

Sustainable landscape governance: Lessons from a catchment based study in whole landscape design

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Abstract

This paper investigates the implementation of governance for sustainable landscapes, based on a catchment case study in lowland England. A participatory research process, spanning six and a half years, employed formal and informal in-depth interviews, focus group work and workshop techniques with 71 stakeholders representative of a wide range of interests in the catchment. A scenario design process within a GIS framework was used as a focus for capturing the key issues and visions of the stakeholders. Two contrasting but plausible scenarios for 2020 emerged from this process; one scenario was driven by the sustainable intensification of agricultural production and world trade, the other by the enhanced protection of ecosystem services and multi-objective land use. It was clear from discussions with stakeholders that the mechanisms for delivering an integrated approach to landscape management are not currently in place, although there have been some policy successes that could be built upon. There is also a need for new approaches to land tenure which include tax incentives and improved forms of cooperation and leadership in both policy and contiguous landscape stewardship. The methodology itself was appreciated by the stakeholders who found it useful to think more holistically. In addition, the study demonstrates an approach that individual practitioners and researchers can develop the skills to implement.

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1. Introduction

The implementation of governance for sustainable landscapes is a key component of sustainable development thinking, with academics and practitioners increasingly attempting to form integrative frameworks and methodologies to address the challenges involved (MacFarlane, 1998, 2000; Dolman et al., 2001; Matthews & Selman 2006; Pearson et al., 2010). However, defining what a sustainable landscape might be is not straightforward, not least because of the differing contexts in which it is framed. This is despite the term being routinely used, often with an assumed common understanding of its meaning (Selman, 2008). Certainly the unification of the natural and socio-economic domains is critical, as is the delivery of well-being for future generations, yet the manifold dimensions of sustainable landscape design raise challenging questions regarding the nature of how to design and manage them (Antrop, 2006). There is nevertheless a growing ideology that spatially explicit holistic planning and implementation will be required, with a focus on the provision of multiple objectives and ecosystem services, and the connection between social and natural components of landscape systems (Millennium Ecosystem Assessment, 2005; Selman, 2006). Various approaches to achieving this are being implemented and studied, such as integrated coastal zone management (Shipman & Stojanovic, 2007), integrated catchment management (Macleod et al., 2007), the ecosystem approach (Millennium Ecosystem Assessment, 2005, Defra, 2007a) and whole landscape design (MacFarlane, 1998, 2000; Dolman et al., 2001).

The increasing emphasis on more connected approaches reflects the contemporary understanding of the management challenges that have to be addressed (OECD, 2006; Kidd & Shaw, 2007).

These new approaches often incorporate varying degrees of transdisciplinary research that

includes multiple stakeholder values, social learning, participatory decision making and scenario analysis to deal with future uncertainty (Peterson et al., 2003; Tress et al., 2005; Macleod et al., 2007). They also take greater account of ecological units, such as catchments and species' ranges, within new administrative frameworks and spatial planning strategies that are informed by ecological principles (Folke et al., 2007; Kidd & Shaw, 2007). These "experimental" approaches are in their infancy, and examples of successful joined-up landscape scale governance in practice are rare (Olsson et al., 2004). Nonetheless, these approaches are increasingly being favoured by policies and governance arrangements, although these are complex and currently in a state of flux. Despite this "new paradigm", landscape planning is still embedded in sectoral approaches (OECD, 2006), and the ability of apparently well functioning institutions of developed countries to deliver sustainability is questionable (O'Riordan & Stoll-Kleemann, 2002; Russel, 2007).

1.1. Multiple objectives and the landscape perspective as an integrating framework

Evidence for the sustainability of landscapes is often related to their multifunctionality, an important paradigm within sustainable development thinking (Selman, 2008). Landscapes can be seen as "bundles" of multifunctional services as well as practices and outputs, particularly in highly productive human dominated systems (Mander et al., 2007). This multifunctionality can come in two basic forms, spatial and integrated multifunctionality (Brandt et al., 2000). The former pursues different goals in a corresponding matrix of separate land use types, while the latter pursues different goals on the same parcel of land, either achieving them simultaneously, or sequentially through time (Brandt et al., 2000). These multiple functions are in essence similar to the increasing interest placed on the implementation of an ecosystem based approach stimulated

recently by the Millennium Ecosystem Assessment (2005). Such an approach also emphasises generating markets, new income streams and institutional arrangements around multifunctional land use.

The paradigms of multifunctional land use and ecosystem service provision are inducing a shift in land use strategies, and are an important part of the ongoing sustainable development debate (Brandt & Vejre, 2003; OECD, 2006). New forms of holistic landscape planning for sustainability will, however, require a joined up delivery framework, necessitating increased levels of integration between the natural and social sciences, land and water managers, planners and policy makers across multiple landscape scales and levels of governance from landowner to national strategic governance (Macleod et al., 2007; Selman, 2008).

1.2. Aims of this research

The aim of this paper is to illustrate an approach that could move landscapes and people towards a sustainable outcome by looking at what it would mean in practice to attempt to do so. The study was driven by the question; what policies, institutional arrangements and governance mechanisms could facilitate the delivery of a sustainable landscape? Evidence is presented through a catchment based case study involving multiple stakeholders over a six and a half year period in a lowland farmed landscape in the county of Norfolk, England.

2. Methods

2.1. Case study policy context

Approximately 70% of the English landscape is farmed (Defra, 2008a), and landowners and other stakeholders have had to operate within a shifting tapestry of policies, regulations and institutional arrangements, particularly during the last five years. The key drivers for this have been world trade policy and reforms to the Common Agricultural Policy (CAP), European Union (EU) Directives (e.g. the Water Framework, Nitrate, and Habitat Directives) and “surprise” global events, such as a food “crisis” in 2008, an economic “crisis” in 2009 and a growing realisation that climate change could be more serious than previously thought (New et al., 2009).

The 2003 CAP reforms have led to the emergence of a new policy paradigm of multifunctional agriculture, supported by associated policies and institutional frameworks. This is set within the context of commodity market liberalisation and declining farm profitability, the decoupling of farm subsidies from production support and the linking of them to environmental measures, biofuel policy, food security and the “sustainable intensification” of agriculture that maintains ecosystem functionality (Gorton et al., 2008; Royal Society, 2009; Foresight 2010). CAP reform together with the EU environmental directives and the adoption of an ecosystem based approach (Defra, 2007a) are driving a need for greater integrated planning based on hydrological boundaries and the inclusion of socio-economic systems in parallel with environmental systems, as well as the incorporation of wider public participation in the land use planning process (Moss, 2004; Stringer, 2006; Macleod et al., 2007).

The governance structures currently in place within England to deliver sustainable landscape planning are still fragmented in the sense that policy and operational responsibilities are divided between an array of organisations (Figure 1), with sometimes competing and contradictory objectives and a disconnection between national, regional and local scales of governance (OECD, 2006; Kidd & Shaw 2007). This is despite the establishment of a new “integrated” agency, Natural England in 2006, that combined the responsibilities of what were formerly three separate organisations into one, integrating wildlife and conservation activities with public access, recreation, landscape protection and the delivery of agri-environment policy to deliver a broad sustainability remit (Defra, 2006).

