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Date deposited: 10th January (uploaded 1st March 2012)

Version of file: Author final

Peer Review Status: Peer reviewed

Citation for item:

Phillipson J, Lowe P, Proctor A, Ruto E. [Stakeholder Engagement and Knowledge Exchange in Environmental Research](#). *Journal of Environmental Management* 2012, **95**(1), 56-65.

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<http://dx.doi.org/10.1016/j.jenvman.2011.10.005>

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1 **Stakeholder Engagement and Knowledge Exchange in**
2 **Environmental Research**

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7 Pre-proof author version
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9 Phillipson, J., Lowe, P., Proctor, A. and Ruto, E. (2012) Stakeholder
10 Engagement and Knowledge Exchange in Environmental Research, *Journal of*
11 *Environmental Management*, 95 (1), 56-65.
12

13 **Abstract**

14 It is commonly put forward that effective uptake of research in policy or
15 practice must be built upon a foundation of active knowledge exchange and
16 stakeholder engagement during the research. However, what is often lacking
17 is a systematic appreciation of the specific practices of knowledge exchange
18 and their relative merits. The paper reports on a 2009 survey of 21 research
19 projects within the UK Research Councils' Rural Economy and Land Use
20 Programme regarding the involvement and perceived impact of over a
21 thousand stakeholders in the research. The survey reveals that most
22 stakeholders were involved as research subjects or as event participants.
23 Large numbers were also engaged in the research process itself, including
24 involvement in shaping the direction of research. Stakeholder engagement is
25 perceived as bringing significant benefits to the process of knowledge
26 production. A close relationship is found between mechanisms and
27 approaches to knowledge exchange and the spread of benefits for
28 researchers and stakeholders. Mutual benefits are gained from exchange of
29 staff or where stakeholders are members of research advisory groups.
30 Different stakeholder sectors are also associated with different patterns of
31 engagement, which lead to contrasting impact patterns. Any efforts to alter
32 knowledge exchange processes and outcomes must overcome these differing
33 engagement tendencies. Overall, much greater attention should be given to
34 early processes of knowledge exchange and stakeholder engagement within
35 the lifetime of research projects.
36

37 **Keywords:** knowledge exchange, stakeholder engagement, research impact,
38 rural economy and land use
39

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40 Stakeholder Engagement and Knowledge Exchange in 41 Environmental Research

42 43 1. Introduction

44
45 Though efforts to enhance the relevance and uptake of research are by no
46 means new, over the past decade aspirations for research impact, evidence-
47 based policy and the knowledge economy are being deployed more and more
48 to justify public investment in research. In the UK, this change reflects
49 intensified government effort to steer science towards economic and social
50 betterment, and to gauge its achievements accordingly (HM Treasury et al.,
51 2004). Funding of the science base is not considered sufficient, on its own, to
52 realise social and economic benefit (Research Council Economic Impact
53 Group, 2006). According to Research Councils UK, the challenge is to “ensure
54 that research outcomes are exploited” (RCUK, 2004). What remains uncertain
55 is how these aspirations should be incorporated into the conduct of research
56 and its interaction with fields of application.

57
58 Under pressure to justify and demonstrate the impact of investment in
59 science, research funders have focused attention on potential users of
60 research, in an effort to deliver a “step change in economic impact” of what
61 they fund (Research Council Economic Impact Group, 2006: p. 3). There has
62 been growing emphasis upon directed (or themed) research programmes.
63 Research projects are also increasingly required to identify the potential
64 beneficiaries of their work (Shove and Rip, 2000) and develop strategies for
65 knowledge transfer and pathways to impact (RCUK, 2009).

66
67 However, research funders are often reproached for presiding over research
68 communities that are poorly motivated and equipped to address matters of
69 relevance and impact, or for being biased towards facilitating academic ‘push’
70 rather than user ‘pull’ (House of Commons Science and Technology
71 Committee, 2006; External Challenge Panel, 2006). Such criticisms often
72 reveal much about prevailing conceptions of, and claims for, knowledge
73 transfer, as being logically distinct from knowledge production. This divide is
74 encapsulated in the terminology of ‘(end)-users’ and in models of research
75 utilisation that segregate the scientific process from subsequent
76 communication and application of the results (Shove and Rip, 2000). The
77 divide lies at the very heart of performance measurement, in separate metrics
78 for scientific output, knowledge transfer and impact.

79
80 If this separation is not accepted, then the possibility is opened up of
81 interactive models of knowledge production, in which knowledge transfer
82 might be a more complex, multi-directional affair. The UK Research Councils,
83 for example, advocate the engagement of potential users in research as being
84 as valuable in knowledge transfer as specific mechanisms for exploiting
85 research findings. They point to the potential benefits of an interactive
86 approach that engages users “throughout the overlapping stages of identifying
87 the issues to be addressed, the generation of new knowledge ..., and its
88 utilisation” (RCUK, 2006: p.19-20).

89

90 There is therefore an emerging realisation, albeit not commonly reflected in
91 practice, that effective research uptake in policy and practice may be built
92 upon a foundation of active knowledge exchange and stakeholder
93 engagement during the process of knowledge production itself. This
94 realisation revives a long-established discussion regarding contrasting ways
95 of conceiving of the relationship between science and society. On the one
96 hand, the scientific process may be viewed as hermetic and self-referring,
97 albeit shaped at its beginning and end by wider societal preferences and
98 contexts. Knowledge production and its application should therefore be
99 conceived of as logically distinct and separate. From this perspective, the
100 prospect of stakeholder engagement in knowledge production is typically
101 viewed, at best, as a distraction and, at worst, as undermining scientific
102 integrity.

103
104 Alternatively, scientific knowledge production can be conceived of as
105 creatively open to, or even dependent upon, non-scientific sources of
106 expertise. The distinction between knowledge producers and users is seen as
107 being fluid and the boundary between them permeable. In this view, the
108 generation, diffusion and use of scientific knowledge and techniques are an
109 iterative and networked process, built on adaptations, innovations and
110 exchange of expertise from multiple sources. Here, notions of knowledge
111 production and transfer are effectively conflated (what Nowotny *et al.* (2001)
112 characterise as ‘Mode 2’ knowledge production).

