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Seeing Like a Standard: EU, sustainable biofuels, and land use change in Africa

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Abstract

Biofuels have expanded across the globe, generating a range of concerns in the places of production. One approach to controlling the effects of biofuel production has been sustainability standards. This article takes a 'seeing like' approach to analyse how the EU Sustainability standard contributes to narrowing the vision of what sustainable biofuels are. Six biofuel cases in Africa are examined through the lens of the standard, using remote sensing to investigate the criteria on land use and canopy cover change. The standard view is also compared to on ground views regarding the sustainability of the projects. The effects of seeing like the EU standard are two: 1) diluted seeing, which prioritises global environmental problems over more nuanced social and institutional aspects; and 2) distributed seeing, which transforms standardised sustainable biofuels into multiple, uncertain forms because of hybrid governance. High carbon losses due to biofuel projects were detected, but at the same time, the standard simplifies and skips over wider problems related to unsustainable biofuel projects.

Keywords

Biofuels; land use change; standards; sustainability criteria; EU; sub-Saharan Africa

Introduction

How do standards 'see' sustainable biofuels? By 'seeing like a standard', this article seeks to expand our knowledge of how standards diffuse the meaning of sustainable biofuels. The idea that standards are necessary for sustainable biofuels emerged as a range of concerns related to biofuel crop production emerged in the early 2000's, such as problematic land use changes leading to deforestation, loss of biodiversity, carbon emissions, displacements, food insecurity, and so forth. A large number sustainability standards and certification schemes were launched to enable states and other actors to 'see' and control the impacts of biofuel production (Scarlat and Dallemand, 2011). This is how many see sustainable biofuels today, through a standard grid that makes legible biofuel plantations in faraway places.

In this article, we take a 'seeing like' approach to understand the standard mode of governing, which draws on James Scott's argument that the ability to govern relies on 'seeing' and making subjects legible for rule. In 'Seeing like a state' (1998), Scott details how states try to engineer societies, forests, agricultures and cities into standardised, bureaucratic realities, only to fail precisely because planners created a distorted picture of society and nature which distances themselves from local, interested, contextual, and historically specific realities.

Drawing on Scott, we probe the role of standards in making sustainable biofuel production legible for schematic knowledge and control; in short we attempt to look at biofuels through the lens of international standards in order to 'see' what the standard sees. By 'seeing like a standard', we can therefore increase our understanding of how criteria, control and verification contribute to narrowing our vision of what sustainable biofuels are.

With this in mind, we decided to look closer at one of the meta-standards for sustainable biofuels, namely the standard of the European Union (EU). Beginning in the early 2000s, EU policymakers introduced targets for renewable energy in all forms of transport, and later added to these policies a set of mandatory sustainability criteria for biofuel crop production. These criteria were issued simultaneously through the Renewable Energy Directive (EU-RED) 2009/28/EC (Articles 17-19) and Fuel Quality Directive (EU-FQD) 2009/30/EC (Article 7b-d). This standard applies to biofuel and bioliquids sold within the EU, including biomaterial produced beyond the EU. By controlling the large EU market, the standard can partly govern the rules of global biofuel production (Di Lucia, 2010). The standard may therefore 'orchestrate' how sustainable biofuels are viewed and practiced globally (Schleifer, 2013). The standard is not innocent in this sense, as it aspires control at-a-distance. Our contribution is in understanding how the standard seeks to sanction, permit and create a particular form of sustainable biofuels, which justifies specific values, authorities, expertise, and technologies, while blocking out others.

In this article, we ask what the EU 'sees' through the standard, and what it misses seeing, given that standards are not all-seeing but quite selective in their view. Whereas earlier studies have shown that the standard offers an EU-centric and partial definition of sustainability, leaving issues such as livelihoods, equity, water and rural development aside (Franco et al., 2010; Hunsberger et al., 2013; Larsen et al., 2013; Levidow, 2013), few have extended the analysis to ask how the EU has codified 'sustainable biofuels' into a legible and administratively more convenient format that allows greater control of biofuels as a whole. In part one; we therefore identify the criteria through which sustainable biofuels are read. We find that sustainable biofuel production has been made intelligible through a grid of greenhouse gas (GHG) and land use change (LUC), and we discuss the reasons behind this simplified rendering and the control mechanisms. Given the focus on LUC, it is noteworthy that earlier research has been doubtful to the efficiency of standards to control LUC (Pavlovskaia, 2014).

In part two, we investigate how the LUC criteria can be controlled, primarily through 'remote seeing' and specifically how the criterion on canopy cover change (CCC) is assessed using Earth Observation (EO) and Geographical Information Systems (GIS). The CCC criterion is central to the standard as it benchmarks the maximum forest crown cover which can be cleared for sustainable biofuel production. We examine the degree of CCC in six biofuel cases, namely for plantations of the oil crop *Jatropha curcas* L. located within or near *Miombo* woodlands and coastal forests in Mozambique, Zambia, Tanzania, and Kenya. Moreover, in our attempt to understand the standard optic and what is missed, we briefly explore on the ground views regarding the sustainability of the projects, by analysing media, civil society reports, official impact assessments, and interviews with local residents. Indeed, some have argued that high environmental standards have to a certain degree legitimised land acquisitions, later critiqued as 'land grabbing' and 'green grabbing' (Borras and Franco, 2012; Fairhead et al., 2012). Standards fuse in these ways into the wider governance by government agencies at local, state and union levels, private sustainability schemes, international organisations, NGOs, and economic operators.

In our research, we find that the standard mode of governing has moved beyond Scott's state-centric conceptualisation. Indeed, Scott's 'seeing like' approach has been used extensively to explain the optics of governance beyond the state (Bridge, 2014), to examine the powers of private, non-governmental and international organisations and their technical devices of measurement, calculation and visualization (Broome and Seabrooke, 2012; Ferguson, 2005; Li, 2005; MacEachern, 2010; Schuller, 2007). Standards are part of a broader hybridisation of power, in which public and private authorities actively interact (Ponte et al., 2011b). Seeing like the EU standard resembles this diffusion of power, which both enables and constrains EU to 'see' beyond its borders. In our analysis, the effects of seeing like the EU standard are two: 1) diluted seeing, which prioritises global environmental problems, GHG emissions and biodiversity loss over more nuanced social and institutional aspects; and 2) distributed seeing, which transforms standardised sustainable biofuels into multiple, uncertain forms because of hybrid governance. In this view, we detected high carbon losses due to biofuel projects, but at the same time, the standard simplifies and skips over wider problems related to unsustainable projects.

Seeing like a standard: EU and its sustainability criteria for biofuels

Diluted seeing

A key argument within the 'seeing like' literature is that knowledge and control require a simplified, narrowing of vision, that is, to bring into 'sharp focus certain limited aspects of an otherwise far more complex and unwieldy reality' (Scott, 1998, 11). The literature on standards, audit and verification follow this logic to argue that the standard apparatus (its construction, content, form, shape, and technologies) reduces matters into simplified forms. On the one hand, standards can make sustainable biofuels legible by bringing into view critical matters of concern. On the other hand, standards are often criticised for using 'universal' and 'science-based' criteria and indicators to represent reality as qualitatively and quantitatively homogeneous (Power, 1997; Strathern, 2000). Standards also tend to require responses to be classified as 'neutral', 'quantifiable',

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and 'epistemologically objective' (Fortin and Richardson, 2013; Jensen and Winthereik, 2013, 121-46). Seeing like a standard is performative in this way, as the optic requires reproducing the world through a narrow syntax. In Scott's terms, 'a selective reality is achieved' (1998, 11). This is what we call a diluted view. Values are reduced. Meanings are thinned out.

For the EU standard, this dilution has worked in favour of global environmental values. A main criterion of the standard pertains to the GHG emissions savings, which must exceed 35% when compared to fossil fuel emissions (the savings minimum increased to 50% in 2017). The GHG criterion is tied to restrictions on LUC. The assumption is that if land with high stocks of carbon in its soil or vegetation is converted for the cultivation of raw materials for biofuels or bioliquids, some of the stored carbon will be released into the atmosphere and thus 'offset the positive greenhouse gas impact of the biofuels, and its ability to combat climate change' (RED Item 70). The standard therefore includes various criteria for controlling LUC, including disqualifying any biofuel sources produced from land that is 'highly biodiverse', 'primary forest', and 'continuously forested'. The EU sets the benchmark values for land use change in accordance with the status of the land after January 2008. In practice, this means that changes are attributed to biofuel operations irrespective of the actual cause. Table 1 summarises the criteria that carves out sustainable from unsustainable land use for biofuel production. These include quantitative criteria which accounts for carbon in terms of canopy cover change, hectares and height of trees, and qualitative criteria which make legible biodiversity values.