Catchment scale planning and management is the main responsibility of the Environment Agency, although numerous other agencies and stakeholders are ultimately responsible for delivery, including multiple land managers and their advisors, private water companies, and Natural England (Kidd & Shaw, 2007). The Environment Agency is responsible for the development of River Basin Management, Abstraction and Flood Management Plans. These are either focused on specific issues (e.g. abstraction licensing) or have a regional scale emphasis that has made little significant impact on landscapes, although they have been informed by a degree of stakeholder consultation. The Environment Agency also administer Nitrate Vulnerable Zones (NVZs) which were expanded in 2007 to cover approximately 70% of England (Defra, 2007b), imposing additional nitrogen related measures on land management.

Although the Environment Agency are the lead body delivering the EU Nitrate and Water Framework Directives, with key monitoring and regulatory responsibilities, Natural England administers a key implementation mechanism through the Catchment Sensitive Farming Delivery Initiative. This was launched in April 2005 and now covers approximately 40% of England's agricultural area (Defra, 2010). The initiative directly addresses the issues of diffuse agricultural pollution, placing particular emphasis on the reduction of nitrogen, phosphate and silt pollution. The approach is voluntary, and implementation is through project officers who are appointed for specific catchments. Capital grants have been made available and workshops for farmers, agronomists and other farm advisors have been arranged to raise awareness of the issues and facilitate the utilisation of mechanisms within new agri-environmental schemes to reduce diffuse pollution.

At the strategic level England has a national strategy that outlines sustainable development principles. These have been agreed by all levels of government (HM Government, 2005), recognising that sustainable land use cannot be achieved without addressing how societies as a whole can learn to live sustainably and nurture the land and its dependent communities. Spatial planning was also given a central coordinating position in the Government White Paper "Planning for a Sustainable Future" (Communities and Local Government et al., 2007). This has generated a degree of regional spatial planning that is still far from integrated and which is hampered by a planning system administered by local authorities that is complex, bureaucratic and in need of reform (Kidd & Shaw, 2007). There is consequently a need for a greater emphasis on the landscape scale, a review of sustainability planning and the development of a vision for sustainable landscapes that can be translated into practice.

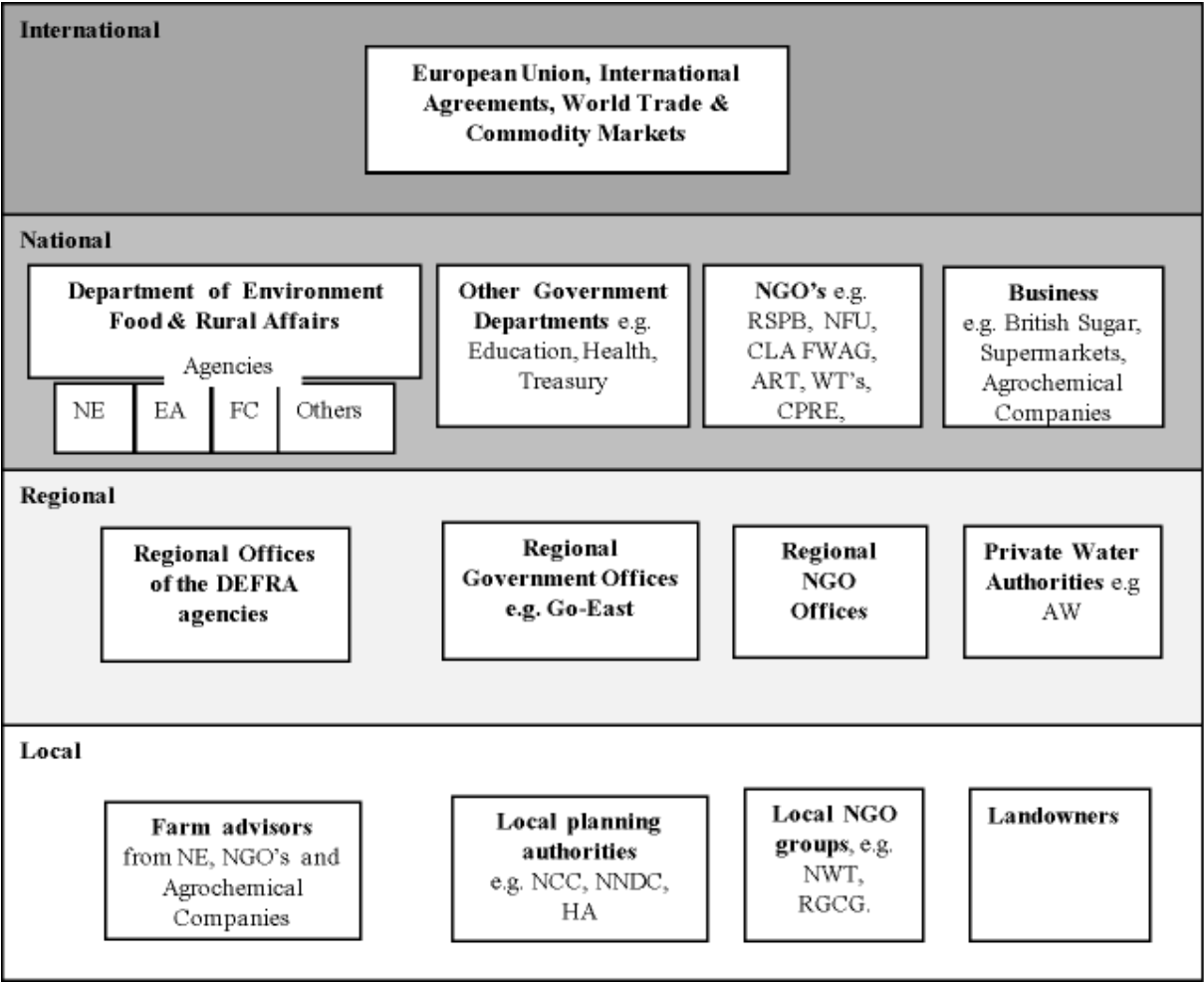


Figure 1. Institutional arrangements for the delivery of landscape policy in England, acronyms used (arranged in alphabetical order); ART = The Association of River Trusts; AW= Anglian Water; CLA = Country Land and Business Association; CPRE = The Council for the Protection of Rural England; DEFRA = The Department for Environment Farming and Rural Affairs; EA = Environment Agency; FC = Forestry Commission; FWAG = Farming and Wildlife Advisory Group; HA = Highways Agency; NCC = Norfolk County Council; NE = Natural England; NFU = National Farmers Union; NNDC = North Norfolk District Council; NWT = Norfolk Wildlife Trust; NGO = Non-governmental Organisation; RGCG = The River Glaven Conservation Group; RSPB = Royal Society for the Protection of Birds; WT's = Wildlife Trusts; WTT = Wild Trout Trust.

