

Biogas from seaweed as a local energy source

Case of anaerobic digestion for electricity in the Western Isles, Scotland

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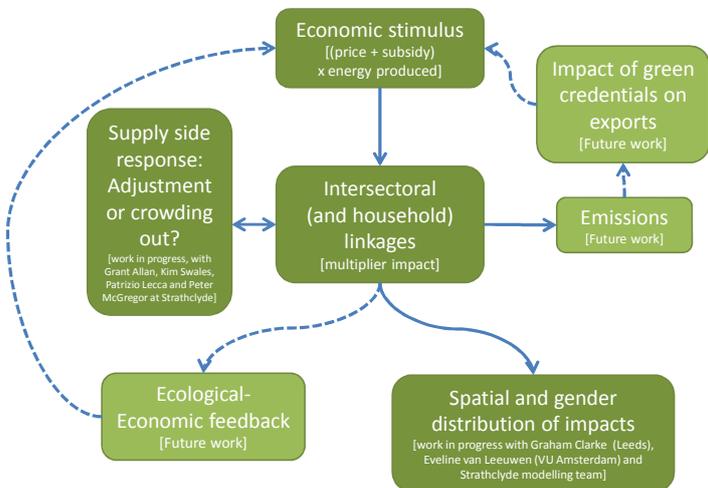
Motivation

Energy crops tend to displace alternative land use, such as for food. Therefore seaweed has been suggested as a source of next generation bioenergy. It is harvested and cultivated on a commercial scale in several countries, but in most coastal areas it is relatively underexploited. Using known technology wild seaweed can be harvested to decompose in an anaerobic digester. This produces heat and biogas, which in turn can be used to generate electricity or heating. As a standalone commercial venture this is a marginal prospect. However, there are potential wider benefits that could justify this development.

Energy potential

- Electricity for 2,140 – 2,600 homes
- Based on household consumption of 3,300 – 4,000 kWh
- 12,200 households in Western Isles
- Could supply 17%-21% of household needs
- For Scotland as a whole seaweed could supply electricity for approximately 11,000-12,000 homes

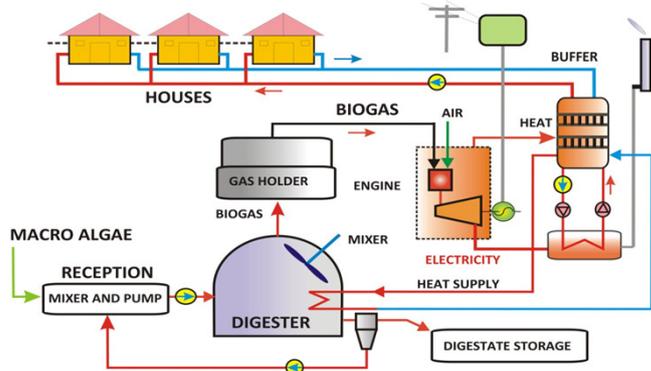
Modelling socioeconomic impacts



Local expenditure impacts

	Type-I			Type-II		
	Output	GRP	FTE Emp.	Output	GRP	FTE Emp.
Impact (£000's, FTEs)	4,154	1,407	95.8	4,633	1,848	100.1
% of ES total	0.63%	0.39%	1.04%	0.70%	0.52%	1.08%
Multiplier	1.56	0.53	0.036	1.74	0.69	0.038

Energy from anaerobic digestion



Source: Hewitt et al (2012), University of Ulster

Western Isles as a case study

The Western Isles, or Eilean Siar in Gaelic, is a council area in the Hebrides of the west coast of Scotland. It is a community of 26 thousand inhabitants residing on 14 islands. The islands are situated in waters that produce large quantities of seaweed (macroalgae). There is already an anaerobic digester in operation that is used to dispose of household waste and produces both heat and gas as its outputs. Furthermore, there is a wide range of know-how in existing marine-focused sectors, such as fisheries and aquaculture, which can be drawn on in the development of an algae harvesting sector.

The availability of economic accounts for the islands permits an evaluation of interactions between different business sectors, households, government and the external world. However, conventional economic impact methods suffer two main drawbacks: disregard of available production capacity in the economy (supply-side) and geographic complications. Furthermore, during the course of the project it has arisen that harvesting seaweed could affect other marine focused sectors. Conversely, a positive side-benefit that needs considering is whether increasing the green credentials of the community can be utilised by local businesses to access premium markets.

Implementation?

- Commercial viability marginal
- But positive side effects
- Important ecosystem (needs careful assessment)
- Detailed engineering studies required
- But amenable to small scale demonstrations