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Stakeholder engagement within the sustainability assessment of bioenergy: Case studies in heat, power and perennial and annual crops from the UK

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ABSTRACT

The growth of the fledgling UK bioenergy sector is characterised by the slow development of the market and supply chains for biomass, resulting in part from potential market entrants' and other stakeholders' unfamiliarity with its emerging technologies, and in part from lack of coherent policy support. The nature of the sector demands mutually reinforcing activity on local, regional and national scales. TSEC-Biosys is a consortium research project that addresses the development of the sector from economic, environmental, social, regulatory and policy perspectives. A participatory sustainability assessment framework is being developed and tested, based on systems thinking and approaches and using stakeholder engagement methods derived from Multiple Criterion Decision Analysis (MCDA). A series of case studies and workshops is being used to test the framework. The participatory processes involve producers, consumers, other stakeholders, members of the public, experts, regulators and policy-makers. We describe here the initial development of sustainability criteria and attributes from local focus groups on (1) woodfuel for heat and co-firing for electricity generation, held in the county of Yorkshire, and (2) perennial and annual energy crops for heat and electricity generation, held in the county of Dorset. During the focus groups, issues of concern, objectives, and sustainable development evaluation criteria for emerging bioenergy systems, as well as barriers and drivers to the development of the sector were elicited from the participants. The workshops revealed that some chains are resource-driven (i.e. the availability of the resource is the driver for supply chain development), while others are demand-driven. Considerable variations in issues of concern, objectives and evaluation criteria were found between the focus group cases and among the participants in each subgroup. Although the information gathered aided the development of the emerging sustainability assessment framework, it is concluded that with such a diversity in perceptions and perspectives among stakeholders more creative and possibly novel approaches to problem structuring (including techniques for problem identification and system description) are required. Subsequent work on this project has thus focussed on the development of (1) problem structuring processes to enable actions from descriptions, and (2) ways of describing actions within "narratives" or storylines.

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1. Introduction

The recent UK Energy Acts [1] and the UK Renewable Energy Strategy [2] identify bioenergy as an important means of meeting the Government's energy and environment objectives, including energy security and the reduction of greenhouse gas (GHG) emissions. They also highlight the role of bioenergy in rural diversification and development. The Strategy indicates that bioenergy will need to be a major contributor to the renewable energy mix by 2020 if EU renewable energy targets are to be met.

Attempts by the UK Government to stimulate the bioenergy sector have so far had limited success. Bioenergy currently has almost no established infrastructure or market within the UK, and comprises only 3% of aggregate energy generation. As long ago as 2004, the Royal Commission on Environmental Pollution (RCEP) report on bioenergy [3] attributed the lack of progress to (1) a focus on promoting specific technologies without full consideration of the wider market (a "whole-system" issue), (2) the lack of integration of biomass supply with demand, and (3) issues of public perception and planning. The Energy Acts point out the need for technological and institutional innovation in the emerging bioenergy sectors, for assessments of the implications of alternative development pathways and large-scale bioenergy use, and for a roadmap for bioenergy development.

Overcoming such limitations, and moving towards meeting the aims of the Energy Acts and Renewable Energy Strategy, requires an understanding of the various bioenergy pathways which make up the sector. These pathways are: (a) in small to medium heat and power plants, fuelled by locally grown biomass from energy crops or a range of agricultural and forestry residues [4]; (b) in large-scale power generation plants, either burning dedicated biomass or co-firing with fossil fuels [5]; or (c) in the transport sector, initially as biodiesel and bioethanol blended with conventional fuels, and possibly as new fuels, such as synthetic diesel or hydrogen [6,7]. Because there are multiple ways in which our limited bioenergy resources could be exploited, it is essential to consider the implications of alternative development options and strategies [2,8]. Within the major pathways there are many possible technology and process options that could be pursued and biomass resources that could be used, including bioenergy imports, by investors, policy-makers, planners and members of communities.

The various pathways give rise to variability across both the spatial and temporal scales, as is illustrated in Fig. 1 (after [9]). The delivery of biomass for heat takes place over relatively short spatial and temporal scales. Progressing through different uses of biomass from CHP to co-firing for power, dedicated power and biofuels, however, the scales increase. Also shown in Fig. 1 are the temporal and spatial horizons associated with various planning/modelling tools and approaches, and with various well-known scenarios from the literature.

In addition to the various pathways available, and the temporal and spatial scale considerations, the sector is characterised by a large number of stakeholders, including those involved directly in the supply chains (suppliers, customers, regulatory authorities and the public), and other stakeholders including investors, policy-makers, planners and members of the wider community. Together these stakeholders have

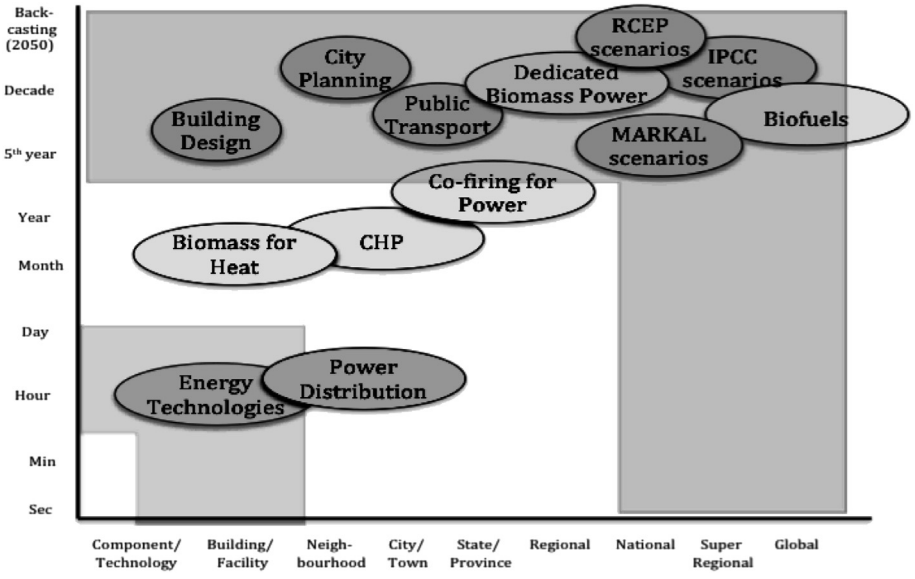

Fig. 1 – Spatial and temporal scales associated with various energy technologies, activities and scenarios. "RCEP scenarios" are the Royal Commission on Environmental Pollution carbon dioxide scenarios of [20], which proposed a 60% reduction between 1990 and 2050. These have since been superseded by an 80% greenhouse gas reduction target over the same period, which became legally binding in the Climate Change Act of 2008. "IPCC scenarios" are the Intergovernmental Panel on Climate Change scenarios of IPCC (www.ipcc.ch/); and "MARKAL scenarios" are the scenarios of the MARKAL energy model [21]. The MARKAL energy model was integrated with bioenergy data to form the TSEC-Biosys scenarios [22].