Working with Stakeholders to Increase Adaptive Capacity for Climate Change:

A Review of Relevant Workshop Methods

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1. Introduction

As climate change progresses, the need to build on adaptive capacity has become increasingly relevant in the renewable resources sector. One of the ways in which adaptive capacity is assessed and/or created in these sectors is through workshops with relevant stakeholders. This literature review examines the workshops that currently exist to build on adaptive capacity in order to prepare for climate change adaptation. It reviews the main points of adaptation workshops, stakeholder selection methods, workshop facilitation, the purpose of climate adaptation workshops, and the two main method types of adaptation workshops; participatory methods and futures studies.

The purpose of this literature review is to gather information to design a workshop for the research project Climate Learning and Adaptation for Northern Development (C-LAND) – a research initiative at The University of Winnipeg focused on building adaptive capacity in organizations partnered with Indigenous communities in Canada in the renewable natural resources sector. The information collected will help inform a stakeholder workshop that was originally planned for the winter of 2019, but will now be held in the fall of 2023.

2. Workshops

Rogers defines workshops as "academic structures of learning and knowledge dissemination" that can be used as a practical research method or as learning environments (2010, p.127). For Nygren, workshops are "deliberative meetings where a group of people analyze a focal issue, perhaps debate and hopefully comprise solutions, proposals or visions," (2019, p.29). According to Bartels et al. (2013), workshops are one of a range of methods through which to assess climate-related views, values, and stakeholder expectations.

A well-designed workshop typically meets client objectives, responds to a clearly identified purpose, and is crafted after reviewing a number of possible designs relevant to the specific context (Ackermann et al. 2011). To ensure a workshop meets its purpose, careful consideration

needs to be given to the tools and activities used within the workshop, and the stakeholders whom are chosen to participate (McEvoy et al. 2018; Kok et al. 2006; Bonsu et al. 2017).

Involving Local Stakeholders

Voinov et al. (2018) define stakeholders as "those who have a stake in the project." It can be useful to divide stakeholders into various groups in order to ensure that all relevant stakeholders are involved. Hertzog et al. (2014) divide stakeholders into three different groups: Local actors (also known as defenseless actors); decision makers; and influential actors. Kok et al. (2006) divide them into four groups: policy makers, business representatives, citizens, and experts.

There are various ways in which stakeholders can be selected to participate in a workshop. One approach is to categorize stakeholder groups according to their relative influence and power over facilitating or impeding policy reform design and implementation, and their interests or levels of engagement in a specific policy reform (Bonsu et al. 2017). According to these levels, stakeholders can be divided into primary, secondary, and tertiary stakeholders (Bonsu et al. 2017). Recruiting can also be less systematic; Carlsson-Kanyama et al. (2008) recruited through informal methods such as local advertisement and personal invitations, people who self-proclaimed to feel committed to their local society and who considered environmental and futures issues important. Ernst et al. (2017) call for a diversity of participants in a workshop to ensure that various interests, values, and belief systems are represented. Kok et al. (2006) follow this same technique, where stakeholders for their scenario workshop were not chosen only due to their occupation, but also according to their age and gender in order to maximize the diversity of the group.

Including diverse stakeholders in the climate adaptation process has become a key aspect of building on adaptive capacity, particularly at a local level. The inclusion of practitioners beyond the science community leads to the creation of knowledge and actionable science useful for climate change adaptation (Leith and Vanclay 2015; Bartels et al. 2013). Pearce-Higgins et al. (2022) state that stakeholders may have varying visions of what climate change adaptation should look like. According to Bartels et al. (2013), thoughtful design of stakeholder engagement

in a workshop can strengthen adaptive capacity within communities. However, effective participation cannot always be expected immediately. Facilitating and encouraging more participation depends on the confidence-building and trust that is present between researchers and the local stakeholders (Voinov et al. 2016). One way to increase this trust is to include stakeholders at all stages of the process, which ensures that their interests, beliefs, and values are treated fairly and are incorporated at all levels of the workshop (Stocker et al. 2012). Additionally, including coordinators from local communities in this process may "help facilitate gaining trust," (Basel et al., 2020, p .3). Teodoro et al. (2021) find that participation amongst stakeholders can help create social connections between diverse stakeholders.

Sharing knowledge on climate change and climate adaptation with stakeholders can be a challenge. Bartels et al. (2013) outline that when appropriate climate adaptation responses are shared with stakeholders, researchers should aim to share this knowledge in a way that "transcends disciplinary boundaries, embraces uncertainties, and incorporates diverse cross-scalar stakeholder interests," (p. 53). It is also recommended that researchers focus on being more problem-oriented in order to produce knowledge that is relevant to complex decision-making situations, which more immediately meets stakeholder needs (Bartels et al. 2013; Leith and Vanclay 2015).

