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Does stakeholder involvement really benefit biodiversity conservation?

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Abstract

The establishment of protected areas, such as Natura 2000, is a common approach to curbing biodiversity loss. But many of these areas are owned or managed by private actors. Policies indicate that their involvement should be encouraged to ensure long term success. However, to date there have been no systematic evaluations of whether local actor involvement in the management of protected areas does in fact contribute to the conservation of biodiversity, which is the expressed policy goal. Research incorporating both qualitative and quantitative data was carried out in three case studies in Scotland where local actor input was required in the development and/or implementation of Natura 2000 management plans. No relationship was found between stakeholder involvement and expected biodiversity outcomes. Social outcomes of increased stakeholder involvement, such as increased trust, did however increase the likelihood of positive future biodiversity outcomes. The findings indicate that efforts aimed at increasing stakeholder involvement in the management of protected areas need to consider making processes more independent, and acknowledge and address underlying biodiversity conflicts. The findings also emphasise the need to evaluate multi-level conservation efforts in terms of processes, social outcomes and biodiversity outcomes.

Keywords: Biodiversity conflict; Natura 2000; public participation; Scotland; Special Area of Conservation; Stakeholder involvement.

1. Introduction

Stakeholder involvement is widely advocated in a range of policy activities including decision-making (Renn, 2006), policy implementation (e.g. Ferreyra & Beard, 2007; Huitema et al. 2010) and policy evaluation (Fischer, 1995). It has particularly gained ground in the environmental sector since the 1980s with the Brundtland report resulting in a trend towards more multi-level management of natural resources. As a result, such involvement is seen as "one of the fundamental prerequisites for the achievement of sustainable development" (UNCED, 1992: paragraph 23.2).

The main arguments for increased involvement are well known. Fiorino (1990) outlined three main types of argument for participation, namely normative, i.e. to strengthen democratic cultures and processes (Webler and Renn, 1995), substantive, i.e. to bring additional knowledge and values into decision-making in order to make better decisions (Renn, 2006) and instrumental, i.e. to provide greater legitimacy (Svarstad et al., 2006), increase trust (Munton, 2003), and reduce the intensity of conflicts (Young et al., 2010). These three types of argument for increased stakeholder involvement are highly relevant in the context of biodiversity governance. Indeed, anthropogenic pressures on ecosystem goods and services, combined with the current global financial crisis, are increasingly leading to the devolution of biodiversity governance through stakeholder involvement (Young et al. 2012). While this is an appealing concept due to the important substantive and instrumental benefits of such an approach (Carlsson and Berkes, 2005), it is essential, particularly in the current economic climate, to ensure that any public money spent on biodiversity conservation efforts, including processes to involve stakeholders at local levels, is being used effectively. The evaluation of stakeholder involvement is not only important for accountability and auditing purposes but, in line with the more normative and substantive arguments for stakeholder involvement, can help ensure fair representation and involvement; and increases our knowledge of human behaviour in these contexts (Rowe and Frewer, 2004). In view of these important goals, there is a growing body of work on evaluation of stakeholder involvement (Reed, 2008).

Many academic evaluations of stakeholder involvement focus on the processes of involvement (i.e. the normative goals of stakeholder involvement). Other evaluations focus on outcomes (linked to substantive and/or instrumental goals), be they social outcomes (such as increased trust, or conflict resolution) or policy outcomes (i.e. changes 'on the ground' that contribute to the achievement of the policy goal(s)). There is also a growing body of work suggesting and testing a combination of criteria relating to process, social outcomes (e.g. Berkes, 2009; Blackstock et al., 2007; Carlsson & Berkes 2004; Grant and Curtis, 2004) and environmental outcomes (Beierle & Konisky, 2001; Conley & Moote, 2003; Ferreyra & Beard, 2007).

There has, however, been less research evaluating the *links* between process, social outcomes and environmental outcomes. In their study on environmental planning in the Great Lakes region, Beierle and Konisky (2001) found that although stakeholder involvement had helped improve the quality of decisions and improved the relationships amongst stakeholders, there was no obvious link between stakeholder involvement and improved environmental quality. While Sultana and Abeyasekara (2008) found that social cohesion was slightly stronger and that stakeholder involvement had led to a faster uptake of community actions for fisheries management, no direct links were made between stakeholder involvement and improved environmental conditions. Newig and Fritsch (2009) explored the ability of participatory decision-making to deliver environmental policy output, compliance and implementation.

Again, no direct links emerged, indicating this is an aspect of policy evaluation that requires further work (Burgess and Chilvers, 2006). In addition to the direct links between process and environmental outcomes, little is known about the *indirect* links between process, social and environmental outcomes (Kenney, 1999). Whereas conflict will hamper efforts to develop collaborative management strategies, good social outcomes may perhaps be more likely to lead to a greater willingness and better knowledge on the part of land owners and managers to engage, to assimilate new knowledge and want to adapt their activities in order to conserve biodiversity.

To test the direct and indirect links between stakeholder involvement and biodiversity outcomes, this paper focuses on the implementation of the European Natura 2000 network of protected sites. Setting land aside for conservation dates back thousands of years and is recognised as an effective way of conserving biodiversity (Mulongoy and Chape, 2004). Consequently, protected areas have grown in range and extent since the creation of Yellowstone National Park in 1872, covering 12.9% of the global terrestrial area (Jenkins and Joppa, 2009). As little "untouched" land remains and most ecosystems are, to a certain extent, shaped by if not directly dependent on humans, the president of the International Union for Conservation of Nature at the time concluded that "if local people do not support protected areas then protected areas cannot last" (Ramphal 1993; cited in Warren, 2002: 196). This understanding together with the recognition of local stakeholder rights and democratisation of policy processes has resulted in a move from state-centred to multi-level governance of protected areas (Lockwood, 2010), which has been accompanied by the development of mechanisms to facilitate stakeholder involvement in the decision-making and management of protected areas. Protected areas therefore represent an appropriate setting in which to evaluate stakeholder involvement.

This paper provides qualitative and quantitative empirical evidence from stakeholders involved in the development and implementation of management plans on the direct and indirect links between stakeholder involvement and expected biodiversity outcomes. We provide evidence to inform biodiversity policy development and implementation, as well as wider academic debates, which would appear to have often run ahead of empirical studies of association. Using three in depth case studies of local stakeholder involvement in the development and/or implementation of biodiversity management plans in Scotland, this paper explores three main hypotheses to address the direct and indirect links between stakeholder involvement and biodiversity outcomes. The first hypothesis was that process characteristics of stakeholder involvement would influence biodiversity outcomes. The second hypothesis was that process characteristics of stakeholder involvement would influence social outcomes. Our third hypothesis was that social outcomes of stakeholder involvement processes would influence biodiversity outcomes. These hypotheses are tested using a combination of qualitative and quantitative data derived from semi-structured interviews carried out with policy stakeholders in three case studies. The main results are then presented before discussing implications for stakeholder involvement in conservation and for wider academic debates about stakeholder involvement processes and outcomes.

2. Research design and methods

2.1. Study system

In the European Union, the main mechanism for protected areas is the Natura 2000 network, consisting of Special Protected Areas (SPAs) and Special Areas of Conservation (SACs) designated under the Birds and Habitats Directives respectively. Natura 2000 covers 17.5% of the EU's territory, making it the largest network of protected areas in the world (European Commission, 2010). The majority of Natura 2000 sites are privately owned and their use is not primarily nature conservation. The European Commission stated that for the Natura 2000 network to be a success, the active involvement of those who live in or depend on these sites is needed (European Commission, 2000). Member States are required to “establish the necessary conservation measures”, for example management plans, statutory, administrative or contractual measures in accordance to their ecological requirements (Article 6 (1)) as soon as an SAC is designated. By 2004, the UK and France were the most advanced Member States in establishing management plans (European Commission, 2004), making them appropriate settings in which to examine and evaluate stakeholder involvement.

Three case studies located in Scotland were selected for this study. The main criterion for case study selection was the existence of a management plan that had required, at some stage of its development and/or implementation, the active involvement of a range of local stakeholders. Case studies comprised:

A. The river Bladnoch. The river Bladnoch and its tributaries were designated as an SAC in 2005 for their population of Atlantic salmon (*Salmo salar*), listed under Annex II of the Habitats Directive. The Bladnoch was considered of particular value due to its ‘spring run’ or ‘early running’ salmon, which run from January onwards, an uncommon characteristic for rivers in this part of Scotland (JNCC, 2009). The river Bladnoch SAC Atlantic Salmon Catchment Management Plan was commissioned by Scottish Natural Heritage (SNH) in 2004 and produced by the Galloway Fishery Trust in 2007. Its objectives were to identify potential or actual negative impacts on the SAC; to assess existing management; and to identify and prioritise further measures required (Scottish Natural Heritage, 2007). The main stakeholders in this case study were representatives of the Galloway Fisheries Trust, Scottish Natural Heritage, Forestry Commission Scotland, Forest Enterprise, Scottish Environmental Protection Agency, the Bladnoch District Salmon Fishery Board, as well as local fishermen, farmers and forest owners. Whilst no funding was allocated specifically to implement the plan, it is the responsibility of statutory agencies to ensure that the Bladnoch is in favourable condition; hence measures listed in the plan would be implemented. While many measures could be implemented by the statutory agencies and the Galloway Fisheries Trust alone, local stakeholders could add greatly to the success of these measures though voluntary engagement. The main issues raised by local fishermen were whether measures within the plan adequately ensured the return of Spring salmon by addressing the main perceived impact on the river, namely acidification from forestry practices.