113
114 This spectrum of epistemological perspectives, which reflects the diverse
115 evolution of forms of scientific research (Whitley, 2000), offers support for
116 different knowledge claims (Evely *et al.*, 2008; Raymond *et al.*, 2010;
117 Eigenbrode *et al.*, 2007). From proponents of knowledge exchange, there is
118 much proselytising about appropriate models of knowledge production: such
119 as collaborative or participatory research (Denis and Lomas, 2003; Nerbonne
120 and Lentz, 2003), democratising science (Liberatore and Funtowicz, 2003),
121 transdisciplinary research (Nicolescu 2002; Tress *et al.* 2005; Brown *et al.*
122 2010), or open innovation (Von Hippel, 2005). However, what is lacking in the
123 welter of normative claims about the potential for interaction and mutual
124 enrichment of scientific and non-scientific knowledges is systematic
125 appreciation of the specific practices of knowledge exchange and their relative
126 merits.

127
128 In this journal, Raymond *et al.* (2010) recently considered the philosophical
129 challenges associated with integrating different types of knowledge for
130 environmental management. Their work emphasises the diverse forms of
131 knowledge (experiential, local, scientific, hybrid) that may potentially be
132 brought to bear by involving stakeholders within the research process, and
133 how epistemological beliefs serve to privilege or constrain certain knowledge
134 inputs. Reed *et al.* (2009) also developed a typology of stakeholder analysis
135 which includes methods for identifying and investigating relationships between
136 stakeholders, addressing questions of “representation, legitimacy,
137 participation, power, and knowledge – essentially “who’s in, and why?”” (p.
138 1934). The socially situated and often contested nature of knowledge is all too
139 clear in these contributions (Berger and Luckman, 1971). They are also

140 informed by wider perspectives on adaptive co-management, which view
141 knowledge exchange as involving social learning between formal and informal
142 institutions, individuals and communities of practice (Kellert, 2000; Phillipson,
143 1996; Allen and Kilvington, 2002; Armitage *et al.*, 2009; Berkes, 2009).

144

145 Following on from these contributions, we propose that an appreciation of the
146 modalities and effects of stakeholder engagement in environmental research
147 could also contribute to an understanding of how knowledge is produced and
148 applied in environmental management. Stakeholder² engagement in research
149 is thus widely pursued, but has yet to be subject to systematic evaluation
150 (Abreu *et al.*, 2009). Evidence is emerging that it can enhance knowledge
151 exchange and increase the likelihood that conservation efforts will be
152 successful. Kainer *et al.* (2009), for example, found that different phases of
153 the research cycle can provide distinct opportunities for partnership,
154 depending on the needs of researchers and local stakeholders. In research
155 into the role of local community members as co-researchers, Garnett *et al.*
156 (2009) also highlight the importance of involving stakeholders in the shaping
157 of research questions from the outset.

158

159 In the remainder of the paper, we present a case study of how a
160 contemporary research programme, the UK Research Councils' Rural
161 Economy and Land Use Programme, has actively pursued stakeholder
162 engagement. We report on a survey of research project leaders regarding
163 their approaches to involving stakeholders and their perceptions of the effects
164 of this engagement on both the stakeholders and the research. The paper
165 addresses two main questions. Firstly, how are stakeholders involved in
166 research projects? Secondly, what is the ongoing perceived impact of the
167 engagement, both on the research process and on the stakeholders'
168 knowledge and practices?

169

170 **2. Survey Context and Method**

171

172 *The Rural Economy and Land Use Programme*

173 The Rural Economy and Land Use (RELU) Programme supports
174 interdisciplinary research on the challenges facing the UK countryside. As a
175 programme funded by the Research Councils, the research is intended to be
176 strategic in nature and relevant to policy and practice, with a focus on the
177 development of sustainable food chains, integrated land and water use and
178 the management of animal and plant diseases (Lowe and Phillipson, 2006;
179 2009; Lowe *et al.*, 2008). RELU was given a strong mandate by the Research
180 Councils to engage stakeholders at all levels of the programme, which led it to
181 adopt a philosophy of knowledge exchange (Phillipson and Liddon, 2007).
182 This philosophy included a commitment to engaging stakeholders at all stages
183 of the research process. Emphasis was placed on the need to facilitate
184 sharing of knowledge between researchers and a range of practitioners,
185 businesses, policymakers and wider publics in developing new and novel

² We use the term 'stakeholder' broadly in the paper as including non-academics with a potential direct or indirect interest in the research. This is informed by Freeman's (1984) view of those actors 'who affect or are affected by a decision or action' (Reed *et al.*, 2009).

186 approaches to the environmental, economic, social and technological
187 challenges facing rural areas.

188

189 An experimental approach to knowledge exchange was encouraged across
190 the programme's 38 major research projects. They adopted varied
191 methodological approaches, including different forms of action research, the
192 development of decision-support systems and various types of participatory
193 modelling (Odoni and Lane, 2010; Reed *et al.*, in press), and the initiation of
194 knowledge co-operatives (Tsouvalis, 2009) and competency groups
195 (Whatmore *et al.*, 2008) involving researchers and local communities. To
196 gauge the effects of the different types of stakeholder engagement, we
197 designed and conducted a survey of leaders of the programme's research
198 projects. This paper draws on data collected from them in 2009, covering their
199 stakeholder engagement in 2008.

200

201 *Data collection*

202 Each project leader was asked to complete a proforma describing the
203 stakeholder interactions in their research. They were first asked to list the
204 stakeholders who were involved. At the data processing stage, each
205 stakeholder was categorised as to whether they were from the public
206 (government departments, local government, state agencies etc.), private
207 (small and large businesses, trade associations, etc.), or third (voluntary
208 bodies, charities, non-governmental organisations, etc.) sectors. Individual
209 consumers or members of the public were categorised as 'societal'
210 stakeholders.

211

212 Respondents were asked to identify, in open question format, the form of
213 engagement with each stakeholder, and a number of example responses
214 were given. These were subsequently categorised by the research team into
215 seven categories:

216

- 217 1. research subject, where the stakeholder took part as survey
218 respondent, interviewee etc.;
- 219 2. event participant;
- 220 3. steering/advisory group member;
- 221 4. project partner;
- 222 5. consultee, where the stakeholder was described as being sent
223 research findings for feedback;
- 224 6. research customer, where the stakeholder was described as an end-
225 user or receiver of research findings;
- 226 7. visitor to project/work shadowing host (work shadowing involved
227 researchers spending a few weeks in external contexts where their
228 research had relevance).