Workshop Facilitation

The way in which a workshop is facilitated can shape its outcomes (Reed et al. 2013; Dufva & Ahlqvist 2015). Facilitators play an important role in ensuring that the opinions of stakeholders that hold more power do not dominate the discussion (Stocker et al. 2012; Ernst et al. 2018). Facilitation methods can have positive impacts on workshop results; in Wallin et al.'s (2016) participation research workshop, the facilitation method used allowed participants to increase their capacity to understand other perspectives and the ability to learn from others. When more than one facilitator is present, not ensuring that facilitators are using the same methods can lead to unintentionally different results (Dufva & Ahlqvist 2015). In order to avoid this, facilitation training, specifically in regards to how to facilitate a group of heterogeneous stakeholders, is a valuable step to ensure consistency in the facilitation methods (Kok et al. 2016).

Facilitation styles can also influence feelings of trust (or distrust) in the capacity to tackle a problem through the workshop process, which can affect the outcome of the workshop (Tavella and Papadopoulos 2015). For example, contributing to the workshop process itself as a facilitator can be seen as invasive, however if the participants feel that the facilitator also has a personal interest in the outcome of this workshop, distrust is less likely (Tavella and Papadopoulos 2015). Tavella and Papadopoulos (2015) recommend that by balancing the use of facilitation roles to manage social processes, complexity of content, and substantive expertise, successful facilitation can be achieved.

Facilitators also present an opportunity to gather data throughout a workshop. Kok et al.'s (2006) workshop required the facilitators to write a 1-3 page report on the group process of both a storyline activity and a discussion activity.

3. Workshops for Climate Adaptation

The workshop methods featured in this literature review are focused on climate change adaptation (van Vliet and Kok 2015; Stocker et al. 2012; Salvini et al. 2016; Thomas et al. 2018; Clarke et al. 2013; Sautier et al. 2017). These workshops often include stakeholders, and as a result, they use participatory methods to engage these stakeholders in workshop processes (Bartels et al. 2013; Carlsson-Kanyama et al. 2008; Robinson et al 2011; Stocker et al. 2012; Clarke et al. 2013; Moskwa et al. 2018; Picketts et al. 2012).

Teodoro et al. (2021) state that "stakeholder participation is becoming commonplace in climate change adaptation" (p. 7). Workshops serve as a method through which to include stakeholders in climate adaptation planning, as well as engage them in promoting greater understanding and awareness of climate change and its impacts (Clarke et al. 2013; Picketts et al. 2012). According to Picketts et al. (2008), including stakeholders in adaptation planning leads to better overall results because community members possess important local knowledge, it encourages future buy-in and support for implementation, and the public is more likely to listen to local stakeholders than external experts.

While it is beneficial to include stakeholders within workshop processes, there exists challenges. It is important to be open and willing to navigate the concerns, interests, and suggestions of diverse working group participants (Bartels et al. 2013). Preparing for this includes careful preparatory planning, and ensuring that the tools and methods chosen for the workshop meet the ethical and social needs of chosen stakeholders (Bartels et al. 2013; Voinov et al. 2018). Another challenge that can occur throughout a stakeholder workshop is the accomplishment of what is asked of those participating in the workshop. Many methods and tools used within a workshop have never been utilized by present stakeholders, and as a result, many may require more time to complete the tasks than what is given by the facilitators (van Vliet and Kok 2015; Priess & Hauck 2014). Such aspects need to be considered when planning workshops for stakeholder groups.

Through participatory methods, the purpose of the workshops is to create, alongside stakeholders, an outcome to structurally support and advance climate adaptation, such as creating policy (van Vliet and Kok 2015; Bond et al. 2015; Castleden et al. 2008; Havas et al. 2010; Shaw & Corner 2017; Ackermann et al. 2011; Wallin et al. 2016). These policy workshops use a variety of tools such as photovoice, visual methods, and futures methods such as scenarios, foresight, and narrative methods, to engage stakeholders in creating the appropriate policies for local climate adaptation (van Vliet and Kok 2015; Castleden et al. 2008; Havas et al. 2010; Petheram et al. 2012; Andersen and Andersen 2017; Shaw & Corner 2017; Moskwa et al 2018; Wallin et al. 2016). Involving local actors in policy-making has become recognized as an important practice in creating effective policies (Havas et al. 2010, Petheram et al. 2012). This section of climate adaptation workshops can be challenging for stakeholders who have never participated in policy-making processes previously (van Vliet and Kok 2015). Van Vliet and Kok (2015) suggest that in order to improve policy results, such policy-making processes should be continuous through ongoing implementation, monitoring, and evaluation with involved stakeholders.

4. Common Methods in Climate Adaptation

Methods are defined as "a structured set of processes and activities that include tools, techniques, and models, that can be used in dealing with a problem or problem situation" (Voinov et al. 2018, p.233). Throughout the literature on workshops concerning climate change adaptation involving stakeholders, two specific types of workshop methods continuously re-appeared; participatory methods and futures studies methods. In this next part, we review these two categories of methods used to foster climate adaptation. Note that the various methods, tools, and activities mentioned in this section are not mutually exclusive; methods from each group are often applied together to ensure satisfactory workshop outcomes.

i) Participatory Methods

Stakeholder participation is considered a key part of climate change adaptation (Collins et al. 2009; Stocker et al. 2012; Bartels et al. 2013; McEvoy et al. 2018). Participatory methods in policy and decision making supports the fact that decision-making should be inclusive of external opinions and interests, especially when addressing complex problems which influence many groups and individuals (Wallin et al. 2016; Stocker et al. 2012). Wallin et al. (2016) differentiate between two types of participation: It can be instrumental (a means to an end), or transformative (an end in itself). In workshops that aim to increase the adaptive capacity of diverse groups of people, transformative participation is the ideal choice as it is a bottom-up approach that empowers citizens and communities through personal and social learning, and as a result, leads to democratic social change (Wallin et al. 2016). This next section will review the various ways in which participation takes place within climate adaptation workshops, and identify outcomes associated with each approach.