The standard has thinned out complex local, environmental and social aspects within the compliance process to mere reporting on 'social sustainability'. Social aspects are used as an umbrella term for social, economic and environmental dimensions that have implications for the well-being of local residents, such as labour rights, land and resource rights, community participation and consent in land acquisition processes, human rights, food security, livelihood impacts and contributions to rural development, gender-differentiated impacts (German and Schoneveld, 2012). None of these issues were translated into criteria. Rather, the Commission is required every two years to report the impact on social sustainability in EU and in third countries, specifically 'on the availability of foodstuffs at affordable prices, in particular for people living in developing countries, and wider development issues' (EU-RED 17:7; EU-FQD 7b:7). The report shall address the respect of land use rights, and whether countries that produce biofuels have ratified and implemented a number of Conventions of the International Labour Organisation (ILO) concerning forced labour, child labour, discrimination, the right to organize, and equal pay for women and men. However, to report whether conventions have been implemented is not the same as requiring that their principles are being practiced. This dilutes the social responsibility of the EU.

Seeing Like a Standard

Others have also found that the meaning of sustainable biofuel production has been watered down. Larsen et al. (2013) concluded that the standard is 'water blind' as it gives no consideration of water resources in the locale of biofuel production. A case-study of the standard in Indonesia found that it ignored issues of accountability and 'the intrinsic exploitative dynamics of large-scale agroindustry' (p.303). Others have also questioned the assumptions behind EU-RED (Franco et al., 2010; Hunsberger et al., 2013; Levidow, 2013). Hunsberger et al. (2013) has noted that issues such as income, food security, access or control over land and resources, social inclusion, and gender have been marginalised in biofuel policies, and the question of whether engaging in biofuel production is a sustainable option has been largely ignored. In reference to EU-RED, Levidow (2013) argued that the controversy over harmful changes in land use has been reduced to efforts at accounting for carbon, while disregarding other environmental harm and obscuring people's experiences of harm and dispossession. Levidow concluded that carbon accounting is used to depoliticise such harmful changes by framing natural resources as qualitatively homogeneous and quantitatively comparable.

It is remarkable that EU has not moved far from Scott's (1998) account of the creation of the 'scientific forest'. To a large degree, an actual tree with its vast number of possible uses has been replaced by an abstract tree representing carbon stock. Like the state in Scott's parable, the EU has ignored 'the vast, complex, and negotiated social uses of the forest for hunting and gathering, pasturage, fishing, charcoal making, trapping, and collecting food and valuable minerals as well as the forest's significance for magic, worship, refuge, and so on'. Missing is 'nearly everything touching on human interaction with the forest' (p.13).

The failure to make these dimensions legible through the standard has not gone unnoticed. Global biofuel expansion has been widely criticised, specifically the way that expansion has been at the expense of forests and customary rights to land and resources, and corresponding displacement of traditional land use, food and livelihood systems (Dauvergne and Neville, 2010; Fargione et al., 2008; German et al., 2011b; Sulle and Nelson, 2009). These concerns are pertinent especially for poorer and vulnerable groups, for whom forests operate as a form of safety net, providing food and fuel for basic survival when other incomes are scarce (Dufey et al., 2007; IIASA, 2009; OECD, 2011; World Resources Report, 2005). Indeed, the EU's standardised optic seems contingent on the global institutionalised view of forests that prioritises deforestation and forest degradation related to biodiversity loss and climate change. From a governance perspective, the EU's optic shifts from governments to the standards, and market-based certification and self-regulation by market actors (Arts and Buizer, 2009).

There are various reasons for this diluted optic. A working document by the Commission recommended excluding social and food security criteria due to their lack of feasibility, WTO compatibility and significance (German and Schoneveld, 2012, 767). Specifically, to attribute social impacts to precise locations and operations was deemed unfeasible. The issue of food security was instead related to global agricultural markets, and other social issues were too contingent upon national legislation and enforcement. Others have also shown that the deliberations were influenced by fears that social considerations would result in World Trade

Table 1: EU's land use criteria, based on EU-RED Article 17 and EU-FQD Article 7b

1. Biofuels/bioliquids cannot be produced from raw materials obtained from land with *high biodiversity value*. This includes land that had the following statuses in or after January 2008:

(a) Primary forest and other wooded land, namely forest and other wooded land of native species, where there is no clearly visible indication of human activity and the ecological processes are not significantly disturbed.

(b) Areas designated: (i) by law or by the relevant competent authority for nature protection purposes; or (ii) for the protection of rare, threatened or endangered ecosystems or species recognised by international agreements or included in lists drawn up by intergovernmental organisations or the International Union for the Conservation of Nature.

(c) Areas of highly biodiverse grassland that is: (i) natural, namely, grassland that would remain grassland in the absence of human intervention and which maintains the natural species composition and ecological characteristics and processes; or (ii) non-natural, namely, grassland that would cease to be grassland in the absence of human intervention and which is species-rich and not degraded, unless evidence is provided that the harvesting of the raw material is necessary to preserve its grassland status.

2. Biofuels/bioliquids cannot be produced from raw materials obtained from land with *high carbon stock*. This includes land that had the following statuses in January 2008 and no longer has that status:

(a) wetlands, namely land that is covered with or saturated by water permanently or for a significant part of the year

(b) Continuously forested areas, namely, land spanning more than one hectare with trees higher than five metres and a canopy cover of more than 30 %, or trees able to reach those thresholds in situ. (Our CCC criterion)

(c) Land spanning more than one hectare with trees higher than five metres and a canopy cover of between 10 % and 30 %, or trees able to reach those thresholds *in situ*, unless it can be proven that greenhouse gas emission reduction targets can still be achieved following conversion.

Organization disputes (Ackrill and Kay, 2011). Since protectionism is prohibited, it is thought that only environmental issues acknowledged by international conventions, such as climate change mitigation and biodiversity protection, can be allowed as criteria, even if they produce trade barriers (Di Lucia, 2010).

However, as German and Schoneveld (2012, 767) note, it remains unclear why it is considered highly feasible to link biodiversity to specific operations, but not social impacts. The widespread legislation and use of Environmental, Social and Health Impact Assessment (EIA, EISA, ESHIA) methodologies is one indication that social issues can be made legible at project level using current globally accepted techniques. Moreover, international conventions are increasingly translated into corporate guidelines which require the respect of human rights, customary land rights and food security when introducing large-scale land projects, indicating that standards can at least in part 'see' these social dimensions in other contexts.

The EU standard also fails to engage with indirect land use change (ILUC). The position of the EU has been that ILUC should not be included as a sustainability requirement in any of the reporting methodologies because it is difficult to calculate, predict and validate (European Commission, 2010). A number of uncertainties associated with the modelling of ILUC have long undermined any scientific and political consensus over how to quantify and attribute ILUC to individual biofuel operators and the industry at large (Levidow, 2013; Liska and Perrin, 2009). However, the EU has increasingly recognised that ILUC occurs where pasture or agricultural land previously destined for food and feed markets is diverted to biofuel production, because 'the non-fuel demand will still need to be satisfied either through intensification of current production or by bringing non-agricultural land into production elsewhere' (EU, 2015, (4)). Given that current biofuels are mainly produced from crops grown on existing agricultural land, the EU has put a cap on total food crops used to produce biofuels and has reviewed the possibilities for making ILUC legible within the standard (EU, 2015). This illustrates the continuous process of making complex issues legible for simple control and administration.

Summing up, this section has shown how sustainability concerns are distilled and simplified; matters of societal concern are reduced to concerns for the EU and economic actors, particularly by enrolling trade rationales and scientific controversies into the definition of sustainable biofuels. We have therefore already begun to see how the standard was not developed freely within a grid of European objectives; instead, the power to define the criteria was distributed across global actors, and through this type of distributed seeing, social responsibilities could be traded away. The next section further develops this notion of distributed seeing.

Distributed seeing

The EU standard distributes power in various ways. Apart from the influence of trade organisations, the EU has invited various authorities to co-define its criteria. Producer states may claim a stake, because the standard excludes areas that are protected for nature purposes as designated by law or the relevant authority in the country of production. The standard also excludes areas that are hosting rare,

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threatened or endangered ecosystems and species, but only when recognised by international agreements or included in lists drawn up by intergovernmental organisations or the International Union for the Conservation of Nature (IUCN). Other global authorities such as the Food and Agriculture Organisation of the United Nations (FAO) are invited to define the type of 'primary forest' that cannot be deforested. This includes areas where collection of non-wood forest products occurs, provided the human impact is small. Other types of forests as defined by the FAO, such as modified natural forests, semi-natural forests, and plantations, should not be considered as primary forests (EU-RED Preamble Item 69; EU-FQD Item 11).

The diffused nature of governance comes to view here, as the coding process is drawn into the daily work and negotiations among these authorities. What is sustainable or not relies upon the efforts of international organisations to ensure that areas deemed worth protecting are properly mapped out and protected within clear boundaries. Such tasks may not have been picked up yet by these organisations, which means that some forests or areas with biodiversity might be more valued than others across different places targeted for biofuel production. The 'neutral', 'quantifiable', and 'epistemologically objective' stance of the standard view has begun to wither.