2.2 The Glaven catchment

The rural River Glaven catchment in north Norfolk (115 km², 11,500 ha) has a population of approximately 7,900 people, and represents in a microcosm many of the issues, policies and institutions relevant to the integrated delivery of landscape management in lowland England (Figure 2). The Glaven is typical in terms of experiencing many of the environmental problems associated with surface water catchments, particularly, river siltation and the associated erosion of the free draining sandy soils. It is this siltation that has resulted in the inclusion of the Glaven in the Catchment Sensitive Farming Delivery Initiative. Other forms of diffuse water pollution, particularly nitrogen and phosphate from agricultural activities, and the abstraction of water for crop production and domestic use, along with the changing economics of rural land management are implicated in the declining integrity of the Glaven ecosystems throughout the 1970s and into the 1990s.

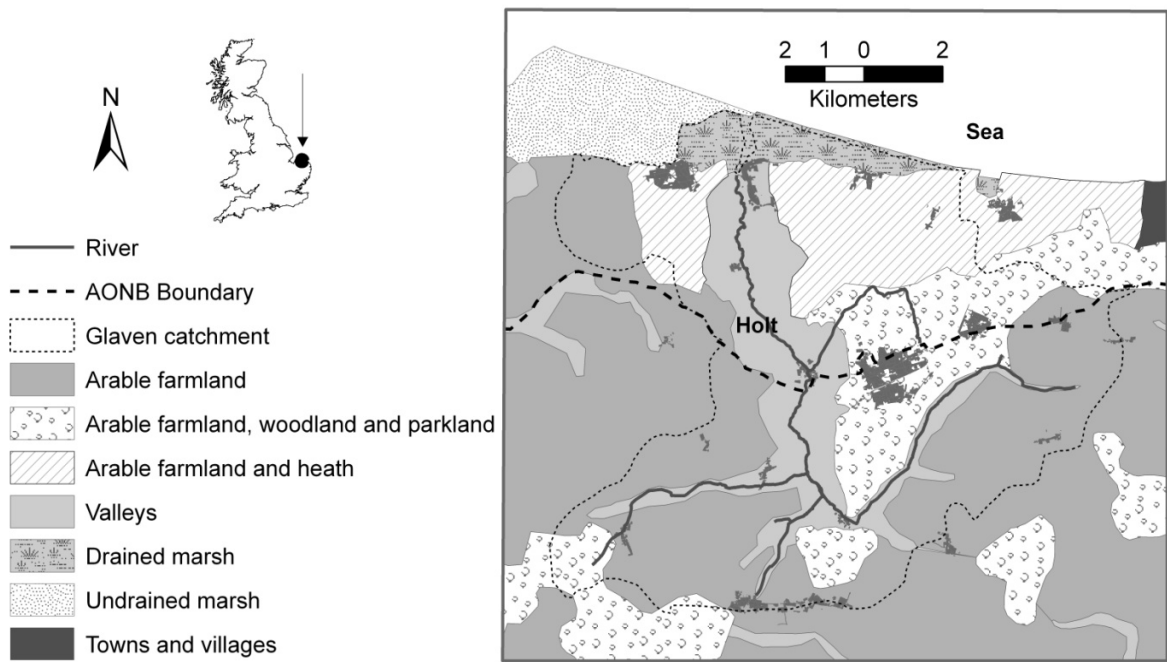


Figure 2. Study site location and landscape character (adapted from NNDC, 2008), the Area of Outstanding Natural Beauty (AONB) boundary indicates the southern extent of the designation.

The system has essentially been influenced and altered significantly by human activities for centuries, with arable agriculture currently dominating 63% (7240 ha) of the land use. Crop production on the mostly Grade 3 (average quality) agricultural soils is predominantly wheat, malting barley, sugar beet and oilseed rape, together with some high value vegetables, mostly potatoes or carrots. Livestock production in the catchment has declined in the last 30 years in line with regional trends, although outdoor pig production is important on the large estates. Three estates cover a quarter of the land area within the catchment and approximately 120 other

holdings have agricultural interests in the area. There are also forestry (198 ha) and conservation organisations (267 ha) with significant landownership within the catchment.

The landscape is characterised by the long shallow Glaven valley and rolling farmland interspersed with woods, parkland and heathland underlain by a Cretaceous chalk geology that strongly influences the Glaven's ecology and associated mosaic of wetlands. The landscape beauty and riparian ecology has inspired strong grass roots conservation efforts in the form of the River Glaven Conservation Group, which established itself in 1999 to conserve and restore the river. The scenic value of the Glaven is important economically and 45% of the catchment falls within the North Norfolk Area of Outstanding Natural Beauty. This is essentially designated on the grounds of landscape amenity, with the management vision of enhancing countryside character, the re-creation of wildlife habitats, improved recreational access, greater stakeholder involvement in decision making, and the promotion of more integrated approaches to land management. The catchment also forms an integral part of the North Norfolk Coast Conservation Area which has virtually every environmental designation under UK, European and international legislation.

2.3 The “whole landscape” design methodology

The core of this research was based on a “whole landscape” design approach. This can be described as a conscious and premeditated integration of multiple land holdings, optimising the amount, location, configuration and spatial management of ecosystems to deliver explicit social, economic, environmental, and biodiversity benefits in a particular place (MacFarlane 2000;

Dolman et al., 2001). It addresses two critical issues in many human dominated landscapes. In particular, it tackles the challenge of managing a multi-owned landscape where responsibility for its collective governance has no legal status (O'Riordan et al., 1999). Secondly, the process challenges land-based policy to move beyond the individual landowner to address incentives that encourage cross boundary working (MacFarlane, 1998). Thus, the research methodology involved a participatory process of multi-stakeholder engagement, encompassing 71 individual stakeholders who lived and/or worked in the Glaven catchment over six and a half years between June 2004 and January 2010 (Table.1). This included 27 farming and 12 non farming landowners, and a representative range of national and local government agencies and NGOs involved in landscape governance; all of the institutions listed in the caption of Figure 1 participated in this study.

Table 1. Number and type of stakeholders participating in the study.

Research phase	Government	NGO	Farming Landowners ¹	Non-farming landowners	Total number of stakeholders
Initial contact	6	3*	1	1*	(10)
Landowner interviews	2*	2*	27*	12*	(39)
Scenario validation	7	9*	2*	1*	14 (3)
Governance workshop	12	6*	9	1*	26
Feedback meeting	3	6*	5*	3*	14

¹ Also includes farmers who are not landowners, * includes stakeholders that were representative of more than one of the main categories, the total number of individual interviews with stakeholders is shown in parentheses as opposed to those engaged via small group and workshop sessions.

The methodology was designed to allow long-term associations with stakeholders, enabling individual interviews, group work and workshops to be used on a number of occasions. The

approach drew on the theory and practice of focus group research (Krueger 1998), with group interviews of 4-12 individuals focused on a specific topic and in-depth discussion groups (Burgess, 1988a, 1988b) to engage researchers and participants in group work over a period of time. The process also incorporated methods of scenario mapping and design that mix stakeholder participation with integrated Geographic Information System (GIS) modelling (Dolman et al., 2001; Tress & Tress, 2001; Walz et al., 2007).