B. The Moray Firth. The Moray Firth is a complex setting, home to seven SACs covering three species: bottlenose dolphin (*Tursiops truncates*), common or harbour seal (*Phoca vitulina*) and Atlantic salmon (*Salmo salar*). All three species are listed under Annex II of the Habitats Directive. The Moray Firth Seal Management Plan was developed in 2005 to address the conflict between seal conservation and salmon fisheries. The main stakeholders in this case study included representatives from the Scottish Government, Scottish Natural Heritage, the District Salmon Fishery Boards, scientists from the Sea Mammal Research Unit in St Andrews and local netsmen. Its objectives were to i) contribute to the fulfilment of the conservation objectives for the SACs in the Moray Firth; ii) reduce the impact of shooting by District Salmon Fishery Boards on the common seal population; iii) reduce the impact of common and grey seal predation on depleted adult spring salmon stocks, smolts, and on rod and net fisheries; iv) monitor and research the status of common and grey seal populations, salmon stocks and interactions between them through a Seal and Salmon Research Programme; and v) develop non-lethal methods of reducing seal-salmon conflict, and training for fishery managers (Butler, 2005). All measures above were being implemented at the time of the study. While some funding was available for the development of the plan and some of the scientific research associated with objective iv above, continued implementation depends fully on the voluntary engagement of local stakeholders (netsmen and fishermen) in reducing shooting of seals and cooperating with the scientific research carried out.

C. The Forth and Borders moorlands. Moorlands are habitats of international and European importance, home to animal assemblages of conservation importance (Thompson et al., 1995). There have been major losses of moorland habitat and a decline in the quality of the remaining moorland (BRIG, 2008). The Forth and Borders Moorlands Management Scheme, centred on 12 protected areas, aimed to "maintain and improve the habitats and species" (Scottish Natural Heritage, 2004: 2) associated with the protected areas. In order to achieve this aim, a number of prescriptions were available to land owners and managers under the scheme to promote good moorland management practices. All land owners and managers choosing to sign up to the scheme were entitled to subsidies – the value of which depended on the amount of land put under the scheme and the number of prescriptions adopted. In this case study, success depended entirely on the number of local landowners and managers taking up the scheme, and their level of involvement. The main stakeholders in this case were Scottish Natural Heritage employees (mainly local area officers responsible for implementing the scheme) and local landowners and managers. This case study was embedded in a conflict between grouse management and raptor conservation.

2.2. Data gathering

Both qualitative and quantitative data were gathered in this study. A total of 59 in-depth semi-structured interviews were carried out from January to July 2009 with stakeholders who had been involved in the development and/or implementation of the management plan. Evidence gathered from documentary data was instrumental in selecting the initial interviewees. The selection of initial interviewees followed a purposive sampling strategy designed to ensure that the views of each of the main types of stakeholder were included. Further contacts within the stakeholder network associated with each of these sites were obtained from these initial interviewees and extended through a process of 'snowball' or chain referral sampling. This approach to sampling, which has long been used in sociological and political science research, is particularly suited to identifying members of policy or other networks, who often may be few in number, in that it can lend the researcher some of the characteristics of an 'insider', thereby facilitating access (Lewis-Beck et al, 2004). The resulting "policy stakeholders" (Fischer, 1995) interviewed were divided into three groups: Government and government department representatives (referred to as GA in later quotes); scientific and technical advisers (SA) and biodiversity users (BU)(Table 1). The first group comprised local and regional stakeholders responsible for implementing or regulating biodiversity policy. The second group comprised local or regional scientists external to governmental bodies (e.g. university, independent research organisations). The third group included local stakeholders who were affected by or involved directly in the management of the target species/habitats in the protected areas. These included farmers, fishermen, fishery managers, foresters and local businesses owners. The proportion of these groups in each case study varied (see Table 1). This was mainly related to the nature of the management plans: there is a stronger emphasis on implementation in the Forth and Borders plan, hence more biodiversity users were suggested in the snowballing process; whereas scientific input was an important aim in the Moray Firth plan, hence the more balanced range of stakeholders interviewed. While most interviews were face-to-face, three interviews were carried out over the phone.

Table 1. Breakdown of interviewees in each case study: The first letter refers to the case study (B=Bladnoch; M=Moray Firth; F=Forth and Borders Moorlands); the middle letters refer to the stakeholder group (GA=Government and government department representatives; SA=scientific and technical advisers; BU=biodiversity users).

Interviewee background	**Bladnoch**	**Moray Firth**	**Forth and Borders Moorlands**
Representatives of the Scottish Government or government departments	BGA1 BGA2 BGA3 BGA4 BGA5	MGA1 MGA2 MGA3 MGA4	FGA1 FGA2 FGA3 FGA4 FGA5 FGA6
Scientific advisers	BSA1 BSA2	MSA1 MSA2 MSA3 MSA4 MSA5 MSA6	FSA1 FSA2 FSA3 FSA4
Biodiversity users	BBU1 BBU2 BBU3 BBU4 BBU5 BBU6 BBU7 BBU8 BBU9 BBU10 BBU11 BBU12	MBU1 MBU2 MBU3 MBU4 MBU5 MBU6 MBU7 MBU8 MBU9 MBU10	FBU1 FBU2 FBU3 FBU4 FBU5 FBU6 FBU7 FBU8 FBU9 FBU10

Semi-structured interviews incorporated qualitative elements relating to interviewees' experiences of developing the management plan and their perceptions of the social and biodiversity outcomes (for the full interview guide, see Supplementary Material Appendix A). Based on pilot interviews, interviews were modulated to start with a general question, usually about their relationship with the protected area. This was an effective means of understanding the personal experiences of interviewees with the designated area(s) and opening up discussions towards their concerns, not covered necessarily in the semi-structured interview. The table in the interview guide (Supplementary Material Appendix A) was used to elicit more discussion on the process itself and scores. Interviewees were asked to discuss and then score, on a scale from one to five, the process criteria (n=6), social outcome criteria (n=6) and the criterion relating to expected biodiversity outcomes (n=1). Each criterion was scored and then discussed in more detail again, if needed. Interviewees could change their score as the discussion progressed. All but three interviewees took part in the scoring exercise. Interviewees were also asked to compare the expected biodiversity outcomes with and without a management plan. They were asked to suggest any other potential respondents and whether they had any other comments. All interviews were transcribed verbatim and coded using NVivo qualitative data analysis software (QSR International, 2010). The coding used generic theory-based criteria (Rowe and Frewer, 2000) and social and environmental outcome criteria (Beierle and Konisky, 2001) (Table 2) derived from the public participation literature as a benchmark to evaluate stakeholder involvement.

Table 2. Theoretical framework for the evaluation of stakeholder involvement in the implementation of Natura 2000 in Scotland based on generic theory-based criteria (Rowe and Frewer, 2000) and social and environmental outcome criteria (Beierle and Konisky, 2001)

Evaluation focus	**Criteria measured**

Evaluation focus	Criteria measured
Procedural evaluation	
Representativeness	1. Were the participants representative of the affected public?
Independence	2. Was the process carried out in an independent, unbiased way?
Transparency	3. Was the public able to see what was happening and how decisions were being made?
Influence	4. Did participant input have a genuine impact on the management plan?
Early involvement	5. Were stakeholders involved as early as possible?
Cost-effectiveness	6. Was the process cost-effective?
Social outcome evaluation	
Stakeholder values	7. Were stakeholder values incorporated into decision making?
Technical quality	8. Was the technical quality of decisions improved?
Conflict resolution	9. Was conflict resolved among stakeholders?
Increased trust	10. Was trust increased between stakeholders?
Learning	11. Did stakeholders become better educated and informed?
Creation of new structures	12. Were organisations established to implement decisions?
Biodiversity outcome evaluation	
Biodiversity outcomes	13. How successful was the plan in ensuring the long-term conservation of the target species/habitats?

2.3. Data analysis

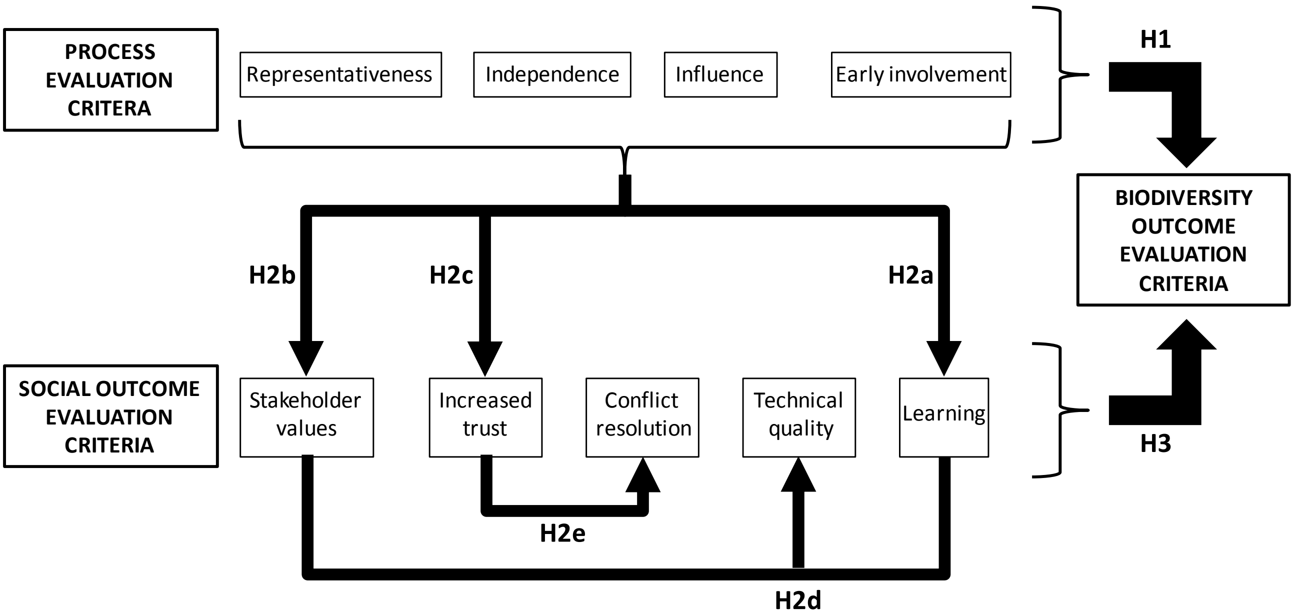
As stated in the introduction, 3 main hypotheses were tested in this study:

- *Hypothesis 1. Process characteristics of stakeholder involvement influence biodiversity outcomes.*
- *Hypothesis 2. Social outcomes derived from stakeholder involvement are influenced by process characteristics.*
- *Hypothesis 3. Social outcomes derived from stakeholder involvement influence biodiversity outcomes.*

The qualitative data gathered through the scoring exercise in the interviews was used to test all the above hypotheses.

