

1 **Guidelines for Stakeholder Engagement in Systematic**

2 **reviews of Environmental Management**

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19 **Abstract**

20 People have an interest in conservation and environmental management both for their own
21 interests and the sake of the environment itself. Environmental decision-making has changed
22 somewhat in recent decades to account for unintentional impacts on human wellbeing. The
23 involvement of stakeholders in environmental projects has been recognised as critical for ensuring
24 their success and equally for the syntheses of evidence, providing key benefits and challenges. As a
25 result of increased interest in systematic reviews of complex management issues, there is a need for
26 guidance in best practices for stakeholder engagement. Here, we propose a framework for
27 stakeholder engagement in systematic reviews/systematic maps, highlighting recommendations and
28 advice that are critical for effective, efficient and meaningful engagement of stakeholders. The
29 discussion herein aims to provide a comprehensive toolbox of stakeholder engagement activities,
30 whilst also recommending approaches from stakeholder engagement research that may prove to be
31 particularly useful for systematic reviews and systematic maps.

32

33

34 **Keywords:** stakeholders, communication, dissemination, methodology, best practice,
35 conflict resolution, stakeholder analysis

36 **Background**

37 Environmental management is a multifaceted subject, influencing humans and the environment
38 alike in a plethora of complex and intricate ways. People have an interest in conservation and
39 environmental management both for their own interests and the sake of the environment itself.
40 Environmental decision-making has changed somewhat in recent decades to account for impacts on
41 human wellbeing, for example through the instigation of the '*at least do no harm*' mandate of the
42 Convention on Biological Diversity [1]. In accordance with the dual recognition of the importance of
43 the environment to human wellbeing, and of human wellbeing in environmental management, the
44 involvement of stakeholders in management projects has been recognised as a critical step in
45 ensuring their success [e.g. 2].

46

47 This recognition builds on a similar drive for stakeholder engagement in health. There has been a
48 broad recognition that stakeholders should be involved in the selection, design, funding and conduct
49 of medical research [3]. More specifically, the Agency for Healthcare Research and Quality (AHRQ)
50 Effective Health Care (EHC) programme has stakeholder engagement at the centre of its evidence-
51 based approach to medicine [4]. Stakeholder engagement is also seen as critical to social science
52 research, and a framework for involvement has recently been developed [5].

53

54 Stakeholder engagement provides several key benefits to environmental management research
55 projects, including improving the evidence base, greater public acceptance, higher likelihood of
56 intervention success, wider communication of findings, and increased likelihood of impact on
57 decision-making. However, stakeholder engagement is associated with a number of challenges that
58 makes its implementation problematic, including; increased demand on time and resources,
59 potential for marginalising or favouring certain groups of stakeholders, biased representation of true
60 stakeholder groups, and tokenistic engagement. Nevertheless, stakeholder engagement has been

61 shown to increase the efficacy of management interventions, particularly where success relates to
62 uptake of activities by practitioners.

63

64 Secondary syntheses, like primary research, can greatly benefit from engaging with stakeholders to
65 ensure that inputs and outputs are of the greatest relevance and reliability to all interested parties.

66 The Guidelines for Systematic Reviews in Environmental Management [6] states that stakeholders
67 play an important role in formulating the review question and advising on the search strategy, and

68 that involving stakeholders at an early stage is of particular importance. The guidelines recognise

69 three (potentially overlapping) groups involved with a review: the review user group, the review

70 team, and the stakeholder group (the latter defined as “all individuals and organisations that might
71 have a stake in the findings of the review”). Early systematic reviews in conservation and

72 environmental management were, to a large extent, trial cases and focused perhaps more on

73 academic topics, or those with restricted groups of identified and engaged stakeholders (i.e. often

74 just the commissioner). However recent developments in systematic review and systematic map

75 methodology and an increase in the uptake of systematic review methods in evidence-based

76 conservation and environmental management, have resulted in increasing interest in stakeholder

77 engagement throughout review processes. As a result there is a need for guidance in best practices

78 for stakeholder engagement.

79

80 Here, we formulate guidance for stakeholder engagement in systematic reviews/systematic maps,

81 highlighting recommendations and advice that are critical for effective, efficient and meaningful

82 engagement of stakeholders. This guidance is based on extensive first-hand experience of

83 undertaking systematic reviews and systematic maps, and follows a series of key informant

84 interviews with systematic review experts, all with experience of stakeholder engagement. These

85 interviews were conducted between September and November 2014 with 9 key informants from a

86 range of research and policy organisations with varying degrees of experience of working with

87 stakeholder engagement in systematic reviews. Informants were asked a range of open-ended
88 questions (see Additional File 1 for the questionnaire) and their responses were recorded and
89 transcribed. Thematic analysis was then used to identify key major themes emerging from their
90 experiences, and these were grouped and discussed by three researchers (NH, RS, NRdDS) during
91 working meetings in Johannesburg in November 2014 before producing draft conceptual models.
92 These models were in turn discussed and refined in a workshop including all other authors in
93 November 2014 in Cape Town.

94

95 This document will introduce key ideas in stakeholder engagement and provide key advice to those
96 designing stakeholder engagement for their review. It aims to provide a comprehensive toolbox of
97 possible stakeholder engagement activities, whilst also recommending approaches from stakeholder
98 engagement research that may prove to be particularly useful for systematic reviews and systematic
99 maps.

