The major barriers to evidence-informed conservation policy and possible solutions

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71 **Abstract**

72 Conservation policy decisions can suffer from a lack of evidence, hindering effective decision-
73 making. In nature conservation, studies investigating why policy is often not evidence-
74 informed have tended to focus on Western democracies, with relatively small samples. To
75 understand global variation and challenges better, we established a global survey aimed at
76 identifying top barriers and solutions to the use of conservation science in policy. This obtained
77 the views of 758 people in policy, practice, and research positions from 68 countries across six
78 languages. Here we show that, contrary to popular belief, there is agreement about how to
79 incorporate conservation science into policy, and there is thus room for optimism. Barriers
80 related to the low priority of conservation were considered to be important, while
81 mainstreaming conservation was proposed as a key solution. Therefore, priorities should
82 include the elaboration of public policy pathways with education initiatives that promote the
83 importance of long-term conservation-compatible policies.

84 **Challenges for evidence-informed conservation policy**

85 Loss of biodiversity is occurring at accelerated rates. Although there are uncertainties
86 associated with the causes of biodiversity loss (Game *et al*., 2014), there is evidence that a
87 range of conservation interventions are effective (Sutherland *et al.*, 2017). Many papers,
88 however, highlight a gap between scientific evidence and policy, suggesting disagreement
89 between the priorities of research scientists and decision-makers (e.g. Arlettaz *et al.*, 2010),
90 with one study even accusing decision-makers of 'evidence complacency' (Sutherland and
91 Wordley, 2017). Various processes are underway to improve the link between science and
92 policy, including IPBES, and also the EU EKLIPSE 'mechanism', where selected scientists
93 and practitioners resolve questions posed by policy-makers. To enhance the likelihood of
94 success of such science-policy initiatives, research on the key barriers and solutions to the
95 uptake of conservation science in policy is important.

96 Various publications note that scientific knowledge is just one factor in policy-making
97 (Marshall *et al.*, 2017; Rose *et al.*, 2016). In response, research has sought to increase the
98 influence of science. These include techniques to link science and policy (e.g. Cvitanovic *et*
99 *al.*, 2015; Neßhöver *et al.*, 2016), training scientists and policy-makers to understand mutual
100 workflows (Bainbridge, 2014), encouraging collaborative inter-disciplinary research (Adams
101 and Sandbrook, 2013; Young *et al.*, 2014), and telling policy-relevant stories (Cook *et al.*,
102 2013; Rose, 2015; Sarkki *et al.*, 2014). Solutions, though, have often been studied with little
103 attention to their context dependencies (Kovacs and Pataki, 2016) (i.e. whether the same
104 solutions will work everywhere especially if the problems are different), nor indeed has the
105 majority of social science work at the science-policy interfaces been solution-oriented (Watts,
106 2017).

107 Furthermore, most studies on conservation science-policy interfaces have been based on a
108 relatively small number of respondents from Western democracies. Since gaps between science
109 and policy may arise from cultural and/or social barriers (Amano *et al.*, 2016), in addition to
110 political and institutional factors (Owens, 2015), geographical bias can contribute to a
111 misunderstanding of issues.

112 This research addresses the perceptions of different stakeholders about the relative importance
113 of barriers to the consideration of evidence in decisions about conservation, placing the
114 emphasis on identifying solutions to highly ranked barriers. Primary data was collected through
115 multiple surveys in two phases across three groups of global respondents: people in policy
116 positions, practitioners, and research scientists[1]. The aims of the surveys were to understand

[1] See supplementary material (Table S1) for information on how we categorised respondents. Briefly, people in policy positions were generally either politicians, civil servants (including scientists and economists working for government or a statutory agency), or NGO staff who had a specific remit for policy work, and hence for interacting with policy communities. Practitioners were comprised of roles that implemented conservation on the ground, whereas research scientists were post-docs or academics in university or research institutions, or those with a specific research remit in an NGO. We acknowledge that some people had dual roles which could have overlapped, but we asked respondents to pick the role that best suited their primary job.

the key barriers preventing the use of conservation science in policy, and to highlight potential solutions to overcome them.

Survey

The survey consisted of two phases (scoping survey followed by a global online survey translated into six languages). We briefly explain the stages involved in each of the two phases below. For more detailed information about methodology, including categorisation, coding, survey dissemination, and sensitivity analyses, please see the supplementary material (S1 and Figure S1).