The study involved six distinct phases:

- 1) *Initial stakeholder contact*; Informal meetings with ten key individuals were arranged to identify key stakeholders and build support and awareness for the project.
- 2) *Landowner and manager interviews*; A series of 39 in-depth semi-structured interviews with individual landowners and farmers representative of the key holdings in the study area, and covering 54% of the catchment, were conducted in the winter of 2004-05. These interviews were designed to inform landscape scenario mapping and design by collecting land management data not readily available from other sources, such as the extent of land holdings, future land management plans and visions for the wider landscape.
- 3) *Scenario modelling*; An initial stakeholder informed iteration of two scenarios was built around a comprehensive catchment scale database developed from 11 different data sources within a Geographic Information System (GIS) framework (using ArcMap v9.1, ESRI, 2008, and Ordnance Survey Mastermap[®] topography data, Ordnance Survey, 2008). This was checked against aerial photography and combined with national landscape designations and agricultural soil classifications, hydrological data, and the Norfolk Wildlife Trust

designations. The two scenarios differed in the amounts of land dedicated to agricultural production, managed as part of agri-environmental schemes (including that “set-aside” from production), or in semi-natural habitats. These scenarios were compared to a 2005 baseline using a set of five model-based indicators representative of a range of ecosystem services including: land use change, agricultural gross margins (Nix, 2004, 2006), ecological connectivity using least cost modelling (Adriaensen et al., 2003), nitrogen levels in the river water using export coefficient modelling (Johnes, 1996), and soil erosion. The ecological connectivity modelling formed the basis of significant land use change in one of the scenarios. Targeting this change was based on overlaying areas more susceptible to soil erosion and the potential willingness of landowners and farmers to participate in land use change. The other scenario was based on increasing the area of agricultural production and crops in line with farmer preferences and EU agricultural policy (for more details of the modelling see Southern et al., 2010).

- 4) *Scenario model validation*; A series of seven “validation” meetings with 17 key stakeholders were arranged to advise on the feasibility of the initial iteration of the scenarios, and provide further input into their design before they were finalised. At this stage the stakeholders were also consulted about their willingness to participate in the next stage of the research.
- 5) *Governance workshop*; In October 2007 a 26 participant multi-stakeholder workshop was used to bring together a range of people identified as key players throughout the course of the research. The workshop involved extensive planning and preparation and was designed to be a deliberative opportunity, rather than an attempt to build consensus, which can sometimes constrain the process (van de Kerkhof, 2006). The stakeholders were carefully selected to be representative of a broad range of interests in the catchment (Table 1). The primary objective

of the workshop was to address the question, “What mix of policies, institutions and delivery mechanisms would best deliver a multi-objective whole landscape for the Glaven catchment?” However, during the validation stage a prominent local farmer suggested this would be better phrased as; “*How do we make a landscape that is fit for our grandchildren?*” Both questions were introduced to the participants in information provided to them prior to the event and were clearly communicated throughout the workshop. Additionally, each farmer was given a field by field scenario impact assessment for their land. This was augmented by two colour A0 size catchment scale scenario maps with individual fields and other prominent landscape features clearly shown. These were displayed as a backdrop throughout the entire event to facilitate discussions around the primary objective of the workshop. The workshop was facilitated by four academics with the support of five assistants and was structured around the following three sessions; (i) Introduction and presentation of the scenarios to illustrate the issues and encapsulate stakeholder visions (90 minutes). (ii) Identification and discussion of the key issues (60 minutes). This was done in four stakeholder groups, each addressing one of the following themes; ecosystem service enhancement and protection, institutional arrangements, policy issues and delivery mechanisms. (iii) Discussion of an appropriate governance framework (75 minutes), when all participants convened to address directly the governance question stated above. Additionally, a post workshop questionnaire was distributed to the participants to provide feedback on the event.

6) *Feedback meeting;* in January 2010 a two hour meeting was arranged with 14 stakeholders where the results and conclusions from the whole project were presented to them and they

were specifically asked if the project had been useful to them, how things have changed since the governance workshop and how their interests could be developed in the future.

An important part of the methodology included taking advantage of other opportunities to meet and interact with stakeholders throughout the period of the research. This included regular contact with representatives of the Area of Outstanding Natural Beauty partnership, attending quarterly River Glaven Conservation Group committee meetings, a farm open day attended by approximately 50 local stakeholders, a National Farmers Union Norfolk sugar beet growers meeting, and the launch event for the Natural England regional team.

With the exception of interviews with two landowners, all of the formal individual and group meetings, including all the workshop sessions, were digitally recorded and an abridged transcript created for analysis (Krueger, 1998).

3. Results

3.1. Scenarios

The two landscape scenarios that emerged from the process varied in several characteristics (Table 2) (Figure 3). The “2020ag” scenario was driven more by agricultural production, biofuel policy and world trade, while “2020eco” focused more on the enhanced protection of ecosystem services and multifunctional land use.