Participatory Adaptation Planning

Adaptation planning involves the participation of stakeholders in the planning processes for making communities more resilient to the effects of climate change (McEvoy et al. 2018;

Campos et al. 2016). According to Picketts et al. (2012), involving stakeholders in adaptation planning has proven to be successful for various reasons:

i. Community members possess important local knowledge of the unique social, environmental, and economic conditions of an area

ii. Engaging with local stakeholders promotes greater understanding and awareness of climate change and its impacts

iii. Working with a community encourages future buy-in and support for implementation

iv. The public is more likely to listen to local stakeholders than external experts

In order to involve stakeholders in such planning decisions, participatory activities such as role playing games, workbook exercises, dialogue sessions, and simulation models, are practiced within a workshop setting (McEvoy et al. 2018).

The popularity of adaptation planning has led to the creation of tools which can be used within a workshop, such as the Adaptation Planning Support Toolbox. This toolbox includes a climate adaptation app and an adaptation support tool which, when used alongside each other, can help stakeholders work together to find conceptual plans that work best based on various climate scenarios (van de Ven et al. 2016). Another tool, the Adaptation for Conservation Targets Framework, facilitates the incorporation of climate change into natural resource management (Cross et al. 2013). These tools, alongside the activities discussed below, create an opportunity for stakeholder involvement in climate change adaptation strategies, leading to better adaptation results within a community (McEvoy et al. 2018; Picketts et al. 2012).

Modeling

Participatory modeling (also known as PM) is "a technique for improving social and policy learning about social ecological systems" (Clarke et al. 2013, p. 95). Modeling allows researchers and stakeholders alike to take a subject that is complex, such as a natural system, and transform it into a simple conceptualization (Clarke et al. 2013; Robles-Morua et al. 2014). Halbe et al. (2020) suggest that PM may encourage "stimulating learning processes or promoting mutual understanding of stakeholders" (p. 60). This tool allows various stakeholders to collectively make decisions regarding, for example, resource management issues, and the tradeoffs between resources needed and the impacts of that resource's extraction, contributing to climate change adaptation capacity (Robles-Morua et al. 2014; Voinov et al. 2016). According to Voinov et al. (2018), PM methods generally have five stages:

i. Fact finding: Focuses on finding, generating and communicating data, information, and knowledge relevant to the problem being considered. This can be done through surveys, interviews, and even crowdsourcing.

ii. Process orchestrating: The organization of the PM process, which includes how it is organized, managed, monitored, and reported. This stage includes facilitation, and activities such as roleplaying and brainstorming.

iii. Qualitative modeling: In this stage, project participants build conceptual, visual representations of the components of the problem being considered, and identify, articulate, and represent the relationships among the many components of a problem. Tools like rich pictures, cognitive mapping, causal loop diagrams, cultural consensus, and decision tree analyses, are utilized to achieve these goals.

iv. Semi-quantitative modeling: In this stage, any collected data that is a mix of quantitative and qualitative is processed via fuzzy cognitive mapping, scenario building, social network analysis, or analytical hierarchy process.

v. Quantitative modeling: Quantitative data is transformed into models through various methods such as computer-based mapping framework, empirical modeling, and/or cost-benefit and other economic analyses.

Throughout a PM process, various levels of participation can be undertaken with local stakeholders. Local experts have the ability to provide data to be used by modelers, and at a higher level, stakeholders can be involved, through collaboration, at stages such as advising on key indicators or appropriate measurement techniques (Voinov et al. 2016). A very high level of participation will involve stakeholders at all levels of the process, including the identification of the problems(s), model design, parameter selection, data collection, data validation, up until the application of the model and the decision-making process once the data is obtained and analyzed (Voinov et al. 2016). Voinov et al. (2016, p. 198) recommend two specific considerations when making decisions regarding stakeholder involvement:

i. A PM process should always consider the reasons and intentions of stakeholders in becoming involved

ii. A PM process should consider the reasons and intentions of modelers (and other professionals) in suggesting and enabling involvement of stakeholders

Overall, PM is meant to, through collaborative learning, promote systems understanding and increase awareness for all stakeholders involved, which will lead to better and more informed management actions and policy decisions (Voinov et al. 2016; Voinov et al. 2018).

There exists a variety of PM methods, some of which include their own modeling tools. One of them is called the Systems Methodology (SSM), which 1) considers a problem, 2) expresses the problem using Rich Pictures, a freestyle mapping of the different elements of a problem, 3) develops conceptual models to represent possible actions to improve the situation, 4) compares models to the real world, 5) debates and identifies desirable and culturally feasible changes, and 6) takes action to improve the situation (Voinov et al. 2018). PM workshops have been utilized to improve on watershed management, improve impacts assessment processes, and even to model the causes, consequences, and solutions of the Flint Water Crisis, a water crisis in India, and territorial transformations in Amazonian floodplains (Robles-Morua et al. 2014; Bond

et al. 2015; Voinov et al. 2018). Voinov et al. (2018) acknowledge that there is often a lack of justification as to how PM methods are chosen for various projects, and that this needs to be improved upon.