Phase 1: Scoping

This survey (S2) had two iterations.

Scoping survey 1

The first survey was distributed at a conference on conservation decision-making. Respondents were asked to i) select a role, ii) name three barriers preventing the use of conservation science in policy-making, and iii) suggest solutions for the proposed barriers. The barriers and solutions sections were left open-ended such that respondents were not constrained by our beliefs.

Scoping survey 2

This was followed by a second survey that asked the same questions, but added questions relating to country of work, and their number of years of experience in a conservation role. This was distributed throughout other networks globally. In total, 134 responses were gained[2] from 30 countries and open-ended answers to both the barriers and solutions question were pooled and coded into categories (S3). The categories were ranked according to the number of

[2] This total figure included 53 academics/research scientists, 33 people in policy positions, and 21 practitioners. 24 students also responded, but responses from this group were lower for the second online survey, and thus their responses are not included in the final analyses (see Table S2).

times it was mentioned in both of the scoping surveys. This led to a top ten list for barriers and solutions. A list of the most highly ranked solutions was also developed (Table S3).

Phase 2: Online survey

A second online survey was created based on the answers provided in Phase 1 and translated into five other languages. In the second phase, the survey was mostly close-ended (S4). The respondents were asked to score each of the top ten barriers and corresponding solutions from Phase 1 on a Likert scale of 1 (not important) to 8 (very important). The list of solutions for each barrier was based on the responses to the Phase 1 survey, but did not include every solution mentioned for each barrier (see S1). A range of approaches were used to disseminate the survey (e.g. known networks, social media, email lists).

Models

Cumulative link models were applied to test the relationship between the score of each barrier/solution (as ordinal response variables) and two explanatory variables: barrier/solution identity (see Table 1) and the role of respondents (policy position/practitioners/academics), as well as their interaction. The significance level of each term was derived from likelihood ratio tests and deviance for each term was also calculated, following Christensen (2015a). To rank the overall importance among distinct barriers and solutions, we calculated the mean of the median scores across the three roles for each barrier/solution. The aim of using the mean of medians, instead of the overall median per barrier/solutions was to control for the difference in the sample size across the different roles. We used the Kendall's rank correlation coefficient (τ) to test – in each of the three studied roles – for positive relationships between the percentage of respondents that experienced each barrier and the median barrier score. We thus performed one-tailed tests because we expected these relationships to be positive. Sensitivity analyses were also performed to test whether scoring was affected by other covariates. The analysis was

conducted in R (R Core Team 2016) and cumulative link models were implemented with the R package ordinal (Christensen 2015b).

Results

Phase 1 survey – compilation of top ten barriers and associated solutions

In the phase 1 survey, 32 barriers were proposed by 133 respondents (Table S4). From these responses, the top ten barriers and associated solutions (Table 1) were identified and used in phase 2.

Phase 2 – Online survey ranking barriers and solutions

The phase 2 quantitative survey was filled in by 758 people from 68 countries, comprising those in policy positions (238), practitioners (237), and research scientists (283) [Fig. 1].

Based on the mean of median scores across the three roles, two barriers (2. Conservation not a political priority and 7. Priority of the private sector's agenda over conservation[3]) were given the highest importance (mean of medians = 7.0), followed by three barriers (mean of medians = 6.0–6.3; 3. Mismatch of timescales, 6. Lack of funding for conservation science and 10. Bad communication between scientists and policy-makers). The other five barriers showed mean scores smaller than six (mean of medians = 4.7–5.7) [see Fig. 2].

Understanding what explains barriers and solutions between science and policy

Scores provided by the 758 respondents varied significantly among both barriers and the three groups' roles (Table 2). Though the interaction between barriers and role was significant; the majority of model deviance (79.2%) was accounted for by barrier identity (95.1% of the explained deviance), with role identity or the interaction term (role x barrier) giving negligible

[3] We acknowledge that these barriers are interlinked, in the same way for example, as lack of funding for conservation science is linked to lack of political priority. However, we argue that they were sufficiently different to include as separate barriers, particularly since barrier 7 specifically identified the power of the private sector to override environmental arguments.

contributions (3.8%, Table 2). This suggests that patterns in scoring barriers were similar amongst roles. Patterns for barriers were reasonably consistent amongst countries with different Human Development Index levels, although there were variations (Figure S2).