100

101

102 *Stakeholder Engagement and Systematic Review Methods*

103 Stakeholder engagement should reflect systematic review methodology, by being a reliable,
104 transparent process that aims to be as verifiable and objective as possible. Objectivity and
105 repeatability may seem particularly challenging when dealing with people and what may often be
106 strong and variable opinions, but by maintaining a high level of transparency and clarity, stakeholder
107 engagement can remain a reliable and verifiable process: key tenets of the parallel process of
108 systematic review.

109

110 Whilst there is undoubtedly a need for transparency in any stakeholder engagement activities,
111 measures to reduce bias in stakeholder engagement can only be recommended, since appropriate
112 stakeholder engagement methods will be to a great extent context-specific, and available resources

113 for stakeholder engagement may be limited to varying degrees. Reviewers should therefore consider
114 this guidance critically in order to attempt to identify which activities are priorities, and which are
115 likely to work best in a particular context, and what their impact on the review might be.

116

117

118 *Defining Stakeholders*

119 *Various definitions of stakeholders exist in the literature, with perhaps the most widely cited one*
120 *being “any group or individual who is affected by or can affect the achievement of an organisation’s*
121 *objectives” [7]. Systematic reviewers may define the term stakeholder in much the same way (Table*
122 *1), although in practice many use the term synonymously with ‘commissioner’ or ‘end user’. It may*
123 *be appropriate, however, to take a broad definition of stakeholders that includes all parties that may*
124 *affect or be affected by a systematic review. To that extent, we have produced a conceptual model*
125 *that categorises and separates stakeholders according to three dimensions: who they are, what their*
126 *roles are, and what actions they may take in relation to the review (*

127 *Figure 1). This broad definition includes several key actors that are seldom recognised in definitions,*
128 *but that we feel should be included to ensure that all affected parties can be given appropriate*
129 *opportunity for involvement and discussion where appropriate, or can be taken into consideration*
130 *when formulating a stakeholder engagement plan. Stakeholders can perform multiple roles within*
131 *this model.*

132

133 **Guidance:** Using a broad, encompassing definition of stakeholders can help to ensure
134 that all relevant stakeholders are engaged, particularly minority groups.

135

136

137 *Why Engage with Stakeholders?*

138 Stakeholder engagement in systematic reviews/systematic maps is undertaken for several major
139 reasons: i) to ensure the relevance of the review from a broader society perspective; ii) to prioritise
140 review questions; iii) to suggest and locate relevant evidence; iv) to interpret the review findings or
141 set them in context; v) to improve the clarity and readability of the review report; vi) to increase the
142 communication and impact of the review results; and vii) to endorse the review. Reviewers may
143 have any number of reasons for undertaking stakeholder engagement, but a comprehensive
144 stakeholder engagement strategy will ensure that all benefits are felt.

145

146 We described the major justifications for and benefits of stakeholder engagement briefly above, but
147 some additional specific benefits are worth mentioning. Figure 2 summarises these benefits visually
148 and we give some examples in more detail here. Along with ensuring clarity and readability of the
149 review report, engaging with stakeholders can ensure that processes remain transparent, since
150 additional appraisal of the process is inherently involved. Furthermore, by identifying, categorising
151 and understanding the characteristics and nature of various stakeholder groups, potential
152 controversies and conflicts during communication of the review results can be anticipated. Along
153 with refining the scope of the review, stakeholders can provide a practical understanding of
154 definitions that may be critical to the review's inclusion criteria: getting these wrong can significantly
155 reduce the utility of the review's conclusions [8]. Stakeholders can improve the quality of a review
156 by improving the search strategy, helping to set the balance between specificity and sensitivity, also
157 potentially improving the review's efficiency. Stakeholders can also improve review quality by
158 providing access to evidence critical to the review; studies or data that is inaccessible, un-indexed, or
159 un-published in academic resources (i.e. grey literature). This may be particularly useful if the
160 evidence base may consist of useful data from practitioner-held information, such as consultancy
161 reports, or if non-English language research may be likely. Reviews can be made more relevant
162 through gaining a better understanding of the context in which the findings fit. Similarly,
163 stakeholders can help to tailor communications for the right audience. Finally, stakeholders can help

164 to formulate dissemination media for the review (such as policy briefs, press releases, fact sheets,
165 etc.) that can greatly increase the coverage of dissemination activities and maximise impact.
166 Furthermore, stakeholders may be a useful resource in documenting impacts in decision-making;
167 something that has as yet been notoriously difficult to do [9]. Finally, stakeholder engagement may
168 be seen as a key means of promoting evidence-based approaches to decision-making, and may be a
169 useful means of capacity-building.

170

171

172 *Challenges of Stakeholder Engagement*

173 Stakeholder engagement is not without its challenges. An analysis using systematic review key
174 informant interviews by Cotrell et al. [3] identified key challenges that were also reflected in
175 responses by systematic reviewers in a study of CEE systematic review authors (see Box 1).