The quantitative data gathered in interviews was also used to test the three hypotheses, using ordinal regression models (which treat the data as categorical and exploit the ordered nature of the data when perform regression analyses; Christensen 2011). Our analysis of the quantitative data involved seven analyses, divided into three phases (see Figure 1).

Figure 1. Diagram of quantitative analyses performed to estimate links between process and biodiversity (H1); process and social outcomes (H2a-e); and social outcomes and biodiversity outcomes (H3). Arrows represent separate ordinal linear regression models.



Firstly, we investigated hypothesis 1 (*Process characteristics of stakeholder involvement influence biodiversity outcomes*) by modelling the relationship between the score for 'biodiversity outcome' and the scores for four process characteristics ('representativeness', 'independence', 'influence' and 'early involvement'). The effects of 'social group' were also considered. Two process characteristics ('transparency' and 'cost-effectiveness') were not used in the analysis due to large numbers of missing responses from interviewees in these categories. Secondly, we investigated Hypothesis 2 (*Social outcomes derived from stakeholder involvement are influenced by process characteristics).* This involved five separate analyses, linked to five specific sub-hypotheses (Table 3).

Table 3. Quantitative analyses that were used in investigating hypothesis 2.

<table>
<tr><th></th><th>Sub-hypothesis</th><th>Response variable</th><th>Explanatory variables</th></tr>
<tr><td>2a)</td><td>Learning is improved by higher scores of process characteristics</td><td>Learning score</td><td rowspan="3">Representativeness
Influence
Independence
Early involvement
Social group</td></tr>
<tr><td>2b)</td><td>Stakeholder values are improved by higher scores of process characteristics</td><td>Stakeholder value</td></tr>
<tr><td>2c)</td><td>Trust is improved by higher scores of process characteristics</td><td>Trust</td></tr>
<tr><td>2d)</td><td>Technical quality scores are improved by higher social outcome scores</td><td>Technical quality</td><td>Learning score
Stakeholder value
Social group</td></tr>
<tr><td>2e)</td><td>Conflict resolution scores are improved by higher scores of trust</td><td>Conflict resolution</td><td>Trust
Social group</td></tr>
</table>

Thirdly, we investigated hypothesis 3 *(Social outcomes derived from stakeholder involvement influence biodiversity outcomes)* by modeling the relationship between 'biodiversity outcome' and five social outcomes ('stakeholder values', 'technical quality', 'conflict resolution', 'increased trust', and 'learning'). 'Social group' was included as a sixth explanatory variable. One social outcome ('creation of new structures') was not used in the analysis due to large numbers of missing responses from interviewees in this category. The missing responses were due to the fact that no new formal structures had been created in any of the case studies to implement measures. In all models, the case study (Bladnoch, Moray Firth, Forth and Borders) was included as a structural variable to account for any systematic differences amongst study systems.

The ordinal regression models were fitted using the 'clm' function within the 'ordinal' package in R (R Development Core Team, 2011). All models were based on the cumulative logit, and were of the form

$$\text{logit}\{\mathbf{P}(y_i \leq v_j)\} = \theta_j - \boldsymbol{\beta}_i^T \mathbf{x}_i, \qquad j=1,\ldots,9, \quad i=1,\ldots.,n \qquad \textbf{Eq 1.}$$

where y_j is the response variable for the ith interviewee, which may take on a value between 1 and 5 (including half decimals), and $v_j = (j + 1) / 2$ denotes the nine possible values of y_j. The parameters θ_j provide a separate intercept for each category j, whilst x_i is a vector of explanatory variables for the ith observation and β_i is the vector of associated regression parameters.

Correlations between the explanatory variables within each model were computed using Spearman's rank order correlation (package 'cor' in R), but never exceeded 0.71 (Supplementary Material Appendix B) – multi-collineraity is therefore unlikely to be an issue. We also examined the distribution of scores for each variable – all of the variables showed a reasonable range of scores (i.e. no variable was heavily concentrated on one particular score), and none exhibited a particularly high degree of skewness (Supplementary Material Appendix C). 'Social group' was entered into all analyses as a categorical variable, but we used an empirical criterion - the Akaike Information Criterion (AIC) - to determine whether other explanatory variables were best entered into models as continuous or categorical variables. We did this by performing separate ordinal regressions of 'biodiversity score' against the continuous and categorical versions of each explanatory variable – the type (continuous or categorical) with the lowest AIC score was used for all subsequent modeling. This approach led us to treat 'learning' as categorical and all other exploratory variables as continuous within our analyses (Supplementary Material Appendix D).

Within each analysis we considered all possible subsets of explanatory variables (all subset selection), and calculated the AIC value for the model that corresponds to each subset. Backward and forward selection using AIC led to identical results. In general, differences in AIC values between models of 0-2 are considered as having substantial support in the data, differences of 4-7 as having considerably less support in the data, and differences of more than 10 as having essentially no support in the data (Burnham and Anderson, 2002). Finally, we calculated Akaike weights for all combinations of variables, which can be considered as the weight of evidence in favour of a particular model being the best model, given the data available (Burnham and Anderson, 2002). We then summed Akaike weights across models in the set where each particular variable occurred to assess the importance of each variable (Burnham and Anderson, 2002). Larger values of the summed Akaike weight (SAW) for each variable, the more important that variable is in relation to the other variables – a value of SAW close to one indicates a high level of importance and a value close to zero a very low level of importance.

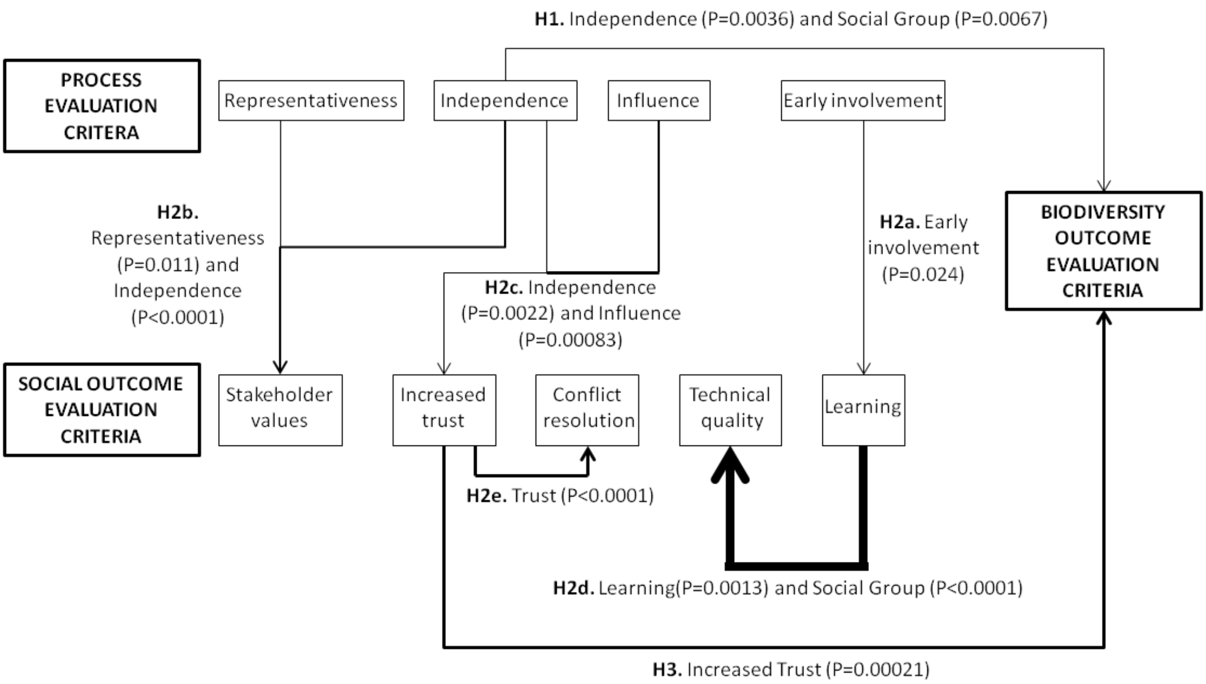
3. Results

3.1. *Process characteristics of stakeholder involvement influence biodiversity outcomes (Hypothesis 1)*

3.1.1. Results based on the quantitative analysis

The most important variables in determining biodiversity scores, according to summed Akaike weights, were social group (SAW=0.92) and independence (SAW=0.82) (Fig. 2), with the remaining variables (influence: SAW=0.61, representativeness: SAW=0.40, and early involvement: SAW=0.37) being less important.

Figure 2. Diagram of significant relationships identified during quantitative analysis to estimate links between process and biodiversity (H1); process and social outcomes (H2a-e); and social outcomes and biodiversity outcomes (H3). Arrows represent significant effects identified by ordinal linear regression models. The width of the arrows is proportional to the estimate of effect size for all significant relationships.