Scores of solutions to the top five barriers (barrier mean of medians ≥ 6) varied significantly and accounted for over 70% of the deviance explained by the models (Table 2). Scores for solutions varied significantly among roles in four out of the five barriers, and the interaction 'solution × role' was significant in three out of the top five barriers. Yet, both role identity and the interaction term explained a much smaller proportion of deviance compared to the effect of solution identities (Table 2). This again shows that patterns in scoring solutions were similar among the three roles.

Top-ranked solutions for four of the barriers (2, 3, 6, 7) referred to the need to mainstream conservation, and to change the attitudes of policy-makers in favour of pro-environmental, long-term decision-making; these included the need to develop 'different measures of prosperity than GDP' (Barrier 2), the importance of 'demonstrating the benefits of conservation' (Barriers 2, 7), and a dedication to 'encouraging the strategic use of science for long-term policy-making' (Barrier 3) with associated 'long-term government advisory groups' (Barrier 3) and a 'permanent environmental budget' (Barrier 6). In response to Barrier 10 ('bad communication between scientists and policy-makers'), the solutions 'more knowledge brokers' and 'collaboration between scientists and policy-makers' were ranked highly [Fig. 3].

Participants were also asked whether they had experienced any of the ten barriers. Overall, we found a consistent positive correlation across roles between experiencing a barrier and ranking it more highly (Kendall's $\tau = 0.49–0.77$, all $P < 0.033$ - see Fig. 4). The top five most experienced barriers were the top five ranked barriers, although the order varied (Table S5 and Figure S3).

Discussion

208 *A surprising amount of agreement?*

209 A logical conclusion from previous research (e.g. Arlettaz *et al.*, 2010) would be that policy-
210 makers, practitioners, and scientists disagree on the barriers and solutions to the use of
211 conservation science in policy. In reading the exchange between Sutherland *et al*. (2013) and
212 Tyler (2013), for example, we may have expected scientists to place the emphasis on training
213 policy-makers to comprehend science, in other words blaming policy-makers for lack of
214 understanding, rather than criticising themselves for communicating evidence badly (see
215 Kenny et al. 2017). Contrastingly, one may have expected policy-makers to focus on
216 encouraging scientists to present their evidence in a user-friendly manner, instead of blaming
217 themselves for lack of understanding. Yet, our results suggest that there is, in fact, widespread
218 agreement, and thus, at the very least, that disagreement between groups would not be the
219 limiting factor preventing the successful uptake of highly-ranked solutions. Our results also
220 suggest that Sutherland and Wordley's (2017) notion of 'evidence complacency' is not caused
221 by a lack of awareness of science on the part of decision-makers; rather, their use of evidence
222 may be constrained by other drivers, such as political barriers.

223 Our results suggest that there is little difference between rankings of barriers and solutions
224 amongst different genders, and individuals with greater or less experience in conservation
225 (Figures S4, S5, S6). In addition, there is little difference between rankings provided by
226 individuals in different countries ranked in order of Human Development Index (Figure S2),
227 although poorer countries did prioritise 'lack of funding for conservation science' more highly[4].

[4] There were subtle variations in ranking of barriers and solutions by HDI (Figure S2). A 'lack of funding for conservation science' was ranked more highly in groups of countries with low HDI, mainly across Africa and South America. This would suggest that adequate funding for conservation science is a particularly acute problem in countries where financial resources are low. The barrier of not 'including or valuing stakeholders' in conservation science also tended to be scored more highly in countries with low HDI. This might perhaps be linked to the low resources for outreach.

It is interesting to note that the two top-ranked barriers (2 and 7) relating to the low priority of conservation were not the most experienced (although they were in the top-five for 'experienced' too). This suggests that they are perceived to be *the* major barriers, even by those not directly experiencing them. Other highly-ranked barriers were the most experienced, which suggests that respondents were ranking them based on real-life exposure rather than merely perception.

Barriers

Here, we examine the top five barriers, offering a selection of quotations written by online survey respondents in the 'other' category (S5 for discussion of barriers 6-10).

Three of the five top-ranked barriers relate in some way to the low priority of conservation on the policy agenda – 'conservation not a political priority', 'priority of the private sector's agenda over conservation', and the 'lack of funding for conservation science'. While opinion polls have suggested that the environment is an important issue (EU Barometer, 2014), it is rarely selected as the top priority (Marshall *et al.*, 2017), which in turn influences the agenda of policy-makers. An extract from one survey highlights this (see Q1-2 S6 for more): 'If you do not have public support for conservation, you will rarely gain political support' (Policy position, Ireland*).*

Research suggests that anti-environmental lobbying of some private sector groups convinces policy-makers to put industry needs ahead of conservation (Guerrette, 1986). As one practitioner from Brazil noted, 'conservation is effective when there are no economic interests'. Where the private sector has attempted to embrace an environmentalist agenda, there have been claims that nature is exploited (Rodriguez-de-Francisco and Budds, 2015).

