatory to the 1997 Kyoto Protocol, the European Union (EU) and its member-states identify the reduction of GHG emissions as a core component of its energy policy (EC, 2005). Emissions from transport accounted for nearly a quarter of global energy-related carbon dioxide emissions in 2006 (IEA, 2008), with more than 90% caused by road transport (EEA, 2008). Various methods exist to reduce GHG emissions from road transport, such as incentivising the use of public transport, creating cleaner engines, and moving from fossil fuels to bio-energy. In addition to biofuels for transport, bio-energy end-uses include heating and electricity generation (Rajagopal and Zilberman, 2008) and are categorised as either first or second generation, referring to their level of commercial and technological maturity.

First generation comprise biodiesel from oil seeds or ethanol from corn or sugar, while second generation comprise more experimental biofuels such as cellulosic ethanol from perennial grasses, or algae-based biofuels. Biofuels are projected to account for approximately 6% of road transport fuels globally by 2030 (IEA, 2008). However, after an initial 'honeymoon' period, the environmental and social impact of biofuels production, and concomitantly, policies which promote biofuels use are increasingly being questioned. The primary catalyst behind this concern is increasing evidence that biofuels production may actually *increase* GHG emissions when factors such as indirect land-use change are taken into account. The social implications of biofuels are also controversial, with several commentators arguing that there is a link between fuel-crop production and increases in global food prices (see Rosegrant, 2008).

One such policy promoting the use of biofuels is Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources (referred to hereafter as the *Renewable Energy Directive* or RED). The three motivations for the RED are: security of supply; regional economic development; and, environmental sustainability/GHG emissions reduction (EP, 2009). The RED forms part of the EU's '20-20-20' climate and energy package which mandates a 20% reduction in GHG emissions for all energy compared to 1990 levels, a 20% reduction in energy consumption through improved energy efficiency, and, in the RED, a 20% increase in the use of renewable energy, all by the year 2020 (Schill, 2009). The RED transformed a voluntary target of 5.75% by 2010 for biofuels or other renewable fuels in the 2003 *Biofuels Directive* (2003/30/EC) into a binding 10% minimum target for renewable content in transport fuels in all EU member-states by 2020 (EP, 2009). This 10% target is expected to be met predominantly by biofuels.

This paper interrogates the drivers behind the creation of the 10% target and critically assesses its merit, not only in light of the environmental sustainability motivations for EU energy policy, but also against the precautionary principle and the EU's own guidelines on the collection and use of expertise (EC, 2002). It focuses in particular on the role of scientific evidence as an input to the policy-making process and attempts to uncover the rationale behind the 10% renewable energy target for transport fuels in the RED. The key research question is why, in the face of scientific uncertainty on the GHG emissions impact of biofuels production, is there a 10% renewable energy target for transport fuels in the RED? In addressing this issue, the complex mix of the political and scientific which resulted in the creation of the 10% target is uncovered and presented as an intriguing case study in environmental policy-making.

The paper is divided into four main parts. The first investigates the nature of the science/policy interface and the significance of values conflicts and scientific uncertainty in the policy process. The second outlines the research method, and the third analyses the policy drivers situated in the political, scientific and moral spaces of the 10% target. The concluding section reflects on the policy choices made during the development of the RED.

2. The policy process

Recent articulations of policy practice propose that the decision-making element of the policy process should be based, at least in part, on sound and transparent evidence (Sutton, 1999). This concept of evidence-based policy attempts to reduce uncertainty and risk in policy decisions by basing them on scientific or other evidence that can, in effect, provide 'hard data' about whether the proposed course of action will bring about a desired effect (Bulmer *et al*., 2007). The notion of evidence-based policy has become somewhat of a mantra in policy circles over the last ten years (see Clarence, 2002) as it

is seen as an attempt to reclaim technical policy areas from the impacts of prejudice and cronyism. It is also a reaction against the observation that even when they may be required, 'there is little evidence that technical arguments (based on science and research evidence) necessarily have much of a direct impact' (Nutley and Webb, 2000: 14) on policy decisions.

In practice, however, an evidence-based approach to policy-making is not straightforward. Narrow interpretations which rely on a strictly linear relationship between evidence and policy have been criticised as technocratic (Black, 2001) and are now recognised as less suitable for situations where scientific evidence is uncertain. More nuanced understandings of evidence-based policy, such as 'evidence-aware' , 'evidence-informed' or even 'evidence-inspired' policy-making, argue that in cases where the science is uncertain or contested, there may be no clear 'right' or 'wrong' path to follow (Nutley, 2003; Owens *et al*., 2006; Holmes and Clark, 2008). While such situations may tempt recourse to a narrow interpretation of evidence-based policy as an excuse *not* to make a decision, ultimately it is the role of policy-makers to assess a wide range of relevant evidence even when it is inconclusive.