Models are generally indicated as useful by stakeholders, as they allow for a visual representation of the subject at hand, and are able to integrate many perspectives in order to create a shared meaning of a subject (Robles-Morua et al. 2014; Voinov et al. 2018). However, they do pose some challenges: Modeling required a significant amount of resources to complete, and to sufficiently engage stakeholders requires a large time commitment; something that not all stakeholders have (Voinov et al. 2018). Even if participants may find models useful for informing a problem, there is not always enough trust in the model for it to be adopted and realized in real life (Robles-Morua et al. 2014).

Participatory GIS

A common method of participatory modeling is participatory GIS, or at times called participatory Google Earth Mapping when Google Earth is utilized in the process. Participatory GIS was first coined in the mid-1990's to describe when GIS is used as a tool for community engagement. It can be used to process quantitative and qualitative data (Stocker et al. 2012). This is especially used in local resource management and neighbourhood planning as it enables participants to analyze land and resource use issues, raise awareness of sustainability, and foster good governance (Stocker et al. 2012; Clarke et al. 2013). These maps can be used to visually conceptualize ecological, cultural, social, and economic values within a geographic area, which, once identified, can assist in making decisions regarding adaptation strategies (Stocker et al. 2012). Welling et al. (2019) found that scenarios utilized in GIS maps could align with concerns brought forth by stakeholders when maps incorporate potential additions made to land in the future (e.g., roads).

Participatory GIS can create positive results; in Stocker et al. (2012), GIS allowed participants to combine everyone's ideas without prioritizing one over the other, and in the end participants increased their self-rated involvement in sustainability and climate change activities. According

to Clarke et al. (2013), participatory GIS is useful for its ability to engage knowledge and decision-makers simultaneously, its ability to map both qualitative and quantitative data, and its ability to consider social, cultural, ecological and economic values without prioritizing one over the other. However, the time it takes to collect and input stakeholder knowledge into GIS or Google Earth Mapping is significant which, depending on the project, can cause obstacles (Stocker et al. 2012).

Problem Structuring

Problem structuring refers to "composing conceptual models (e.g. mind maps), creating, and negotiating views of the decision situation, its components, inputs and outputs in a systemic view and with the aid of an external group-learning expert" (Khadka et al. 2012, p.1). Problem-structuring methods have been created to facilitate modelling within group decision-making, with the purpose of identifying, modeling, and solving the problem at hand (Khadka et al. 2012). Smith and Shaw argue that compared to other problem-solving approaches, problem structuring offers a unique perception of problems and how to solve them (2019). Various methods exist to facilitate problem structuring, including stakeholder analysis, soft systems methodology, system dynamics, viable systems models, and scenario planning (Khadka et al. 2012; Marttunen et al. 2017). Not all problem structuring methods use models, however from Khadka et al.'s literature review, 40% of their sample utilized a modeler throughout the method (2012). Problem structuring methods have a positive impact as they allow participants to learn meaningfully by linking information gathered during the process with their existing knowledge. They have been shown to increase participant commitment to problem-solving, as well as knowledge exchanges between stakeholders within communities (Khadka et al. 2012). Gregory et al. (2020) note that problem structuring is suitable when there is "a plurality of stakeholder viewpoints" (p. 322). However, most approaches for problem structuring are time consuming, and the need for specific technology (computers; the internet) in order to complete the processes can become a limiting factor (Khadka et al. 2012).

Photovoice

Photovoice is a tool developed by Wang and Burris (1994), with the intention of using it as a participatory health promotion intervention in rural China (Carlson et al. 2006). Photovoice had four goals: "(a) to engage people in active listening and dialogue, (b) to create a safe environment for introspection and critical reflection, (c) to move people toward action… and (d) to inform the broader, more powerful society to help facilitate community changes," (Carlson et al. 2006). According to Castleden et al. (2008), photovoice utilizes photographs taken by participants (usually local community members) to engage participants (those with less power) and policy-makers (those with more power) in group dialogue to initiate change. It is based on the belief that giving those with less power a camera, will empower them to record and be the catalyst of change in their communities (Castleden et al. 2008). This participatory method has been utilized to build capacity in a variety of communities such as youth, minority groups, and seniors, it has covered a variety of topics, including resource management and climate change (Clarke et al. 2013). The method can be facilitated through a number of workshops (Carlson et al. 2006; Castleden et al. 2008). The photography involved in the photovoice method can lead to issues of ethics, and because only so much can be photographed, subjects not included in the pictures are not discussed (Castleden et al. 2008). Most evidently, the biggest limitation to photovoice is the need for the materials themselves that provide the pictures, which are central to the method (Castleden et al. 2008). However, photovoice provides a path for community empowerment, which can encourage community members to see themselves as part of the solution, and encourage them to take action as a result (Carlson et al. 2006; Castleden et al. 2008).