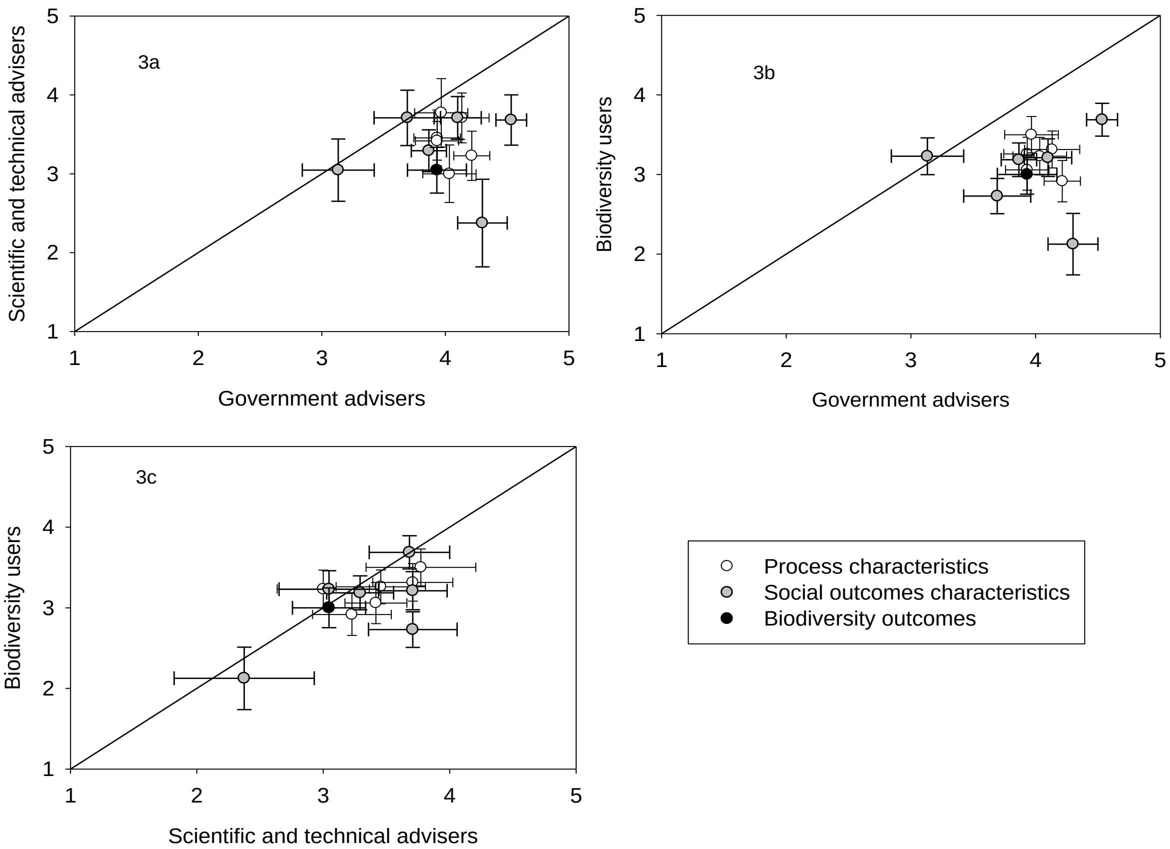
Model selection using AIC identified the best model as being that which contained independence and social group (Supplementary Material Table E1), and both of these variables were statistically significant (Table 4).

Table 4. Model estimates and test statistics for the best-fitting cumulative logit models identified by full subset model selection using AIC. The best-fitting model from each section of the quantitative analysis is presented. For models including categorical explanatory variables (3.1.1, 3.2.1. d & e) significance values were calculated using likelihood ratio tests (LR = log-likelihood ratio statistic, P = significance assuming chi-squared distribution for test statistic).

3.1.1 Influence of process characteristics on biodiversity outcomes						
	estimate	**s.e.**	**95% CI**	**z**	**LR**	**P**
Independence	0.73	0.25	0.26, 1.25	2.92	-	0.0036
Social group 2 v 1	-1.64	0.92	-3.52, 0.11	-	10.01	0.0067
Social group 3 v 1	-2.58	0.86	-4.38, -0.95	-		
3.2.1. Influence of process characteristics on social outcomes						
a) Learning						
Early	0.56	0.25	0.074, 1.06	2.25	-	0.024
b) Values						
Representativeness	0.77	0.30	0.20, 1.39	2.55	-	0.011
Independence	1.27	0.30	0.72, 1.90	4.25	-	<0.0001
c) Trust						
Independence	0.81	0.26	0.31, 1.35	3.06	-	0.0022
Influence	1.13	0.34	0.50, 1.84	3.34	-	0.00083
d) Technical quality						
Values	0.82	0.45	-0.22, 1.77	1.83	-	0.068
Learning 2 v 1	2.81	1.72	-0.21, 6.92	-	17.85	0.0013
Learning 3 v 1	4.08	1.72	1.11, 8.25	-		
Learning 4 v 1	5.85	2.09	2.21, 10.74	-		
Learning 5 v 1	6.59	2.01	3.05, 11.20	-		
Social group 2 v 1	-4.95	1.62	-8.78, -2.18	-	22.88	<0.0001
Social group 3 v 1	-5.46	1.59	-9.32, -2.80	-		
e) Conflict resolution						
Trust	1.58	0.36	0.92, 2.33	4.42	-	<0.0001
Social group 2 v 1	0.62	0.80	-0.94, 2.20	-	4.66	0.097
Social group 3 v 1	-0.86	0.71	-2.28, 0.51	-		
3.3.1. Social outcomes influence biodiversity outcomes						
Trust	1.59	0.43	0.79, 2.49	3.71	-	0.00021
Values	0.69	0.38	-0.031, 1.38	1.47	-	0.067

The effect of independence was positive, so that higher levels of independence were associated with higher biodiversity scores, and the biodiversity scores for social group 1 was higher than those for groups 2 and 3 (Table 4).Indeed, a scatterplot of responses from the three different stakeholder groups (Fig. 3) highlighted similar views generally on stakeholder involvement and its outcomes by biodiversity users and scientific advisers (Fig. 3c). There were, however, much greater differences between biodiversity users and government advisers, and between scientific and government advisers (Fig. 3a and 3b).

Figure 3. Comparison of process, social outcome and biodiversity outcome evaluation across interviewee groups. Circles represent the mean, and error bars the standard error of the mean.



3.1.2. Results based on the qualitative analysis

Interviewees highlighted the importance of bringing together in discussions all relevant stakeholders in the process. This was successful in the Moray Firth, where one scientific adviser commented that stakeholders were "*trying to get to the same end together and* […] *very committed to making it work*" [MSA6]. In the Bladnoch, integration and discussion was mainly successful amongst the statutory agencies, one representative stating that "*different organisations use English as their main language but actually it's not true. We use the same words for different things. Actually the meetings are so important to share the understanding of what we're actually meaning by that bit of paper*" [BGA3].

Interviewees also highlighted two more aspirational procedural aspects that would lead to more likely biodiversity outcomes: clarity of management plan objectives, and clarity of stakeholder involvement. The lack of identification of issues that needed to be addressed was most apparent in the Bladnoch and the Forth and Borders, where one government adviser commented that it could "*be half the battle, working out what the issues are that you're trying to deal with in the plan*" [BGA5]. In this respect, the perceived lack of clarity of issues in the Bladnoch and Forth and Borders case study resulted in less positive scores of biodiversity outcomes. Even in the Moray Firth case study, where the focus was on addressing the conflict between seal conservation and fishery interests, and where the procedural aspects were evaluated very positively, different groups of stakeholders perceived the objectives of the management plan differently, and therefore evaluated the potential biodiversity outcomes differently. A key aspect highlighted by interviewees was therefore to clarify what was expected from the management plan itself, to "*keep it simple*" [BBU1], and to "*pick on one objective and sort that one*" [MGA2]. The need to be open and clear about the objectives or goals of stakeholder involvement could also impact directly on biodiversity outcomes by assigning clearer roles to those involved in implementing the actions in management plan.

3.2. Social outcomes derived from stakeholder involvement are influenced by process characteristics (Hypothesis 2)

3.2.1. Results based on the quantitative analysis

a) Learning is improved by higher scores of process characteristics

The most important variables in determining learning score were early involvement (SAW= 0.65) and influence (SAW=0.48) (Fig. 2), with the remaining variables appearing to be less important (representativeness: SAW=0.33; independence: SAW=0.28; social group: SAW=0.16). The best model, according to AIC, contained a statistically significant effect of early involvement (Table 4). However, models that exclude early involvement were moderately well supported according to AIC (ΔAIC=1.5 for a model containing 'influence' alone, ΔAIC=2.54 for a model containing 'representativeness' alone, and ΔAIC=3.07 for a model containing no explanatory variables at all, asides from the structural effect of case study that was included in all models; Supplementary Material Table E3). The estimated effect of early involvement was positive (Table 4).

b) Stakeholder values are improved by higher scores of process characteristics

The most important variables in determining stakeholder value scores were independence (SAW=1.00), influence (SAW=0.62), and representativeness (SAW=0.59) (Fig. 2), with early involvement (SAW=0.34) and social group (SAW=0.13) being of less importance. The best model, according to AIC (Supplementary Material Table E4), contained independence and representativeness, and both of these variables had highly significant positive effects (Table 4). There was also some evidence for the existence of an effect of influence, however, and a model that replaces representativeness with influence performs almost as well as the best model (ΔAIC=0.14).

c) Trust is improved by higher scores of process characteristics

The key variables in determining trust were independence (SAW=0.98) and influence (SAW=0.99) (Fig. 2), with early involvement (SAW=0.38), representativeness (SAW=0.29) and social group (SAW=0.18) being of less importance. The best model, according to AIC (Supplementary Material E5), contained independence and influence, with the effects of these variables being positive and statistical significant (Table 4).

d) Technical quality scores are improved by higher social outcome scores

Summed Akaike weights for learning and social group were very high (SAW=0.99 and 1.00, respectively) (Fig. 2), whilst the SAW for stakeholder values was considerably lower (0.67). The best model, according to AIC (Supplementary Material Table E6), was that which contained learning, social group and values. Both learning and social group had statistically significant positive effects (Table 4), while values had a close to significant positive effect (Table 4). However, a model that excluded values was moderately well supported according to AIC (ΔAIC=1.64 for a model containing only learning and social group).

e) Conflict resolution scores are improved by higher scores of trust

The best model, according to AIC, was that which contains both trust and social group (Supplementary Material Table E7), with trust having a very strong positive relationship with conflict resolution (SAW=1.00, $P < 0.0001$ within the best model; Table 4) (Fig. 2), and social group having a non-significant relationship with conflict resolution (SAW=0.58, Table 4). However, a model that excluded social group was also well supported according to AIC (ΔAIC=0.66 for a model containing 'trust' alone). Interestingly, social group 2 (scientific advisers) tended to have a more positive view of conflict resolution than social group 1 (government advisors), while social group 3 (biodiversity users) tended to view conflict resolution more negatively than social group 1.