Bridging the gap between scientists and policy-makers to improve the decision-making process is a widely recognised challenge (for example, Nutley et al, 2000). In situations of uncertainty in particular it requires both sides rejecting the notion that science is always able to provide 'verifiable facts about reality on which rational policy decisions can be based' (Gulbrandsen, 2008: 100). While a strict application of the scientific method may be the most appropriate avenue in certain policy situations and can indeed provide a valuable counterbalance to other actors with competing agendas, alternative scenarios where complex, messy policy problems encounter scientific uncertainty may require a different approach (Ezrahi, 1990). Confronting the claim that 'scientific objectivity is divorced from the political aims and values of interest groups and governments' (Gulbrandsen, 2008: 101) leads to a 'political-institutional' approach. This attempts to cast light on the motivations behind the development of scientific evidence and reinforce the awareness that 'the boundaries between science and policy or politics are constantly being renegotiated as part of the political process' (Sarewitz, 2004: 386).

Thus, in those situations where no clear boundary between scientific knowledge and political context exists, heightened awareness must be given to who, how and why knowledge is produced and, subsequently, its interaction with the policy process. If we accept that knowledge is no less significant to the policy process than the concept of power (Radaelli, 1995), its ability to bestow influence on the actor who brings it to the policy process and uses it to influence decisions must be interrogated. Just as knowledge can be used to formulate strategies, or generate particular actions in a more instrumental sense, it also has a highly symbolic function. As Radaelli (1995: 162) explains, '[j]ustifying a decision in terms of information is a way in which a decision process is symbolized as legitimate'.

Boswell (2008) expands on the legitimising function of knowledge, also known as 'epistemic authority', by presenting it as that which enables those who hold or employ knowledge to claim rights to particular policy areas or decisions. This legitimising function also includes justifying policy choices to stakeholders, which is a critical and positive feature of the policy process, but can also have negative consequences. These arguments owe a debt to the work of Weiss (1979) and in particular, her identification of the interactive and political models of research utilisation. The former model presents scientific evidence as one type of evidence amongst many, and which contributes to the final form of the policy in conjunction with other factors such as political insight and previous policy experience. The latter is where research is used as political ammunition, often to support a previously predetermined position. Sarewitz (2004: 389-390) coins this the 'excess of objectivity' argument, which 'views science as extracting from nature innumerable facts from which different pictures of reality can be assembled, depending in part on the social, institutional, or political context within which those doing the assembling are operating'. The frequency by which political actors assemble legitimising knowledge claims from the scientific literature to either support a pre-existing position or to establish a desired interpretation of reality arguably increases when there is uncertainty as to which scientific conclusions are most valid. These concepts are particularly important to note in the context of this case study due to the high stakes implications of biofuels targets.

Uncertainty, considered here in relation to complex problems where insufficient evidence is available to easily reach a conclusion, is an important idea in this context. Indeed, this is especially the case if

Pielke's (2007: 40) argument that 'science plays a different role in situations of values consensus and low uncertainty than in the opposite circumstances' is to be accepted. As Sarewitz (2000) argues, so long as the possibility of different scientific perspectives exists, uncertainty will always remain a key factor in decision-making. This is not because uncertainty *causes* values conflicts; rather he suggests that the uncertainties themselves may emerge because the values conflict has not yet been resolved in the political domain. He goes onto argue that it is not necessarily uncertainty inherent to individual pieces of scientific research that create conflict when introduced to the political sphere, but a 'lack of coherence among competing scientific understandings' (2004: 386). This means that because different stakeholders bring different bodies of contextual knowledge to the debate, there will inevitably be uncertainty and debate as to which knowledge is more 'truthful' or acceptable (Wynne, 1989).

This perspective brings into question the traditional conception of a body of 'relevant facts' which are able to bring about the resolution of a controversy. The policy process must, therefore, incorporate those scientific 'facts' which are the most appropriate for the decision to be made. These decisions are often based on various guidelines or by recourse to acknowledged sources of expertise. Guidelines such as the European Commission's (EC) guidelines on the collection and use of expertise (EC, 2002) attempt to create order in the midst of the complexity of policy and politics, and propose a framework for the application of evidence to policy problems. While many sets of guidelines exist to direct the science/policy interface, it is noted that, as with evidence-based policy models, their practical application is often moderated by time constraints, levels of scientific competency, or other political drivers (Lagacé *et al*., 2008).