Role Playing

Role playing games (also known as RPGs) is a method that "uses an engaging narrative, character roles, practical and interactive challenges, room for collaboration and fantasy, and direct feedback to establish strong intrinsic motivation and a safe environment, fostering cognitive learning, collaboration and critical thinking" (Salvini et al. 2016, p. 114). RPGs are

utilized in environmental negotiation training, and for social learning and collective action for natural resources management (Salvini et al. 2016). Essentially, the purpose of the activity is to give the opportunity to various stakeholders to put themselves in others' shoes, and try to see the world from other people's perspective (Thomas et al. 2018). Workshops which utilize RPGs allow stakeholders to experiment with potential changes without incurring any financial losses (Fouqueray et al., 2022).

Not only has this method engaged the public in decisions about energy and natural resources, it has also been shown to empower marginalized groups, open new communication channels between groups, and encourage critical thinking about issues such as energy use and natural resources (Thomas et al. 2018). For example, Hertzog et al. (2014), in combination with scenario methods (a common combination) used an RPG called *Future of water in irrigated systems* to engage both decision makers and local actors in order to create a unified strategy about water management in Mali. Depending on which stakeholders are involved, participants can be divided into various groups, such as "decision makers", "local actors", and "influential actors", in order to ensure all relevant groups are included in the game (Hertzog et al. 2014).

RPGs do have their limitations; even if promising solutions are extracted from the method, it is not always possible for the local actors to play out these solutions in real life (Salvini et al. 2016). As always, time limitations are a threat, and as a result, the limited amount of knowledge that is transferred to participants can severely limit the potential of the method (Thomas et al. 2018). However, RPGs allow participants to act out future scenarios, which engages them in potential futures, and allows them to explore a variety of future strategies for addressing the issue at hand (Hertzog et al. 2014). They have also been shown to promote social learning, specifically socio-institutional learning (Salvini et al. 2016), and allows researchers to have a look into how participants utilize their own personal experiences to interact with other stakeholders (Thomas et al. 2018).

Visual Methods

A more recent development in participatory methods related to climate change adaptation has been the development of participatory visual techniques, such as diagramming, photography, video, GIS, and 3D landscape visualizations (Petheram et al. 2012). This category is not mutually exclusive from participatory GIS or photovoice, two methods discussed earlier in this text. According to Petheram et al. (2012), visual tools promote engagement and facilitate dialogue among local groups about relevant issues, and help communicate that local message to policy-related stakeholders. Examples of visual methods include 'the Fogo process', where participatory videos made by the people of Fogo Island, Canada, were used to open a dialogue between community members and Cabinet ministers about future land management options on the island (Petheram et al. 2012). Another example is the 'Flint Photovoice Project' where Flint residents used photographs from a photography project to communicate their concerns about neighbourhood violence to policy-makers (Petheram et al. 2012).

Overall, participatory methods use various tools to successfully realize one of the core necessities for climate adaptation – stakeholder involvement – to gather local knowledge and encourage a local increase in adaptive capacity.

ii) Futures Studies and Scenario Methodologies

Futures studies were inspired by Fred Polak, a Dutch historian who advocated for the importance of visionary images of the future in order to strengthen engagement and coordinated action among local stakeholders (Carlsson-Kanyama et al. 2008). Futures workshops have been attributed to Austrian futurist Robert Jungk, who developed the basic form of futures workshops to increase democratic participation and incorporate people whose lives are affected by specific decisions (Lauttamäki 2016). Such methods were utilized in the 1980s for workshops within the peace movement to develop images about a world without weapons, and inspire action among those involved (Carlsson-Kanyama et al. 2008). Overall, the purpose of futures workshops is to

produce, collect, and communicate views on potential future developments through participatory methods that involve stakeholders (Lauttamäki 2016).

Wollenberg et al. (2000) indicate four different methods for gaining information about the future: Creative visioning; projecting and forecasting; assessment of potential hazards; and exchange and dialogue methods. As a result, a variety of futures workshops exist, such as forecasting workshops, foresight workshops, scenario workshops, scenario planning workshops, and backasting workshops (Lauttamäki 2016; Nygren 2019). Workshops vary based on the methods that are used within the workshop, however they have commonalities such as the fact that they are participatory, and they employ future possibilities to inform policy decisions in the present day (Lauttamäki 2016; Nygren 2019).

In some of the literature, authors seem to use the words futures studies and scenarios interchangeably, even if in other cases, scenarios are a subcategory of futures studies. The relationship between scenario methods and future studies is not completely clear within the literature, however the confusion might be due to the fact that future studies methods generally require the use of scenarios about the future.

Scenarios are defined as “a description of a possible future situation, including the path of development leading to that situation. Scenarios are not intended to represent a full description of the future, but rather to highlight central elements of a possible future and to draw attention to the key factors that will drive future developments,” (Kosow & Gabner 2008, p.1). According to Wollenberg et al. (2000), scenario methodologies are participatory, and were partially developed and broadly used by the Royal Dutch Shell Corporation to anticipate future events and adjust to such futures.