176

177 Box 1. Key challenges in stakeholder engagement.

178

- 179 1. Stakeholder engagement requires additional time and resources
- 180 2. Where resources are limited stakeholder engagement must be carefully planned to ensure the
181 results are sufficient
- 182 3. Stakeholder engagement may divert resources away from the conduct of the review
- 183 4. Reviewers should understand and be transparent about the desired objectives of stakeholder
184 engagement from the outset
- 185 5. The group of engaged stakeholders may not be balanced and representative
- 186 6. Specific criteria may be needed to aid stakeholders in prioritisation of review questions
- 187 7. Reviewers must bear in mind stakeholders' concerns about confidentiality when writing up their
188 findings and discussing stakeholder inputs with other parties
- 189 8. Conflicts between stakeholders can arise that must be carefully resolved

- 190 9. Inputs from multiple different stakeholders can sometimes contradict and processes must be in
191 place to develop and deal with any compromises that may be necessary
- 192 10. Difficulties in maintaining continued engagement throughout the review to maintain interest
193 and involvement
- 194 11. Tokenism in stakeholder engagement must be overcome to ensure activities are worthwhile
- 195 12. Stakeholders must be briefed in systematic review methods carefully to ensure full
196 understanding and appreciation of the possible inputs they can have without using
197 overcomplicated explanations
- 198 13. Reviewers may need training in how to coordinate stakeholder engagement and interact with
199 stakeholders, particularly where conflict may arise

200

201 One significant challenge with stakeholder engagement is that of explaining systematic reviews to
202 those with no previous experience of the methodology. Systematic review methods are novel in the
203 field of environmental management, with a small minority of the research community aware of
204 precisely what is involved in a formal CEE review. The concepts and processes involved in a CEE
205 systematic review are the subject of extensive documentation and training ([6];
206 www.environmentalevidence.org), and an understanding of these processes requires a solid grasp of
207 the way in which academia and science research publishing works. There is thus a significant
208 challenge in explaining systematic review to stakeholders sufficiently that their involvement is
209 meaningful without overloading them with jargon and complicated novel concepts. Organisations
210 working closely with stakeholders and systematic reviews have approached this challenge in slightly
211 different ways, but common themes identified in a set of key informant interviews suggested that
212 minimising the amount of new information regarding methodology was useful initially, whilst also
213 allowing stakeholders to gain further awareness using online information and tutorials at their own
214 speed. Workshops and meetings were often started with short presentations that gave a brief
215 overview of systematic review methodology. Several key informants in our interviews, however,

216 recognised a need for a 'soft landing' when it came to explanations of systematic review; perhaps
217 through the use of infographics or explanatory booklets in lay terms.

218

219 Another challenge frequently mentioned by key informants was the importance of clearly stating the
220 objectives of stakeholder engagement from the outset. Providing stakeholders with examples of the
221 ways in which they can be involved and the types of information and inputs they can supply can be
222 critical to ensuring that resources are used efficiently and inputs are meaningful. For example, it may
223 be useful to give examples of the types of comments on a protocol that would be useful along with
224 the types of comments that might not. Equally it is important to outline exactly what stakeholders
225 can expect from stakeholder engagement; what they can influence and what they cannot.

226 Procedures for dealing with conflict and contradictions should also be specified from the outset. For
227 example, experienced or trained mediators or facilitators may be used in physical meetings, and
228 where conflicts cannot be resolved, lead reviewers may be given the final say in the approach used
229 in the systematic review.

230

231 Whilst some people may fear that stakeholder engagement can derail a systematic review, this
232 should not be possible (unless of course the derailment is warranted – for example if the review
233 question or outcomes under consideration are deemed inappropriate). Stakeholder engagement
234 should help to direct a systematic review by providing advice and experience to the review team: it
235 should not be able to unduly influence it (i.e. their influence should not significantly alter review
236 methodology unless agreed by all/the majority of stakeholders and the review team of subject and
237 methodology experts). The transparent, objective, and verifiable methods used for the systematic
238 review running parallel to stakeholder engagement should remain robust to any potential
239 stakeholder bias or undue stakeholder influence. However, stakeholder engagement could
240 potentially reduce the efficiency of review activities, where significant resources are diverted to this
241 task, reducing those available for the conduct of the review.

242

243

244 *Stakeholder Engagement in Practice*

245 **Stakeholder Analysis and Balance**

246 Stakeholder analysis is the process by which key actors in a system are identified, categorised and
247 understood [10]. It has been used extensively in dispute resolution and conflict management [10,
248 11], but is likely an implicit aspect of most stakeholder engagement activities, despite perhaps not
249 being recognised as such. Stakeholder analysis is undertaken for a range of reasons, including: i)
250 ensuring balance in stakeholder groups; ii) prioritising certain groups of stakeholders over others
251 where resources are limited; iii) identification and investigation of possible conflicts between
252 stakeholders; iv) tailoring contact to specific types of stakeholder; and v) phasing contact with
253 stakeholders through a project according to their relevant utility to and benefit from the research.
254 Whilst always a useful exercise, stakeholder analysis may not always be necessary; for example,
255 where the stakeholders for a given subject are already well known.