229

230 Project leaders were also asked to indicate the nature of stakeholders'
231 involvement in the research project. They could tick up to nine contributions:

232

- 233 1. contributed to objective setting/problem framing;
- 234 2. provided access to research facilities, materials or study sites;
- 235 3. contributed to discussions on project design;

- 236 4. contributed to knowledge production as equal partners;
- 237 5. provided information or views as research subjects;
- 238 6. assisted in data collection for project;
- 239 7. received copies of research findings/ outputs;
- 240 8. gave feedback on findings;
- 241 9. helped to disseminate findings.

242

243 Data were also collected on the impact of engagement. Project leaders were
244 asked to indicate for each stakeholder the 'perceived impact' on 'research
245 relevance' and 'scientific quality', on a five point scale (from very positive to
246 very negative). They were also asked to indicate the 'perceived impact' on the
247 stakeholder's 'policies or practices' and 'knowledge or understanding', on a
248 four point scale (very high, high, slight, so far none). The impact component of
249 the survey therefore takes on board both the instrumental and conceptual
250 dimensions of knowledge exchange as discussed by Davies *et al.* (2005).

251 Non-academic research impact, they argue, concerns identifying influences of
252 research on "policy, managerial and professional practices, social behaviour
253 or public discourse" (p. 12). Instrumental impacts include influencing changes
254 in policy, practices and behaviour. Conceptual impacts involve changing
255 people's knowledge, understanding and attitudes towards social issues. Our
256 survey translated these dimensions into measures for both the impact of
257 stakeholders on the research as well as impact of research on stakeholders.
258 For about two-thirds of their stakeholders, researchers were able to report on
259 perceived impact. We would expect there to be a degree of inflation in the
260 responses of some researchers regarding their perceived levels of impact on
261 stakeholders - researchers who want, or are encouraged, to demonstrate
262 impact, are being asked for their perceived impact on stakeholders. Others
263 may well underestimate impact – our experience is that many researchers can
264 be reluctant to claim, or unable to judge, the impacts of their research.

265

266 All data were entered into a SPSS spreadsheet. Chi-square tests were used
267 to analyse the relationships between patterns of stakeholder engagement and
268 perceived impact. Here, we tested for a number of relationships as presented
269 in Figure 1. Our aim in adopting a quantitative survey and analysis approach
270 was to provide a systematic account of stakeholder engagement practices,
271 which would complement qualitative research perspectives on knowledge
272 exchange and the contingent nature of research utilisation and impact (Davies
273 *et al.* 2005; Molas-Gallart *et al.*, 2000).

274

275 All 21 of RELU's ongoing research projects were in the mid or end phases of
276 their research and were asked to complete the proforma. The leaders of all
277 these projects responded to the request. There were 3849 individual
278 stakeholders involved across the 21 projects. Project leaders provided over
279 500 rows of data describing their own project's stakeholder interactions, with
280 many rows referring to engagements with groups of stakeholders (e.g. 6
281 farmers, 5 deer managers etc.). The dataset was overshadowed by three
282 rows of data, each referring to a large scale stakeholder survey undertaken by
283 three of the research projects (these were of 2000 consumers, 700 farmers
284 and 101 community councils). The three project surveys swamped the dataset
285 and initial analysis with a single form of stakeholder relationship, that of the

286 research subject. To enhance the sensitivity of our analysis of the varied
287 forms of relationships between stakeholders and research projects, we chose
288 to remove these overly-dominant data points from further analysis. This left a
289 dataset of 1048 stakeholders, comprising 37.5% (n=393) from the public
290 sector, 35.6% (n=373) from the private sector, 12% (n=126) from the third
291 sector, and 14.9% (n=156) from societal interests.

292

293 Naturally, the research projects have involved stakeholders with a strong
294 interest in the substantive themes of the research programme. The most
295 prominent groups in the public sector were the relevant central government
296 department, the Department for Environment, Food and Rural Affairs
297 (involved in 11 out of the 21 projects), the Environment Agency (11 projects)
298 and Natural England (10 projects). The Royal Society for the Protection of
299 Birds (7 projects) and the National Trust (6 projects) were prominent third
300 sector stakeholders. In the private sector, 9 projects were engaged with the
301 National Farmers' Union and 6 with the Country Land & Business Association.
302 The majority of private sector stakeholders were individual farming and land-
303 based businesses (of which there were 282), with 11 projects engaged in
304 some way with farming businesses. There were also 59 non-farming
305 businesses and 32 private interest groups or trade associations.

306

307 **3. Survey Findings**

308

309 *3.1 How were stakeholders engaged?*

310 Table 1 gives details of the primary relationship that stakeholders had to the
311 research. Many stakeholders were involved as research subjects, for
312 example, as interviewees, survey respondents or members of focus groups.
313 A third had been involved as event participants, and almost 1 in 10 had been
314 members of advisory groups. Much smaller numbers had taken part as
315 partners or consultees, or had hosted researchers on work shadowing, or had
316 been visitors to projects.

317

318 Through these varied relationships, Table 1 also shows that stakeholders
319 made a variety of inputs to projects. While most provided views and
320 information as research subjects, many contributed in other ways too.
321 Stakeholders helped to shape the direction of the research: 19% contributed
322 to project design; and 18% contributed to objective setting. Many also made
323 tangible contributions to knowledge production itself, assisting in data
324 collection activities, providing access to facilities, materials or study sites, and
325 being equal partners in the research. Some 30% of stakeholders had received
326 copies of research findings, and 18% had given feedback on findings.
327 However, taking part in their wider dissemination, which would be the main
328 function under knowledge transfer, figured very little in the processes of live
329 knowledge exchange here.

330

331 Not all stakeholders made an active contribution to the research process.
332 Some 30% were considered to have made no contribution across the nine
333 elements. The vast majority of these non-contributors (63%) had taken part as
334 event participants.

335

336 3.2 *What were the impacts of engagement and how were patterns of*
337 *engagement and impact linked?*

338 Most stakeholders were perceived by the project leaders to have had a
339 positive impact on the research, more on its relevance (in 29% of cases this
340 was considered to be very positive) and only a little less on its quality (where
341 26% were considered to have made a very positive contribution). Just two
342 private sector stakeholders were considered to have had a negative impact on
343 research relevance.

344
345 Project leaders judged most impacts of the research on stakeholders to still be
346 slight. The perceived impact of the research on stakeholder knowledge was
347 high for 27% of stakeholders. By comparison, the perceived impact of the
348 research on their behaviour was high for only 19%. And for 45% of
349 stakeholders, there were judged to be no impacts so far. As we might expect
350 impacts on stakeholder knowledge outstrips impact on practices, but this
351 influence may be laying the basis for future behavioural change.