Moreover, the EU distributes power by outsourcing the control and verification mechanisms for standard compliance (EU-RED Art.18; EU-FQD Art.7c). (See figure 1 for an overview.) The EU emphasis is primarily on member states, which 'sees' that states implement and fulfil the standard. Member states should in turn organise national systems that control how biofuels are counted in order to fulfil national binding targets. Member states can implement the standard in national legislation, and allow biofuel operators to demonstrate compliance by becoming certified through recognised private sustainability schemes. The Commission has so far approved 19 private schemes, which have been developed by various constellations of business alliances, non-governmental organisations (NGOs), international organisations (IOs), and governmental agencies (European Commission, 2016). These private schemes should include the standard requirements, but they can also vary greatly both in their general system requirements, and in their environmental and social criteria (German and Schoneveld, 2012). Research suggests that those merely mirroring the EU criteria, the most commercially-oriented, top-down and global North-focused biofuel certification schemes, were fast to monopolize the market, thus closing off the expansion of more inclusive and transparent certification systems (Ponte, 2014). In addition, this distributed mode of governing relies heavily on self-control by each company for providing evidence to auditors.

The EU attempts to govern sustainable biofuels at the global scale are not unlike how international organisations 'see' and influence member states (cf. Broome and Seabrooke, 2012; Sharman, 2012). In addition to using one of the EU-approved schemes and enrolling the services of private auditing firms, operators can also show compliance by operating under bilateral and multilateral agreements between governments, which confirm compliance with some or all of the sustainability criteria. The EU has already approved an agreement with Australia (European Commission, 2016) and the United States has made petitioned to recognize US environmental protection laws as a proxy for the EU standard (German and Schoneveld, 2012). How these agreements come about is not well documented. Research indicates that the standard can influence third country legislation in more indirect and market-driven ways (Di Lucia, 2010). For example, the biofuel sector in Mozambique was developed in line with the EU sustainability criteria to potentially meet the requirement of the EU market (Schut et al., 2014). These circumstances suggest that the EU standard can influence standardisation more widely. Despite its blind spots, the EU's standard is more stringent than many other global attempts at governing biofuels. It is thus hopeful that the EU's 'seeing' can persuade other states (and non-state actors) to adopt, implement and sustain these standards over time.

There are several important consequences of market involvement in this quasi-state, hybrid governance arrangement. First, approved schemes must only cover the environmental criteria, and evidence suggests that few biofuel operators opt for schemes that have gone beyond the standard to also 'see' social issues such as labour, land and food rights (German and Schoneveld, 2011; Schleifer, 2013). Certain schemes might also be preferred due to verification procedures, as some rely primarily on field audits while others make extensive use of self-declaration or desk audits (Schleifer, 2013, 541). While these simplified schemes can help to lower costs, they can also open up to fraud as the conduct of biofuel operators, independent auditors and representatives of sustainability standards are not necessarily neutral actions and can be influenced by profit making motives (Pavlovskaia, 2014, 105). The use of different mechanisms to ensure compliance to the same sustainability criterion can therefore lead to 'uncertainty, local differences in the achieved results and insecurity' (ibid.). The distributed nature of the compliance system, which extends over various private standards and audit bodies, increases the multiple ways that 'sustainable biofuels' can be seen.

The ways that sustainable biofuels can be seen is distributed further if we return to the EU's rationale to side-step social aspects. The EU assumed that issues such as labour rights, chemical use, and pollution can be left aside, as they are governed by other regulations. For example, biofuel feedstock produced within the EU must comply with its environmental and social requirements for agriculture. However, this legislation is restricted to the EU jurisdiction, and the EU has also recognised 'that production of biofuels and bioliquids in certain third countries might not respect minimum environmental or social requirements' (EU-RED 74). The administrative grid that the EU assumes the standard can hook onto is often lacking. Poor local law enforcement, underdeveloped policy measures and absence of infrastructure can therefore lead to very different outcomes, depending on the place of production (Pavlovskaia, 2014, 105). There are of course legal jurisdictional reasons why the EU cannot simply expand its grid across the world.

There are various reasons why the EU has adopted this distributed mode of governance. The adoption of a more traditional 'command-and-control approach' would have required considerably more time and public resources; costs which instead have been passed onto private schemes and biofuel operators (Schleifer, 2013, 540). Indeed, the EU uses satellite imagery for overseeing the implementation of its agricultural policy, but to extend this remote seeing to outside the EU has been considered merely hypothetical. Other control mechanisms, such as aerial photographs, maps, data registers on land use, acquisition and farming processes, and regular field surveys, would require significant technical knowledge and expertise, with substantial economic and administrative costs (Pavlovskaia, 2014, 98-99). These costs and challenges do not disappear but they are now distributed onto the 'private governors' along the biofuel chain.

Nonetheless, according to Schleifer (2013), the Commission, member states, lobbyists and international organisations actively supported, facilitated, and embraced the governance arrangement using private schemes. Seeing like the EU, it allowed the Commission to 'orchestrate' emerging biofuel standards and certification bodies; yet, seeing like corporations, it gave industry power to shape what biofuel governance was becoming. Some schemes already existed when the standard was negotiated, and these were used to block out outlying issues (Schleifer, 2013). This connects to the wider literature on biofuel standards and certification, which collectively question whether these can successfully govern 'sustainable biofuels', given that they are highly influenced by market interests, technical language, and weak in terms of legitimacy and enforcement (Diaz-Chavez, 2011; Elgert, 2012; Fortin and Richardson, 2013; Levidow, 2013; Ponte, 2014; Schouten et al., 2012).

The ability of actors to orchestrate rules is also managed through the standard view. The approach to use voluntary standards reduces the possibility of coming into conflict with the WTO rules. Technical regulations are commonly regarded as nontariff trade barriers and discriminatory treatment of imported products, whereas the requirements of voluntary sustainability standards 'do not normally contradict international trade rules' (Pavlovskaia, 2014, 103). In contrast to cross-border inspections through the EU or its member states, private auditing companies are unconstrained by national borders and able to monitor compliance in the industry's transnational production networks (Schleifer, 2013). This makes the diffusion of the EU-centric standard beyond EU borders possible. Seeing like a state-led standard on other states' territories is indeed a delicate endeavour.

Taken together, the EU approach has been described as a new form of establishing control through an increasingly hybrid, network mode of governance combining binding regulations for the member states, private and self-governed sustainability standards, and growing reliance on independent auditors (Bailis and Baka, 2011; Pavlovskaia, 2014). It therefore reaches beyond what has been called 'distributed public governance' which is concerned with the protection of the public interest in an increasingly wide variety of government organisational forms, such as agencies, authorities and other government bodies (OECD, 2002). The EU approach extends to what Swyngedouw (2005) terms 'governance beyond the state', but it is not simply a process of deregulation. Rather, it is a re-articulated, negotiated and less hierarchal form of governance (Ponte et al., 2011b). Borrowing from Foucault, the EU approach also stretches 'governmentality beyond borders' (Larner and Walters, 2004), or brings about 'transnational governmentality' (Ferguson and Gupta, 2002). Drawing on Ferguson, it implies that the work of government 'does not unfold within a national grid; it is, instead, spread across a patchwork of transnationally networked bits' (Ferguson, 2005, 380).

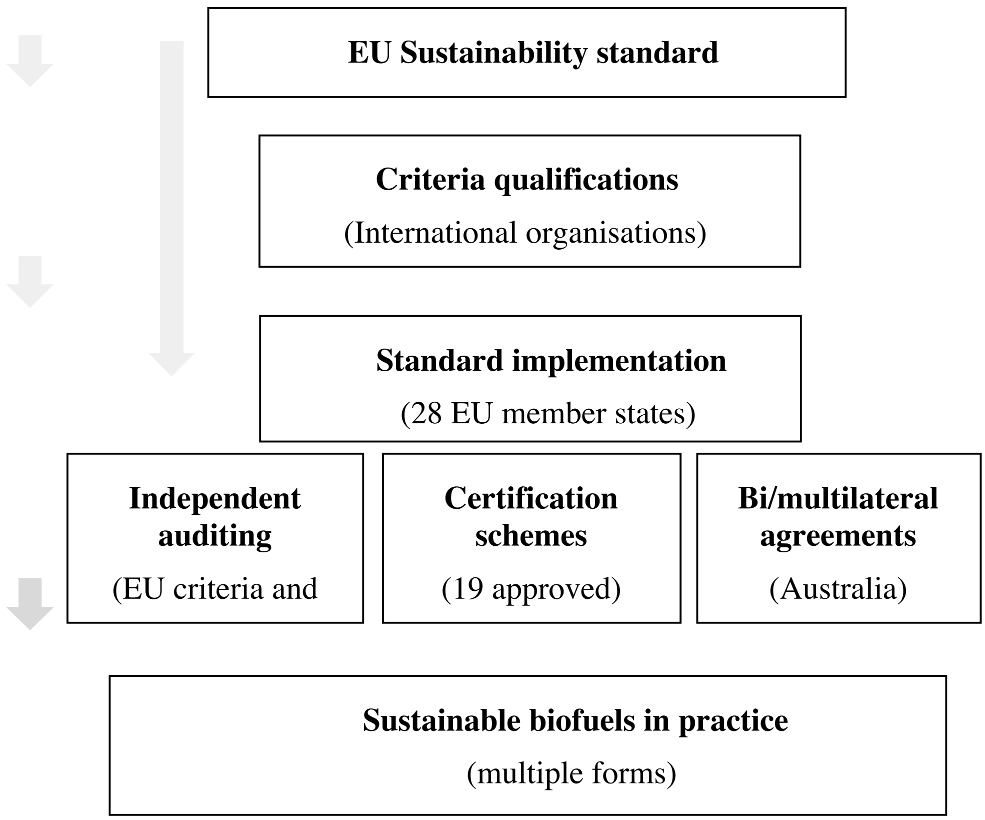

Figure 1: Various options for verification of compliance with the EU sustainability criteria

The seeing and governmentality approach to standards go hand in hand, as they both address the two dimensions of governing, namely the thought (the political rationalities, principles, values and knowledge that frame the object of governance), and the concrete process of governing (the technologies, tactics and tool used in governing) (Djama et al., 2011). Drawing on Science and Technology literature (Harbers, 2005), this involves the performative power of technologies, such as the satellite and GIS technologies that we employ in our case analysis. This means that the standard mode of governance becomes the property of networks rather than the product of a singular authority (cf. Spencer, 2010). In the next section, we take a pragmatic turn to see like the EU standard on six cases in Africa.