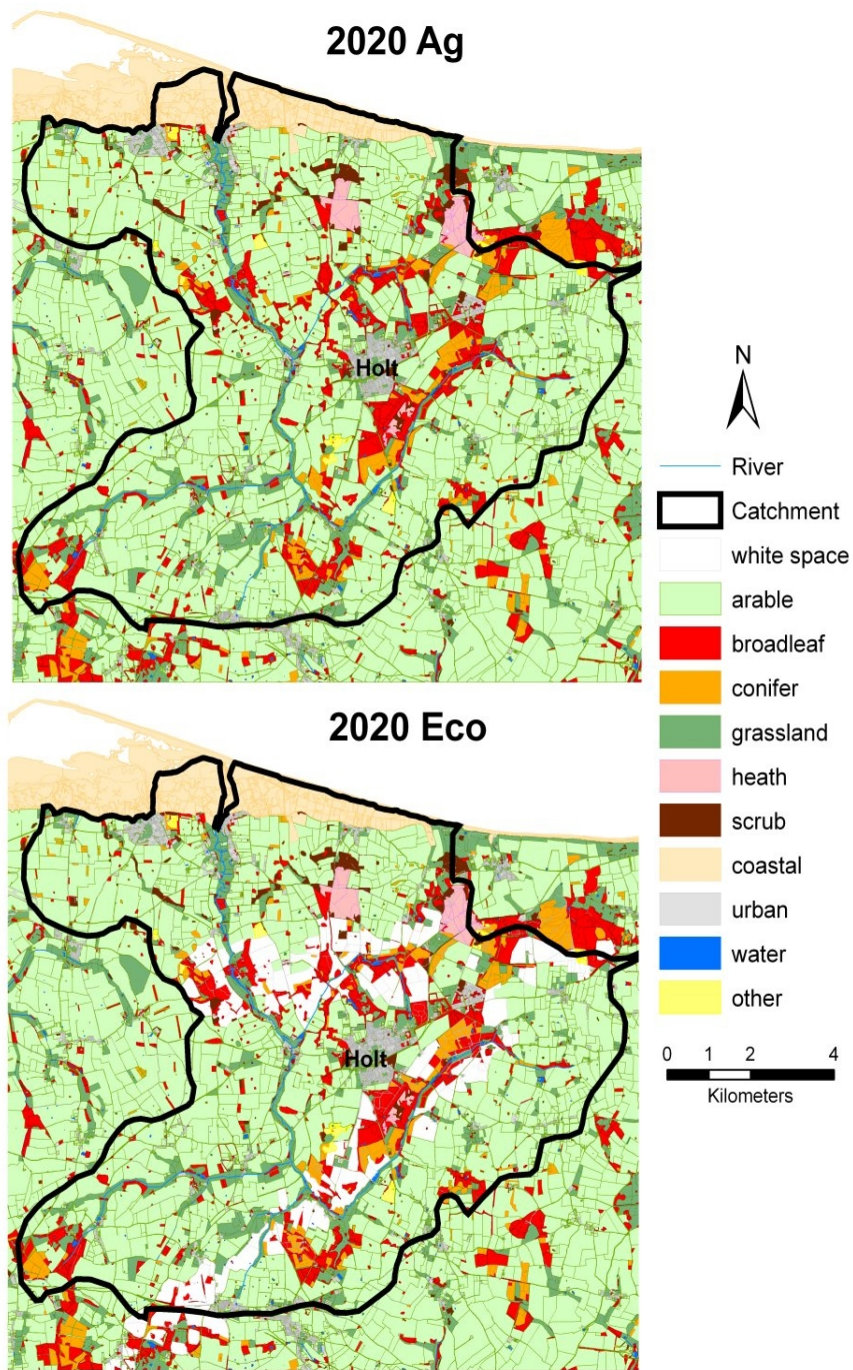


Figure 3. The land use structure of the two scenarios in the form they were presented at the workshop. The “white space” in the 2020 Eco scenario represents 10% of the arable land converted to new land use which contributes to a connected habitat mosaic and farm diversification activities.

The landowners broadly envisioned an open agricultural landscape not too dissimilar from the existing configuration. Many felt there would be a decline in arable land use by an average of 10.9 % (n = 21), which would be replaced by semi-natural habitat (grassland, broadleaf woodland and heathland). This formed an important guide for the reduction of arable land in the 2020eco scenario. There was, however, a clear difference in the attitude to heathland between the non-farming and farming landowners, the latter being much less inclined to view heathland favourably. This was mostly due to the additional mandatory public access arrangements that come with heathland restoration.

During the interview period break cropping was a critical issue for the farming landowners. In 2005 sugar beet, a major break crop, comprised 50% of the total gross margin for all arable crops in the catchment and farmers relied heavily on it for profit. Sugar beet was, however, generously subsidised and significant reforms in the sugar beet market were expected (Giha et al., 2006). So when farmers were asked how they might change their break cropping practices, if sugar beet was to become unprofitable as a result of agricultural policy reforms, there was general uncertainty and concern. Four farmers thought oilseed rape could be a plausible alternative if the biofuel market expanded in line with EU policy, and another was already growing oilseed rape for this niche. There was also broad support for biofuel production and 15 of the farmers expressed an interest in growing unspecified types of biofuel crops. This result, supported by an increase in oilseed rape production in the region, formed the rationale for making oilseed the primary break crop in the 2020ag scenario. Although this was a plausible scenario at the time, two changes have since contributed to making the adoption of oilseed rape as a break crop less likely. Firstly, it was not known that subsequent sugar beet subsidy reforms would cut gross

margins by approximately 57% in the catchment, reducing returns from the crop, but still making it profitable to grow. Secondly, in late 2008 British Sugar, who monopolise sugar production in England announced the closure of a northern production plant to focus their business in the eastern region. This is expected to lead to an increase in sugar beet production in the catchment rather than a decrease. The reduction in sugar beet profitability was included in the economic modelling for the whole catchment, but the trend towards increased production did not become apparent until after the completion of the scenarios and governance workshop.

Substantial increases in the price of wheat in 2007 helped make a “new age” of agricultural prosperity plausible, although there was little difference in the whole catchment gross margins for the two scenarios (Table 2). This was because the incorporation of a high wheat price into the scenarios, even at £188 £/t (Farmers Weekly, 2007), was offset by reductions in land use for production in the 2020eco scenario, a switch to the less profitable oilseed rape crop in 2020ag, and the 57% decline in sugar beet gross margins. The type of break crop grown was clearly a critical sensitivity, not only financially but also environmentally. For instance, the scenarios highlighted the water quality trade off inherent in switching to oilseed rape from sugar beet, which could lead to increased nitrate export to the river because rape is a much “leakier” crop. This is the primary driver for the higher nitrogen grades in the 2020ag scenario, oilseed rape contributing 27% of the total catchment N loading, compared to only 0.7% in the 2020eco scenario and 6.8% in 2005. It was also noted by an experienced farm advisor that there was often a trade-off between managing for nitrogen pollution and soil erosion when changing crop types. In this instance sugar beet, being a winter harvested crop, required careful erosion control measures, but was less of a nitrogen problem.

The interviews were effective in informing the scenario design. They captured the essence of the key issues and lent credibility to the scenarios that were ultimately received favourably by the stakeholders, although it was challenging to link the qualitative data with the quantitative modelling data in a rigorous fashion (see Walz et al., 2007). Nonetheless, the scenarios served as a useful focal point for the interviews and small group work. The validation meetings were also a critical step in the process, for four key reasons. i) They highlighted the need to avoid constraining the land use decision making of farmers by specifying particular semi-natural habitat types within the ecologically connected habitat mosaic of the 2020eco scenario; instead the term “white space” was adopted. ii) They helped to reduce technical jargon, which improved their use as communication vehicles in the governance workshop. iii) They built confidence in scenario plausibility. iv) They were used to assess the willingness of the key stakeholder groups to meet in one multi-stakeholder workshop, rather than two or three small group meetings, which might have been necessary if there had been a greater degree of conflict between the different stakeholder groups. It was not until the end of this stage in the process that a decision to run one final workshop could be made.

The production of scenario maps that clearly showed the impacts on a field by field basis was particularly appreciated by farmers. This improved engagement with the process as well as discussion during the validation meetings and the governance workshop. In the majority of cases farmers were mostly concerned about impacts on crop production and revenue generation. However, one prominent farmer was concerned that the targeting of new land use would benefit some farmers more than others; he suggested that this would lead to fewer opportunities for

revenue from agri-environmental schemes for him and others in the catchment not favoured by the targeting.

Table.2. Summary of the scenario storylines that emerged from the stakeholder engagement process.

2020ag	2020eco
Key driver: economics of bioenergy and increased global food demand.	Key driver: economics of increased global food demand, amenity and diversification.
Maximisation of productive arable land for “sustainable intensification”.	10% (1200 ha) of the arable land is converted to “white space” ^a which represents alternative land use that contributes to an ecologically connected habitat mosaic and farm diversification activities.
New age of agricultural prosperity, 63% (7248 ha) of the catchment is under intensive arable production. Whole catchment arable gross margins are approx. £3,600,000.	New age of agricultural prosperity, 53% (6087 ha) of catchment is under intensive arable production. Whole catchment arable gross margins are approx. £3,400,000.
No set-aside ^b (100% in production). Oilseed rape as the primary break crop.	No set-aside ^b (50% in production, 50% in “white space” land use). Sugar beet as the primary break crop.
All arable fields susceptible to soil erosion are under appropriate land management that minimises or prevents soil erosion	All arable fields susceptible to soil erosion are under appropriate land management that minimises or prevents soil erosion
100% of the catchment is designated an Nitrate Vulnerable Zone (NVZ) ^c	100% of the catchment is designated an Nitrate Vulnerable Zone (NVZ) ^c
Nitrate levels in the river increase a water quality grade ^d	Nitrate levels in the river decrease a water quality grade ^d
Riparian connectivity is improved in conjunction with an increased area of agricultural field margins and buffers.	Catchment scale connected habitat mosaic, riparian connectivity, with enhanced agricultural field margins and buffers.
Ecological service protection and multifunctional land use are important within the context of a highly productive arable landscape, although it is difficult to reconcile trade-offs in nitrate levels.	Greater emphasis on the enhancement of ecological services and multifunctional land use within a productive arable landscape.