352
353 Relationships were explored between patterns of engagement and perceived
354 impact, and generally found to be statistically significant across all six types in
355 the framework set out in Figure 1. Turning first to *R1*, the relationship between
356 type of stakeholder and impact, we find distinct patterns (see Figures 2 and
357 3). Within the overall picture of positive impact on (in declining order) research
358 relevance, research quality, stakeholder knowledge and stakeholder
359 practices, the different types of stakeholder had different effects. Whereas
360 societal and private sector stakeholders were associated with positive impacts
361 on the research, public and third sector ones were more associated with high
362 impacts on the stakeholder. Table 2 summarises the relationship between
363 sector and perceived impact. The two sides of the table mirror each other, but
364 in roughly reverse order suggesting asymmetric patterns of knowledge
365 exchange.

366
367 The asymmetric pattern of impact in Table 2 is in part explained by the way in
368 which stakeholders from different sectors tend to be engaged in distinctive
369 ways (*R2*), and thus make somewhat different structural contributions to
370 research projects (*R3*) (see Tables 1 and 3). For example, the majority of
371 public sector stakeholders related to research projects as event participants,
372 but they were also most numerous on advisory groups and as consultees. In
373 terms of their contributions to projects, the public sector featured most
374 prominently among those stakeholders who contributed to project design and
375 objective setting for the research, and in helping to disseminate or give
376 feedback on research findings. We characterise their prevailing involvement in
377 broad terms as one of *Research Audience and Feedback*. Turning to the third
378 sector, the largest group of stakeholder-research relationships was also as
379 event participants, and the third sector stakeholders were most prominent as
380 project partners. Regarding their contributions, the third sector were most
381 prominent in relation to project design and objective setting as well as the
382 dissemination of findings. Their engagement pattern, which had some
383 similarities to the public sector stakeholders, we denote as *Third Sector*
384 *Research Audience*.

385

386 In contrast, the majority of private sector stakeholders related to projects as
387 research subjects. They also dominated the modest number of situations
388 where stakeholders were research customers or hosted researchers on work
389 shadowing. In terms of contributions to projects, the private sector was most
390 prominent in supporting research activities, whether through data collection or
391 providing access to facilities and study sites. We characterise their overall
392 relationship with research projects as *Private Sector Research Subjects and*
393 *Research Enabling*. Societal interests too were largely involved in the
394 projects as research subjects. The contributions in which they were most
395 prominent included providing access to facilities and assisting in data
396 collection. Their pattern of engagement resembles that for the private sector,
397 and we describe it as *Societal Research Subjects and Research Enabling*.
398

399 There is a clear association between the nature of relationships that
400 stakeholders have with projects and the particular contributions made (*R4* in
401 Figure 1) (Table 4). For example, those that were project partners were
402 heavily involved in guiding and enabling the research in terms of objective
403 setting, project design and assisting in data collection, but had little to do with
404 giving feedback on findings and dissemination. Those that were research
405 subjects contributed information and assisted in data collection, while many
406 event participants gave feedback on findings. Steering group members made
407 contributions across the board, with a particular focus on shaping project
408 design and objectives, and on giving feedback. Consultees were active in
409 providing information and access. Stakeholders as visitors and work
410 shadowing hosts contributed heavily on all fronts, except for project design or
411 dissemination.
412

413 There is a statistically significant link ($p < 0.05$) also between the relationship of
414 stakeholders to projects and their perceived impact (*R5*) (Table 5). It is clear
415 that work shadowing or bringing in visitors to projects helps to promote mutual
416 impact – on both the research and stakeholder. Likewise, establishing a
417 stakeholder advisory group contributes to both types of impact. But other
418 relationships are more one-sided. Thus a customer relationship or event
419 participants are likely to improve impacts on stakeholders. In contrast, having
420 stakeholders as research subjects or project partners is likely to improve
421 research quality and relevance.
422

423 There is generally a statistically significant relationship ($p < 0.05$) between the
424 contribution stakeholders make to projects and perceived impact (*R6* in Figure
425 1). Figure 4 reveals that some forms of contribution have a beneficial
426 influence across the board, including contributions to objective setting and
427 helping in dissemination of findings. Impacts on research were especially
428 pronounced where stakeholders had contributed to objective setting, project
429 design, knowledge production and access to facilities. In contrast, impacts on
430 stakeholder knowledge and practices were especially felt where stakeholders
431 had received copies of findings, helped disseminate findings or provided
432 feedback. Some relationships were quite one-sided. Paradoxically,
433 stakeholders who gave feedback on findings were thought to be impacted
434 themselves but did not impact on the research. Those stakeholders providing
435 information or views as research subjects and assisting in data collection were

436 not impacted in terms of their own policies or knowledge, but did impact on
437 the research.

438

439 **Discussion**

440

441 Against a backdrop of limited systematic quantitative evidence of stakeholder
442 engagement in research (Abreu *et al.*, 2009), the survey results have
443 demonstrated a complex and diverse range of knowledge exchange relations
444 taking place between stakeholders and research projects. The findings raise a
445 number of issues for researchers and research funders looking to involve or
446 develop strategies to engage stakeholders in the research process. Though
447 the survey results undoubtedly reflect the complexion of the research
448 community under study, we expect there are wider lessons to be learned.
449 These lessons would be especially relevant to programmes committed to
450 stakeholder engagement.

451

452 Figure 5 presents a summary of the knowledge exchange relations involved
453 (drawing together the relationships R2, R4 and R6). It shows the association
454 between type of stakeholder, the nature of stakeholder relationships, the
455 particular contributions they make to research and perceived impacts.
456 Different stakeholder relationships were found to be associated with particular
457 contributions to the research. Most stakeholders were involved as research
458 subjects (inputting information and assisting in data collection) or as event
459 participants (receiving and giving feedback on project findings). Despite the
460 fact that the RELU programme actively promoted stakeholder engagement,
461 these rather traditional and hierarchical relationships between researchers
462 and stakeholders predominated, at least numerically. Nevertheless, large
463 numbers were also involved in the research process itself, including
464 involvement in shaping the direction of research. They were taking part as
465 members of advisory groups, as project partners, as work shadowing hosts, or
466 as visitors to projects, where they were making a variety of contributions.

467

468 An aim of the paper was to explore patterns and emerging impacts of
469 stakeholder engagement within ongoing research projects, as perceived by
470 research project leaders. Most impacts on stakeholders' practices or
471 knowledge were still slight. Primarily, stakeholders were judged to have had a
472 positive impact on research relevance and quality. The perception from
473 researchers that stakeholder engagement can bring significant benefits to the
474 process of knowledge production is an important finding for research funders
475 looking to encourage knowledge exchange.

