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Review

Participatory scenario planning and climate change impacts, adaptation and vulnerability research in the Arctic

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ABSTRACT

Participatory scenario planning (PSP) approaches are increasingly being used in research on climate change impacts, adaptation, and vulnerability (IAV). We identify and evaluate how PSP has been used in IAV studies in the Arctic, reviewing work published in the peer-reviewed and grey literature (n = 43). Studies utilizing PSP commonly follow the stages recognized as 'best practice' in the general literature in scenario planning, engaging with multiple ways of knowing including western science and traditional knowledge, and are employed in a diversity of sectors. Community participation, however, varies between studies, and climate projections are only utilized in just over half of the studies reviewed, raising concern that important future drivers of change are not fully captured. The time required to conduct PSP, involving extensive community engagement, was consistently reported as a challenge, and for application in Indigenous communities requires careful consideration of local culture, values, and belief systems on what it means to prepare for future climate impacts.

1. Introduction

Scenario planning approaches are increasingly used in climate change research to identify future vulnerabilities and examine adaptation options. This work builds on a long history of futures work in diverse areas including military planning (Kahn, 1964), disaster risk reduction (Tomaszewski et al., 2016), climate change mitigation (IPCC Climate Change, 2014), social development (Butler et al., 2016; Institute for Alternative Futures Vulnerability 2030, 2011Institute for Alternative Futures Vulnerability 2030, 2011), ecology and resource management (Wesche and Armitage, 2014; Bohensky et al., 2006; Palomo et al., 2011), and health planning (World Economic Forum, 2013; Martens and Huynen, 2003). Scenarios are defined broadly as an internally consistent description of a plausible or possible future state of a system (IPCC, 2015; Birkmann et al., 2013).

The majority of scenarios work in the climate change impacts, adaptation, and vulnerability (IAV) field have been top-down in nature, led by the scientific community and typically engaging experts in academia, practitioners, consultants, and government to inform the creation of plausible futures at a regional or national scale (e.g. IPCC's SREX scenarios (IPCC, 2012). Increasingly, however, 'bottom-up' scenarios that work with impacted or vulnerable communities are being developed to aid social learning, and plan for adaptation in-light of multiple stresses, uncertain climatic conditions, and competing policy priorities (Wesche and Armitage, 2014; Addison and Ibrahim, 2013; CARE, 2011; Kok et al., 2006; Oteros-Rozas et al., 2016). Such approaches, commonly referred to as participatory scenario planning (PSP), offer additional benefits to top-down approaches, including increasing the local understanding of how climate change may impact local lives, enabling the identification of contextually appropriate adaptation options, encouraging multi-stakeholder evaluation of adaptation options, and promoting the incorporation of multiple forms of understanding, including both western science and traditional knowledge (Butler et al., 2016; CARE, 2011; Bizikova et al., 2011; Oteros-Rozas et al., 2015).

The Arctic is experiencing dramatic climate change and is the region where the most pronounced future warming is projected (ACIA, 2004). These changes have implications for human livelihoods and are being experienced in the context of other social, economic, political, and environmental changes that influence how people understand and respond to climate change risks (ACIA, 2004). To date, most IAV research in the Arctic has focused on identifying and describing current climate-related exposure-sensitivities and adaptive strategies (Ford et al., 2014). When future vulnerabilities have been considered, they have

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often been done so as hypothetical extrapolations of current conditions and responses (Ford et al., 2014; Pearce et al., 2011). Limited work, however, has reviewed how future drivers of change in the Arctic have been captured in IAV research, or examined how/if scenario planning approaches have been used. Against this backdrop, we systematically review the peer-reviewed and grey literature to identify and evaluate how PSP is being used in community-based climate change IAV research across the Arctic.