'Lack of funding for conservation science' was also ranked in the top five barriers. Gill *et al.* (2017) found that the effectiveness of MPAs was influenced most by staffing and resources, yet there are finite resources for experimentation, implementation, and monitoring (Sutherland

253 *et al.*, 2017). Our study noted that this was a particular problem in poorer countries (Figure
254 S2).

255 A contributory factor to conservation not being a political priority is the 'mismatch of
256 timescales'. Policy-makers usually focus on short-term issues (Lawton, 2007), and demand
257 evidence quickly. Conservation science often takes a longer-term view with slower reporting
258 timescales. Since conservation is a long-term issue, relevant policies are easily 'kicked into the
259 long grass' when other short-term needs arise. Furthermore, scientists rarely seize upon policy
260 windows for the uptake of knowledge (Rose *et al.*, 2017).

261 The final barrier in the top five related to 'bad communication between scientists and policy-
262 makers'. Poor communication, and lack of interaction between these groups, manifests itself
263 in a variety of ways, including lack of access to scientific papers, inadequately communicated
264 policy/management demands, and conservation science being presented in unusable formats
265 (Marshall *et al.*, 2017; Walsh *et al.*, 2015). Although there is some overlap between science
266 and policy/practice spheres (Rose, 2014b; Vadrot, 2014), they are distinct. Fundamental
267 differences in workflows, background, and objectives create challenges for successful
268 communication (Farwig *et al.*, 2017). A survey respondent suggested that it was an 'illusion'
269 to think that effective joint meetings and seminars could be held with scientists and policy-
270 makers because of different workflows (Policy position, Germany).

271 *Solutions*

272 Increasing the priority of conservation in public policy would seem to be the key issue as agreed
273 by all groups [Fig. 3]. A staff member in a policy position (Germany) stated that 'compiling
274 more scientific facts does not help' (also Q3-4 S6). Instead, several comments wanted a
275 'revolution' in societal attitudes (Q5-7 S6). Establishing a long-term mind set to environmental
276 policy, including setting up advisory bodies that span political timescales, was considered
277 necessary. Given the short-term nature of politics (Lawton, 2007), it is challenging to consider

that adopting different measures of prosperity can occur without a step-change in voting. As one survey respondent noted, 'if the electorate are not interested in long-term solutions, policy-makers will not be' (Policy position, UK).

To foster a long-term positive view of the environment, 'raising awareness among the public and decision-makers regarding the long-term consequences of inaction' (Policy position, Switzerland) was considered important. Two highly ranked solutions for 'conservation not a political priority' and 'priority of the private sector's agenda over conservation' suggested better public outreach to show the benefits of conservation. The 'paradox of timescales' (Lawton, 2007) could be overcome if policy-makers were elected on the strength of their long-term environmental commitment. As one respondent in a UK policy position stated, 'shifting policy means shifting the politics, which is only possible if one shifts public opinion' (also Q8 S6).

The overwhelming message for overcoming the top-ranked barriers, therefore, is to convince policy-makers to adopt pro-environmental long-term policies, and to measure prosperity in other ways than just GDP. This requires larger numbers of people to join the conservation community and demand convincing, inclusive messages (Begon, 2017). We stress the need for several messages to be told since each person responds differently to different messages (Blicharska and Grandin, 2015). Telling good news stories might help (Balmford and Knowlton, 2017), as people need to be inspired, rather than served with doomful scenarios (https://conservationoptimism.com). It is also vital to know how to change behaviour (Tannenbaum *et al.* 2017). Also it is worth remembering that policy-makers are people too and they can be influenced by relevant, human-based stories (Begon, 2017); a fact noted by a practitioner from Brazil who urged conservationists to make the problem 'more real' by developing closer relationships with policy-makers. Conservationists could frame carefully for

302 nature conservation (Mace, 2014), as varied arguments may be more convincing to different
303 people at different times (Tinch *et al.*, 2016).