476

477 The survey results show how knowledge exchange with stakeholders and its
478 impact in terms of new connections, perspectives and understandings can
479 occur during the knowledge production process itself. It is, of course, hard to
480 judge how enduring any early effects will be over time. These impacts may be
481 fleeting, or formative, laying a foundation for future impacts and knowledge
482 exchange processes – only time will tell. However, longer term impact
483 analysis faces possibly insurmountable difficulties, none more so perhaps
484 than the challenge of attributing effects back to specific research endeavours
485 (Davies *et al.* 2005; Molas-Gallart *et al.*, 2000). Such retrospective attributions

486 will always be acts of imaginative reconstruction. Thus, there may be
487 advantages in considering early formative effects before the links of causality
488 are lost or have become opaque. In this way, processes of knowledge
489 exchange can be exposed. An 'audit trail' of early encounters between
490 researchers and stakeholders may at least give a clearer steer about where to
491 look for longer term research impacts. The research therefore runs counter to
492 the prevailing consensus among researchers and funding organisations,
493 which suggests that impact analysis should be left until many years after a
494 research project has been completed.

495
496 The paper also considered how patterns of stakeholder engagement and
497 impact may be related. The data have highlighted those mechanisms and
498 approaches to knowledge exchange that are associated with mutual or one-
499 sided benefits for researchers and stakeholders. Such insights are important,
500 because they highlight choices in research programme and project design that
501 can enable research to be better equipped to integrate different types of
502 knowledge among scientists and stakeholders (Raymond *et al.*, 2010).

503
504 The most pronounced impacts on research take place when stakeholders
505 contribute to objective setting, project design, knowledge production and
506 provide access to facilities. In contrast, gaining feedback on findings and
507 involving stakeholders in dissemination are associated with impacts on their
508 practices and understanding. Impacts on stakeholder knowledge are linked to
509 involvement of stakeholders in project design and objective setting, a finding
510 which supports that of Garnett *et al.* (2009). Small numbers of stakeholders
511 were involved in dissemination, but when they were, they were likely to be
512 impacted in terms of their practices or knowledge.

513
514 The findings confirm the importance of informal networks and the transfer of
515 people between research and practice in promoting the effective exchange of
516 ideas and information. This finding was especially demonstrated in the mutual
517 benefits gained by both the research projects and stakeholders from
518 exchange of staff through work shadowing or being a visitor to projects, or
519 where stakeholders were members of advisory groups. The findings suggest
520 that these mechanisms should be given much more systematic attention by
521 research programmes and projects. Other relationships are one-sided but
522 may also bring specific benefits. For example, event participants were more
523 likely to be impacted by the research, in part through the process of giving
524 feedback on research findings, while project partners play a prominent role in
525 influencing research quality and relevance.

526
527 A question that emerges from Figure 5 is whether it is possible to engineer or
528 increase the prevalence of certain connections in order to increase the
529 likelihood of particular knowledge exchange benefits. Could, for example, the
530 membership of advisory groups be broadened or expanded? Could more of
531 the members of advisory groups be involved in dissemination activities on
532 behalf of the research? Or might it be possible to get more of the stakeholders
533 who are receiving copies of research findings to give feedback?

534

535 An important consideration in addressing this question is that the various
536 stakeholder sectors are associated with different patterns of engagement,
537 which in turn result in contrasting patterns of impact. Private and societal
538 stakeholders tend to be involved as research subjects. Their involvement is
539 therefore associated more with impacts on the research rather than their own
540 practices or understanding. They are also prominent among stakeholders who
541 undertake enabling roles within projects (data collection, access etc.). In
542 contrast, public and third sector stakeholders are especially active as event
543 participants and are more likely to have experienced high impacts on their
544 own knowledge and practices. Many are also active in helping to shape
545 research design and objectives through their involvement as research
546 partners (third sector) or on project advisory groups (public sector). The public
547 sector contributes most to research framing and this may go some way in
548 explaining the lesser relevance of the research to private sector and societal
549 stakeholders.

550

551 It is not possible from the data to fully explain these patterns. To what extent,
552 for example, do they reflect traditional relationships between certain research
553 and stakeholder communities, or differential resources and capacities for
554 knowledge exchange? How far might they be the result of implicit power
555 relations or assumptions about how various stakeholders should have an
556 input to research? It is the case, for example, that any stakeholder
557 involvement in the formative and agenda setting stages of academic research
558 programmes is often dominated by public sector interests (Lowe and
559 Phillipson, 2006). It is also possible that the patterns reflect particular
560 strategies of engagement held by the stakeholders themselves. For example,
561 public sector organisations may well see their input at the research agenda
562 setting stage as the most effective way in which to inflect research in line with
563 their interests.

564

565 What is clear from Figure 5 is that any efforts to alter knowledge exchange
566 processes and outcomes may therefore need to overcome what appear to be
567 differing engagement tendencies between sectors. This differentiation will be
568 an important consideration for approaches to stakeholder identification and
569 analysis (Reed *et al.*, 2009). For the private and societal stakeholders,
570 overcoming these tendencies is likely to mean increasing their involvement in
571 project design and framing. For the public and third sectors, the issue is
572 whether they could become more active in providing enabling functions within
573 research projects, such as in data collection or providing access to facilities
574 and study sites.

575

576 Finally, the survey findings suggest a number of other avenues for future
577 research, combining quantitative and qualitative approaches (Molas-Gallart *et al.*,
578 2000). Areas for attention would include: exploring the differing patterns of
579 engagement between stakeholder sectors; considering the processes of
580 negotiation, selecting and integrating different knowledge sources within the
581 research design process; and identifying stakeholder perceptions of their
582 engagement in research. The survey, for example, focused on project
583 leaders' perceptions of stakeholder engagement. Much insight is likely to be
584 gained through comparing the perceptions of researchers with those of

585 stakeholders themselves. In part, this inclusion will help corroborate the data.
586 But perhaps more interestingly, it could explore the ways in which different
587 parties may construct and contest knowledge exchange processes and
588 impacts.