Seeing like the EU standard on six jatropha projects in Africa

To increase our understanding of how standards make sustainable biofuels legible, we now turn to 'see like the EU standard' on actual operations. Seeing like a standard implies that neither the Commission nor the member states or third states directly assess compliance. In line with its distributed seeing, the EU has extended this task to private certification bodies and independent auditors. To our knowledge, there has been no systemic investigation of the methods used by different auditors. The outcomes of different GHG accounting methods have generated some interest (Hennecke et al., 2013), but the LUC criteria remains a blind spot. A UK study found that companies had considerable challenges tracing their supply chain to identify previous land use (Chalmers and Archer, 2011). Remote sensing using Earth Observation (EO) and Geographical Information Systems (GIS) has been frequently proposed for these purposes (Gao et al., 2011; Scarlat and Dallemand, 2011). These are not the only options for establishing LUC, CCC and showing standard compliance, but remote sensing remains a strong competitor in the technologies of rule.

Scientists have been quite forthcoming about the limitations of remote technologies both for the construction of historical baselines and for monitoring change in, for instance, forested areas. The lack of time series with sufficient temporal or spatial resolution, definitional disparities, and the complexities of establishing the social aspects of deforestation using quantitative data all serve to limit what can be 'seen' (Fitzherbert et al., 2008; Gao et al., 2011; Nalepa and Bauer, 2012; Skutsch et al., 2007; Wicke et al., 2011). Most studies have used remote sensing to establish the causal relation between biofuels and LUC on a global scale (Efroymson et al., 2016). Less attention has been given to the question of rendering LUC legible at plantation level (which is more difficult to capture through remote sensing) and in accordance with a standardised approach. These inadequacies are likely to be 'black-boxed' when brought into the standard apparatus aiming to generate simple answers. In our research, we were interested in opening up this black-box to discuss how remote technologies produce simplified images. In so doing, we also illustrate how knowledge and technologies for remote seeing contribute to the exercise of power. We begin this exercise by developing our methodology, then we analyse each of six cases, followed by a summarising discussion.

Seeing Like a Standard

We selected biofuel projects that bring the issue of land use and deforestation into view, more specifically projects located within or near *Miombo* woodlands and coastal forests in Mozambique, Zambia, Tanzania, and Kenya (see figure 2). The *Miombo* is considered an important sink for carbon, through both the standing- and below-ground biomass (Ryan et al., 2010; Walker and Desanker, 2004; White et al., 2000). Locally, the area is culturally and economically valuable for the inhabitants, who diversify their livelihoods through charcoal production and the collection of traditional medicines, mushrooms, edible caterpillars, fuel wood, and building materials (Romijn, 2011; Sulle and Nelson, 2009). The area was selected because several EU companies were known to be clearing large areas for the production of jatropha, sugar cane, and oil palm at the time of this study (Anseeuw et al., 2012; Holden and Pagel, 2013; Hultman et al., 2012; Matondi et al., 2011; von Maltitz and Setzkorn, 2012). We have chosen to look at projects around the oil shrub *Jatropha curcas* L., as most biofuel investments were jatropha-based during the peak biofuel interest in the region (Anseeuw et al., 2012). Five of the companies (Kenya Jatropha Energy, D1 Oils-BP Fuel Crops, Moçamgalp, Sun Biofuels and BioShape) were partly owned by large EU-based companies. These were purposefully selected because they were developing industrial-scale projects for the EU market. Moçamgalp is a Portuguese-Mozambican energy venture, which aimed to supply the Portuguese energy company Galp with biofuels for the EU market. Moçamgalp initiated several jatropha projects around Mozambique, and we focus on the project in the remote northern part of the country. Sun Biofuels was a UK-based biofuel company with jatropha projects in Tanzania and Mozambique, and we focus on the project in Tanzania. BioShape belonged to another EU-based energy company, namely the Dutch Eneco. The UK-based D1 Oils and the energy giant BP cooperated for a short period of time in order to produce jatropha biofuel for the UK and EU. Kenya Jatropha Energy was set up to supply the Italian-based energy company Nuove Iniziative Industriali (NII) with jatropha oil. These companies officially claimed that the EU standard would be met. Note that these companies prepared the land for jatropha production when the EU standard was under negotiation, but they would anyhow need to comply if they wished to sell their produce on the EU market for 'sustainable biofuels'. We included a sixth company with EU ties, which intended to meet a Mozambican standard instead (Niqel). To our knowledge, only Niqel is still intent on producing jatropha biofuels (see niqel.nl).

Our primary methodological approach was to 'see these projects like an EU standard'. We mixed natural and social scientific methods to give insight into how different methods and evidence convey different sustainability aspects. Our analysis was orientated towards the LUC criteria (see Table 1).[1] The GIS expert in our team developed a quantitative methodology for analysing LUC, more specifically for measuring CCC in and around the vicinity of the project areas. This method was used to assess the standard criterion on CCC. The CCC criterion states that biofuels and bioliquids cannot be produced from raw materials obtained from land with high carbon stock. This includes land that was continuously forested in January 2008 and no longer has this status, namely, land spanning more than one hectare with trees higher than five metres and a canopy cover of more than 30 %, or trees able to reach those thresholds *in situ* (EU-RED 17.4b and EU- FQD 7b.4b; see 2.b in Table 1). Qualitative data and methods were used for the following: to identify cases; to establish the location of the project and timing of project implementation; and to ground truth images whenever possible.

Drawing on established techniques in remote sensing, three separate modules were used to establish CCC. First, we used Moderate Resolution Imaging Spectral-radiometer (MODIS) Vegetation Indices (MOD13Q1) data, and chose a 16 day NDVI (Normalized Difference Vegetation Index) composite with spatial resolution of 250 meters (see Lunetta et al., 2006). Data from several seasons (times of the year) was compared to establish the optimum time to study CCC. Change over time was then identified manually and complemented by image analysis. This first module established the extent and time of CCC, which we used in the second module. The second module used high resolution data from the Landsat 5 and Landsat 7 satellites to measure LUC. Imagery from before and after CCC established the extent of the cleared area using manual delineation (mapping cleared areas manually in GIS programs). The third module established CCC in more detail, by using Very High Resolution (VHR) imagery available from Bing and Google. If imagery was available for the time before CCC, the canopy cover was established by a grid classification method (Axelson and Nilsson, 1993). Efforts were made here to code for changes at a higher resolution than 250 meters in order to capture plantation level data. We used a 50 x 50 meter grid and manually interpreted the occurrence of ground or canopy cover at the central point of each cell. If imagery was not available, the canopy cover was estimated using the best available High Resolution (HR) Landsat 5 or 7 imagery. Together these modules produced a digitalised representation of CCC for each of our six cases, which we used to see if land spanning more than one hectare with a canopy cover of more than 30 % was used for biofuel purposes. This type of averaging LUC from a distance circumscribes how we come to know LUC, as models are information-organising schemes which 'see' selective realities. Forested areas

[1] In our presentation of the results here, we try to balance between the needs of technical experts in very different fields for particular kinds of data and have endeavoured to translate technical terms for a wide audience. The citations point readers to more technical explanations.

smaller than the remotely sensed grid, poor images, and the inability to capture biodiversity or cultural and socio-economic forest values, all influence what is revealed from remote sensing (Nalepa and Bauer, 2012). Large-scale plantations can be seen, whereas small-scale production models are more difficult to trace from above, especially in contexts where farmers tend to integrate biofuel crops with other crops (German et al., 2011b). Remote sensing therefore skews what we can see, and data and imagery generated from remote sensing is one way to produce 'truth' about LUC, among others (Nightingale, 2003).