3.2.2. Results based on the qualitative analysis

a) Learning is improved by higher scores of process characteristics

In the Moray Firth, the early integration of local stakeholders in an industry-led process of developing the management plan enabled all stakeholders to learn about the issues surrounding seal and salmon ecology. One scientific adviser commented that "*the folk that have been involved in the plan have learned a lot and lot of our preconceived ideas of what was happening have changed enormously*" [MSA6]. There were some visible effects of learning, namely a change in attitudes, so that "*it wasn't a case now that they were going out and saying "there's a seal, let me shoot it", they were going out and saying "there's a seal in the river but is it actually causing a problem?*" [MGA3].

In the Bladnoch and Forth and Borders case studies, learning was limited amongst biodiversity users. In the Forth and Borders, one consultant explained that learning had not been maximised, resulting in a situation in which farmers "*won't have really known where the options came from, what they were trying to achieve*" [FBSA1]. Learning had, however, taken place from the perspective of government advisers.

b) Stakeholder values are improved by higher scores of process characteristics

In the Moray Firth case study, the inclusion of stakeholder values was very closely linked to the independence of the process. The process was being carried out mainly by a biologist on the Spey District Salmon Fishery Board (DSFB). He was trusted by those involved in the process and considered as the "*the lynchpin in the project*" [MBU1], bridging different communities including the fishing community, as well as the scientific and government departments. Interviewees that were involved in the process felt that, through the involvement of this 'champion', they were broadly able to incorporate their values into the plan and have an influence on the plan early on.

In the Bladnoch and Forth and Borders case studies, a critical consideration was "whose values" were being addressed. In this aspect, this characteristic was very closely linked to the perceived level of influence of government departments compared to biodiversity users and scientific advisers. This led one farmer to comment on the fact that "*it was more a case of the values of those with the money rather than the values of the people on the ground*" [BBU3]. There was little evidence from biodiversity users to suggest that they had shaped the process and final decisions to reflect their priorities. In the Bladnoch case study, the lack of incorporation of biodiversity users' values resulted in a plan viewed as "*insipid*" and "*an exercise rather than a weapon*" [BBU9].

c) Trust is improved by higher scores of process characteristics

As highlighted above, the process in the Moray Firth was perceived by biodiversity users as 'independent', which allowed them to voice their views and concerns through "*an informed and trusted honest broker*" [MGA2]. Trust was also seen to have increased from the point of view of the Scottish Government and government department representatives who perceived that this trust came from "*getting to know where they're coming from, that they're not all mad axe-men and vice-versa, knowing that we're not green-wellied mad men*" [MGA2]. However a number of interviewees from the fishery boards and many netsmen were a little more cautious in their views on trust. To explain this, one netsman referred to the fact that they could not be completely open during the process because "*there could be SNH folk there that would take offence because it's not everybody's thing at all* [shooting seals]" [MBU3].

In the Forth and Borders case study, where the process was driven by Scottish Natural Heritage and therefore not evaluated by interviewees as "independent", the evaluation of trust and influence varied depending on the (often already existing) relationship between local area officers and land owners and managers. In the Bladnoch, levels of trust varied little between government advisers, who already knew each other before the process. For most biodiversity users interviewed, the process of developing the plan had been helpful in enabling them to understand different perspectives better, a key aspect of learning. Unfortunately, for some interviewees, this increased awareness of the workings of government departments emphasised their failings. As such, the process of developing the plan "*just drew the lines a bit more starkly*" [BBU3] between biodiversity users and government advisers.

d) Technical quality scores are improved by higher social outcome scores

In the Bladnoch case study, the Galloway Fisheries Trust, who wrote the plan, had a very good reputation in the Bladnoch area, leading one fisherman to claim that "*nobody else could have done it* […] *their technical analysis of the situation is spot on*" [BBU4]. Contributions from the forestry sector and on water quality were also acknowledged by interviewees. However, some interviewees commented on the lack of integration of their local knowledge and values into the plan. One fisherman claimed that despite the fact he was "*familiar with the area, you know what goes on year after year* […] *what we think should be done* […] *we're told "no, you just don't"*" [BBU7]. One aspect on which all interviewees agreed was the pressing need for more data and research on acceptable levels of afforestation for the survival of species such as the Atlantic salmon – considered a key issue for biodiversity users. One interviewee, however, felt that government advisers were unwilling to increase their learning on the issue "*for fear that it's going to bring out information that is politically unwelcome*" [BBU2].

In the Moray Firth, having an "independent" industry-led approach was perceived as allowing local knowledge and values to be collected and integrated into the process. A situation was reached in which "*it was the salmon guys working directly with the scientists and actually getting some robust data back*" [MBU1], thereby augmenting the technical quality of the plan and strengthening the learning and acceptance of the data by the District

Salmon Fishery Boards, who could "*see that the figures that are coming out are not just from conservationists who want to stop everyone taking salmon*" [MBU1].

In the Forth and Borders case study, the importance of high quality decisions was essential to maximise uptake of the voluntary scheme. While most prescriptions and payment rates were consistent with existing schemes, being "*quite well researched and then just copied into here*" [FBSA1], new management prescriptions were more contentious among land owners and managers and led them to doubt the quality of these prescriptions. One such prescription was 'diversionary feeding of hen harriers'. This was seen as impractical from a farming perspective, with one independent adviser dismissing it as "*very tenuous*" [FBSA1]. One farmer remarked that "*practical knowledge certainly would definitely have helped* […] *Of course farmers don't know everything but maybe small things that could have added to the scheme*" [FBBU2]. The implication was that for those drawing up the scheme, local knowledge gained from experience was not on a par with scientific knowledge. This lack of integration of local knowledge and values also affected the acceptability of the scheme.

e) Conflict resolution scores are improved by higher scores of trust

The strong positive relationship between trust and conflict management was apparent in the qualitative analysis, but uncovered different understandings of 'conflict'. The government advisers tended to refer mainly to inter-personal conflicts, i.e. in the Moray Firth the conflict was "*between salmon fisheries, both the rod angler and the netsmen and seal conservation interests*" [MGA2]. In the Bladnoch, government advisers did not perceive conflict but instead mentioned "*challenges*" [BGA3] and "*tensions in terms of pace of change, those sorts of things*" [BGA5]. For government advisers in the Moray Firth and Bladnoch case studies, these inter-personal conflicts were well addressed, and were strongly linked to the fact that stakeholders had had the opportunity to communicate and build trust with each other. For other stakeholders such as scientific advisers and biodiversity users, perceptions of conflict were different, and had maybe not been addressed as well as they could. The netsmen, and district salmon fishery board members to a lesser degree in the Moray Firth case study, for example, perceived ‘conflict’ as being intrinsically linked to the issue of declining salmon stocks, and were, accordingly, disappointed with the process, which although a step in the right direction in terms of bringing stakeholders “*together finding common ground, agreeing common ground* [… had not…] *made a dent on what needs to be done*” [MBU9] in terms of controlling seal populations.

In the Bladnoch and the Forth and Borders case studies, perceived conflict had not been adequately managed. In the Forth and Borders case study, trust was limited and resulted in allocating blame. For one grouse manager, “*they* [SNH] *buried the predatory bird thing*” [FBBU8]. In the eyes of one Scottish Natural Heritage representative, the low uptake of the supplementary feeding prescription was hindering efforts to resolve the conflict: “*where there’s conflict and they’re* [the land managers] *not convinced that it’s the right way forward then there isn’t uptake and it’s very difficult to know if it’s the right way forward*” [FBGA4]. For the Royal Society for the Protection of Birds, “*ultimately the issue of wildlife crime hasn’t gone away and there will be a need for land owners and their employees to take this more seriously and stop the illegal killing of birds of prey because that ain’t part of modern day land management practice*” [FBBU9]. This led another interviewee to conclude that “*they* [the conflicts] *haven’t been resolved and there’s no real evidence that a scheme like this has really helped resolve conflicts at all*” [FBBU10].

In the Bladnoch case study, conflicts were very present for many biodiversity users, especially the conflict between afforestation and acidification, which had "*not moved forward, either from the catchment plan side of it or from the people that have issues with it*" [BSA2]. As such, the process was seen as ineffectual, leading to frustration, scepticism and distrust concerning the drive behind the plan. For three biodiversity users, the process had actually exacerbated the conflict. Some interviewees did perceive the plan as a basis for conflict resolution, as long as implementation switched from 'consideration speak' to action, "*in other words they took their own advice and "where we are able" becomes "we will"*" [BBU9]. Others believed that the basic conflict of forestry in the landscape could not be resolved unless other measures, such as a change in legislation, compensation or mitigation measures such as liming, were put in place.

3.3. *Social outcomes derived from stakeholder involvement influence biodiversity outcomes (Hypothesis 3)*

3.3.1. Results based on the quantitative analysis

The key social outcomes in determining biodiversity scores were trust (SAW=0.97), and values (SAW=0.60) (Fig. 2), with technical quality (SAW=0.49), conflict resolution (SAW=0.37), learning (SAW=0.26), and social group (SAW=0.26) being of lesser importance. The best model, according to AIC, contained trust and values, but models that omitted values were also relatively well supported (ΔAIC for model with trust and technical=0.15, ΔAIC for model with trust alone=1.52). Trust was statistically significant within the best model (Table 4), having a positive effect on biodiversity scores.

3.3.2. Results based on the qualitative analysis

In the Bladnoch case study, government advisers highlighted indirect impacts on biodiversity that included identifying the important issues affecting Atlantic salmon in the protected area and coordinating efforts to address these issues. The greater contact had contributed to organisations gaining a greater degree of focus and cohesion. In the Moray Firth case study, government advisers again concluded that while it was currently too difficult to say whether the management plan had "*made a real difference to the actual biodiversity, it's certainly made a difference to the way things are managed and handled*" [MGA2]. The most frequently cited indirect benefits to biodiversity in the Moray Firth case study were the increased trust between stakeholders and the improved quality of decisions through the integration of scientific and local knowledge and values. The increased contact between stakeholders had contributed to "*generate some trust between the different parties tha*t […] *would have carried on their own way*" [MSA5]. Finally and closely related to the issue of increasing trust, interviewees highlighted the importance given during the process to "*gathering the scientific evidence to support the policy*" [MSA4]. In the Forth and Borders case study, there were also a number of indirect biodiversity benefits, again mainly highlighted by government advisers. One key issue impacting on biodiversity in the long-term were improved levels of trust between government advisers and land owners and managers. One government adviser said that the management scheme had given her "*a very good tool with which you can go and talk to owners and occupiers about their site*" [FBGA2].