256

257 Generally speaking, 'balance' in stakeholder engagement may be understood as the representation
258 of all main interests, views and opinions [12], but its application in practice is challenging. What
259 stakeholder engagement balance should not be aiming for is the strict proportional, quantitative
260 representation of stakeholder groups present in society. There are many reasons for avoiding
261 quantitative balance in stakeholder engagement. Firstly, activities such as workshops are unlikely to
262 be able to cater for and attract all relevant stakeholder groups, so ensuring that one representative
263 from every group is present is likely to be an intangible aim. Furthermore, some individuals may
264 represent larger stakeholder groups, whilst other individuals represent only themselves. Such group
265 representatives, however, may have collated the views and speak on behalf of a large number of
266 individual stakeholders. Accordingly, quantitative assessments may ignore the underlying numbers.
267 The key aim with ensuring balance is to allow all major types of stakeholder to be given the

268 opportunity to provide input. For example, where a review focuses on the environmental impacts of
269 'fracking', a balanced stakeholder pool might consist of citizens, policy-makers, conservation
270 practitioners, representatives from the fossil fuel industry, land-owners, representatives from
271 regional water boards, etc. Balance is most evident when it is absent: for example, through the
272 notable absence of fossil fuel industry representatives. In this way, stakeholder analysis can help to
273 identify where balance is lost by categorising stakeholders and predicting which groups should be
274 present.

275

276 Often, resources for stakeholder engagement are limited, and key stakeholders must be prioritised
277 and contacted in preference to others. This pragmatic approach should be undertaken carefully to
278 ensure that balance is still maintained wherever possible, and that the engaged stakeholders
279 provide knowledge and opinions that are representative of or accepted by the stakeholder
280 community at large. Basing a review on definitions that are not broadly accepted, for example, can
281 drastically reduce the worth of a review [8]. Similarly, using stakeholder analysis to phase contact
282 with stakeholders may be a useful way of dealing with limited resources with maximum efficiency.
283 Equally, the phased inclusion of stakeholders should be based on sound analysis of the risks of
284 excluding certain groups from specific processes. It should also be noted that systematic reviews are
285 long-winded processes, and long gaps between contact for those phased stakeholders that are
286 involved more than once can lead to significant *stakeholder attrition* (drop out) if contact is not
287 suitably maintained. Stakeholder analysis can also be useful in identifying groups of stakeholders
288 that might benefit from different forms of contact. Certain groups may interact more if contacted in
289 a specific way or at a specific time; such as teachers being more responsive by telephone after
290 school hours. Other groups may require different wording in emails, for example, if their level of
291 understanding of academic literature and systematic review methods is expected to be higher.
292 Stakeholder analysis can also be a vital means of early identification of potential conflicts between
293 different stakeholder groups. Such awareness can be crucial for ensuring that stakeholder

294 engagement activities run smoothly, for example by interacting with conflicting groups at different
295 meetings rather than assembling them in one room. Finally, stakeholder analysis can also help to
296 identify potential bias that may reduce stakeholder engagement balance. Sources of bias in
297 stakeholder engagement are discussed in further detail below.

298

299 Stakeholder analysis is typically done using a range of methods that relate to the categorisation of
300 stakeholders [13]. The majority of these methods are ‘top-down’: they involve categorisation of
301 stakeholders by a third party, usually a reviewer [14]. There are also ‘bottom-up’ methods, however,
302 that involve (amongst other things) categorisation of the various stakeholders by other stakeholders
303 [14]. This latter method can be particularly resource intensive, however, but can identify intricacies
304 that would otherwise be missed by reviewers less familiar with the existing relationships amongst
305 stakeholders.

306

307 The most common means of stakeholder analysis is via interest-influence matrices [15]. These
308 matrices classify stakeholders along two dimensions; interest in the subject in hand and influence in
309 the processes involved. Such matrices allow the identification of key groups that should be targeted
310 (e.g. high interest, high influence) or modified (e.g. low interest, high influence). Other dimensions
311 can be plotted on such matrices, for example, amount of available evidence and necessary
312 engagement effort. Other means of categorisation described in the stakeholder analysis literature
313 include semi-structured interviews, snowballing, social network analysis, knowledge mapping, etc.
314 [reviewed by 16]. Further details on these methods should be sought from the extensive
315 methodological literature.

316

317 **Guidance:** Stakeholder analysis can help to categorise stakeholders according to useful
318 categories related to the type of benefits they might provide to the systematic review or
319 receive from it. Stakeholder analysis can help ensure balance, prioritise limited

320 stakeholder engagement resources, help to identify or anticipate potential conflicts, and
321 assist in tailoring and phasing contact with stakeholders, particularly if reviewers are less
322 familiar with or uncertain of the stakeholder community linked to a certain review
323 question.

324

325

326 **Stakeholders and Review Stages**

327 Prioritising and phasing stakeholder engagement should be based on a sound understanding of the
328 major stages in a systematic review or systematic map, and a clear appreciation of the types of roles
329 and actions that stakeholders can perform. These actions are summarised in
330 Figure 1.

331 Table 3 and Table 2 display the relationship between these actions and the review stages and
332 processes for which they are relevant, from question formulation through to communication and
333 integration of results into decision-making. Engagement activities can be focused towards different
334 groups of stakeholders depending on the actions they are believed to be able to perform. Care must
335 be taken to avoid surprises relating to actions performed by stakeholders that were not identified in
336 advance, since this information may come too late and may risk full endorsement and acceptance of
337 the review.