In order to triangulate for both convergence and divergence (Nightingale, 2009), we sought to compare the remote sensed results to qualitative data. Qualitative methods were used to investigate other LUC criteria (biodiversity), and to see beyond the standard view onto alternative sustainability issues that had voiced about the projects. We drew mainly upon material collected from secondary sources, such as media and NGO reports. The availability of recorded material was not symmetrical, but depended on the degree of on-the-ground organisation, NGO interests, and so on that had investigated issues relating to the individual cases. Methods and dates of data collection therefore differed between the cases. Brief on-ground observations and interviews with company representatives, state officials and NGO representatives were conducted for the Zambian and Mozambican cases. This 'brief seeing' was not ideal for understanding the wider question of sustainable land use. Yet for our purposes this seeing was productive as it mirrors the hasty working conditions of standard and certification auditors. The next section elaborates what seeing like a standard in this way conveys.

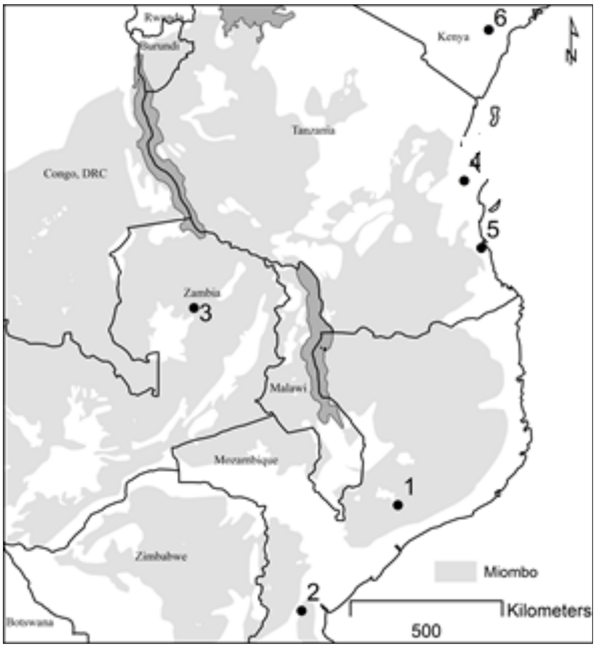

Figure 2: Location of assessed biofuel projects in southern and eastern Africa: 1) Moçamgalp, 2) Niqel, 3) D1 Oils-BP Fuel Crops, 4) Sun Biofuels, 5) BioShape,

and 6) Kenya Jatropha Energy. The grey areas represent the distribution of Miombo woodlands (WWF, 2002).

Case analysis: six jatropha operations

Seeing like the EU standard on six cases in Africa reveals the value of the standardised approach. Paraphrasing Scott, its administrative power depends 'on its abstract sketchiness, its lack of detail–its thinness' (1998, 44). Through this diluted seeing, we detected that four out of six companies deforested land for jatropha production; in total 3102 hectares (ha) were cleared according to our remote sensing analysis, resulting in significant loss of carbon values. Moçamgalp, Niqel, and BioShape clearly violated the standard: the land originally had canopy cover of over 30% and LUC took place after the EU baseline (set January 2008).

In the case of *Moçamgalp* in Lugela district, Mozambique, we observed this extensive deforestation, as we visited the project site during a field visit in November 6, 2011. A large area had been cleared, leaving the soil bare. Figure 3a shows the clearing equipment left at the site, and the size of the trees being cut down. Our CCC analysis showed that deforestation started in mid-2011 and reached over 547 ha. Figure 3b shows the digitalised, point form of our remote seeing. Our CCC method results in different shapes when the land is covered by tree crowns, bare land, or 'no data', that is, when our seeing is diffuse and when we lack data due to clouds, cloud shadows, or lack of VHR imagery. Through our different modules, we established that the estimated canopy cover had been 53% before the start of the clear felling. In this case, CCC was extensive and would not comply with the LUC criteria in the EU standard. High carbon values had been lost, which would disqualify the land for the production of sustainable biofuel under the EU standard.

It is more difficult to trace back the loss of biodiversity, specifically if pre-existing values have been lost. Using our remote lens, we are limited to on-line material and brief interviews with representatives of the company, local NGO and central government. Statements by the NGO indicate that further investigation would be needed to assess compliance with the biodiversity criterion of the standard in the Moçamgalp case. The NGO defined the cleared forest as having been 'native' with high ecological and cultural value for the local community (Oram, 2011). However, local NGOs have little say, as the standard requires that the forest has either been defined as a primary forest by the FAO, or otherwise worthy of protection because of rare, threatened or endangered ecosystems or species recognised by international agreements or included in lists drawn up by intergovernmental organisations or the IUCN. This shows how interlinked the standard view is to the work of international organisations like the FAO. We are not sure if the intent is for operators and auditors to consult these organisations proactively for an assessment, or more likely, that experts will be engaged to 'see as' these organisations by following standards set up for these purposes.

Interviews with a representative of the NGO during the field visit also suggested that the standard view was too simple. One issue was the legality of LUC. The NGO, together with the World Wide Fund for Nature (WWF)-Mozambique, questioned the legality of the land acquisition processes, and stated that there had been a lack of local consultation and environmental impact assessment (EIA) (Oram, 2011). These procedural aspects cannot be easily captured using a remote gaze. On the one hand, the company website stated that a 5,000 ha lease had been granted. On the other hand, the project manager on the ground said that the local authorities had only issued a 100 ha trial permit (personal comm. November 3, 2011). If the latter is the case, deforestation of over 500 ha may have been done against the decision of local authorities, which would be problematic seeing that the company had requested 10,000-25,000 ha with immediate plans to clear 6,000 ha (ibid.).

Our short visit did not suffice for interviews with local government, but it is noteworthy that a representative from Mozambique's environmental ministry decided not to participate in the field visit. She said that these issues were under the responsibility of the local government and not the national ministry (personal comm. November 6, 2011). Seeing as a standard through the state was thus not very helpful, which highlights the problem of relying on distributed seeing. Within the EU, the standard can connect to other encoded and enforceable rules, whereas outside the EU this encoding and enforcement might or might not exist. The hybrid arrangement of governance partly manages this blind spot. Some of the qualifying schemes approved by the Commission have included legality criteria, such as the Roundtable for Sustainable Biomaterial. This means that the legality aspect is internalised in the certification apparatus, and that auditors should check for evidence of permits and procedures. However, since operators can choose schemes which merely mirror the EU's diluted view, there will be differences in how sustainable biofuels are read, depending on the specifics of the hybrid arrangement in each case.

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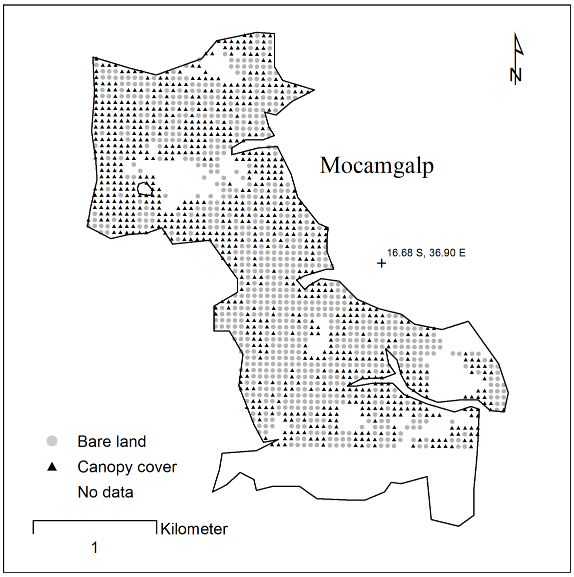

Figure 3: a) Photo showing the size of trees and clearing equipment. b) The extent of the Moçamgalp LUC in 2011. The analysis is based on pre-deforestation imagery from 16 August 2010. 'Canopy cover' refers to points intersecting with a tree crown. 'Bare Land' refers to points intersecting with grass or bare land (deforestation). 'No Data' refers to points lacking data due to clouds, cloud shadows, or lack of VHR imagery.

The case of *Sun Biofuels* in Kisarawe district, Tanzania, indicates similar problems of distributed seeing particularly with regards to the biodiversity question. In 2009, the company acquired 8,211 ha through a process which was said to displace eleven villages from land that provided livelihoods for about 11,000 people (Sulle and Nelson, 2009). Using text analysis as a lens, we tried to establish qualitatively the differing views of the impact on forest values. According to the national press and several NGOs, the area had been uncultivated but used by the villagers for charcoal-making, hunting, and collection of firewood, fruits, nuts, mushrooms, honey, and herbs, while others pointed to on-going clearance and severe degradation including on-going clearance of forest patches for farm land (Carrington, 2011; Land Rights Research and Resource Institute, 2011; Oakland Institute, 2011; Oxfam-International, 2008).

Hence, according to some sources the area was already highly degraded prior to the biofuel activities, which would most likely not qualify as an FAO primary forest. Other sources, however, claim it was the biofuel company and its deforestation that caused the loss of biodiversity and of traditional medicine and livelihood sources. In addition, the environmental NGO WWF claimed that the few patches of natural coastal bushland, grassland, and thickets found in the area most likely contained coastal forest endemic plants and animals species, including the rare tree *Foetidia africana* and migrant populations of hunting dog, elephants, and lions (Gordon-Maclean et al., 2008). The EU standard does not help to resolve these questions but rather diffuses and distributes it further. NGOs such as WWF have not been extended the power to determine biodiversity values, rather the question must be deferred to intergovernmental organisations or the IUCN again.