^aThe term “white space” was used to represent arable land converted to new land-use as a stakeholder communication tool. It also served to convey the notion of landowner choice as to what exactly the “white space” could be used, for rather than be more specific about the use of the land.

^bSet-aside was introduced in 1988 to reduce surplus agricultural production by leaving a proportion of farmland uncultivated or in non-agricultural use each year. This was abolished shortly after the workshop at the end of 2008.

^cRegulations formally designated new NVZs that included the entire Glaven catchment in 2008 (Defra 2008).

^dNitrate classification of river water quality in England is based on a 1, very low to 6 very high grading system (Environment Agency, 2008).

3.2. Governance

The workshop participants found it challenging to address the overarching governance question they were asked to consider. The mix of policies, institutions and delivery mechanisms that emerged from the event (Table 3), revolved around the need to work together in some form of partnership, with a long-term stakeholder driven vision building on past success that would, at least initially require a key person, perhaps in the form of a project officer to aid with the initial start up.

It was envisioned that the partnership would build on existing policy successes and previous experience in the catchment, such as the Area of Outstanding Natural Beauty approach to partnership working, grassroots conservation through the River Glaven Conservation Group, strong uptake of the Catchment Sensitive Farming Delivery Initiative and the high uptake of agri-environmental schemes by the farming community. The local distinctiveness of the catchment could also be capitalised on through product branding and sensitive tourism development.

One suggestion was that the Glaven could be made a special experimental case under existing natural resource legislation to demonstrate integrated landscape management. This could provide a suitable environment for the testing of mechanisms to incentivise landowners to work together across property boundaries. It would also give the partnership the flexibility and authority to challenge higher levels of government where existing national policy and delivery mechanisms

are not working to maximum effect at the local scale, such as with some agri-environmental schemes.

Table 3. Key principles for the design of an integrated governance framework for the Glaven catchment

Principle	Description
Partnership	Some form of partnership should be established composed of a range of stakeholders that would develop a shared long-term vision with a clear set of objectives.
Leadership	Initially there would need to be funding for a key person to explore the development of the partnership, this would be a pump priming arrangement that would assist the embryonic partnership on its road to self sustenance.
Long-term vision	<p>A long-term vision for this partnership would need to be developed that should include:</p> <ul style="list-style-type: none"> ● The exploration of innovative socio-economic incentives, such as the right kind of incentive packages for landowners to work across property boundaries, perhaps in the form of inheritance tax incentives a Glaven Trust or landscape covenant. ● The development of branded produce to capitalise on local distinctiveness and increase revenues. ● The authority to challenge higher levels of governance if policy and delivery mechanisms are not working. ● Possible scope for treating the Glaven as a special experimental case study, to free the community up to experiment with policy and delivery mechanisms outside of the wider political framework.
Build on existing success	<p>The partnership would build on existing successes in the catchment, notably:</p> <ul style="list-style-type: none"> ● Cooperation between Glaven farmers and the sharing of best practice ● A strong uptake of the Catchment Sensitive Farming Delivery Initiative capital grants and diffuse pollution options within the Entry Level Environmental Stewardship (ELS) agri-environmental scheme. ● Higher than the national average uptake of the ELS Scheme which includes 90% of the arable land in the catchment and increasing landowner interest in the more demanding Higher Level Environmental Stewardship Scheme. ● The continuing restoration and conservation of the riparian zone by a strong grass roots organisation, the River Glaven Conservation Group.

The barriers to delivering these principles were made clear throughout the research and specifically in the governance workshop. It is clearly very challenging for a community of stakeholders, regardless of how willing they are to work together towards sustainability, to do so

within a governance framework that lacks the capacity to support grassroots initiatives adequately. The issues raised by the workshop participants highlighted this and can be summarised under five headings. i) There is a lack of clarity and trust surrounding the objectives of central government. ii) The institutional and regulatory complexity of policy delivery makes practical implementation difficult. iii) Water and land management policy are not integrated. iv) There has been a decline in the prosperity of arable and livestock farming. v) There is no long term coherent leadership for the whole catchment.

Additionally, the perceived need to form a partnership was tempered somewhat by concerns surrounding “*partnership fatigue*”, particularly among agency staff. There were also doubts about the short-term nature of project officer appointments, whose role should be strongly related to capacity building, otherwise little can be achieved for the longer term. Good leadership was also seen as essential. Although it was clear that the River Glaven Conservation Group could play a key role in the new partnership, exemplifying a “leading” grassroots organisation, they were keen to stay focused on riparian conservation and restoration. During the research period this group implemented a series of invasive species control and monitoring measures, restored a one kilometre stretch of the river and led or participated in the development of several other river improvement plans. It should also be noted that certain members of the farming community felt threatened by the group, although this receded somewhat towards the end of the research. The mapping of silt entry points into the river by the River Glaven Conservation Group during 2005 highlighted the potential for CAP reforms to shift the power dynamics between stakeholders. This concerned some farmers because the “new” subsidy arrangements that are vital to farm

profitability are tied to conditions of good environmental practice, which can be easily observed by other stakeholders who can report non compliance to regulators.

It is also important to recognise that the River Glaven Conservation Group received invaluable support from the Association of River Trusts who provide technical advice and help with the understanding of regulations for groups interested in river restoration and management throughout England. Likewise, the importance of “good” farm advisors became apparent early in the research. Many farmers rely on the advice of various agronomists, land agents and others from agro-business, NGOs and government. These agents can form an important bridge between the farm scale and the wider system. Their influential role has also been acknowledged by the Catchment Sensitive Farming Delivery Initiative who targeted this stakeholder group as important allies in the delivery of diffuse pollution control measures.

However, building on existing success could be difficult. Several farmers were approaching the end of 10 year agri-environmental schemes that had been popular with farmers in the catchment, and the new schemes, particularly Higher Level Stewardship, were very competitive and bureaucratic to enter. This was threatening to undo progress in farm conservation management and risked further erosion of landowner “*good will*”.

In the last meeting with stakeholders little had changed regarding the broad governance issues, although some progress had been made by a group of farmers around local branding, in the form of collaboratively planning a food festival to raise awareness of local produce in 2010. There was also a pragmatic discussion around “*moving forward cautiously in a muddled way*” with people

who share a similar set of values, and not worrying too much about how the entirety of it will be financed. This was a tried and tested approach in the catchment as the River Glaven Conservation Group started this way in 1999 and has achieved a considerable amount subsequently. Overall there was still a strong will to work together towards greater sustainability although a firm plan was not in place, and there was no sign of support for developing and implementing this by public agencies or other funders.