4. Discussion

This study empirically tested the links between stakeholder involvement and social and biodiversity outcomes in the context of protected area management using both qualitative and quantitative data. Five main findings emerged from the study.

Firstly, the study found mixed results when testing the assumption that the better the process the more likely "good" outcomes are to emerge (Rowe and Frewer, 2004). In two case studies (the Bladnoch and Forth and Borders), the views of interviewees on process, social outcomes and biodiversity outcomes were relatively similar, which would imply a relationship between process and outcomes. In the Moray Firth case study, however, there was a clear lack of an unequivocal relationship between process and outcomes. This was particularly unexpected, because the process in the Moray Firth was evaluated very positively by interviewees but the social and biodiversity outcomes were evaluated much less positively, seemingly going against the assumption that a good process is more likely to lead to good outcomes. This finding emphasises the need in the context of protected area management to carry out evaluations linking all three goals of participation, namely normative, substantive and instrumental with criteria relating to process and outcomes (Burgess and Chilvers, 2006). The finding also emphasises the difficulties of linking stakeholder involvement processes to biodiversity outcomes in light of external factors (Conley and Moote, 2003). In the Bladnoch case study, the life-cycle of the salmon, which spend much of their life at sea, meant that any actions in the Bladnoch were unlikely to impact significantly on the returning population of salmon. In the Moray Firth, impacts other than shooting pressure (such as food availability) were likely to affect seal populations. In the Forth and Borders, extrinsic pressures, including afforestation and agricultural subsidies were, again, likely to impact on moorland habitats. The characteristics of the natural environment (i.e., complexity, high uncertainty, large temporal and spatial scales and irreversibility), used as arguments for increased stakeholder involvement in environmental management (van den Hove, 2000), actually prevented participants from evaluating possible biodiversity benefits derived from the management plans.

Secondly, results across case studies showed that stakeholder involvement in the development and implementation of management plans could lead to good social outcomes, such as increased trust amongst stakeholders and improved learning. These social outcomes could, in turn, impact on biodiversity outcomes in the long-term, for example by leading to a greater willingness on the part of land owners and managers to want to conserve biodiversity. This may be sufficient reason to promote the expansion of well designed stakeholder involvement. Evaluating these biodiversity outcomes at this stage has necessarily, however, been prospective, because these management plans have been in existence for a relatively short time. Such evaluations pose problems, with 'results' difficult to quantify, biodiversity outcomes likely to be long-term and have multiple interacting variables impacting on them (Koontz, 2006) - 'results' have therefore been difficult to quantify in this study. The main lesson is that the success of stakeholder initiatives such as management plans would therefore require long-term state investment in bottom-up initiatives through funding of increased research, adaptive monitoring and evaluation (Bottrill et al. 2011; Young et al., 2012).

Thirdly, the results emphasise the importance of independent processes, more likely to increase trust among stakeholders, better integrate stakeholder values and, in turn, more likely to lead to positive biodiversity outcomes. The management plans in the Bladnoch and Forth and Borders case studies were driven directly by the top-down EU and national level pressure of designating and managing Natura 2000 sites. The perceived lack of integration of local knowledges and values into those plans created the perception that Scottish Natural

Heritage had not aimed to develop some of the more normative or substantive qualities of stakeholder involvement but wanted to gain what Irvin and Stansbury (2004) refer to as “a more cooperative public” (ibid: 57). As such, the development of the management plans in the Bladnoch and Forth and Borders reflected the pragmatic instrumental aims of the representative democracy model, used mainly in a capacity to legitimise certain decisions, increase trust in institutions, and resolve conflicts (Chilvers, 2009). This may go some way to explaining the generally higher scores given by government advisors, whose role it is to ensure that protected areas deliver expected biodiversity outcomes. In contrast, the drivers behind the development of the Moray Firth management plan were influenced by the direct threat of a ban on seal shooting itself, linked to the SAC designation. The deliberative process in the Moray Firth allowed groups, such as fishermen, that are often considered to be disenfranchised and alienated (Jentoft, 2005) into the decision-making process, inputting their knowledge (Berkes, 2009) and exerting their influence on the outcomes of the process. This finding in no way precludes the involvement of government representatives in the process (Koontz, 2006). On the contrary, in the Moray Firth, the involvement of government advisers allowed for clear boundaries to be set and the plan to be implemented (Young et al., 2012).

Fourthly, the results emphasise the importance of acknowledging that stakeholder involvement processes do not occur in a vacuum but are embedded in a complex governance structure (Carlsson and Berkes, 2004). In this study, all case studies were embedded within severe and long-standing conflicts: over acidification and salmon fisheries in the Bladnoch; over seal conservation and fisheries in the Moray Firth; and over farming, game management and moorland conservation in the Forth and Borders case study. The stakeholders involved held very strong preconceptions of other stakeholders and of the environmental problem. The Moray Firth was the only case study in which the conflict was addressed directly. Even in this case study, however, stakeholders held different views over the interpretation of "conflict". In the other two case studies (Forth and Borders, and Bladnoch), stakeholders felt frustrated that what they perceived as the main conflicts had been ignored in the management plan process. This emphasises the need to acknowledge, define and address conflicts with all relevant stakeholders (Young et al., 2010) in protected area management; and to clarify the role of stakeholders in the conflict management process. The results also reflect the broader issue of clarifying the goals of stakeholder involvement processes (Ferreyra and Beard, 2007), and the role of stakeholders in those processes (Mostert et al. 2007).

Finally, our results demonstrate the possibility and cost-effectiveness of using a mix of qualitative and quantitative data, together with a mix of and relationship between process and outcome criteria in the evaluation of stakeholder involvement approaches. The potential weakness of this approach - and of evaluations of outcomes in general – is, as explained above, the difficulty of evaluating quantifiable outcomes. Whilst we believe stakeholder perceptions of outcomes was a useful proxy for evaluating short and long-terms social and biodiversity outcomes, management plans focusing on simpler (maybe sedentary) natural systems affected by fewer external impacts could help to reduce confounding influences in order to detect links between social and biodiversity outcomes.

5. Conclusions

These results add to a small but growing body of work on the links between increased stakeholder involvement and conservation of biodiversity. Our findings emphasise the risks associated with the assumption that good processes are more likely to lead to good outcomes. This highlights the need for multi-dimensional evaluations incorporating process, social outcomes and biodiversity outcomes. Establishing direct links between stakeholder involvement processes and outcomes in biodiversity conservation is complicated by the context in which such processes are embedded. Results across case studies did, however, show that stakeholder involvement in the development and implementation of management plans can lead to good social outcomes such as better understanding of stakeholder values, increased trust and learning. These indirect benefits of increased stakeholder involvement may be sufficient reason to promote the expansion of stakeholder involvement, and to carry out further research on how social benefits may contribute to biodiversity outcomes.

Our results also highlight the need to widen the current debate on stakeholder involvement in biodiversity policy implementation. Stakeholder involvement is costly both in time and resources and, if badly implemented, can lead to greater social conflicts. It is therefore essential to carry out evaluations such as that used in this study to establish how stakeholders are currently involved in conservation and the risks and opportunities associated with stakeholder involvement in biodiversity management.

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SUPPLEMENTARY MATERIAL

A1. Semi-structured interview guide

Short introduction:

The aim of this research is to better understand how local people are involved in the management of protected areas. I'll be asking you a series of questions about your experience of the site and its management plan. The interview usually takes about an hour. There are no right or wrong answers, it's all confidential and your identity will not be revealed at any stage.

I've divided the interview into three main parts, just to help me remember everything: initially I'll just ask a few background questions about you and your experience of the area, the meat of the interview is really about the process of writing the management plan (that's where the table comes in), and then a quick look at the plan itself.

Background questions to be filled before-hand

Date of interview:	
Location of interview:	
Name and contact details of interviewee:	
Profession of interviewee:	

FIRST OF ALL, A FEW QUESTIONS REGARDING YOUR *PERSONAL EXPERIENCE OF THE AREA*

Q: **How well do you know the site** (**How long** have you lived in the area? **How often** do you visit the site? How well do you know **the local inhabitants**?)

Moving on to the Natura 2000 site:

Q: **Have things changed since the site was designated as a Natura 2000 site**? (Has the **use of the site** changed? Are there any **activities** you can no longer carry out? How will **future use** of the site be affected, i.e. increase in **tourism**? How might this future use affect you **personally**?)

NOW IN TERMS OF YOUR *PERSONAL LEVEL OF INVOLVEMENT IN THE DEVELOPMENT OF THE MANAGEMENT PLAN*

When did you first get involved? What were your **responsibilities**? How many **meetings** did you attend? Did you have any **other related activities** apart from attending the meetings? Generally, **how well** do you think the drafting of the management plan went?

Table exercise: Focussing still on the **drafting of the plan**, I’ve got a list here of different aspects that could be true of the process. It’s my list and there are probably lots of aspects I’ve missed out, so if you think of anything else as we’re going along, just let me know. For each of these aspects I’d you think back, talk me through it and at the end score each of the aspects along a gradient from 1 to 5 where 1 is very bad and 5 very good.

How good was the process at:	1 (very bad)	2	3	4	5 (very good)
Representing the people affected					
Allowing people to have a real impact					
Incorporating the values of people					
Involving people as early as possible					
Increasing trust between all involved					
Resolving any existing conflicts					
Being unbiased and independent					
Being transparent and clear					
Being cost-effective					
Improving the technical quality of decisions					
Providing information and educating people					
Leading to new organisations or structures being established to implement decisions					
Leading to long-term biodiversity benefits					

Q: Were there any aspects **missing**? Irrespective of how you scored, what were the **three most important aspects** for you in the above list during the process of drawing up the plan?