These kinds of conflicting stories, prioritisation of values, and land rights issues are entirely invisible when we 'see like the EU standard'. Our remote sensing methodology is also limited in its ability to establish carbon loss. Our analysis indicates that 2,000 ha were deforested after January 2008, which represented only a fraction of the total area obtained by Sun Biofuels. However, we were not able to measure CCC accurately because only post-LUC imagery was available for this area. Instead, we measured the canopy cover of a nearby area with a similar spectral signature (close to 30%). Although the comparative data cannot be used as evidence, they suggest that carbon values may have been lost, and further on the ground investigation is needed to see the actual LUC in this case.

In the case of *BioShape* in Kilwa district, Tanzania, we had to move our remote sensing to actually see the project. BioShape acquired 34,000 ha for a jatropha plantation in 2006, and setting the gaze itself proved the first challenge, as the project had been relocated. Just identifying the site on a map required cross-referencing with WWF-Tanzania, scrutinising company web sources, and interviews with the government. The company had initially been allocated an area suitable for agriculture but had managed to 'locally negotiate' its way into a forested area (personal comm. Government representative, January 23, 2013). Our EO analysis showed that 145 ha of Miombo woodland had been cleared adjacent to the designated project area. The site was deforested in 2008-2009, including areas with over 30% in canopy cover.

Similar to Moçamgalp, this case presents issues that are not captured by the EU standard. Various sources claim that BioShape started logging and timber processing before receiving a proper permit from the district council (ESD, 2008; IPS, 2011; WWF, 2008). The company denied accusations of illegal logging, yet referred to a consultancy report establishing that 8-12 m^3 of timber/ha had been retrieved and used for local construction purposes and to cover land preparation costs of the biofuel farm (bioshape.phpwebhosting.com/, accessed November 05, 2011). BioShape claimed compliance with the EU standard and promised to retain forested areas with canopy cover over 30% (WWF-Tanzania, 2008). In our understanding, this strategy to cut and compensate is not acceptable within the standard. Yet it illustrates how actors may begin to bend the standard optic to incorporate financial sustainability aspects, such as to rationalise the harvesting and selling of timber to recover land preparation costs. As Scott might say, the local, interested, contextual, and historically specific influence here how 'sustainable biofuels' is perceived and practiced. Though further qualitative research is necessary to firmly establish precisely how these social aspects undermine the spirit of the EU standard, other rationalities contradict it, particularly if non-compliant timber harvesting was used to sustain operations under the standard.

This challenges the too often taken-for-granted notion that standards reshape realities according to plan. Instead, our analysis shows how the standard slips away in practice due to our limits to measure things and in the multi-scalar battle between rules and authorities.

In this case, it is possible to trace how the EU standard networks with national mechanisms to 'see' the potential impacts of LUC. A central node is the EIA, which auditors can use to measure baseline environmental values. The EIA (EMAC, n.d.) in this case had raised concerns over the amount of *Miombo* woodland that would be clear-cut for the biofuel plantation, including concerns that the deforestation would lead to an overall decrease in the GHG balance due to the carbon loss associated with the clear felling. Yet the final recommendation was to go ahead with the project. The initial EIA was heavily criticized by NGOs and was therefore redone. Among the issues raised about the initial EIA were: falsely referring to mature coastal forest as degraded; adding an author to the EIA reporting process who was not involved in the assessment; failing to acknowledge that the forest was listed as one of 21 global biodiversity hotspots; failing to address risks to coastal forest endemic species; failing to consider the impacts of migration into the area (Fibronot, n.d.; German et al., 2011a; wa Simbeye, 2010; WWF-Tanzania, 2008). While the EIA was redone, it nevertheless draws attention to the fact that a poorly conducted EIA may undermine the EU standard by 'hiding' non-compliance as the EIA is often the key source for making biodiversity and carbon values legible to auditors. It is by shaping information through these types of blurred images – such as poor reports, cloudy images, or wrong sites – that technologies contribute to rewriting how sustainable biofuels is seen. Remotely sensed or other data are simplified representations, but they also produce new and possibly less negative representations of LUC than we can produce through other methodologies.

D1 Oils-BP Fuel Crops in Lukulu district, Zambia, also shows how project sustainability comes to matter beyond the standard view. We looked at one of the D1 Oils-BP Fuel Crops jatropha projects planned for a 15,000-35,000 ha-sized plantation in northern Zambia (interviews; D1 Oils, 2005). Our EO analysis based on coordinates, captured during a site visit, shows that deforestation started in April 2006 and reached 610 ha in 2008. We based this EO analysis only on module 1 and 2, and interpreted Landsat data in combination with statements from interviews with company management, three agricultural officers, and two former local managers who resided in the area (site visit, March 2011). The former managers affirmed deforestation (651 ha), stating that the cleared area had been 'virgin' and 'untouched' forest. Also the agricultural officers made a point of distinguishing between the cleared area and nearby forested areas degraded by slash-and-burn practices, which contributed to our conclusion that extensive CCC had occurred. Even the company director was forthcoming in affirming deforestation. The director referred to the cleared area as a scar shaped as tear drop on the border of a forest and wild life reserve.

Seeing Like a Standard

In our attempts to qualify the environmental value of the lost forest, the limitations of our methodologies were again clear. Just as it is for the EU standard, our data is limited by the practices of transnational companies and national authorities. An EIA had not been conducted (at least the Environmental Council had no record of a full EIA in this case) and accounts were again contradictory. The provincial forest authority had no documented evidence on the type of forest values that had been lost. The official at the provincial forest department said that he was not familiar with the plantation, and, given that he only had access to old paper maps of the area, he referred us to digitalised maps available in the capital Lusaka. There, the only person with access to the map was out of the office. Rapid appraisals commonly used by auditors are similarly challenged by these every-day difficulties of establishing LUC, which diffuse what the standard approach can see. This case illuminates the fact that site visits may not be sufficient in establishing LUC, specifically in green field projects outside of the state administrative grid (this project was established on customary land). It also demonstrates that those attempting to establish LUC cannot simply arrive and 'check' evidence if there has been no effort to gather such evidence beforehand.

By combining our data sets, we estimate that an area with more than 30% of the canopy cover was cleared. Yet this LUC is not viewed as unsustainable through the standard optic because CCC took place before January 2008. Although LUC can be clearly traced back to the biofuel company, the produce can be sold within EU as if it did not change the carbon balance. This reminds us that standards are governing tools that require technical delineations in time and space. Delineations create blind spots not only in reference to events in the past, but also to actions in the future in addition to their failure to adequately capture social aspects. Interviews with the residents indicated that the loss of forest values was not their major concern, for example. Rather, it was the sudden deforestation, termination of the project and the loss of jobs that was deemed unsustainable, leaving the area bare and short of employment, with the few surviving jatropha plants of little or no value to local residents especially when compared with the pre-existing forest. Again, project sustainability was an issue which escaped the standard view. Summing up these points, seeing like a standard and using EO services is one way to establish carbon loss, yet it comes with a range of blind spots, such as losses outside the time scope of the standard and project sustainability which are closely tied to the question of what is locally defined as sustainable LUC.

Turning to look at *Kenya Jatropha Energy* in Dakatcha, Kenya, a distributed view is quite revealing. Kenya Jatropha Energy requested a 33-year lease to establish a 50,000 ha jatropha plantation in the Dakatcha Woodland which international NGOs vehemently protested the project as Dakatcha is classified by the NGO BirdLife International as an Important Bird and Biodiversity Area. Other sources claim that the area shelters IUCN red-listed and globally endangered species (BirdLife, 2010; Hance, 2012; Ng´weno, 2009). Seeing like the standard, the IUCN designation would disqualify the land for biofuel production. Attempting to halt LUC, an international NGO conducted a life cycle analysis of the proposed project, concluding that emissions from biofuels on this site would be 2.5 to six times higher than emissions from energy-equivalent fossil fuels (North Energy, 2011). Such results also help make legible the unsustainability of the land use for the EU market, in reference to the GHG emissions savings required by the EU standard.