304 Our results suggest that recent calls for science to become more inclusive of society may be
305 warranted (Collof *et al.*, 2017; Keeler *et al.*, 2017; Nature Human Behaviour, 2017; Redford
306 *et al*., 2015). A practitioner from Uganda argued that 'it is necessary to win the hearts and
307 minds of people', recruiting them to the conservation cause, in order to convince policy-makers
308 that it is a priority issue. The same practitioner thought that this had been 'downplayed' in
309 previous conservation efforts, and a respondent from Italy (policy position) argued that
310 conservationists have wrongly focused on 'addressing already acquired audiences'. Our work
311 also suggests that there may be a need to involve the private sector more as allies of
312 conservation.

313 To improve communication between scientists and policy-makers, two solutions related to
314 better collaboration and the use of knowledge brokers scored '7'. Research scientists could be
315 encouraged to collaborate with policy-makers through better reward systems, and to respond
316 quickly to evidence demands (Neßhöver *et al.*, 2016). Policy-makers could likewise be
317 encouraged to work closely with the research community and make demands for evidence
318 available to researchers. Where collaboration is not possible, knowledge brokers are vital. They
319 speak the language of both science and policy and are important entrepreneurs linking the two
320 worlds (Cvitanovic *et al.*, 2015; Nguyen *et al.*, 2017). Scientists could make more use of key
321 intermediaries, for example policy think-tanks and NGOs, who may have direct lines into
322 public, business, or policy-makers, links that are difficult for universities and academics to
323 develop. More support is required to create, and appreciate, knowledge brokers and this
324 requires a shift towards value cross-disciplinarity.

325 *Evaluation*

The major positive of this study is that the survey was translated into multiple languages and responded to by different types of respondents globally. There were, of course, some flaws to the methodology. These included respondents providing information on their perceptions of the barriers and solutions. However, we counteracted this by asking respondents if they had experienced the barriers; the fact that the highly ranked barriers were also the most experienced suggests that responses were based on real-life exposure. Also, although we may have expected individual groups to blame failings on the part of others, the fact that we found widespread agreement seems to suggest that this was not a major problem.

Concluding remarks

Contrary to previous research that highlights disagreement between scientists and decision-makers, we found that people in policy positions, practitioners, and research scientists across countries tended to agree on the barriers and solutions to incorporating conservation science in policy. In order to overcome highly-ranked barriers related to the low priority of conservation in public policy, top solutions focused on the need to mainstream conservation. The ranking of solutions suggests that harnessing public (and policy) support for a pro-environmental, long-term approach to decision-making can improve the prospects for evidence-informed conservation policy. Our study thus suggests we need to appreciate the importance of winning the hearts and minds of people to help us achieve evidence-informed conservation policy. The study also suggested that there might be small variations in the priority of barriers and solutions in different contexts, for example poorer countries considered 'lack of funding for conservation science' to be a particular concern (although the differences were small). This illustrates the importance of understanding national and regional contexts for science-policy interactions.

The optimistic message from this study relates to the apparent agreement between research scientists, policy-makers, and practitioners about the key barriers and solutions to the use of

conservation science in policy. We argue, therefore, that it should be possible to implement solutions to win the hearts and minds of people.

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Figure legends

Figure 1: Heat map of responses by role (Red: Policy position, Yellow: Practitioners, Blue: Research Scientists)

Figure 2: Boxplot (median, quartiles, and 5th/95th percentiles) showing the scoring for ten barriers restricting the use of conservation science in policy by three groups of conservation professionals. Numbers denote mean of medians across professionals. Bold numbers denote the top five ranked barriers.

Figure 3: Boxplot (median, quartiles, and 5th/95th percentiles) showing the scoring for the solutions to the top five ranked barriers by three groups of conservation professionals. Numbers denote mean of medians across professionals. Bold numbers denote the highest ranked solution(s) for each barrier.

Figure 4: Relationship between the percentage of respondents that experienced a barrier and the median barrier score for each of the three professional groups. For illustrative purposes only, regression lines are shown.