Today, these methods are used in workshops. Scenario workshops are broadly defined as “a local meeting that includes dialogue among four local groups of actors: policy-makers, business representatives, experts, and citizens,” and are usually guided by a facilitator (Andersen & Jaeger 1999, p.332). The involvement of stakeholders in the creation of scenarios is crucial, as it improves decision making through ensuring that local priorities, norms, and institutions are represented in the scenarios (Beach & Clark, 2015).

In scenario methodology, according to Kosow and Gabner (2008, p.14), there are three different views about the future, and how the future relates to the present, that can be distinguished:

1. The future is predictable: Whatever will come to pass in the future can (in principle at least) be calculated from our knowledge of the present and past.

2. The future is evolutive: Our present knowledge is taken to be inadequate for predicting future developments; the future follows a chaotic, uncontrolled, and random path.

3. The future is malleable: The course of future events is not predictable, but neither is its development fully chaotic.

These three views of the future have led to the definition of two classes of scenario methods: exploratory methods (what could happen?) and normative methods (what should happen?) (Vergrat & Quist 2011; Cotton 2013). The following section of this literature review will be divided into these categories, as well as review case studies where both exploratory and normative methods are combined.

Exploratory: What could happen?

Forecasting

Forecasting emerged before the 1970s, where exploring normative futures was known as normative forecasting (Vergragt & Quist 2011). It is normally associated with prediction, and uses quantitative models that start in the present and infer into the future (Kok et al. 2006). Forecasting is best used for setting goals in technology development, and it eventually led to the development of backasting, which was more focused on sustainability (Vergragt & Quist 2011). Backasting is discussed further in the following section.

Foresight

Foresight emerged as a systematic and participatory method to address the policy-making challenges associated with the large-scale, global impacts of emerging technological, economic, societal, political and environmental trends (Havas et al. 2010; Dufva & Ahlqvist 2015). According to Havas et al. (2010), this policy tool highlights the possibility of shaping futures, allows for more flexibility in policy-making and implementation, broadens perspectives, and encourages thinking outside the box. A typical foresight process involves stakeholders exploring possible futures through scenarios, roadmaps, visions, or recommendations for future actions, in order to understand the consequences of present-day actions (Dufva & Ahlqvist 2015).

A core feature of foresight is scenario building, as foresight looks at the potential futures which may occur through scenarios (Ortiz-Miranda et al. 2022). For example, a foresight workshop was used to address potential future water management issues in Mali, and in order to ensure participation, a role playing game named FOWIS, where different scenarios were set forth to stakeholders, was utilized to explore potential futures (Hertzog et al. 2014). To ensure success in the foresight process, Andersen and Andersen (2017) emphasize that the creation of relationships, specifically public-private partnerships, ensures its success in terms of policy-making. Dufva and Ahlqvist (2015) argue that knowledge creation takes place between stakeholders throughout the foresight process. Lacroix et al. (2019) state that foresight practices encourage future collaboration between stakeholders by networks that are formed from these types of practices.

Minkkinen et al. (2019) analyzed six different ways that foresight could be framed as a means of forming a standard typology for foresight analysis, which were based on their degree of perceived unpredictability and the level of pursued change. Minkkinen et al. (2019) describe perceived unpredictability as “openness to alternatives” (p. 5). The level of pursued change is described as considering varying combinations of both concern for other people and agency beliefs, which are “assumptions about the ability to influence future outcomes” (p. 3), when considering change as a different future (Minkkinen et al., 2019). The six frames that are considered for foresight analysis are predictive frames, scenaric frames, visionary frames, planning frames, transformative frames, and critical frames (Minkkinen et al., 2019). These

frames have varying outlooks on what futures can look like in foresight, for example, predictive framing looks at futures that are probable or abstract, while critical framing looks at futures that are considered possible or lived futures (Minkkinen et al., 2019). Minkkinen et al. (2019) state that these six frames can act as a basepoint for foresight analysis.

A foresight workshop was conducted regarding narratives on climate change adaptation in the Gulf of Morbihan in France, including twenty stakeholders in the process (da Cunha et al. 2020). This workshop enabled participants to collaboratively work together to design future narratives of their priorities regarding what adaptation could look like in the Rhuys Peninsula, which is located in the Gulf of Morbihan (da Cunha et al. 2020). da Cunha et al. (2020) utilized two chronotopes in their foresight workshop, which are defined as:

> Points in the geography of a community where time and space intersect and fuse. Time takes on flesh and becomes visible for human contemplation; likewise, space becomes charged and responsive to the movements of time and history and the enduring character of a people (p. 2).

Chronotopes and narratives were utilized in the foresight workshop, which were beneficial for climate change adaptation planning (da Cunha et al. 2020). Utilizing both of these methods for climate adaptation planning may "turn 'matters of fact' into 'matters of concern'" (da Cunha et al. 2020, p.10).

Scenario Planning

Scenario planning (or building, or exploration) is most appropriate when there is a high amount of uncertainty about the conditions of the future and the forces shaping that future are highly uncontrollable and rapidly changing (Biggs et al. 2007; Beach & Clark 2015; Daconto & Sherpa 2010; Voinov et al. 2018; Serrao-Neumann et al. 2019). The purpose of scenario planning is to create better planning for events that may be unpredictable, by preparing responses to a variety of different circumstances (Beach & Clark 2015). It also aims to empower stakeholders, encourage innovation, mitigate conflicts, encourage social learning, and integrate various types of knowledge into one project (Oteros-Rozas et al. 2015). Generally, scenario planning has been

implemented in policymaking processes which "support multi-stakeholder engagement" (Burt et al. 2021, p. 4).