338

339 **The Need for Acknowledgement**

340 As stated above, stakeholder engagement activities should be transparently documented
341 throughout the process. In addition, the role of stakeholder engagement in a systematic review
342 should be clearly stated in some form of acknowledgement. Stakeholders may have contributed
343 considerable time and resources to a review, and acknowledgement for their efforts is not only fair
344 and important for transparency reasons but also a sensible courtesy. Such acknowledgement can
345 take a variety of forms, including: i) co-authorship of review protocols, reports and resulting
346 publications; ii) documentation in methods text within reports; and iii) mentioning within
347 acknowledgement sections of dissemination media, including formal publications. Care should be
348 taken if stakeholders are to be mentioned specifically, and permission should always be sought
349 before providing any names of individuals or organisations. Care should also be taken where
350 conflicts may arise through publishing individual names of stakeholders, and referring to generic
351 groups or categories of stakeholders may be preferable if anonymity is sought.

352

353 **Guidance:** Acknowledgement of stakeholder contributions should be carefully
354 considered in order to ensure transparency and to thank significant contributors.
355 Permission should be sought before naming specific stakeholders in order not to violate
356 privacy and/or not to be harmful to them in their professional capacity.

357

358

359 *Sources of Bias in Stakeholder Engagement*

360 A variety of biases can find their way into stakeholder engagement that can reduce its efficacy. In
361 the following section we discuss those biases in turn, and provide details of how the bias can be
362 avoided or mitigated. Since it is the reviewers who hold the power in this situation, it is they who
363 must be responsible for identifying, understanding and (where possible) mitigating these biases. We
364 discuss these biases across three key aspects of stakeholder engagement; stakeholder selection,
365 stakeholder response and stakeholder attrition. Each bias is summarised along with suggested
366 mitigation measures in Table 4.

367

368 **Stakeholder Selection**

369 Bias in stakeholder selection arises through the methods used to identify and invite stakeholders.
370 Stakeholders can be invited to engage in one of four ways; purposive selection, ‘snowballing’, open
371 calls, or systematic selection (Figure 3). Bias can arise with any mechanism used to identify
372 stakeholders. Purposive selection involves the identification and invitation of selected, often well-
373 known stakeholders. This process potentially results in a biased sample of stakeholders and risks
374 excluding minorities (**identification bias**). This method is often preferred, however, since reviewers
375 are usually familiar with the contacts meaning that positive responses may be higher, and since the
376 number of engaged stakeholder groups is usually quite manageable. ‘Snowballing’ describes the use
377 of an initial list of stakeholders that is then asked to propose further stakeholders, continuing on in a
378 rapidly expanding approach. Snowballing can also result in identification bias, and can further
379 compound the risks of ignoring minorities by repeating the same bias across multiple stakeholders
380 (**network bias**). Multiple iterations of snowballing with several different starting points (perhaps
381 using key stakeholder groups or known minority stakeholders) can reduce network bias. Open calls
382 for stakeholder engagement can generate much greater numbers of interested stakeholders, with a

383 potentially wider diversity by avoiding identification and network bias. However, open calls risk
384 missing those with no access to the advertisement (**awareness bias**). It may also produce an
385 unmanageable number of interested stakeholders, and minority views may be swamped if all parties
386 are engaged yet reviewers' resources are limited. Systematic identification of stakeholders mirrors
387 the systematic approaches used to identify evidence within a systematic review/systematic map,
388 and involves a search for potential stakeholders, for example the Poverty and Conservation
389 organisations database (<http://povertyandconservation.info/en/organisations>; an IIED project).
390 Systematic approaches are inherently less likely to suffer from bias and they use a verifiable,
391 justified methodology. However, large numbers of stakeholders may be identified, and use of the
392 method online risks missing those without an online presence (**self-promotion bias**). Systematic
393 searches may be the least biased method for identifying stakeholders, but the use of multiple
394 methods is likely to result in the least overall bias and unbalance in the stakeholder pool.

395

396 **Stakeholder Responses to Invitations**

397 Once stakeholders have been identified, invitations to engage should be sent out. Stakeholder
398 response to invitations is another point at which bias can manifest itself. As described above,
399 stakeholders can only respond to open calls if they are aware of them (**awareness bias**). In addition,
400 the ability to respond to invitations requires that stakeholders have the ability to contribute (e.g.
401 access to an email account), something that may prove challenging in certain situations
402 (**access/technology bias**). Stakeholders may not be able to attend physical meetings due to limited
403 time or money (**resource bias**). Minority stakeholder groups may not respond if they feel their views
404 are unlikely to be heard over the views of the majority (**intimidation bias**). Similarly, stakeholders
405 may not engage if they believe that their views will not be heard due to failures on the part of the
406 reviewers or the review methodology (**faith bias**). Finally, some stakeholders may not respond if
407 they feel others will perform their role for them (**apathy bias**).

408

409 These biases can be mitigated in a range of ways, including: i) using multiple advertisement channels
410 for open calls to maximise the audience; ii) providing multiple modes of response for those who may
411 not have access to the internet; iii) providing support to minority stakeholders by tailoring contact
412 and ensuring that views will be heard in initial invitations; iv) undertaking stakeholder analysis to
413 identify and avoid potential conflicts between stakeholders; v) offering financial support for
414 attending meetings to those with limited budgets; and vi) ensuring openness and contactability to
415 support and facilitate response from less vocal and minority stakeholder groups.