Another form of guidance available to European policy-makers is the precautionary principle which offers regulators a method 'to acknowledge the limits of science as a basis for policy, while seeking to clarify uncertainties' (Levidow, 2001: 842). The recommendation to adopt a precautionary approach when 'preliminary objective scientific evaluation, indicates that there are reasonable grounds for concern that the potentially dangerous effects on the *environment, human, animal or plant health* may be inconsistent with the high level of protection chosen for the Community' (EC, 2000: 3, emphasis in the original) suggests that decision-makers should act to protect the environment even when full scientific certainty is absent (Whiteside, 2006). However, this is somewhat problematic in that, as discussed earlier, the notions of objective science and claims of full scientific certainty (to offset the 'reasonable' grounds for concern) are extremely contentious (Levidow, 2001).

Determining what is 'reasonable' implies the need for a value judgement to be made. Those decisions which have contested economic, political or social outcomes often use knowledge in a way that can be quite distinct from a 'rational' model of knowledge 'facts' influencing decisions. Authors such as Sarewitz (2004; 2006) argue that science itself cannot decisively resolve values controversies because they are not technocratic disputes; instead, their explicitly political nature must be brought to the fore. This builds on Salter's (1988) theory of 'mandated science' which acknowledges the tensions that values controversies bring to the policy process. The decision to make a decision is thus not a value-neutral activity. This is particularly obvious when Weiss' (1979) political model of research utilisation is apparent and makes Barker and Peters' (1993: 6) observation that those who 'depend on science and technology for 'the answer' are very likely to be disappointed' all the more telling. The case of the 10% target is no exception, with a wide array of influences from both the political and scientific realms influencing the decision-making process.

3. Methods

The research on which this paper is based was undertaken between April and September 2009 and comprised a qualitative investigation into the development process of the 10% target in the RED. It followed two main methodological avenues: assessment of the RED and associated documents; and, 21 semi-structured interviews to uncover the background stories behind the final form of the RED and to obtain insider and observer comment on its passage through the policy process.

The 21 interviewees were chosen from members of the RED policy network and included policy officials directly involved in the creation of the RED, non-governmental organisation (NGO) and biofuels industry representatives, and academics working in related fields. The majority were Brussels (11 of the 21) or UK-based (6 of the 21) and are identified subsequently throughout this paper by category when attached to interview quotes. These categories are: academia, consultant,

industry, media, NGO, policy, and other. Responses to a base matrix of questions were gathered to identify the perspectives of different groups on similar topics and were subsequently analysed and grouped by category of interviewee to allow for overall group opinions to be identified. Qualitative coding was employed to analyse the interview data and a number of themes presented themselves throughout this process, the most salient of which, in terms of answering the key research question (*why, in the face of scientific uncertainty on the GHG emissions impact of biofuels production, is there a 10% renewable energy target for transport fuels in the RED?*), were identified as:

- Science as a tool/scientific rationale:
  - Tagged to comments referring to the use of science as an explanatory tool or negotiating tactic in advocating for or arguing against the 10% target.
- Political/policy driver:
  - Tagged to comments referring to the political nature of the debate, specifically, policy rationales that were explicitly non-scientific in nature.
- Morals/values:
  - Tagged to comments referring to the moral or values element of the biofuels debate, most notably the 'food versus fuel' argument.

These themes represent an attempt to understand why and how information was used in the policy process, as well as identifying other policy drivers critical to the decision-making process. Building on this analysis, the choice was made to organise the analysis of the controversy surrounding the existence of the 10% target into three spaces: political, scientific, and moral. These spaces reflect the policy drivers (explicit or otherwise) that appear to have impacted the choice of the target.

4. The spaces of the 10% target

As far back as 1997, the EU has explicitly stated that its objectives for energy policy are security of supply, regional economic development, and, environmental sustainability/GHG emissions reduction (EC, 1997). There appears to have been little or no debate about potential trade-offs between these objectives, but this research suggests that the objective of reducing GHG emissions was de-emphasised in favour of the other two objectives. Analysis of interview data reveals that this outcome derives most heavily from the policy drivers located in the political space, rather than the scientific or moral spaces.