Q: Do you think the process **could have worked better**? How?

MOVING ON THE **IMPLEMENTATION OF THE PLAN**:

Q: **How well** do your think the management plan is being **implemented**?

Q: Do you think **things could have been different** in the area if there wasn’t a plan in place? What about in terms of **biodiversity** specifically?

Q: Do you have any **suggestions** as to who else I should interview?

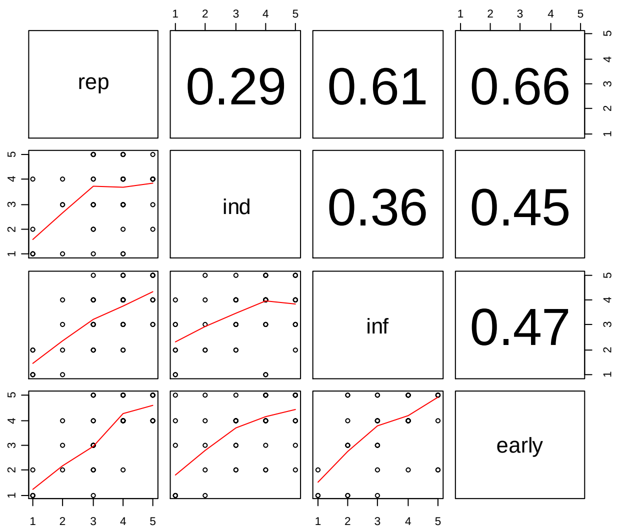
Q: I fully appreciate that this is a very general approach and that there are probably lots of things I haven’t mentioned. I don’t know if anything comes to mind now? If later, provide contact details.

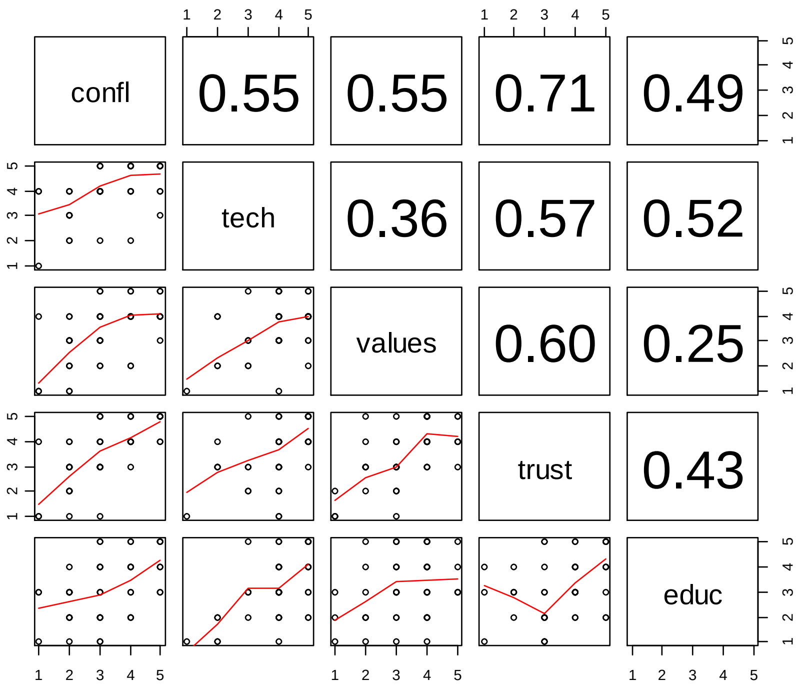
Q: Do you want to be **kept informed** of research findings? Yes or No? Contact details?

Appendix B

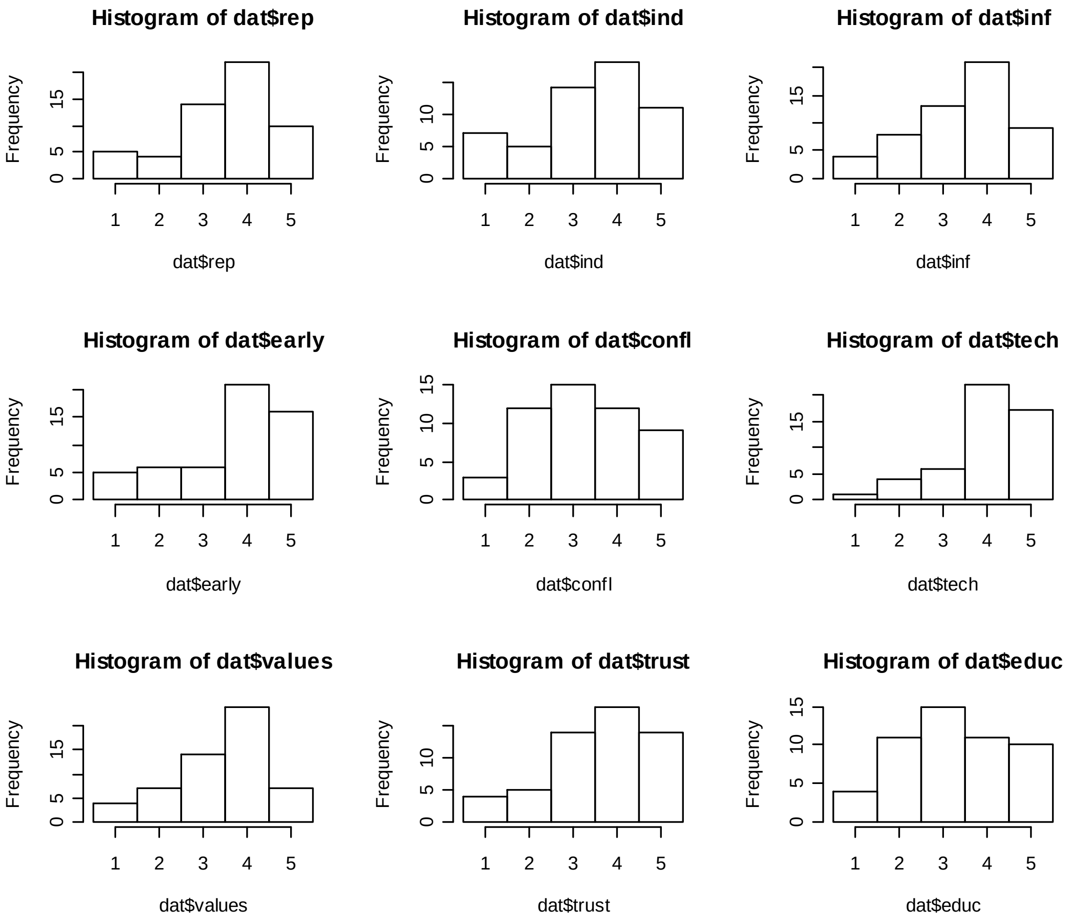
Correlation between explanatory variables

Correlation tables for sets of explanatory variables using Spearman's rank correlation:





Appendix C. Distribution of scores across each variable



Appendix D. Data type for explanatory variables (AIC)

Check for whether explanatory variables should be continuous (numeric) or categoric (factor) – using AIC to compare both options for explaining variation in biodiversity scores:

Variable	Numeric AIC	Categorical AIC
Representativeness	136.11	139.79
Independence	129.02	129.58
Influence	131.09	134.59
Early involvement	136.78	137.71
Technical quality	116.45	118.93
Conflict resolution	112.66	113.41
Trust	106.04	110.11
Values	113.15	114.05
Learning	120.05	117.26

Appendix E

Table E1. Effect of process outcomes on biodiversity outcomes (system: case study, rep: representativeness, ind: independence, infl: influence, early: early involvement, social: social group).

MODEL	AIC	Delta AIC	Akaike W
system + ind + social.group	124.84	0.00	0.179
system + ind + inf + social.group	125.11	0.27	0.157
system + rep + ind + inf + social.group	126.00	1.16	0.100
system + rep + ind + inf + early + social.group	126.26	1.42	0.088
system + ind + early + social.group	126.64	1.80	0.073
system + rep + ind + social.group	126.83	1.99	0.066
system + ind + inf + early + social.group	127.09	2.25	0.058
system + rep + inf + early + social.group	127.12	2.28	0.057
system + inf + social.group	127.76	2.93	0.041
system + rep + ind + early + social.group	128.29	3.45	0.032
system + ind + inf	128.81	3.97	0.025
system + inf + early + social.group	128.99	4.16	0.022
system + rep + inf + social.group	129.32	4.48	0.019
system + rep + ind + inf	130.22	5.38	0.012
system + early + social.group	130.56	5.72	0.010
system + ind + inf + early	130.80	5.96	0.009
system + ind	130.84	6.01	0.009
system + rep + ind + inf + early	131.62	6.78	0.006
system + inf	131.98	7.14	0.005
system + social.group	132.14	7.30	0.005
system + rep + early + social.group	132.21	7.37	0.004
system + rep + ind	132.32	7.49	0.004
system + ind + early	132.38	7.54	0.004
system + rep + social.group	132.79	7.95	0.003
system + inf + early	133.08	8.24	0.003
system + rep + inf + early	133.34	8.50	0.003
system + rep + inf	133.88	9.05	0.002
system + rep + ind + early	134.26	9.42	0.002
system + early	137.46	12.62	0.000
system + rep	138.64	13.80	0.000
system + rep + early	139.29	14.45	0.000
system	140.98	16.14	0.000

Table E2. Effect of social outcomes on biodiversity outcomes (syst: case study, tech: technical quality, confl: conflict resolution, trust: trust, values: values, educ: learning, social: social group).