416

417 **Stakeholder Attrition in Ongoing Engagement**

418 Stakeholder attrition (drop out) can result in a change in the proportion and balance of stakeholders
419 throughout the ongoing engagement and systematic review processes. Differing abilities to commit
420 to the long-term nature of stakeholder engagement throughout a full systematic review can result in
421 loss of important stakeholders (**commitment bias**). Another effect of the extensive nature of
422 systematic review timescales is the loss of stakeholders through changes in individual job roles over
423 time (**timescale bias**). As mentioned above, stakeholders may drop out of stakeholder engagement if
424 resources are limited (**resource bias**). Similarly, access/technology, intimidation bias, apathy bias,
425 and faith bias may continue to be a problem throughout continued engagement.

426

427 These biases may be mitigated in several key ways. Limitations in the ability of stakeholders to
428 commit resources to engagement can be combated by phased contact with resource-limited
429 stakeholders to ensure that they are contacted at the most appropriate stages and not overtasked.
430 Providing stakeholders with multiple modes of interaction (for example workshops, email, face-to-
431 face interviews, etc.) can mitigate access/technology bias and resource bias. Alternatively, resources
432 to aid travel to physical meetings can be provided to stakeholders. Engaging with multiple
433 stakeholders from key organisations can ensure that organisations are not lost if staff changes occur.

434 Finally, providing stakeholders with an encouraging, supportive environment and ensuring openness
435 and contactability (as described above) can reduce intimidation, apathy and faith biases.

436

437 **Guidance:** Potential for bias to occur in stakeholder engagement can be mitigated by
438 using a carefully planned, systematic approach to stakeholder engagement. Employing a
439 combination of methods to identify stakeholders, using multiple start points for iterative
440 identification techniques (such as snowballing), and systematically searching for
441 stakeholders can mitigate biases during stakeholder identification. Contacting
442 stakeholders and allowing them to respond via multiple channels (e.g. in person, by post
443 and via email) can mitigate biases during stakeholder responses. Avoiding overtasking by
444 phasing contact, providing multiple methods of interaction, including redundancy within
445 stakeholder organisations through multiple contacts, and providing a supportive,
446 encouraging environment can mitigate biases during ongoing engagement. Finally,
447 careful planning can identify potential bias, for example using stakeholder analysis, and
448 allow for attempts to be made to mitigate bias.

449

450

451 **Measuring the Success and Impact of Stakeholder Engagement**

452 A further specific challenge relates to how we measure 'success' in stakeholder engagement.

453 Reviewers should consider the original objectives of the stakeholder engagement process for their
454 specific review, commonly; to assist in defining a scope that is broadly relevant to a wide range of
455 stakeholders; to provide additional evidence where available; to endorse the methods used in the
456 review, and to contribute to communication of the review findings.

457

458 Many reviewers would define success as improving the quality, communication and impact of a
459 review, but success should also include meeting the objectives of the stakeholder engagement

460 process itself. Issues that are related to success include: i) a feeling of inclusion and opportunities to
461 be heard by all relevant stakeholders; ii) acceptance of systematic review methods as a reliable
462 means of summarising scientific evidence on a topic; iii) faith in the review findings as a robust
463 synthesis of the evidence; iv) trust in the review team, which can be a particular problem when
464 tackling controversial issues. These latter definitions of success are likely to be affected by
465 stakeholders' beliefs of 'what counts as evidence', and care should be taken to ensure they are
466 aware that systematic review is only one tool for summarising evidence, albeit the 'gold standard'
467 method. Closely related to measuring success, impact should be documented in stakeholder
468 engagement activities in order to show how stakeholders were able to input to the formulation and
469 undertaking of the review. This is also closely related to acknowledgement and transparency. A
470 further benefit from monitoring impact, however, is that future stakeholder engagement activities
471 may benefit from critical assessment of procedures that resulted in optimum impact.

472

473 **Guidance:** Reviewers should document any impact that stakeholder engagement may
474 have on the review. Reviewers may also wish to formally (internally or externally)
475 attempt to critically assess success or impact to help improve future stakeholder
476 engagement activities. Making results of this assessment open access would also benefit
477 the wider systematic review and stakeholder engagement research community.

478

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480

481 *Framework for Stakeholder Engagement*

482 As we have discussed, stakeholder engagement should be undertaken in a transparent manner,
483 attempting to minimise bias where possible. The framework outlined in Box 2 may act as a checklist
484 for those planning stakeholder engagement. It does not form a rigid set of requirements: rather, it
485 forms a suite of potentially suitable methods for maximising balance and minimising bias throughout

486 stakeholder engagement. The framework provides a guide for processes that may be useful and
487 beneficial in stakeholder engagement.

488

489 *Summary*

490 Stakeholder engagement can be a time-consuming and resource-demanding process, but it is widely
491 felt by systematic review experts that it should form an integral part of all systematic reviews to
492 some degree or other, particularly at early stages of the review. If planned carefully, stakeholder
493 engagement can be a resource-efficient process that provides a variety of tangible benefits to the
494 scope, processes, quality and acceptance of outputs of a systematic review. But more than this,
495 stakeholder engagement can be vital for ensuring that systematic review and systematic map
496 outputs have the greatest relevance and impact to the stakeholders that will be the end-users of
497 and/or affected by the review. Reviewers should be aware of potential pitfalls of stakeholder
498 engagement, avoiding bias and striving for balance. By following the suggestions and
499 recommendations in this guidance, reviewers can plan, undertake and report stakeholder
500 engagement activities to the greatest effect and efficiency possible.