589

590 **5. Conclusions**

591

592 Though the active enrolment of non-academics in research is increasingly
593 called for, there has been limited appreciation to date of the modalities and
594 mechanisms of stakeholder engagement and their effects. In this paper, an
595 analysis has been presented of how research projects, within a contemporary
596 research programme on rural economy and land use in the UK, have actively
597 pursued stakeholder engagement. A survey of research project leaders
598 identified a range of stakeholder relationships with, and contributions to,
599 research projects. Stakeholder engagement approaches and mechanisms
600 were found to be closely related to perceptions of emerging impacts, both on
601 the stakeholders and research projects. The findings contribute to our
602 understanding of how knowledge is produced and applied in environmental
603 management. They highlight that research programmes and projects should
604 pay more systematic attention to early processes of knowledge exchange and
605 approaches to stakeholder engagement within the design and conduct of
606 research in order to generate mutual benefits.

607

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731 **7. Acknowledgements**

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733 The research was funded as part of the UK Research Councils' Rural
734 Economy and Land Use Programme (RELU) (Awards RES-224-34-2003-01

735 and RES-229-25-0025). RELU is a collaboration between the Economic and
736 Social Research Council, the Natural Environment Research Council and the
737 Biotechnology and Biological Sciences Research Council, with additional
738 funding from Defra and the Scottish Government.
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Table 1: Ranking of stakeholder sectors by nature of relationship and contribution to research project (%)

Primary relationship of stakeholder to project	% of stakeholders (N=1032)	Rank			
		1 st	2 nd	3 rd	4 th
Research subject	42.5	Private (47.4)	Societal (30.3)	Public (17.5)	Third (4.8)
Event participant	32.0	Public (60.3)	Private (17.9)	Third (15.2)	Societal (6.7)
Steering / advisory group	8.1	Public (59.5)	Private (25.0)	Third (15.5)	Societal -
Project partner	5.1	Third (56.6)	Public (41.5)	Private (1.9)	Societal -
Consultee	4.2	Public (58.1)	Private (23.3)	Third (16.3)	Societal (2.3)
Research customer	3.6	Private (91.9)	Public (8.1)	-	-
Visitor to project / work shadowing host	2.5	Private (96.2)	Public (3.8)	-	-
Other	2.0	Public (45.0)	Private (40.0)	Third (15.0)	-
Stakeholder contribution to project	% of stakeholders (N=1048)	1 st	2 nd	3 rd	4 th
Provided information or views as research subjects	53.6	Private (42.3)	Public (27.7)	Societal (16.2)	Third (13.7)
Assisted in data collection	32.0	Private (46.9)	Public (25.7)	Societal (15.2)	Third (12.2)
Received copies of research findings/outputs	29.6	Private (55.8)	Public (31.0)	Third (11.6)	Societal (1.6)
Contributed to project design	18.9	Public (50.5)	Third (25.8)	Private (14.1)	Societal (9.6)
Provided access to research facilities, materials, study sites	18.5	Private (27.8)	Public (26.3)	Societal (24.2)	Third (21.6)
Contributed to objective setting / problem framing	17.7	Public (36.6)	Third (27.4)	Private (25.8)	Societal (10.2)
Gave feedback on findings	17.5	Public (44.8)	Private (33.9)	Third (12.6)	Societal (8.7)
Contributed to knowledge production as equal partners	11.0	Public (41.7)	Third (33.0)	Private (24.3)	Societal (0.9)
Helped to disseminate findings	3.2	Public (70.6)	Third (23.5)	Private (5.9)	Societal -

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Table 2: Summary ranking of perceived impacts by stakeholder sector

Impact on:	Research Quality	Research Relevance	Stakeholder Knowledge	Stakeholder Practices
Rank				
1st	Societal	Societal	Public	Public
2nd	Private	Private	Third	Third
3rd	Public	Public	Private	Private
4th	Third	Third	Societal	Societal

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Ranking in relation to research quality and relevance is based on combination of very positive and positive impacts in Figure 2; Ranking in relation to stakeholder knowledge and practices is based on high impacts in Figure 3.

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Table 3: Nature of relationship to research project by stakeholder sector (%)

	Sector			
	Public	Private	Third	Societal
Project partner	5.7	0.3	24.2	-
Steering / advisory group	13.0	5.7	10.5	-
Research subject	19.9	56.8	16.9	85.3
Event participant	51.6	16.1	40.3	14.1
Consultee	6.5	2.7	5.6	0.6
Visitor to project / work shadowing host	0.3	6.8	-	-
Research customer	0.8	9.3	-	-
Other	2.3	2.2	2.4	-

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Table 4: Association between stakeholder relationship and contributions to research projects

Relationship to project	Contributions to project (%)								
	Objective setting	Project design	Knowledge production as equal partners	Provided access to research facilities	Provided information as research subjects	Assisted in data collection	Received copies of findings	Gave feedback on findings	Helped to disseminate findings
Project partner	92.5	100.0	84.9	88.7	81.1	92.5	-	-	1.9
Steering / advisory group	59.5	63.1	44.0	25.0	41.7	23.8	53.6	64.3	19.0
Research subject	8.9	8.2	3.4	14.1	80.4	49.2	25.1	2.5	0.5
Event participant	3.0	8.5	3.0	0.9	18.5	-	32.4	24.8	-
Consultee	30.2	46.5	16.3	53.5	72.1	48.8	14.0	9.3	14.0
Visitor / work shadow host	92.3	-	-	96.2	96.2	92.3	96.2	92.3	-
Research customer	-	-	-	2.7	-	2.7	10.8	10.8	8.1

All associations are statistically significant ($p < 0.05$)

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Table 5: Association between stakeholder relationship to research project and perceived impacts (%)

Relationship to project	Stakeholder impact on research quality			Stakeholder impact on research relevance			Research impact on stakeholder policies or practices			Research impact on stakeholder knowledge or understanding		
	V. Positive	Positive	None	V. Positive	Positive	None	High	Slight	None so far	High	Slight	None so far
Project partner	94.3	5.7	-	96.2	3.8	-	1.9	75.0	23.1	9.4	71.7	18.9
Steering / advisory group	28.9	57.9	13.2	36.8	57.9	5.3	25.0	38.9	36.1	56.9	36.1	6.9
Research subject	21.3	68.7	10.0	22.7	76.6	0.7	4.7	34.1	61.2	8.5	78.7	12.8
Event participant	-	54.1	45.9	0.8	82.0	17.2	56.1	34.8	9.1	71.2	24.2	4.5
Consultee	9.3	76.7	14.0	19.0	78.6	2.4	16.7	38.1	45.2	23.3	44.2	32.6
Visitor / work shadow host	100	-	-	100	-	-	100	-	-	100	-	-
Research customer	-	80.0	20.0	-	100	-	80.0	-	20.0	80.0	-	20.0
Total	25.8	57.1	17.1	28.7	65.8	5.5	18.1	37.3	44.6	26.4	60.8	12.8