2. Methods

2.1. Systematic review methodology

We employ a systematic review of the peer-reviewed and grey literature to identify and evaluate how participatory scenario planning (PSP)–which also captures scenario building/development/analysis and is occasionally referred to as participatory visualization/visioning or storytelling–is being used in community-based climate change impacts, adaptation, and vulnerability (IAV) research in the Arctic, following steps outlined by Berrang-Ford et al. (2015) (Supplementary material (SM) Table 2 for definitions of key terms). Peer reviewed documents were identified through key academic databases (Web of Science, Scopus, PubMed, PAIS International and GreenFILE) (SM Table 3 for search terms). To select relevant grey literature, we first performed a search of Google Scholar, where the first 600 returned results were loaded into the reference management software (Zotero, version 4.0), followed by hand searching of key Arctic websites (see Fig. 1) (Haddaway et al., 2015). Inclusion and exclusion criteria were used to identify relevant studies (SM Table 4) and focused on capturing PSP studies that occurred in an Arctic community. Reviewed studies had to utilize scenarios, visioning, or projections to assess future vulnerability, impacts or adaptation strategies to climate change. The studies were also required to include some form of participation from community members or local decision makers. Key methodological limitations for this study include the limited ability to access information that is not publicly available online and the English-centric focus of the articles covered. Thus the paper may underreport the prevalence of studies based in European and Russian Arctic communities or specific regions such as, Nunavik in Northern Quebec. Study selection took place in three stages. Firstly, after conducting the initial web-based searches, duplicate sources were removed and the title of the source was reviewed. If clear exclusion criteria could not be met at this stage the source would move through to stage two, where a review of the paper abstract was used to determine suitability. Finally, a more in-depth review of the source (e.g. journal article or government report) took place to determine if inclusion criteria were met (Fig. 1). The review process was iterative and following this first round of searches we believed that some potentially key documents were still not captured. Consequently, snowball sampling of citations from articles were also added to the referencing management software and reviewed. An additional search of all academic databases and Google Scholar was also performed when the word “visioning” appeared in several relevant articles. This search term had not been included in the original search cycle.

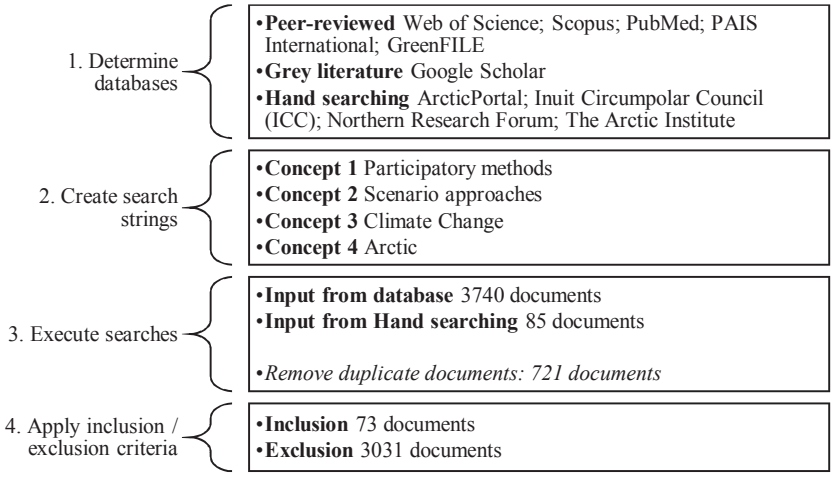

Fig. 1. Overview of systematic review methodology.

2.2. Analysis

2.2.1. Descriptive analysis

Seventy-three documents were retained for analysis. Of these documents a number referred to the same original study, and so the data of these overlapping studies were combined to create 43 total studies for review. A survey was created to systematically extract qualitative data, and information was extracted based on four key themes: (1) key document information including title and authorship, (2) basic information, including the location of the study and the date it took place, (3) methodology, including information regarding scenario creation, degree of community participation and use of traditional knowledge (TK), and (4) utilization of PSP approaches, which included the consideration of key drivers explored in scenarios (both environmental and socio-economic) and which key sectors were utilizing PSP (see SM for questionnaire). This database was exported into Microsoft Excel and used to calculate descriptive statistics including distribution of studies and frequency of occurrence counts as an overview of key trends and insight into methodologies.

2.2.2. Evaluation rubric

An evaluation rubric was then developed based on a review of the general PSP scholarship to examine the extent to which Arctic PSP studies have incorporated ‘best practices’ and ‘participation’ into research design. A review of nine key documents, from the general PSP literature, identified some best practice for PSP methodologies (See SM Table 6). Six key stages were consistently reported to underpin PSP work in diverse contexts:

1. *Context gathering*. Collecting background information on the current situation provides local context. Participation at this stage facilitates knowledge co-production and is particularly important where there are limited locally identified climate impacts based on broader climate projections.
2. *Identification of key trends and/or drivers*. The identification of key trends and/or drivers determines those changes perceived as most important in the community. Such drivers can be climatic (e.g. changes in precipitation) and/or non-climatic (e.g. loss of traditional land skills).