4.1. The political space

The political commitment to the 10% target was made by the European Council in March 2007. However, at the time of the decision to endorse the 10% target as part of the 20-20-20 plan, evidence to justify the policy choice in the form of an impact assessment was absent. An interviewee comments:

> *"...The idea is that normally you should not propose legislation until you've got the evidence to justify it. But there, you had the prime ministers and heads of state signing up to a target that no-one had done any impact assessment of at all...they got them to sign up to these targets, 20% renewables and 10% biofuels, and then only later in the year did they do the impact assessment. And basically they said they didn't need to [properly] impact assess the 10% because it had already been approved by the heads of state!..." (Policy)*

This assertion is backed up in one of the supporting documents for the UK's Gallagher Review of the indirect effects of biofuels production which claims that the 'actual assessment of the impacts of a 10% biofuels target is not fully included in the impact assessment which accompanies the proposal for a RED' (Dehue *et al*., 2008: 2). This same report concludes that the impact assessments eventually undertaken 'do not permit a conclusion that such a 10% target will not cause significant negative consequences resulting from land use change' (Dehue *et al*., 2008: 1). This finding is based on factors such as insufficient consideration of land-use effects outside the EU and flawed reasoning behind the decision not to add additional sustainability criteria on indirect land-use change into the RED. These arguments, and the fact that the impact assessment accompanying the RED came out in 2008 *after* the European Council agreed to endorse the 10% target in 2007, stands in direct contradiction to the EC's own principles and guidelines on the collection and use of expertise. These refer explicitly to the need to carry out a 'thorough analysis of possible economic, social and environmental impacts... [to] help ensure that *future* policies are based on the best evidence available' (EC, 2002: 4, emphasis added). The fact that the European Council was endorsing a target without

having seen a full impact assessment provides the first indication that motivations other than scientific evidence related to environmental sustainability and GHG emissions reductions played a part in the policy decision to establish the 10% target.

So what were these motivations? As outlined previously, the RED has three: security of supply; regional economic development; and, environmental sustainability/GHG emissions reduction. Security of supply was identified by interviewees as a critical element due to internal EU energy production failures, as well as the multiple Russian gas crises of the 2000s which interfered with energy availability in the EU. Security of supply, in this instance, was widely explained by both interviewees and in policy documentation as requiring production internal to the EU. However, interviewees also suggested that overall European security of energy supply could have been provided by numerous production methods other than by this target, such as nuclear power, or even biofuels for heating and electricity generation. Furthermore, the acknowledgment by interviewees, and also in several official and non-official reports that a significant proportion of the biofuels needed to fulfil the 10% target will come from production outside the EU also questions the relationship between security of supply as a driver and the choice of biofuels for transport.

It also became apparent that an influential factor behind the choice of a mandatory target was to give the biofuels industry a far greater level of investment security than would be achieved through a voluntary target. The security of such a wide-scale government target provides the industry with an incentive to invest in the development of second generation crops and technologies that it may not otherwise be able to achieve. Securing future supply through industry support mechanisms can thus be seen as a response to an alternative source of 'evidence', that is, political pressure exerted by vested interests and other political players in the EU. It is also a reflection of the fact that, as the EU itself acknowledges by identifying multiple policy motivations for the RED, policy decisions are rarely taken in isolation and are often expected to address multiple objectives.

Through the research process it became clear that regional economic development was also directly related to the political space of the target. Over half of all interviewees either independently suggested or agreed to the notion of a link between the target and the reform of the sugar regime under the Common Agricultural Policy (CAP):

> *"...I think that one key issue that everybody prefers to forget now, one of the things that really triggered this madness in Europe has been the reform of the sugar regime...There was a huge fight with the European farm lobby. The commission, DG-AGRI [Directorate General - Agriculture], was desperate to find some candies they could give to the farm lobby. Particularly they were desperate to find a way out, to all the sugar beet producers that was clear there was no future for them once they have to compete on selling sugar. And then the brilliant idea was, oh we can use this sugar for ethanol and in general we can create this subsidised market for farmers and it can allow us basically to hide within the energy policy some of these subsidies that are becoming so unpopular in the agriculture policy. That's been the initial main driver..." (NGO)*
>
> *"...Yes, absolutely the sugar reform was important. Everybody was wondering why there was such a clinging to this target? At one point last year there was a cascade of reports from the IMF, the World Bank, really respected economists, against it, and still nevertheless the commission continued to stick to it, no matter what..." (Journalist)*

After reforms in 2003 that decoupled subsidy payments from the volume of production (EC, 2003), the 2006 reform of the sugar regime reduced the guaranteed sugar price by 36% (which was sitting at three times world-market levels) and opened up the EU market to imports from the world's 49 poorest countries from 2009 (EU, 2006). Understandably, this controversial reform was vigorously opposed by the European farm lobby which had significant vested interests in retaining a high level of subsidies. The relationship between this reform and the subsequent rationale for the 10% target (biofuels acting as an alternative market for ethanol from sugar) was confirmed by numerous interview participants. In essence, the mandatory target is alleged to act as a compensatory measure against the reduction in direct subsidies for sugar production.