3.3. Stakeholder evaluation of the design process

The initial feedback on the process received at the scenario validation stage was generally positive. However, it was felt by practitioners that a process of individual engagement with landowners and extensive modelling in a GIS framework would be too time consuming for landscape professionals to undertake. In addition some felt that the process did not directly address other key issues, particularly water abstraction, pesticide use, carbon and energy budgeting, the economics of agricultural diversification and tourism, and the impacts of change on countryside character and aesthetics. These topics had been considered for inclusion in the modelling, but it was impossible to include this degree of complexity within the resources of the project. Nonetheless, the scenario maps of the whole catchment proved to be an important focus for discussions in the validation meetings, and the use of scenarios helped to communicate some of the key issues to a wider audience (Figure 4). In the governance workshop participants clearly felt that the event was well run, that they were listened to, and that it had been worthwhile attending. Over half of the participants agreed that their understanding of the key issues had

improved and that they were more prepared to work toward a designed whole landscape than before participating in the workshop.

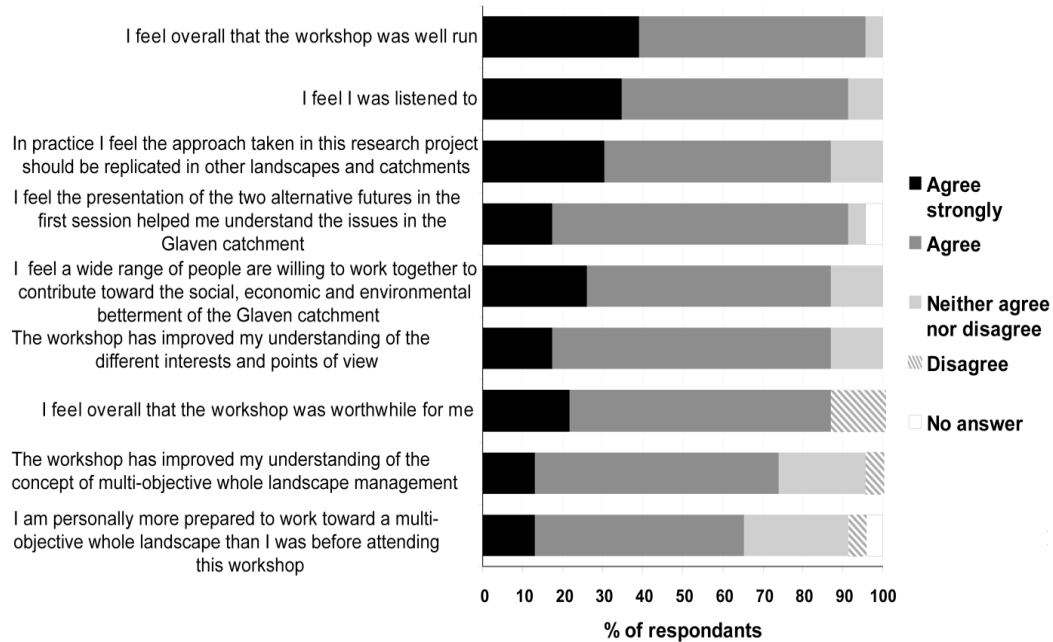


Figure 4. Results of the governance workshop questionnaire; 88 % (n = 23) of the participants completed the survey.

The last research meeting was well attended by a range of stakeholders, and generally the research was considered useful, interesting and thought provoking. It was specifically mentioned by an experienced landscape practitioner that it was useful to get landowners together to discuss wider issues of land management, and that the site specific knowledge generated by the study was invaluable, although it was unclear what the exercise would mean for individual landowners in the future.

4. Discussion

4.1. Whole landscape design methodology and professional practice

A multi-faceted method that could lead to sustainable landscape governance has been presented. The approach was well received by the stakeholders in the case study and it has the potential to be useful in other landscape settings. An important aspect of the method is its adaptive and intuitive approach, which proved effective during a period of considerable policy and institutional transition. The process of constant stakeholder engagement with key individuals over the years enabled the formation of good relationships and was a vital component that inevitably takes time to achieve. Using scenarios as a focal point within a GIS framework, proved an effective technique for exploring the dynamics of the system and its potential future trajectory with a wide range of stakeholders. Maps of the catchment with field scale detail in conjunction with stakeholder engagement raised awareness of the catchment landscape and a willingness to work together for a more holistic outcome. The “validation” meetings were a critical stage in the process, not only contributing to improved scenario design and interpretation of the issues but also helping to assess the appropriate type of engagement to proceed with next. Although a single multi-stakeholder meeting was part of the research plan, it was important to gain support for this at the validation stage and assess the willingness of key stakeholder groups to participate. In the event of more serious disagreement it might have been necessary to have had two or three smaller group meetings with stakeholders.

The criticism that the process is too time consuming to apply in routine practice is a common criticism of participatory exercises more generally (Stringer et al., 2006). Also, the concern expressed that a number of issues were not included in the modelling is a key challenge for sustainable landscape design. Studies that incorporate a more comprehensive set of variables have been larger, and resource intensive (e.g. Hulse et al., 2004; Pearson et al., 2010). In contrast, this study was performed mainly by one full time researcher, focusing on a smaller set of key issues identified by the stakeholders at an early stage in the project. However, based on the experience gained there are two improvements that could be made to streamline the process. Firstly, the in-depth individual farmer interviews could be replaced with individual or small group meetings with key stakeholders, such as representatives of NGOs, farm advisors, land agents and “leading” farmers representative of a range of views. Secondly, it would initially be possible to define the scenarios qualitatively. While detailed modelling might be necessary later, this should not prevent visioning and the identification of specific governance issues, potential conflicts and generally raising awareness of the approach with key stakeholders. However, in this case the use of several different modelling approaches in combination did help to identify where specific problems may lie if certain decisions are made. The modelling could also be more efficient if an integrated data portal was available for practitioners to access, rather than needing to obtain data from multiple sources.

As managing for multiple objectives often requires the understanding of complex dynamical systems, the process could be improved by adding a systems modelling tool. This would facilitate awareness of the inputs and outputs, internal and external linkages of a landscape, and how they may be “redesigned” or modified to build sustainability. In other words whole landscape design needs to embrace whole systems analysis. This is not to detract from the

landscape scale as a focal point around which to engage stakeholders and base strategic planning (Selman, 2006; Gallent et al., 2008). Rather, it highlights the need for a more effective application of the systems perspective at this scale. Unfortunately, there are no readily available software tools that can help researchers and practitioners quickly and easily diagram landscape systems; this would be a useful area of research and software development that would have utility in a range of landscapes.

Nonetheless, the basic framework of the approach remains sound. In real world circumstances the involvement of a team of researchers to do intensive scenario based landscape design is rarely practical, although academically interesting and informative for practitioners. Given appropriate training, government agents, consultants and other practitioners could learn the necessary GIS techniques, stakeholder participation and group facilitation skills, together with the basic systems thinking to ground the delivery of sustainable landscapes in a more holistic and locally situated way. However, the wider governance structure is in need of reform to facilitate bottom up action.