The method of scenario planning uses qualitative, and at times quantitative techniques, combined with a series of workshops, to realize potential future scenarios that require planning (Daconto & Sherpa 2010; Beach & Clark 2015). These developed scenarios are then called "exploratory scenarios", as they are created to describe a variety of possible futures (van Vliet & Kok 2015; Biggs et al. 2007; Bonsu et al. 2017). Exploratory scenarios can be used to "test the robustness or adaptability of different actions, policies or strategies" (Serrao-Neumann et al. 2019, p. 2). Scenario planning is most often participatory, where stakeholders, frequently guided by researchers, are engaged in collaborative processes that allow them to investigate these potential alternative futures (Oteros-Rozas et al. 2015). For example, Burt et al. (2021) hosted a scenario planning workshop to analyze policies surrounding land use, woodland, and forestry, presenting four different scenarios to be discussed during the workshop amongst stakeholders. Reed et al. (2013) developed a framework for participatory scenario development, which can be applied to a variety of participatory scenario workshops.

Multiscale Scenarios – a form of scenario planning – can be used to understand scenarios across multiple decision-making scales, for example, at both a regional and a global level (Biggs et al. 2007). This type of scenario planning can help stakeholders understand changes at a global scale (a level they have little control over) in order to explore scenarios at the regional level, and build capacity at the level over which they have more control (Biggs et al. 2007).

Policy scenario methodology was created by Wright et al. (2020) as a means to provide a structured method of forming policy with the needs of policymakers in mind. Wright et al. (2020) state that this methodology outlines issues which may be considered by policymakers, such as "ethical, legal, social, and economic issues" (p. 3). There are eight elements which Wright et al. (2020) suggest should be highlighted when utilizing policy scenarios, which are: policy need, plausibility, probability and credibility, expertise, objectivity, legitimacy, stakeholder engagement and consensus, and process and trust. Policy scenarios can be used to help determine which actions may be taken to reach a desired future, along with encouraging stakeholders to be committed in the total process of scenario making (Wright et al. 2020).

Ideally, policy scenarios are best used within a desired future that spans the next five to seven years (Wright et al. 2020).

Overall, scenario planning can be used to develop management goals for natural resources, provide a respectful way to apply traditional ecological knowledge and local knowledge in a planning process, and can help people with different perspectives collaborate and understand each other's points of view (Beach & Clark 2015). It has also been shown to increase adaptive capacity and identify policy recommendations to ensure sustainable development and climate adaptation (Biggs et al. 2007; Oteros-Rozas et al. 2015). Suchá et al. (2022) state that utilizing scenarios, specifically future scenarios, is imperative to climate adaptation planning, as this form of planning requires a "long-term, future-oriented approach" (p. 2). However, one disadvantage to scenario planning when considering climate adaptation is that it may not offer scenarios that are the best course of action to take; instead, this process often creates "a list of actions" (Butler et al. 2020, p. 17). Additionally, Butler et al. (2020) note that different views of time, including the past and the future, amongst stakeholders with different cultures may impact "local participants' conceptualisations of scenarios" (p. 17).

Normative: What should happen?

Normative scenarios

Normative scenarios are "goal-oriented descriptions of desired future events that facilitate both shared perceptions of possible futures among stakeholders, and learning about others' perspectives," (Bonsu et al. 2017, p. 2). Normative scenarios are "developed backwards from a desired future state" (Nikolakis 2020, p. 2). This type of scenario method can be used to help stakeholders co-produce recommendations and paths on how to achieve a desirable future (or, in other cases, avoid undesired futures) (Sarkki & Pihlajamaki 2019). Pinpointing this desired (or undesired) future can help "identify policy pathways and actions to achieve this end-state" (Nikolakis 2020, p. 2).

Backasting

Backasting is a method used to develop normative scenarios and explore policy decisions that need to be implemented in order to achieve a desired future (Bonsu et al. 2017). It involves "working backwards from a particular desired future end-point or set of goals to the present, in order to determine the physical feasibility of that future and the policy measures that would be required to reach that point," (Sarkki & Pihlajamaki 2019). As a result, backasting allows for the highlighting of strategies and policy actions that would be necessary to achieve the desired future (Bonsu et al. 2017). The presence of varying narratives between members surrounding a desired future incorporates social learning through backcasting methods (Nikolakis, 2020). Often, this method has been utilized as a "planning tool for environmentally sustainable business and market development" (Kunttu et al. 2021, p. 2).