Box 2. Approaches and tools for stakeholder engagement in systematic review/systematic map considering measures to ensure balance and mitigate bias

1. Identification of Stakeholders
 - a. Stakeholder Analysis
 - i. Check for balance
 - ii. Prioritise certain stakeholders
 - iii. Tailor engagement activities
 - iv. Phase engagement
 - v. Identify potential conflict/bias and plan for mitigation
 - b. Selection process
 - i. Purposive selection
 - ii. Snowballing
 - iii. Open call
 - iv. Systematic approach
2. Initial Invitation
 - a. Invitation type, i.e. open call/advertisement versus closed invitation (selected stakeholders only)
 - b. Invitation format (e.g. email/telephone/conference presentation) and wording
 - c. Tailor invitation to specific stakeholders/stakeholder groups
 - d. Clarify purpose and format of stakeholder engagement
3. Initial Engagement
 - a. Format
 - i. Group meeting/workshop
 - ii. 1-on-1
 - iii. Remote (email, online or post)
 - b. Plan for dealing with conflict
 - i. Involve experienced mediator/facilitator
 - ii. Modify engagement format to minimise conflict
 - iii. Plan for dealing with unresolvable conflict, i.e. where compromise would impact the review
4. Explanation of Subject-Specific Terminology
 - a. Level of explanation of systematic review methodology
 - i. Brief explanation in contact
 - ii. Links to external sources of additional information
 - iii. Full explanation (tailored to specific stakeholders)
 - iv. Explanation through presentation in workshops/meetings
 - b. Agreement on contentious definitions and terminology
 - c. Avoid jargon
5. Maintaining Interest Throughout the Process
 - a. Level of on-going communication with stakeholders
 - i. Regular contact to avoid *lack-of-interest* attrition
 - ii. Warn stakeholders of potential reduced contact during review activities

(Box 2. Continued)

6. Identification of Stakeholders
 - a. Stakeholder Analysis
 - i. Check for balance
 - ii. Prioritise certain stakeholders
 - iii. Tailor engagement activities
 - iv. Phase engagement
 - v. Identify potential conflict/bias and plan for mitigation
 - b. Selection process
 - i. Purposive selection
 - ii. Snowballing
 - iii. Open call
 - iv. Systematic approach
7. Initial Invitation
 - a. Invitation type, i.e. open call/advertisement versus closed invitation (selected stakeholders only)
 - b. Invitation format (e.g. email/telephone/conference presentation) and wording
 - c. Tailor invitation to specific stakeholders/stakeholder groups
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8. Initial Engagement
 - a. Format
 - i. Group meeting/workshop
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 - b. Plan for dealing with conflict
 - i. Involve experienced mediator/facilitator
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 - iv. Explanation through presentation in workshops/meetings
 - b. Agreement on contentious definitions and terminology
 - c. Avoid jargon
10. Maintaining Interest Throughout the Process
 - a. Level of on-going communication with stakeholders
 - i. Regular contact to avoid *lack-of-interest* attrition
 - ii. Warn stakeholders of potential reduced contact during review activities
11. Acknowledging Stakeholder Contributions
 - a. Acknowledge all engaged stakeholders
 - b. Obtain informed consent before naming specific stakeholders
 - c. Describe planned/completed stakeholder engagement activities in the protocol and final review
12. Documenting Stakeholder Impacts on the Review
 - a. Include explanation of inputs from stakeholders (specified, where suitable) that affected the review scope/methodology in the protocol and final review

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537 **Tables and Figure Legends**

538

539 Table 1. Key informant interviewees’ definitions of the term ‘stakeholder’ with respect to systematic
 540 reviews. Source: unpublished data.

Definition	Interviewee
<i>“The client. Also experts engaged to do the topic synthesis.”</i>	Novice reviewer
<i>“People who are either affected by the issue or those who may be able to influence the issue: includes local people (e.g. producers), NGOs and governments”</i>	Experienced reviewer
<i>“Anyone with an interest in a particular issue or anyone likely to be affected by an issue or a decision: includes poor people and researchers, research experts (systematic review methodology experts).”</i>	Experienced reviewer
<i>“People that have an interest in the subject matter: includes researchers and experts. Those generating evidence and the end-users of evidence. Also includes subjects of conservation and development projects.”</i>	Experienced reviewer
<i>“A person or representative of an organisation that is affected by an activity that is being reviewed in one way or another: includes scientists.”</i>	Expert reviewer
<i>“Those who have a stake in the question, e.g. policy-makers, academics, educators, NGOs.”</i>	Expert reviewer
<i>“Someone who has a stake in the findings – the issues have real meaning in their lives; someone affected by the review findings.”</i>	Expert reviewer
<i>“Those in one way or another that use the information from a systematic review: mainly those in decision making (e.g. ministries, agencies – on all levels, local, national and international), includes scientists.”</i>	Expert reviewer

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543

544 Table 2. Systematic review processes and stages.

Process	Stage
Question formulation	Early
Protocol	Early
Searching	Mid
Article Screening	Mid
Data Extraction	Mid
Critical Appraisal	Mid
Synthesis	Mid
Final Review	Final
Communication	Final
Decision-making	Post

545

546 Table 3. Stakeholder actions, systematic review stages and directions of information flow. Table
 547 produced during a workshop to analyse the results of key informant interviews.