4.2. Policy options

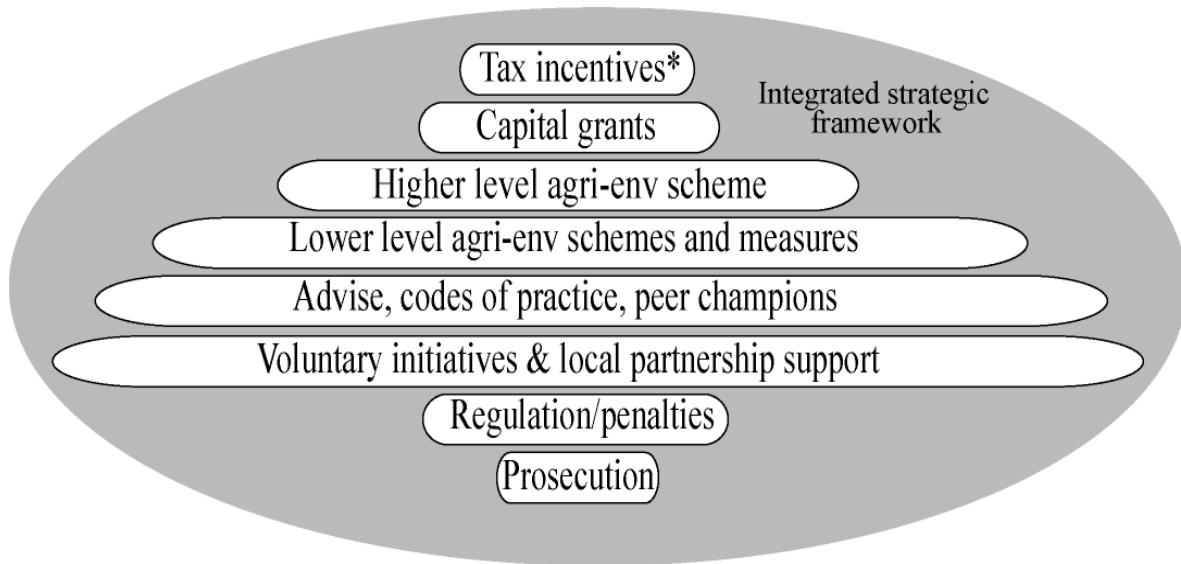
This research illustrates the challenges faced by local stakeholders trying to work together to deliver a sustainable outcome, within a sectoral policy framework. Nevertheless, it can be argued that in this particular case some national and European policies have moved the Glaven slightly closer to a sustainability ideal. Notably this has been achieved through the approach of

the Catchment Sensitive Farming Delivery Initiative, the linking of CAP reforms to environmental benefits, and the adoption of the ecosystem based approach.

Based on the lessons from this study, seven policy options can be suggested that would have wider applicability in other landscapes systems. i) Specifically address integration as an objective across government sectors, and reduce bureaucracy. ii) Develop a “one stop shop” integrated natural resource data base where multiple data sets are available through one portal or source. iii) Clarify national objectives and restore confidence in national government. iv) Develop policy mechanisms that transcend property and institutional boundaries. v) Nurture and cultivate grassroots organisations and key individuals. vi) Learn from past and current policies. vii) Establish long-term integrated test cases to test out new policies and approaches.

There is also a need to balance funding and support for the management of sustainable landscapes with the simplification of current regulations and delivery mechanisms (Figure 5). This would require a move towards more incentive and voluntary based measures, and away from over regulation, penalties or prosecution, to facilitate cross boundary working among land owners and multi-stakeholder partnerships. Key elements of success relate to winning the support of respected “leading” farmers and advisors and demonstrating successful practical implementation at farm and landscape scales. The process will require patience and long term commitment.

PROPOSED DELIVERY MECHANISMS



CURRENT DELIVERY MECHANISMS

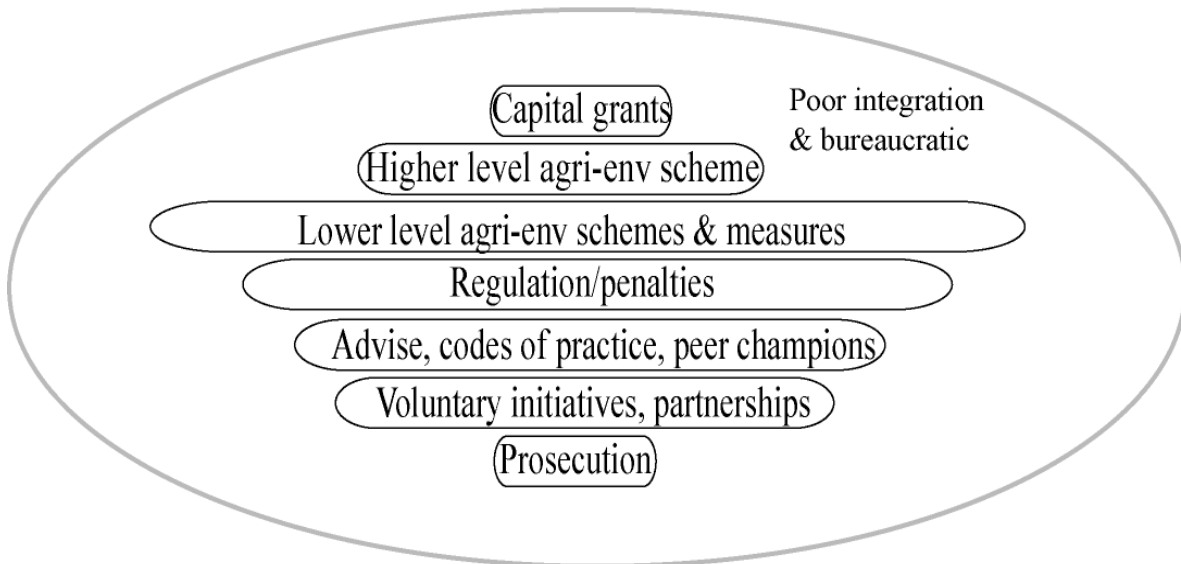


Figure 5. A proposed set of delivery mechanisms for sustainable multi-objective land use management compared to the current arrangements. The size of each box is an indication of the range of tools available, and how extensively they are employed. * = Incentives to encourage landowners to work across holding boundaries.

5. Conclusions

This study has made three important contributions to understanding how to implement sustainable landscape governance. Firstly, the study presents a multi-faceted and adaptive methodological framework that adds to the existing sustainable landscape design literature, incorporating stakeholder and computational approaches to design plausible futures. This was done during a period of considerable policy and institutional transition that illuminated understanding of the system, engaged stakeholders and demonstrated the flexibility of the approach. Secondly, the study has clearly highlighted that the governance framework for implementing sustainable landscapes is not in place, despite the willingness of a range of local stakeholders to work towards a more sustainable future. Although there has been some positive change during the period of research, it will be particularly important to address land tenure issues that favour individual landowners over the need for contiguous landscape stewardship, and reduce over regulation and bureaucracy to balance bottom up and top down approaches. Thirdly, the study demonstrates the value of an integrated approach that blends skills in stakeholder engagement with the latest GIS technology and scientific literacy. This facilitates the visioning of landscape management that individual practitioners and researchers can develop and implement.

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