In addition to the need to find an alternative market for EU sugar production, the other vested interest in the target's creation and which also used regional economic growth as a rationale (among others) was the biofuels industry itself. Interviewees discussed the success of the industry in aligning itself

effectively with the interests of certain member states such as France and Spain which have a strong farm lobby and considerable biofuels activity respectively. It was also acknowledged by almost all interviewees that the choice of the number 10 as the target was a political choice, as was the '20-20-20' framework, essentially because *"...it sounds sexy..."* (NGO) but different interviewees had very different perspectives on whether 10% was based on solid scientific analysis or not. These debates introduce the second conceptual space of the target: the scientific.

4.2. The scientific space

Environmental sustainability/GHG emissions reduction as a motivator for the 10% target quickly identified itself during the research process as the most controversial of the three policy drivers. It is contentious in two senses. Firstly, how should GHG emissions from biofuels production be calculated? Specifically, should they include indirect land-use change for which there is no widely accepted methodology? Secondly, what are the minimum levels of GHG emissions savings renewable energy production technologies should achieve in order to meet EU Kyoto Protocol obligations? Both the interviews and the document review cast doubt on whether the scientific evidence that *was* pertinent to these questions and the final policy decision was able to adequately exert its influence, or indeed whether the EC guidelines on the collection and use of expertise were followed. The data gathered also raised further questions, such as why biofuels production, which is amenable to the first two policy motivations for the RED, but highly questionable on the environmental sustainability front when indirect land-use change is taken into account, ranked so highly as a policy choice compared to other methods of renewable energy production?

Scientific evidence

Numerous pieces of scientific evidence were identified by interviewees as either influencing or being noticeable in their inability to influence the GHG emissions reduction element of the 10% target. Data collected from interviews suggests that internal EC documentation from DG Agriculture and Transport and Energy which supported the decision to proceed with a 10% target was accorded a high degree of influence in the final policy outcome. However, evidence of a more critical bent (e.g. reports from DG-Environment, the Joint Research Council or from various NGOs) did not have the same sway. For example, some interviewees argued that the conclusions of a European Environment Agency (EEA) report from 2006 (EEA, 2006) were misinterpreted to suit the decision to confirm a mandatory 10% target:

> *"... [The EEA report] talked about 2030, they talked about bio-energy not biofuels, they started from restraints, restrictions. They started provided that there are already criteria, so that for example you have protected areas, so that there is a certain percentage of land that is permanently set aside for biodiversity reasons, that you have good rotation practices, and all this, and through these restrictions they came to 16%. How this report was used [by other bodies] was just, 'the EEA says we can do 16%', without taking [their stated] restrictions into account ..." (NGO)*

This example emphasises how "*...one-liners assume an importance that is disproportionate to the accuracy of the content...*" (Academic) and shows how scientific evidence can be misused to suit means other than which it was originally intended. This misuse can be wilful, but it must also be acknowledged that it can be a reflection of the practical challenges of the policy process such as time constraints or pressure from political superiors (Patton and Sawicki, 1993).

A key piece of scientific evidence in the ongoing biofuels policy debate was Searchinger *et al.*'s 2008 paper in *Science* assessing the GHG impacts of biofuels crops in the US. The paper argues that when indirect land-use change is taken into account, GHG emissions may actually be higher than those of fossil fuels. Unsurprisingly, this research strongly polarised opinions with the biofuels industry dismissing its relevance ("*...Searchinger is a lawyer who has nothing to do with land use change...there was no distinction made with the European case where we use hardly any corn..." (Industry)*), and environmental groups lamenting Searchinger's exclusion from 2009 EC discussions on indirect land-use change methodology. While interviewees were divided on the overall influence of academic science on the specific decision to proceed with the 10% target (as an alternative policy driver to political machinations), the Searchinger *et al.* paper clearly had some impact on the wider policy environment. It was referenced heavily in the UK's Gallagher Review (whose findings strongly influenced the UK's more sceptical position on the RED) and, perhaps more significantly, even its

critics now acknowledge that the paper left a "...*trace in the directive, because the commission now needs to look into the indirect land-use change issue more closely and if appropriate, come up with measures..." (Industry).*

In addition to Searchinger *et al*.'s paper, an increasing volume of research published since 2000 in both reputable scientific journals and by highly regarded international organisations exists that is critical of the environmental sustainability and social impacts of biofuels. For example, recently published reports affiliated with both the OECD (Doornbosch and Steenblik, 2007) and the World Bank (Mitchell, 2008) argue that while some second generation biofuels do have the potential to reduce GHG emissions in ways that are less harmful to the environment and society, their commercial viability is not yet at a level commensurate with policy expectations. The OECD report even goes so far as to conclude that 'government policies supporting and protecting domestic production of biofuels are inefficient...are not cost effective...and are on a collision course' (Doornbosch and Steenblik, 2007: 4-7) with sustainable development imperatives.