This case further conveys how legibility is less straightforward in practice. The biodiversity status and carbon calculations mentioned above are open to debate. Dakatcha has no formal protection status, but the boundaries of the woodland are unclear and not yet mapped by the relevant institutions (Kenya Forest Service et al., n.d.; Ng´weno, 2009). Also, the Woodland is described in contradictory ways. It is described as providing local communities with grazing grounds, wild fruits, medicinal plants, and firewood. Yet similar to the case of Sun Biofuels, accusations of deforestation through (illegal) logging, charcoal making, slash-and-burn clearance for agricultural fields, and hunting feature in the descriptions of this area (Citizen TV, 2011). In practice, it is possible for auditors and companies to read certain facts, leaving alternative facts hidden. This case also illustrates how projects can be hidden from a remote view. The location of the project was impossible to establish. The coordinates given by the company were imprecise and did not match those in the EIA map. Drawing on an analysis of written sources, we found that land preparation had occurred along a road and within two 10 ha pilot plots. The company affirmed this LUC, and stated that the designated area was never cleared due to a dispute (Gitau and Beja, 2010). It is noteworthy that this type of smaller sized deforestation outside the prime production site may disqualify the produce for the EU market (depending on how system boundaries are to be drawn around land used 'for production'). The extended control that the standard partly relies on worked to shut down the project in this case. The relevant authorities never issued licenses for this operation (Gari, 2011). By 2012, the company left the area, and NGOs declared the campaign a success and applauded the National Environment Management Agency for stopping the project (ActionAid UK, 2011). It is important to note, however, that it was not the demand to comply with the EU standard that led to the project shutting down. It was national legislation and the activism of NGOs that were important.

Seeing like a standard on *Niqel* in Sofala, Mozambique, differs from the others in that the company did not target the EU market. We include it here to highlight a dimension not captured by the other cases, namely the way different standards overlap or contradict each other. The intention of Niqel was to produce jatropha oil for domestic markets for which there are no specific regulations on deforestation, according to the company director (interview, November 3, 2011). The location of the Niqel project area was provided by the director, and our GIS analysis shows deforestation of 1,800 ha in three areas. We established baseline VHR imagery in two of the three areas: in 2008, the canopy cover was 64% in area (a) and 48 % in area (b). Afterwards, the canopy cover was close to zero, which makes sense because the areas were deforested to provide planting space for the jatropha plantations, according to interviews. (See figures 4 and 5.) Our CCC figures correspond with the figures given by the company that 1,100 ha of jatropha had been planted and another 500 ha had been prepared for planting (the total lease was 7,500 ha) (company presentation, Biofuel Conference, Mocuba, November 2011).

During interviews, the director was forthcoming about the LUC taking place, involving statements that deforestation had occurred to an extent that would disqualify the jatropha oil according to the EU standard. The Mozambican sustainability standard is under development, and as we noted earlier, there are discussions to include EU criteria to facilitate the export of Mozambican biomaterial and biofuels to EU (Schut et al., 2014). This case illustrates how the struggles to define sustainable biofuels are on-going. Sustainability concerns often collide in this way, making their sustainability imprint likely to be continuously

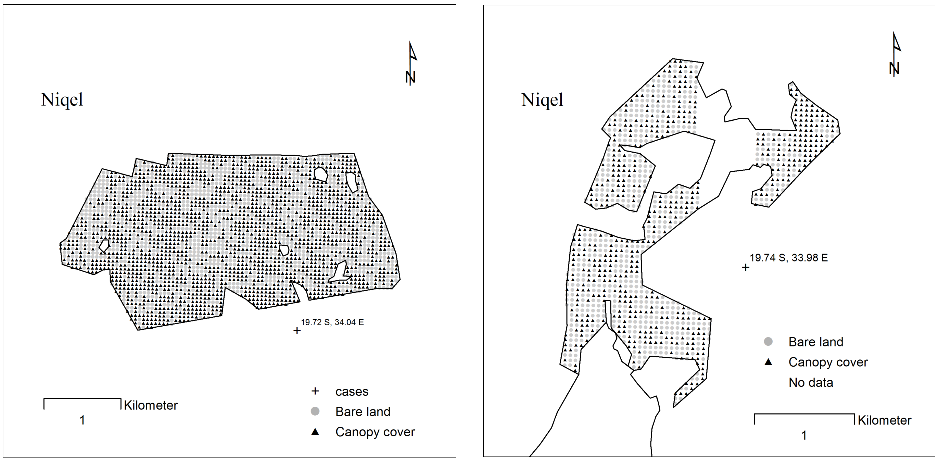

Figure 4: The extent of deforestation in Niqel's project area in 2011. The figure to the left is area (a) and the area to the right is area (b). The analysis is based on pre-deforestation imagery from 14 July, 2009. 'Canopy cover' refers to points intersecting with a tree crown. 'Bare Land' refers to points intersecting grass or bare land (deforestation). 'No Data' refers to points lacking data due to clouds, cloud shadows or lack of VHR imagery.

revaluated and as such, fragile. This land use would be defined as unsustainable according to the EU, but may be sustainable in terms of rural development and income generation as per Mozambican framing (von Maltitz et al., 2014). National demands for rural development and jobs had taken precedence in the decision to deforest. We cannot draw any conclusions in terms of legality or other social issues, as secondary information is lacking. This emphasizes the importance of using multiple methods and triangulating data, as well as not drawing any conclusions where information does not exist, or assuming that everything must be fine (sustainable) because there is no evidence otherwise.

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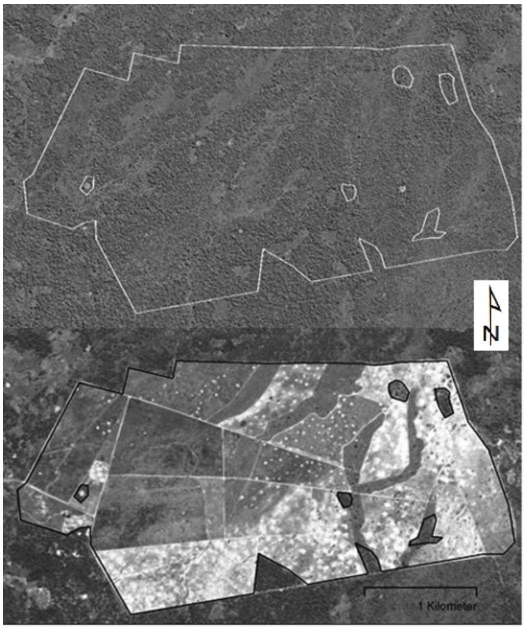

Figure 5: Land cover changes in area (b) of the Niqel project. The imagery on top is sourced from Google Earth and shows land status on 14 July 2009. The imagery below is sourced from Bing maps and shows status on 8 April 2012.

Case synthesis: diluted and distributed seeing

Our six cases show that seeing like an EU standard provides a limited but revealing view of the sustainability of biofuel production. By putting the LUC and CCC criteria into practice, we detected critical loss of carbon values. (See table 2 for an overview.) Four out of six companies deforested land for jatropha production; in total 3,102 hectares were cleared according to our CCC analysis, resulting in significant loss of carbon values. Moçamgalp, Niqel, and BioShape clearly violated the standard: the land originally had canopy cover of over 30% and deforestation took place after the EU baseline (January 2008). In the case of D1 Oils-BP Fuel Crops, we estimated that areas with more than 30% canopy cover had been cleared, but this occurred before January 2008, making it compliant with the EU standard, despite the significant CCC.

Our CCC analysis shows that remote sensing can be used to generate pieces of evidence regarding certain sustainability aspects of biofuel production, yet it remains a partial view. Our qualitative evidence indicates that other issues not seen by the EU standard might be equally critical, such as questions of project durability, legality and accountability towards rural residents. In our analysis, the standard therefore generates what we call a diluted seeing, which prioritises global environmental values over local and social aspects. This partial view can both help to signal concerns that it may not be able to see, but it also can serve to hide social aspects that are of vital importance for people on the ground. For example, in the case of BioShape, controversies over socio-economic, cultural, and legal issues went hand in hand with high carbon values. This would suggest that canopy covers could serve as an indicator of high forest values, but we caution that this is not always the case. In other cases, job creation was valued over the loss of high carbon values. It is in these ways that standards can work to delegitimise certain LUC that are posited as sustainable by local stakeholders, and vice versa.

Furthermore, the discrepancies between quantitative and qualitative measurements illuminate how sustainability claims are scalar and often partial. Looking at large scale projects from a distance, quantitative dimensions of deforestation emerge, whereas situating the analysis in local accounts gives more focus to qualitative accounts of land rights, legality, and processes of decision-making, compensation, and overall sustainability of the project in terms of, so to speak, sustainable rural development (see e.g. Widengård, 2015). Our cases throw these issues into stark relief. At the time of writing, at least three had been either been terminated or had shifted to food production, with no other biofuel companies expressing interest in taking over biofuel production on those lands. These issues of longevity fall outside of the scope of the EU standard. Looking at biofuels and sustainability in broader terms would entail questions of how to 'pay back' the carbon debt or fulfil the promises given to the rural residents. The cases show that the standard is inadequate in terms of protecting land from unsustainable change, in part because of how sustainable land use is oversimplified and in part because of the time frames and standard practice.

Secondly, the case analysis contributes to our argument that the distributed seeing of the standard view transforms the intention of created standardised sustainable biofuels into multiple, uncertain forms. The intention of a homogenous, administrative ordering encountered many obstacles and conflicts. Our investigation, at times clouded by poor imageries, project relocation, or unclear geographical coordinates, proves how difficult it can be to establish what is going on.