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All associations are statistically significant ($p < 0.05$)

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Figure 1: Analysis framework

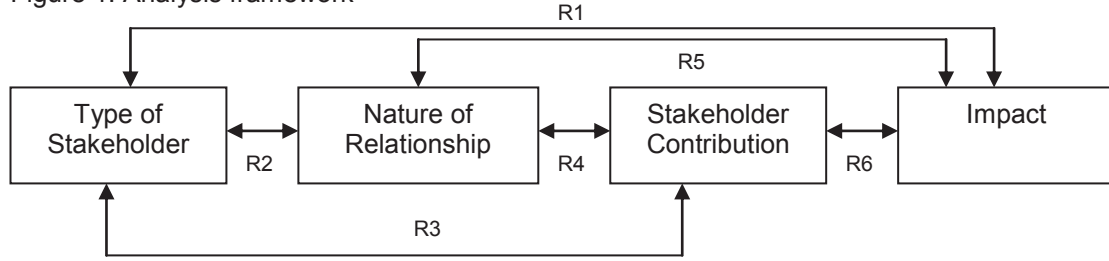
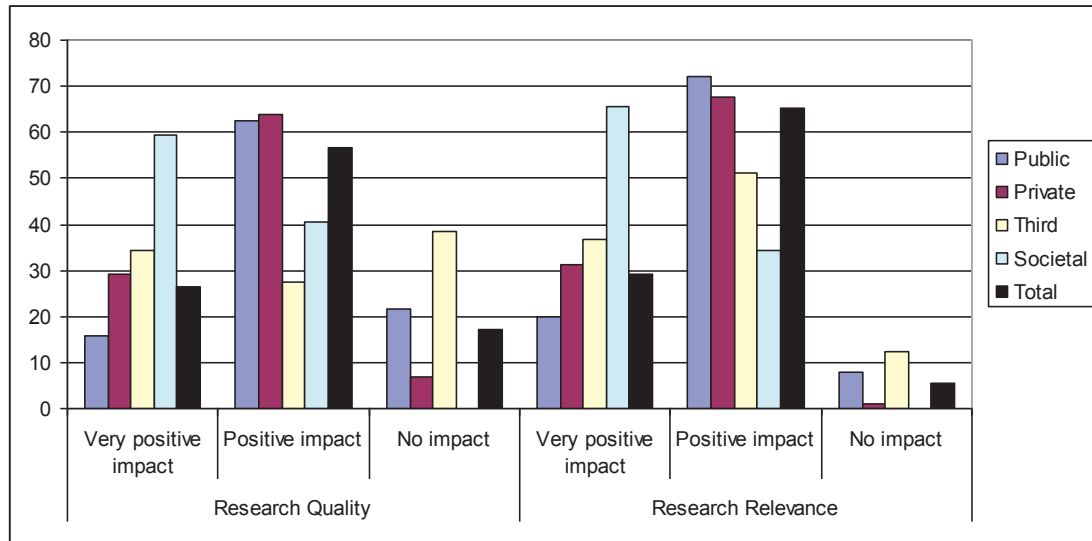
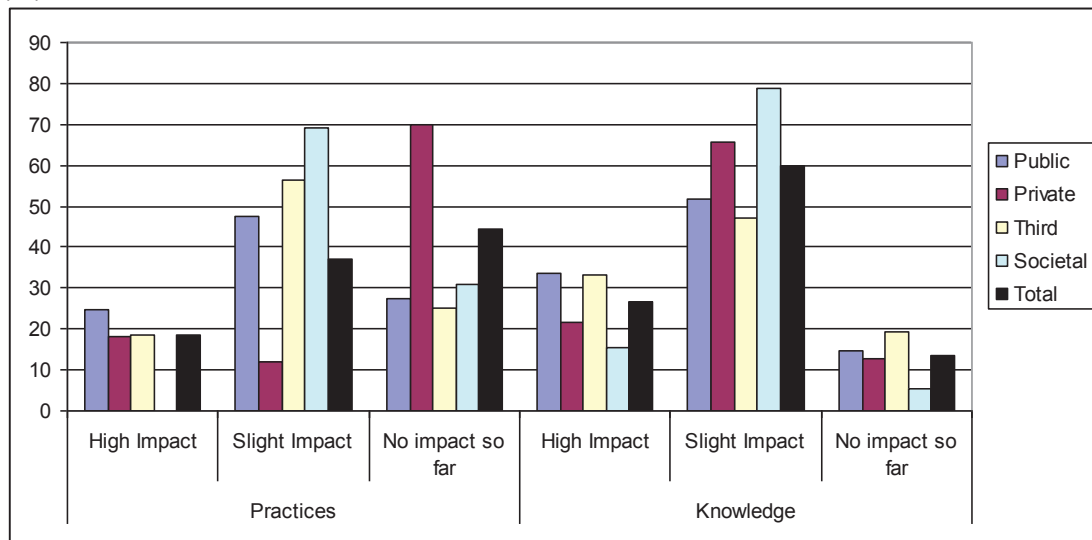


Figure 2: Project leaders' perceptions of how stakeholders impacted research by sector (%)