The policy entrepreneur

The EC's guidelines on the use of expertise state that decision-makers faced with unacceptable levels of risk related to scientific uncertainty have a duty to find answers; however, also that judging 'what is an "acceptable" level of risk for society is an eminently *political* decision' (EC, 2002: 3, emphasis in the original). Thus, assuming these guidelines were being followed, at some point it was decided that either there was adequate scientific certainty regarding levels of GHG emissions to proceed with the policy choice of implementing a mandatory 10% target, or that not knowing for certain the GHG emissions when indirect land-use change was taken into account was an acceptable risk for society to take. Almost all interview participants pointed to an individual actor within the EC who had a strong influence on this policy decision but who stirred up a considerable degree of controversy with other actors in the policy network in the process. This leads to two questions: how could an individual within the EC have such a high degree of influence over the policy process, and why did the increasing amount of scientific data questioning the ability of biofuels production to reduce GHG emissions not have more traction in the policy decision?

Several interviewees indicated that the policy entrepreneur, as the overall policy architect of the RED, was able to retain a considerable degree of influence over its content throughout the policy development process, including internal and external negotiations. They also noted that the policy entrepreneur saw the main stakeholders of the policy (and thus intended beneficiaries) as the transport and biofuels industries and was perceived by other actors in the process as dogmatic in his pursuit of the target. Notwithstanding amendments such as the insertion of sustainability criteria and the requirement to consider a methodology to calculate an indirect land-use change factor, the confluence of the policy entrepreneur's motivations and the political drivers behind the policy appear to have played a major role in the decision to proceed with the 10% target.

Some interviewees also indicated that the policy entrepreneur acted as an information gatekeeper, reducing the level of scientific controversy apparent to policy-makers by ensuring that only data which supported the desired end-point was able to influence the final decision-making process. The ability of the policy entrepreneur to command the scientific literature and argue for the benefits of the 10% target both within the EC and outside of it was identified as a critical factor. This indicates that it wasn't so much an absence of evidence, but an adherence to evidence that was able to tell the desired story. However, none of this critique is intended to suggest that the policy entrepreneur acted in a deliberately malicious or underhand manner. An interviewee suggested that he "...*probably still had the best intentions (even though he was completely wrong)..." (NGO)* and the policy entrepreneur himself appeared to see the policy as an arbitrary victim of a values controversy – biofuels being targeted as the environmental 'baddie of the day'.

That the policy entrepreneur was able to exercise such a significant degree of influence over the policy process (essentially, to ensure the target proceeded in the face of considerable internal and external opposition) appeared to be directly related to his ability to command technical knowledge. The scientific data were harnessed by the policy entrepreneur to establish a reality in which he was framed as the technical expert to which decision-makers in the political realm would defer. Interviewees pointed to his comprehensive knowledge of what had been written on biofuels, and to his exceptional talent to harness that information in making the case for the biofuels target with key

actors in the policy-making process. The example of the policy entrepreneur clearly demonstrates that scientific data, when harnessed by particular sides of the debate, or individuals within the debate, can play an extremely powerful role in policy-making. The ability to command technically challenging evidence in an environment where many other actors do not have the same skill-sets gives a very high degree of influence to individual actors. One interviewee commented on a *"...sort of fatal level of naiveté amongst people involved..." (NGO)* where Members of the European Parliament supported the target after being convinced of the benefits of biofuels from data presented by the policy entrepreneur, industry and other lobbies. This reinforces the notion that scientific evidence can be harnessed as a political tool to sway decision-makers.

The precautionary principle

The application of the precautionary principle in this case is complicated as the potential for negative impacts of biofuels production appears to be high, particularly when factors such as indirect land-use change are taken into account, yet there is 'to date no scientific consensus as to how to quantify the amount of land use change or food price increases attributable to biofuel production' (RSB, 2008: 3). The precautionary principle is easily actionable when there is a degree of certainty regarding likely negative impacts; however, when there is uncertainty over the degree to which *"...the cure is worse than the disease..." (NGO)*, things become less straightforward.