MODEL	AIC	Delta AIC	Akaike W
syst + trust + values	101.45	0.00	0.113
syst + tech + trust + values	101.75	0.31	0.097
syst + tech + trust	101.80	0.35	0.095
syst + tech + confl + trust	102.91	1.46	0.054
syst + trust	102.97	1.52	0.053
syst + confl + trust + values	103.04	1.59	0.051
syst + confl + trust	103.12	1.67	0.049
syst + trust + values + social.group	103.47	2.02	0.041

syst + tech + confl + trust + values	103.55	2.11	0.039
syst + tech + trust + values + educ	103.67	2.22	0.037
syst + trust + values + educ	103.90	2.46	0.033
syst + trust + social.group	103.96	2.51	0.032
syst + tech + trust + social.group	104.49	3.04	0.025
syst + tech + trust + values + social.group	104.70	3.25	0.022
syst + confl + trust + social.group	104.93	3.48	0.020
syst + tech + trust + educ	104.99	3.54	0.019
syst + trust + values + educ + social.group	105.07	3.63	0.018
syst + tech + confl + trust + educ	105.08	3.63	0.018
syst + tech + confl + trust + values + educ	105.10	3.65	0.018
syst + confl + trust + educ	105.17	3.73	0.018
syst + confl + trust + values + educ	105.20	3.75	0.017
syst + confl + trust + values + social.group	105.26	3.82	0.017
syst + trust + educ	105.39	3.94	0.016
syst + tech + confl + trust + social.group	105.78	4.33	0.013
syst + tech + trust + values + educ + social.group	105.91	4.47	0.012
syst + trust + educ + social.group	106.29	4.84	0.010
syst + tech + confl + trust + values + social.group	106.56	5.11	0.009
syst + confl + trust + values + educ + social.group	106.91	5.46	0.007
syst + confl + trust + educ + social.group	107.19	5.75	0.006
syst + tech + trust + educ + social.group	107.33	5.88	0.006
syst + tech + confl + trust + values + educ + social.group	107.71	6.26	0.005
syst + tech + confl + trust + educ + social.group	108.05	6.61	0.004
syst + tech + confl + values + educ	108.58	7.13	0.003
syst + tech + confl	108.84	7.40	0.003
syst + tech + confl + educ	108.99	7.55	0.003
syst + tech + confl + values	109.40	7.96	0.002
syst + confl + values + educ	110.20	8.75	0.001
syst + tech + values + educ	110.41	8.97	0.001
syst + tech + values + educ + social.group	110.68	9.23	0.001
syst + confl + values	110.79	9.34	0.001
syst + values + educ + social.group	110.90	9.45	0.001
syst + tech + confl + values + educ + social.group	111.05	9.60	0.001
syst + confl + educ	111.18	9.74	0.001
syst + confl + values + educ + social.group	111.26	9.81	0.001
syst + tech + confl + social.group	111.53	10.08	0.001
syst + confl + values + social.group	111.84	10.39	0.001
syst + tech + confl + educ + social.group	112.01	10.57	0.001
syst + tech + confl + values + social.group	112.03	10.59	0.001
syst + tech + values	112.14	10.69	0.001
syst + confl + educ + social.group	112.62	11.17	0.000
syst + confl	112.68	11.23	0.000
syst + values + educ	112.93	11.48	0.000
syst + confl + social.group	113.14	11.69	0.000
syst + tech + values + social.group	113.26	11.81	0.000
syst + values + social.group	113.79	12.34	0.000
syst + tech	114.22	12.78	0.000
syst + tech + educ	114.31	12.87	0.000
syst + tech + educ + social.group	114.66	13.21	0.000
syst + tech + social.group	115.24	13.79	0.000
syst + educ + social.group	115.28	13.83	0.000
syst + values	115.92	14.47	0.000
syst + educ	118.73	17.28	0.000
syst + social.group	119.70	18.26	0.000

syst	125.37	23.93	0.000

Table E3. Effect of process outcomes on learning (syst: case study, rep: representativeness, ind: independence, inf: influence, early: early involvement, social: social group).

MODEL	AIC	deltaAIC	Akaike W
syst + early	142.43	0.00	0.171
syst + inf + early	143.23	0.80	0.115
syst + inf	143.94	1.50	0.081
syst + ind + early	144.43	2.00	0.063
syst + rep + early	144.43	2.00	0.063
syst + rep + inf + early	144.73	2.30	0.054
syst + rep	144.97	2.54	0.048
syst + ind + inf + early	145.19	2.76	0.043
syst	145.50	3.07	0.037
syst + rep + inf	145.70	3.27	0.033
syst + ind + inf	145.74	3.31	0.033
syst + inf + early + social.group	146.15	3.72	0.027
syst + early + social.group	146.19	3.76	0.026
syst + rep + ind + early	146.43	4.00	0.023
syst + ind	146.57	4.14	0.022
syst + rep + ind + inf + early	146.68	4.25	0.020
syst + rep + ind	146.76	4.33	0.020
syst + inf + social.group	146.92	4.48	0.018
syst + rep + ind + inf	147.59	5.15	0.013
syst + rep + inf + early + social.group	147.73	5.29	0.012
syst + ind + inf + early + social.group	148.11	5.68	0.010
syst + rep + early + social.group	148.16	5.73	0.010
syst + ind + early + social.group	148.17	5.73	0.010
syst + ind + inf + social.group	148.29	5.86	0.009
syst + rep + social.group	148.57	6.14	0.008
syst + rep + inf + social.group	148.64	6.21	0.008
syst + social.group	149.32	6.89	0.005
syst + rep + ind + inf + early + social.group	149.70	7.26	0.005
syst + rep + ind + social.group	150.06	7.63	0.004
syst + rep + ind + early + social.group	150.13	7.70	0.004
syst + rep + ind + inf + social.group	150.15	7.72	0.004
syst + ind + social.group	150.23	7.80	0.003

Table E4. Effect of process outcomes on values (syst: case study, rep: representativeness, ind: independemce, inf: influence, early: early involvement, social.group: social group)

MODEL	AIC	Delta AIC	Akaike W
syst + rep + ind	120.22	0.00	0.202
syst + ind + inf	120.36	0.14	0.188

syst + rep + ind + inf	120.58	0.36	0.169
syst + ind + inf + early	121.27	1.05	0.119
syst + rep + ind + early	122.22	1.99	0.074
syst + rep + ind + inf + early	122.52	2.30	0.064
syst + ind + early	123.78	3.56	0.034
syst + rep + ind + social.group	123.96	3.74	0.031
syst + ind + inf + social.group	124.18	3.95	0.028
syst + rep + ind + inf + social.group	124.28	4.05	0.027
syst + ind + inf + early + social.group	125.02	4.80	0.018
syst + ind	125.31	5.09	0.016
syst + rep + ind + early + social.group	125.95	5.73	0.011
syst + rep + ind + inf + early + social.group	126.21	5.99	0.010
syst + ind + early + social.group	127.43	7.21	0.005
syst + ind + social.group	128.85	8.63	0.003
syst + inf + early	134.68	14.45	0.000
syst + rep + inf	136.45	16.23	0.000
syst + rep + inf + early	136.51	16.29	0.000
syst + inf	137.16	16.94	0.000
syst + inf + early + social.group	138.29	18.07	0.000
syst + rep + inf + social.group	140.03	19.81	0.000
syst + rep + inf + early + social.group	140.15	19.93	0.000
syst + inf + social.group	140.49	20.27	0.000
syst + rep + early	140.70	20.48	0.000
syst + rep	140.84	20.62	0.000
syst + early	141.99	21.77	0.000
syst + rep + social.group	143.38	23.16	0.000
syst + rep + early + social.group	143.43	23.21	0.000
syst + early + social.group	143.88	23.66	0.000
syst + social.group	153.82	33.59	0.000
syst	154.35	34.13	0.000

Table E5. Effect of process outcomes on trust (syst: case study, rep: representativeness, ind: independence, inf: influence, early: early involvement, social.group: social group).

MODEL	AIC	Delta AIC	Akaike W
syst + ind + inf	124.26	0.00	0.35
syst + ind + inf + early	125.13	0.87	0.22
syst + rep + ind + inf	125.92	1.67	0.15
syst + rep + ind + inf + early	127.12	2.86	0.08
syst + ind + inf + social.group	127.34	3.08	0.07
syst + ind + inf + early + social.group	128.25	3.99	0.05
syst + rep + ind + inf + social.group	129.02	4.76	0.03
syst + rep + ind + inf + early + social.group	130.24	5.98	0.02
syst + inf	132.39	8.13	0.01
syst + rep + ind	133.63	9.37	0.00
syst + inf + early	134.26	10.00	0.00
syst + rep + inf	134.28	10.02	0.00
syst + inf + social.group	134.66	10.40	0.00
syst + ind	134.83	10.58	0.00
syst + rep + ind + early	134.97	10.72	0.00
syst + rep + ind + social.group	135.52	11.26	0.00
syst + ind + social.group	136.13	11.87	0.00
syst + rep + inf + early	136.24	11.98	0.00

syst + ind + early	136.30	12.05	0.00
syst + inf + early + social.group	136.51	12.25	0.00
syst + rep + inf + social.group	136.55	12.29	0.00
syst + rep + ind + early + social.group	137.12	12.86	0.00
syst + ind + early + social.group	137.53	13.27	0.00
syst + rep + inf + early + social.group	138.50	14.24	0.00
syst + rep + social.group	143.20	18.95	0.00
syst + rep	143.81	19.55	0.00
syst + early + social.group	143.94	19.68	0.00
syst + rep + early + social.group	144.65	20.39	0.00
syst + rep + early	145.40	21.14	0.00
syst + early	146.16	21.90	0.00
syst + social.group	147.55	23.30	0.00
syst	151.05	26.80	0.00

Table E6. Effect of social outcomes on technical quality (syst: case study, educ: learning, values: values, social.group: social group).

MODEL	AIC	Delta AIC	Akaike W
syst + educ + social.group + values	84.49	0.00	0.689
syst + educ + social.group	86.13	1.64	0.304
syst + social.group + values	94.34	9.85	0.005
syst + social.group	96.17	11.68	0.002
syst + educ + values	103.37	18.88	0.000
syst + values	107.59	23.10	0.000
syst + educ	107.89	23.40	0.000
syst	114.77	30.28	0.000

Table E7. Effect of social outcomes on conflict resolution (system: case study, trust: trust, social.group: social group).

MODEL	AIC	Delta AIC	Akaike W
system + trust + social.group	130.75	0.00	0.58
system + trust	131.41	0.66	0.42
system + social.group	153.38	22.63	0.00
system + 1	160.72	29.97	0.00