Our cases show that distributed seeing is particularly critical to establish biodiversity values, due to the lack of previous conservation designations, contradictory statements, and unclear boundaries. As we have shown, EO and EIA technologies cannot in themselves overcome conflicting claims. Auditors must make choices among contradictory claims in key documents, such as EIA; licenses issued by local or national governments; permissions granted by local and traditional authorities; rules created and enforced by individual land users or user representative bodies; and statements by non-governmental organisations. Our analysis thus highlights how national processes, such as assessments and permits, are an integral part of understanding the impacts of biofuel projects. As a result, environmental valuation requires evaluating the sources of data themselves. Thrown into this mix of claims, auditors have a challenging task to rapidly

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conclude which authority is more reliable. Standards will have to tackle straight on the problem of how to establish a 'truer' description.

Furthermore, putting the standard into practice, as we do in this article, brings into view how the standard apparatus provokes a mismatch in more ways than simply through discursive frames. Satellite imagery becomes one claim among others, which can overlap, contradict, or compete with other ways of establishing 'truth'. The protection of land and forests, therefore, is more complex than protecting carbon and biodiversity through an expert lens. It also involves protection of those that speak differently about, or on behalf of, land and other natural resources. Our case analysis shows that issues that had been seen by local media and NGOs were more likely to be invoked when evaluating whether or not standards were being met. It is therefore noteworthy that the standard only extends power to certain international organisations and national authorities.

Table 2*:* Overview of CCC in relation to EU-RED 17.4(b) and EU-FQD 7b.4(b).

Project	Deforested area (ha)	Canopy cover status at baseline *	Method of establishing CCC	Time of CCC	Compliance with RED 17.4(b) FQD 7b.4(b)
Moçamgalp	547	> 30%	GIS Interviews Observation	After January, 2008	No
Niqel	1800	> 30%	GIS Interviews	After January, 2008	No
D1 Oils-BP Fuel Crops	610	> 30%	GIS (only module 1 and 2) Interviews Observation	Before January, 2008	Yes
Sun Biofuels	Potentially 2000	No data	Document analysis	-	Not established
BioShape	145	> 30%	GIS Interviews	After January, 2008	No
Kenya Jatropha Energy	Potentially 20	No data	Document analysis	-	Not established

* Baseline is set at January 2008 in accordance with EU-RED/FQD.

Conclusion

In this article, we have used the approach of 'seeing like a standard' to increase our understanding of the processes through which standards make sustainable biofuels legible, and how their criteria and control technologies contribute to this exercise. Using the EU sustainability standard for biofuels and bioliquids as a case, we noted that the standard generates a diffusion of power, which both enables and constrains the EU to 'see' beyond its borders. Our first argument is that the standard mode of governance generates, what we call, 'diluted seeing', which prioritises global environmental problems, GHG emissions and biodiversity loss over broader social and institutional aspects. By combining interdisciplinary qualitative and quantitative methodologies, we detected high carbon losses due to biofuel projects, but at the same time, the standard skips over wider problems related to unsustainable projects. A central argument in earlier literature has been that the EU standard does not match the social-ecological reality in contexts where biofuel crops are produced (Hunsberger et al., 2013; Larsen et al., 2013; Levidow, 2013; Schut et al., 2014). Our analysis contributes to this notion, and extends it to show how the standard both reinforces the focus on global environmental values (carbon, biodiversity) and at the same time, obscures other sustainability aspects which were valued locally (forest livelihoods, legality, long-term commitments, and plantation jobs). Our analysis evaluated projects using criteria in the EU standard and adding some limited qualitative research to show how challenging it is to determine the sustainability impacts on communities and natures. We found conflicting views. In several cases, both shutting down and continuing the biofuel project were regarded sustainable, depending on ones' stake in the project, knowledge, values.

These findings highlight how defining and creating 'sustainable biofuels' remains a challenge. It may not be possible to universally standardise an understanding of sustainable biofuels. Instead, different standards will contradict each other. For example, what appears to have been illegal land use was framed as sustainable land use according to the standard adopted by the EU. This suggests that conflicts around biofuel operations are partly tied to the ways that the standard apparatus dictates what sustainable land use is, potentially leading to further conflicts. It contributes to the notion that land is increasingly a multi-scalar contest taking place around the land *per se,* and over authority and control of institutions at vast distances from the land itself (Margulis et al., 2013). Contests over standard criteria may take place in Europe, but they also continue around the land itself. Standards therefore play a large role in the struggles around land. They authorise certain valuation, and play a part in the networks that work across scales to accomplish or resist LUC. Proclaiming a universal standard is complicated in this case, seeing that countries have different codified laws, measures, customs, viewpoints, beliefs and principles of action. Rather than a fixed and standardised mode, biofuel governance is constituted by a complex web of multi-actor, multi-layered, and multi-sited struggle for authority.

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Struggles for authority tie into our second argument that the standard generates distributed seeing. Unlike Scott's focus on the centralisation of state power, we argue that the EU should be understood as a technology of rule that diffuses power beyond EU's territory onto 'outsourced' arrangements which combine EU benchmarking, member state control, private certification and audit, and additional extension of power to a range of authorities positioned within a complex of governmental, intergovernmental, and non-governmental entities and their technical devices. Instead of a strong and purposeful state, a more complex understanding of the relationships between scientific and political practice emerge (Bridge, 2014). The controversy over global biofuel expansion links precisely to this extended governance, as large-scale biofuel investments help diffuse hybrid forms of state-led, private standards into transnational biofuel geographies, with uncertain outcomes for local natures and societies (German, 2012; Margulis et al., 2013; Sassen, 2013; Sikor et al., 2013). Drawing on Rocheleau (2015), it is critical that the networked and distributed power that standards entail is also rooted in the desires of local communities, so they can be used to resist or accomplish LUC to their benefits.

Our approach that mixed social, natural and GIS scientists certainly proved what Scott calls 'relative simplicity'. Whereas our GIS expert easily manoeuvred these technologies, the simplicity is somewhat lost on us 'who cannot not break the code' (cf. Scott, 1998, 35). It is not a case of simply comparing qualitative data to the EO. Rather, we have had to piece together multiple sources of information and to try to wade through different disciplinary languages, techniques for data validation and attempt to translate all that to craft the stories here. Extending the power of control to technical expertise and complex 'remote seeing' is diluting the participatory aspect of making sustainability legible.

Yet it is crucial to remember that the value of the standard to the EU lies in its universality. Paraphrasing Scott (1998), its administrative power depends 'on its abstract sketchiness, its lack of detail–its thinness' (1998, 44). In principle, the EU standard can be applied throughout the world, regardless of local context, to produce a sustainability profile of the biofuel sold within the EU. Without such simplification, there would be a 'hopelessly bewildering welter of local standards' which do not lend themselves to statistical aggregation that would allow EU and member state officials 'to make meaningful comparisons' (cf. Scott, 1998, 27). However, in practice, our analysis puts into doubt whether governing technologies developed in one part of the world are as effective in other contexts (cf. Joseph, 2009). Remote sensing as well as remote 'seers' are constrained by the distanced optic to fully recognise local impacts, desires, and wider societal implications. Also, given the diversity of economic, social and political arrangements where biofuel crops are grown, 'it is not necessarily desirable to treat each of these considerations the same way in all times and places' (Hunsberger et al., 2013, 245). These insights draw into question the merits of various calls for more globalised, harmonised standards (cf. Scarlat and Dallemand, 2011). At minimum, they need to be treated with caution. Moreover, our analysis puts in doubt global governance per se. Rather, standards generate a wide array of overlapping rules and settings which are perhaps not best described as 'global' (Ponte et al., 2011a).

More than anything, sustainable biofuels is the product of hybrid governance, which is a far more complex network than the EU standard and its approved schemes. The standardised approach will have to tackle straight on the outlying issues which continue to challenge the standardised rendering of what constitutes sustainable biofuels. Like in Scott's account, the local, interested, contextual, and historically specific influence how 'sustainable biofuels' is perceived and practiced. Our approach is one step towards revealing these gaps. One of the limitations of the present study has been an inability to track the evolution of our specific cases and the more performative question of what seeing like a standard means in the mesh of rules manifested locally. More empirical research is needed, seeing that the EU, member states, private sustainability schemes, biofuel operators, third states and local actors continuously update the meaning and practice of sustainable biofuels.

From a distance, it appears as if only one project in our analysis has sustained its jatropha interest, specifically the one which never sought to meet the EU standard in the first place but which rather prioritised Mozambican jobs and rural development. The other five projects abandoned the idea of jatropha biofuels. And yet they caused LUC, loss of high carbon values and possibly also biodiversity values and food, livelihood and people displacements. Being tied to marketed biofuels, seeing like a standard misses these effects, and skips over wider problems related to unsustainable projects. It is not an optic of power which deals with footloose investments; neither can it reverse any irreversible effects caused. The EU policies incentivised biofuel production worldwide, and yet the EU had a limited view on how biofuel production would impact the world. All in all, it seems that Scott's advice is still valid, that is, to take small steps, favour reversibility, plan on surprise, and hope that the involved actors can develop their experiences and insights to improve on the design (Scott, 1998, 345).

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