Table 1 – top ten barriers and selected solutions from phase one

(not in quantitative order of phase one ranking here, see S3 for this)

Barrier number/name	Proposed solutions to each barrier
1. LACK OF POLICY RELEVANT SCIENCE	1. Ask policy relevant questions from start of project, including policy-makers 2. Better incentives for academics to focus on policy/practice relevant research 3. Embed young scientists in the field and train them on importance of real world science application 4. Improve policy education of young scientists/scientists (e.g. through job shadowing, graduate training) 5. More collaboration between scientists and policy-makers (e.g. meetings, seminars, projects)
2. CONSERVATION NOT A POLITICAL PRIORITY	1. Demonstrate benefits of conservation (including economic value) 2. Develop different measures of prosperity other than just GDP/economy 3. Improve policy education of young scientists/scientists (e.g. through job shadowing, graduate training) 4. More scientists working in/with media to engage policy-makers and public

	5. Train policy-makers in conservation science to help them see the importance of conservation
3. MISMATCH OF TIMESCALES	1. Better science advocacy from scientists 2. Dedicated office at research institutions to help researchers communicate key information 3. Encourage government departments to share reading of scientific outputs 4. Encourage the strategic use of science for long-term policy-making 5. Set up government advisory body that spans political timescales
4. COMPLEX, UNCERTAIN PROBLEMS	1. Better communication of uncertainty 2. More transparency about uncertainty 3. Standardise methods and indicators for conservation to improve communication 4. Train scientists in a variety of communication skills 5. Transdisciplinary research to be encouraged
	1. Better science education in schools and universities to improve science literacy of population

5. POLICY-MAKERS DO NOT UNDERSTAND SCIENCE	2. More knowledge brokers (individuals to bridge the gap between science and policy) and system for it 3. More scientists working in media to engage policy-makers and public 4. Tailor evidence to audience - e.g. blogs, summaries, simple language, open access, policy briefs, infographics 5. Train policy-makers in science
6. LACK OF FUNDING FOR CONSERVATION SCIENCE	1. Better incentives for academics to focus on policy/practice relevant research 2. Demonstrate benefits of conservation (including economic value) 3. More collaboration between scientists and policy-makers (e.g. meetings, seminars, projects) 4. Permanent budget for environmental policy-making
7. PRIORITY OF THE PRIVATE SECTOR'S AGENDA OVER CONSERVATION	1. Better science advocacy 2. Demonstrate benefits of conservation (including economic value) 3. Include industry and private sector in research 4. Provide evidence-based argument to counter private sector lobbyists 5. Science outreach to public

8. STAKEHOLDERS ARE NOT VALUED, CONSIDERED, OR OPPOSED BY INTERVENTIONS	1. Better incentives for academics to focus on policy/practice relevant research 2. Better stakeholder outreach in projects and inclusion of stakeholders in project design 3. Include industry and private sector in research 4. More integrated projects to move beyond just conservation outcomes 5. Work with stakeholders from start of project
9. SCIENTISTS DO NOT UNDERSTAND HOW POLICY IS MADE	1. Better incentives for academics to focus on policy/practice relevant research 2. Improve policy education of young scientists/scientists (e.g. through job shadowing, graduate training) 3. More collaboration between scientists and policy-makers (e.g. meetings, seminars, projects) 4. Tailor evidence to audience - e.g. blogs, summaries, simple language, open access, policy briefs, infographics
10. BAD COMMUNICATION BETWEEN SCIENTISTS AND POLICY-MAKERS	1. Better incentives for academics to focus on policy/practice relevant research 2. Journals to translate key results into different languages

	3. More collaboration between scientists and policy-makers (e.g. meetings, seminars, projects) 4. More knowledge brokers (individuals to bridge the gap between science and policy) and system for it 5. Tailor evidence to audience - e.g. blogs, summaries, simple language, open access, policy briefs, infographics

Table 2. Total deviance (%) explained by the cumulative link models (rows) and percentage of the explained deviance accounted by factors 'Barriers'/'Solutions', 'Role' and their interactive effect. The significance of the effects shown in parentheses (ns: non-significant; *: $P < 0.05$; **: $P < 0.01$; ***: $P < 0.001$).

Models	Explained deviance (%)	Percentage of the explained deviance		
		Barrier/Solution	Role	Barrier/Solution × Role
Barriers	79.2	95.1 (***)	1.2 (**)	3.8 (*)
Solutions for B2	74.9	73.7 (***)	16.3 (***)	10.1 (**)
Solutions for B3	76.5	91.1 (***)	6.7 (***)	2.2 (ns)
Solutions for B6	53.5	91.3 (***)	2.4 (ns)	6.4 (ns)
Solutions for B7	64.4	80.8 (***)	8.6 (***)	10.5 (*)
Solutions for B10	82.7	95.3 (***)	1.4 (*)	3.3 (*)

511