To date, the most comprehensive guidelines on sustainable biofuels production come from the Roundtable on Sustainable Biofuels (RSB) whose 2008 guidelines stress that 'within the spirit of the Precautionary Principle, sustainable biofuel supporters should be assured that their good intentions do not have unintended consequences' (RSB, 2008: 3). This implies that if there is the suggestion that biofuels production is causing negative consequences, unintended or otherwise, there is an argument for halting production based on the precautionary principle. While the policy entrepreneur argued that the 10% target was the most appropriate 'least-worst' solution, opponents to the 10% target took a contrary view in interviews. Rather than looking at how best biomass might be used directly in the transport sector to reduce GHG emissions, they argued that the analysis needed to step back and look at the bigger picture, i.e. biomass may be more effectively used in other sectors such as heating and electricity, and that other mechanisms (such as the European Fuel Quality Directive) may be more appropriate in the transport sector.

If it is accepted that a reasonable indication of negative consequences is adequate to delay potentially questionable policy choices (Gray and Bewers, 1996), the increasing volume of scientific evidence that suggests that GHG emissions were not being reduced to the degree claimed, as well as other environmental and social impacts, appears to suggest an inadequate treatment was given to the possible implementation of the precautionary principle in this case.

4.3. The moral space

The precautionary principle is an interesting point from which to approach the moral space as its intent is to set risk boundaries consistent with what is acceptable to Europe's constituent communities. At first, the moral space may appear somewhat incongruent with a discussion on scientific evidence; however, if we acknowledge that neither scientists nor politicians are immune to internal and external values pressure, the influence of the moral space is understandable. The most well known moral debate regarding biofuels is that of 'food versus fuel' which proposes that land previously used for crop production is being transferred to biofuels production, thus leading to food shortages which are particularly significant for those in less-developed countries. Several interviewees suggested that member-state and European politicians were particularly responsive to this debate.

Reactions to the moral element of the biofuels debate sharply contrasted across different actors in the policy process. The biofuels industry was vociferous in their opposition to attempts to link biofuels production to morally or ethically questionable practices and provided scientific evidence, either of their own or from external sources, which disputed the notion that increased biofuels production was the reason behind high food prices, and which asserted positive GHG emissions benefits from biofuels production. However, they felt that this evidence was disregarded in certain quarters because of its origin:

> *"...when you come with this argument it's clear that well yeah, you're going to say that because you're working for the biofuels industry..." (Industry)*

On the other hand, opponents of the 10% target argued that the potential moral consequences were not adequately investigated or valued highly enough. In addition to providing scientific evidence to argue that the GHG emissions savings were not going to be best achieved by way of a 10% target, they attempted to move the debate from being one purely about technicalities to one which looked at the ethical implications of increasing biofuels production outside of the EU so that each member-state could meet the target. In the words of an interviewee: *"...It's quite typical of Europe of basically hiding or disguising moral values debates as technical debates..." (NGO).*

The influence of the moral space and the food versus fuel argument on final decision-making processes is hard to measure. On the one hand, the 10% target exists, but on the other hand, it is accompanied by (controversial) sustainability criteria and an investigation into indirect land-use change is also mandated. Whether this is the influence of scientific evidence or the moral debate is uncertain. Interestingly, although some interviewees pointed out that while the biofuels industry was correct in disputing that increased biofuels production was the *only* cause behind an increase in food prices, most of the evidence available does seem to point to implicate biofuels production as a causal factor. For example, despite the argument proffered by the biofuels industry that there can be no correlation between biofuels production and rising food prices in light of food price decreases caused by the current global economic crisis, the price of sugar continues to increase and by May 2009 was more expensive than at any point since the beginning of January 2008 (Naylor et al, 2007; Runge and Senauer, 2007; The Economist, 2009).

5. Conclusions

This paper provides the 10% target in the RED as a case study of a policy decision mediated by a complex relationship of scientific evidence, political imperatives and individual motivation. The data gathered yields a first conclusion: that if the EU (and specifically, the EC) was following its own guidelines on the use of evidence, the target should have a strong scientific basis. That the decision to proceed with the target does have a scientific underpinning is not contested; however, it appears doubtful that the breadth of scientific data available on the potential GHG emissions from biofuels production was adequately factored into the final policy decision. This initial conclusion questions the notion that the target could be considered an evidence-based policy decision. This is not only due to a degree of scepticism regarding the credibility of the process of collecting and using expert advice, but more importantly, the decision to proceed with the target appears to show that a requirement for plural viewpoints contained within the EC guidelines was not followed. The recognition that there was still a considerable degree of scientific uncertainty regarding the environmental and social sustainability of biofuels production (for example, the controversy regarding whether indirect land-use change ought to form part of the EU's assessment methodology) appears to imply that the precautionary principle was not applied in this case.