Action	Review Stage(s)	Direction of Action
Share own experiences	Early	Review ←
Provide articles	Early, Mid	Review ←
Endorse	Early, Mid, Final	Review ←
Undertake the review	Early, Mid, Final	Review ←
Provide missing/supplementary information for specific studies	Mid	Review ←
Provide context	Early, Final	Review ←
Provide funding	Early, Final (dissemination)	Review ←
Represent an organisation/group	Early, Final	Review ←
Set review standards	Early, Final	→ Stakeholders
Share knowledge	Early, Final	→ Stakeholders
Enable access to the review	Final	→ Stakeholders
Read the review	Final, Post	→ Stakeholders
Share the review	Final, Post	→ Stakeholders
Integrate review findings into decisions	Post	→ Stakeholders

548

549 Table 4. Potential biases that may arise in outputs of stakeholder engagement. Stages include;
 550 stakeholder selection, stakeholder response and ongoing engagement along with suggestions for
 551 mitigation.

Stage	Bias	Explanation	Mitigation
Stakeholder Selection	Identification bias	Purposeful selection of stakeholders using personal/organisational knowledge or unsystematic searches may result in a biased and unbalanced group of stakeholders	Use a combination of selection methods
	Network bias	Asking others to suggest potential stakeholders may result in a biased and unbalanced group of stakeholders	Use multiple starting points (suggestees) from a range of backgrounds
	Awareness bias	Announcing an open call for stakeholder engagement may target a biased and unbalanced group of stakeholders	Advertise the open call using a range of different channels, using stakeholder analysis to identify stakeholders that may require specific forms of contact
	Self-promotion bias	Systematically searching for potential stakeholders may select only those with an online presence, producing a biased or unbalanced group of stakeholders	Use a combination of selection methods
Stakeholder Response	Awareness bias	Announcing an open call for stakeholder engagement may target a biased and unbalanced group of stakeholders	Advertise the open call using a range of different channels, using stakeholder analysis to identify stakeholders that may require specific forms of contact
	Access/technology bias	Stakeholders may not have the ability to respond to invitations, producing a biased, unbalanced group of stakeholders	Provide multiple modes of engagement that do not rely purely on one technology/format
	Intimidation bias	Stakeholders may be less likely to respond if they feel their views are unlikely to be heard over the views of the majority	Provide support to minority stakeholders by tailoring contact and ensuring that views will be heard in initial invitations
	Faith bias	Stakeholders may not engage if they believe that their views will not be heard due to failures on the part of the reviewers	Undertake stakeholder analysis to help identify and categorise potential conflicts. Ensure openness and contactability to support and facilitate response from less vocal and minority stakeholder groups
	Apathy bias	Stakeholders may not respond if they feel others will perform their role for them	Encourage stakeholders to engage by explaining that all views are valid and important, and stress the need for a comprehensive, balanced group of stakeholders
Ongoing Engagement	Commitment bias	Stakeholders may not be able to commit to involvement along the full extent of the systematic review process, causing attrition over time and leaving a biased, unbalanced group of stakeholders	Phase contact with certain stakeholders according to their likely involvement
	Timescale bias	Long timescales involved with systematic reviews may mean that attrition occurs over time as stakeholders change roles, in turn leaving a biased, unbalanced group of stakeholders	Attempt to engage with multiple stakeholders from each organisation to ensure some contacts remain
	Resource bias	Stakeholders' resources may be too limited to allow full engagement throughout the systematic review process, leaving a biased, unbalanced group of stakeholders	Phase contact with certain stakeholders according to their likely involvement. Minimise necessary resources needed for engagement, for example by reducing unnecessary reading

	Access/technology bias	Stakeholders may not have the ability to respond to invitations or ongoing engagement, resulting in attrition and leaving a biased, unbalanced group of stakeholders	Provide multiple modes of engagement that do not rely purely on one technology/format
	Intimidation bias	Stakeholders may be less likely to respond if they feel their views are unlikely to be heard over the views of the majority	Provide support to minority stakeholders by tailoring contact and ensuring that views will be heard in initial invitations
	Faith bias	Stakeholders may not engage if they believe that their views will not be heard due to failures on the part of the reviewers	Undertake stakeholder analysis to help identify and categorise potential conflicts. Ensure openness and contactability to support and facilitate response from less vocal and minority stakeholder groups
	Apathy bias	Stakeholders may not respond if they feel others will perform their role for them	Encourage stakeholders to engage by explaining that all views are valid and important, and stress the need for a comprehensive, balanced group of stakeholders

552

553

554 Figure 1. Conceptual model of stakeholders, identified by the actors, their roles and their actions.

555 Figure 2. Model of potential benefits of stakeholder engagement. Models shows direction of benefit

556 with respect to stakeholders (green arrows benefit the review, orange arrows benefit the

557 stakeholders).

558 Figure 3. Methods of stakeholder invitation with explanations (*italics*) and their relative advantages

559 (red text) and disadvantages (green text).