**Supplementary Materials: Constraining and enabling factors to using long-term climate information in decision making**

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References

# Section S1: Methodological details of the structured review process

The structured review targeted English-language peer-reviewed literature from natural and social science published between January 2006 and October 2014. Inclusion and exclusion criteria are listed in Table 1.

**Table S1: Broad inclusion and exclusion criteria for the literature search**

|  |  |
| --- | --- |
| Included | Excluded |
| Sources published between January 2006 and October 2014 | Sources published before 2006 |
| Peer-reviewed literature (Scopus database) | Grey literature |
| Literature in English | Literature in languages other than English |
| Climate information associated with multi-decadal timescales and beyond | Weather forecasts, seasonal climate forecasts and decadal forecasts\* |
| Use in investment decisions, planning processes and institutional responses | Use in individual or household decision-making |

*\*In instances where a paper included information across multiple timescales the paper only went through to final screening if significant elements of the analysis related to multidecadal timescales and beyond. Code towards individual constraints and enablers were apportioned only if referring specifically to long-term climate information.*

*a) Using a decision tree to screen articles*

We conducted the Scopus search on October 1st, 2014, receiving 2,530 hits from the original string (see the Data and Methods section in the paper for the search terms). In order to narrow down on publications relevant to the research questions, we used the decision tree outlined in Figure S1 (numbers of papers excluded at each point in the decision tree can be seen in Figure S2).

**Figure S1: Structured review decision tree**



Our first selection criterion was whether the paper focused on climate change, climate variability or global warming. Next, we reviewed whether the paper dealt with climate information or climate science. We then verified if the paper was primarily focused on climate change adaptation, omitting papers focused on mitigation and greenhouse gas emissions. The next test was whether the paper specifically dealt with research on the uptake of climate information - this step in the decision tree was where most of the papers were excluded. Articles were excluded if results were based primarily on secondary literature or featured as a commentary. We then assessed whether the article contained information on factors enabling or inhibiting uptake. Following this, we evaluated whether the focus of the paper was on long-term climate information.

The decision tree was applied twice: during the initial title and abstract screening and then again during the full text screening.

*b) Title and abstract screening*

Titles and abstracts of the returned articles were screened by two independent reviewers. Both reviewers screened the first 600 titles and abstracts at which point results were compared and discussed with discrepancies reviewed through an adjudicating review team (comprised of three additional individuals). The Kappa inter-annotator agreement test (McGinn et al., 2004) performed for this round of screening scored 0.508 between the two independent reviewers. Due to a modest Kappa score, the team revisited the inclusion/exclusion criteria and clarified the protocol and its implementation. The remaining articles were independently screened. If, during the title and abstract screening, it was not clear whether or not the article fully satisfied the criteria for inclusion in or exclusion from the study, it was marked as “unclear” and passed to the full text screening. 110 articles showed initial relevance to our inclusion criteria (with 52 clearly relevant to our inclusion criteria and 58 marked as “unclear”).

*c) Full text screening*

The next stage involved the full text screening of the 110 papers that made it through the title and abstract screen. An initial pilot screening of 10 papers was carried out to test the full text screening strategy. This was followed by discussion on any discrepancies and the remaining 100 articles were independently screened by two independent teams each made up of two reviewers. In the cases where screened full texts remained “unclear”, each pair of reviewers first discussed discrepancies internally before consulting with the other team in order to reach agreement. However, when consensus was not reached, an external reviewer was consulted for a final decision on inclusion or exclusion of the articles in question. The full text screening yielded a Kappa test scored 0.916, deemed highly consistent (McGinn et al., 2004). Only literature that fully satisfied inclusion criteria were included in the final database for data extraction. Of the 110 peer-reviewed articles available from the first round of screening, 31 were retained for data extraction.

*d) Data extraction*

Data from the 31 papers were extracted into an Excel spreadsheet and analysed according to the primary research question. The extraction process assessed information on year of publication, author affiliation, geographic focus, spatial scale, sectoral focus of climate information, type of evidence generated, data collection method, timescale of climate information, type of decision-making process, as well as identified constraints and enablers to the uptake of climate information in decision-making and associated quotes from the text.

A pilot extraction on 5 papers was carried out to iron out any discrepancies and amend information categories for the extraction process.

Topics specified as constraints and enablers to the uptake of medium- to long-term climate information in decision making in the papers were coded respectively into ten categories according to their recurring and overarching themes: five categories of constraints and five categories of enablers (see Results section).

**Figure S2: Key steps in the review methodology**



Search string returns

2,530

110

Included articles

31

Included articles

Data extraction of 31 articles

79

Excluded articles

2,420

Excluded articles

DATA COLLECTION

FIRST ROUND SCREENING

Title and abstract

SECOND ROUND SCREENING

Full-text screening

DATA EXTRACTION

**Figure S3: Primary scale of focus of short-listed literature**

# Section S2: Terms and definitions

In the context of this paper, climate information refers to a broad range of data, including: historical observations (used to establish baseline of past and current climate); future projections over multiple timescales (typically achieved through climate and earth system models); and climate impact, vulnerability and adaptation analysis (requiring information and analysis from various sectoral disciplines spanning economic, environmental, social and political sciences) (Jones et al., 2015). We adapt Moser and Ekstrom’s (2010) definition of “barriers” to describe obstacles to improved uptake of climate information in decision making that can be overcome with concerted effort. Within this study, “barriers” are used interchangeably with “constraints”. We recognise “limits” as obstacles that tend to be absolute in a real sense (Moser and Ekstrom, 2010). Finally, we refer to “enablers” as factors that have been found to be associated with improved uptake of climate information in decision making.

In relation to the geographic scales outlined in Figure 2 of the main text, categories refer to the primary geographic focus of shortlisted articles. Here, ‘Multiple regions’ relates to articles that describe case studies in more than one country across more than one continent; ‘Municipal’ refers to the town or city levels; and ‘Local’ refers to the community or village levels. Additional scales are referred to in Figure S3. Here, ‘Multiscalar’ studies relate to studies that transcend scales from, from local to supranational; ‘Supranational’ scale refers to case studies that span more than one country; National scale refers to a country scale of analysis; and ‘Regional’ refers to a regional administrative unit within a country.

# Section S3: Articles included in the analysis (n=31)

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# Section S4: Articles excluded after full text screening (n=79)\*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
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