Examining the way scientific evidence was employed by particular actors, such as the policy entrepreneur, suggests a second conclusion, rooted in Weiss' (1979) political mode of research utilisation and Sarewitz's (2004) 'excess of objectivity'. That is, that evidence appeared only able to influence the final policy choice when its findings coalesced with the political imperatives driving the target. Scientific evidence that questioned the ability of biofuels to reduce GHG emissions appears to have been inadequately addressed in the policy process, despite an increasing amount of research pointing to such conclusions. As a result, the events leading to the creation of the target lend weight to the concept of the policy process as a 'chaotic procedure, dominated by political, practical and socio-cultural forces' (Sutton, 1999: 10) and suggest that a process of 'policy-based evidence gathering' was followed, rather than evidence-based policy. This process, whereby evidence is gathered to support a previously determined policy choice, also colloquially known as the 'cherry-picking of evidence' (Pawson, 2006:7), suggests that a single-minded adherence to a specific point of view, exclusive of divergent viewpoints, characterised the 10% target. Thus even if evidence-based policy may be considered an illusive ideal, the example presented here calls into question whether the emissions reduction component of the policy could even be regarded as 'evidence-inspired'.

While some interviewees went further than this conclusion: *"...It was policy in complete denial of any evidence. There wasn't any evidence!..." (Academic)*, this view does not acknowledge the various ways in which different actors were able to source different pieces of scientific evidence as a tool to support their positions. The role of the policy entrepreneur is interesting and shows the amount of

influence a single individual can have on the policy process – particularly when their goal is consistent with what is politically desirable. The role of the policy entrepreneur as a knowledge gatekeeper between the EC and the political institutions of the EU brings into focus the need for policy analysts to both want to and be able to act as 'honest brokers' of scientific evidence (Pielke, 2007). It is concerning that one policy actor within one specific part of the EC was able to cement a particular interpretation of the evidence so comprehensively in the minds of decision-makers. The intent of this paper is not to discourage policy entrepreneurship as a whole, as it is often important to champion changes through sluggish administrations, but to stress the importance of keeping a watchful eye on unchallenged epistemic authority.

The moral space of the target was perhaps also not adequately reflected upon by those involved. The 'food versus fuel' debate was discounted by certain actors as *too* value-laden; an emotional screen that attempted to distort the 'real' debate. However, as Pielke (2007) reminds us, values debates do require fundamentally different sorts of politics to be engaged. Thus the implication can be drawn that a policy-based evidence gathering mode was employed because the debate over biofuels production was a problem incorrectly allocated to a particular mode of analysis.

As the EU has itself indicated, the RED is motivated by objectives other than those directly related to GHG emissions reduction, it is concerning that in using the 10% target as a bargaining chip to achieve these objectives (security of supply and regional economic development) an inadequate treatment was given to the evidence to support the motivation of emissions reduction. The need to only admit into consideration that evidence which supported the desired end goal of the policy (validation of the target as an appropriate measure), also meant that the implications of the target outside its core sphere of a transport policy (for example, in contributing to indirect land-use change) were unable to be adequately valued in the decision making process.

In addition to identifying concerns about the EU's adherence to its own guidelines on the use of scientific evidence or the precautionary principle, the findings call into question how serious the EU is about mobilising itself to address climate change. Short-termism and territorially-bounded outlooks that favour individual industries appear to have dominated European policy at the expense of a longer-term perspective. The need to show action was being taken in climate change policy to not only address emissions in the transport sector, but also to provide solutions for the reform of the sugar regime created the incentives for short-term thinking. The difficulty in understanding the enormous complexities of the cause, effect, and spatial influence of climate change, and the urgent pressure to change current energy use practices may have also played an important role in promoting a policy solution which inadequately priced its cost both outside the EU and beyond the near future.

Falling prey to short-term thinking and an inability to effectively address complex problems is arguably a weakness shared by most modern political systems. But, as has been argued extensively throughout the literature, greater interaction between those providing the expertise, in this case, scientific evidence on issues such as indirect land-use change, and those who translate the expertise into policy decisions is required (Wolf, 2007). As the example of the policy entrepreneur has shown, the influence of the knowledge broker can be significant and is not a role to be taken lightly. While analysing how the 10% target came to be has been an interesting case study of the use of scientific evidence in the policy-making process, its future will be even more fascinating. Negotiations are presently underway regarding the insertion of an indirect land-use change factor into the RED and the results of a review in 2014 on factors such as the availability of foodstuffs at affordable prices and impacts on biodiversity are unpredictable at present. However, if an increasing quantity of scientific evidence is able to coalesce into agreement that biofuels production as we know it today is unlikely to deliver the quantity of GHG emissions savings required to meet climate change reduction policy requirements (themselves, ironically, the result of similarly political modes of policy-making as the RED), it seems unlikely that the 10% target can remain unchanged.

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