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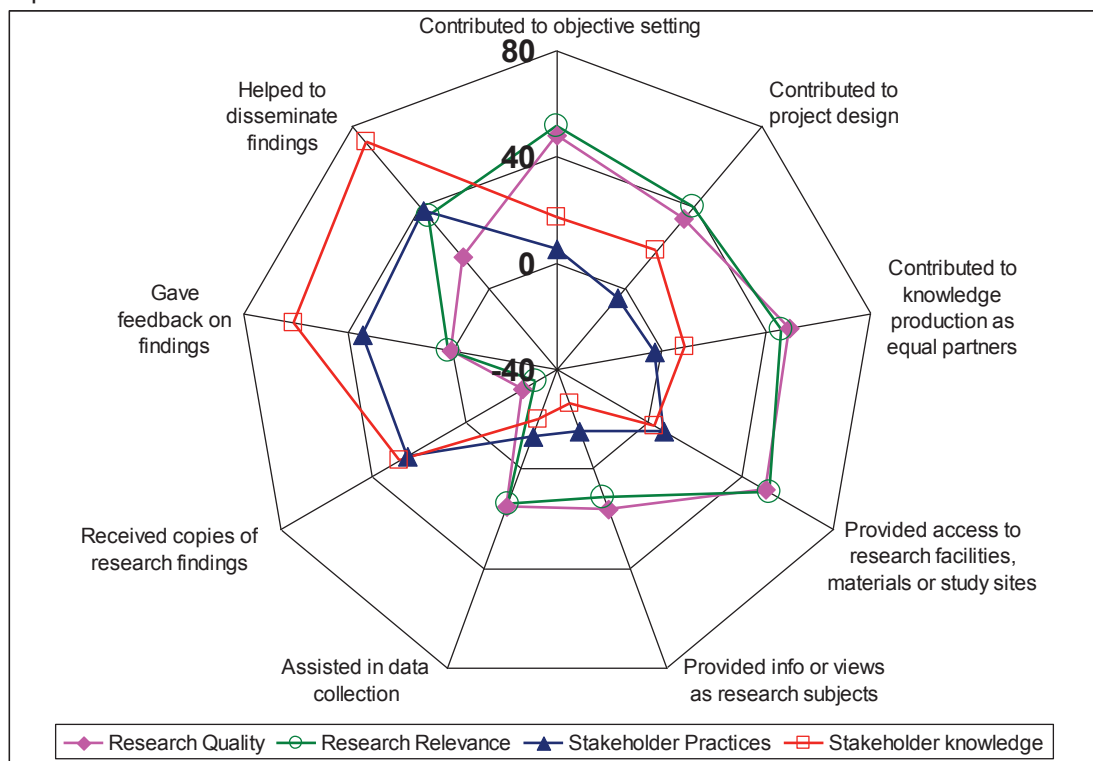
Figure 3: Project leaders' perceptions of how research impacted on stakeholders by sector (%)



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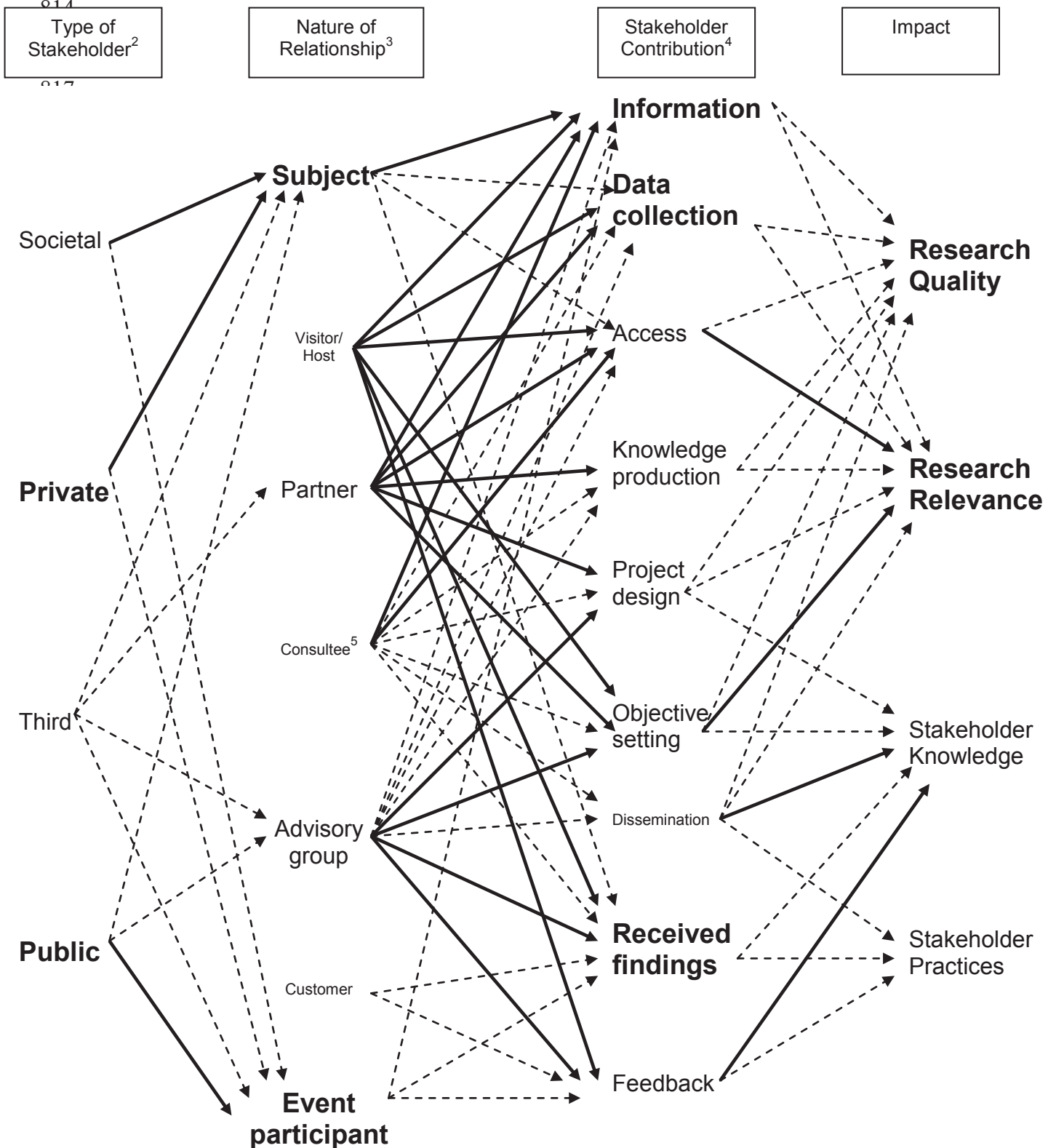
Figure 4: Relationship between the contributions stakeholders make to projects and perceived impacts *



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* For each type of contribution, the percentage of those stakeholders who did not contribute that experienced High or led to Very Positive impacts has been subtracted from the percentage of those that did contribute that experienced High or led to Very Positive Impacts. This gives an indication of the scale of impact of a particular type of contribution.

813 Figure 5: Summary of knowledge exchange relations



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High Frequency¹ —————> Medium Frequency¹ - - - - ->

NOTES: (1) High frequency taken as >50%, Medium frequency taken as 10-50%; (2) Frequencies of stakeholder relationships by type of stakeholder taken from Table 3; (3) Frequencies of stakeholder contributions by type of relationship based on Table 4; (4) Frequencies of impacts by type of stakeholder contribution based on underpinning data for Figure 4; (5) Scale of wording is proportional to percentages of stakeholders in each sector and with data in Table 1 and Figures 2 and 3.