Mixed Approaches

Combining exploratory and normative scenarios

The literature presents cases where exploratory and normative scenarios are combined in the methodology – a combination that is relatively new in futures studies (Kok et al. 2006; Biggs et al. 2007; Bonsu et al. 2017; van Vliet & Kok 2015). Bonsu et al. (2017) utilize both exploratory and normative scenarios to identify uncertain factors, all the while establishing the desired objectives. This allows for the possibility of testing desired objectives in their normative scenarios, in order to test the reliability of developed strategies (Bonsu et al. 2017). Van Vliet & Kok (2015) also used a combination of both scenarios; they found that exploratory scenarios influenced the backcasting process used for developing normative scenarios, and allowed for the identification of robust strategies to address the problem at hand. In their research to address watershed management, Kok et al. (2006) organized two separate workshops: In the first workshop, exploratory forecasting was used to construct three future scenario, and in the second workshop a backcasting exercise was applied to the developed scenarios.

According to Lauttamaki (2016), this type of combination has been formally named ACTVOD futures workshops. These workshops can be conducted within a day, and have three interlinking phases: the first is explorative, the second is normative, and the final one is about defining which steps will lead to the selected future (Lauttamaki 2016). This workshop, as described in Lauttamaki (2016), is easily accessible as it has a reasonable time demand, only uses paper and pen, and since it uses a uniform structure, the results can be compared to other ACTVOD workshops. However, improvements remain to be fulfilled in terms of making the ACTVOD structure more tailored to local and regional levels, and the design of the third phase – the action plan – requires more work once the workshop is complete.

Overall, scenario methods allow for the identification of potential policies and actions that can be implemented in order to reach a certain future (van Vliet & Kok 2015). However, there is also evidence that not everyone finds scenario methods useful, and that depending on a person's cognitive style (or a person's preferred way of processing), certain people will be more effective in participating in participatory scenario methods than others (Franco et al. 2013). Similarly, Nygren (2019) found that some participants who have not participated in scenario making processes before might be limited by the process. However, with a variety of participants, and with a scenario process that is clear, trustworthy, and seeks to utilize the information to benefit stakeholders, results can remain beneficial to all parties involved (Nygren 2019).

Additional Tools in Futures Studies

Narratives

Narratives have emerged as a tool in futures studies and futures thinking that has a lot of potential, as it allows for the deconstruction and reconstruction of current narratives to shape the future by utilizing the fact that humans use narratives to organize their experiences of time, to help participants make sense of possible futures (Milojevic & Inayatullah 2015; Moezzi et al. 2017). Miller et al. focus on the importance of narratives in building capacity:

> Narratives offer an approach to communicative strategies and practices that can help promote broader engagement and participation… Narratives offer a linguistic currency that is accessible to everyone… perhaps more importantly, narratives provide an avenue for people to explain what is important to them, and why it matters… Narrative can help enhance social learning and build social capacity for understanding and governing complex systems problems. (2015, p.67)

Narratives not only offer a way in which to communicate between stakeholders, they also offer stakeholders the opportunity to reorganize their own understandings of the past, present and future, and furthermore, offer a way to engage greater communities in climate adaptation (Moezzi et al. 2017; Shaw & Corner 2017). They also offer the potential to translate scientific data or other less accessible information to local stakeholders, and, from the other direction, allow for local knowledge and experience to be translated into policy-relevant data (Nilsson et al. 2017; Moezzi et al. 2017)

Workshop organizers and facilitators use various methods to develop narratives, including creating an interactive timeline (Bartels et al. 2013), and teaching local place-based storytelling (Robinson et al. 2011). Narratives work well within climate adaptation workshops because they provide a different type of data to work with, they provide room for emotional, psychological, symbolic, and cultural content, and overall, participants can interact with the abstract and complex phenomenon of climate change in a way that is more subjective and recognizes the lived experiences of participants (Moezzi et al. 2017; Shaw & Corner 2017). t Marschütz et al. (2020) propose that "narratives can connect factual happenings in a place (specific climate impacts) with people's values" (p. 2). A downside of narratives is their limited ability to share scientific data about climate change, and without a further action plan, they do not necessarily result in action to address and adapt to climate change (Shaw & Corner 2017).

Role Playing

In futures studies, role playing as an activity allows for participants to have the opportunity to imagine and explore different realities by putting themselves in others' positions in different

scenarios (Thomas et al. 2018). As a result, participants have the opportunity to feel more free to voice their opinions, and enhance their learning, interest, motivation, and participation by making the relevant scenario more concrete through their participation in playing the role (Thomas et al. 2018). As was mentioned earlier, Hertzog et al. (2014) used role playing in their watershed management workshop through a game named FOWIS, where seven people played the role of farmers who used irrigated water, and one person played the role of the irrigation planner. This was played out in various potential future scenarios, and in the end, fostered better planning related to watershed management (Hertzog et al. 2014). Fleming et al. (2020) found exercises that incorporate role play are often viewed as "more like conversation starters" (p. 9).

Visualization/ Visioning

A range of visualization techniques have been used to communicate scenarios to stakeholders (Reed et al. 2013). For example, in their workshop concerning future land-use scenarios, Priess and Hauck (2014) harnessed virtual maps to visually demonstrate four different pathways into the future. Other visualization techniques include georeferenced 3D visualization techniques, GIS, Google Earth, Cinema 4D, photographs, hand drawings, 2D maps, videos, and virtual reality (Tobias & Buser 2016; Nalau & Cobb 2022). Tobias and Buser (2016) note that real-time visualizations can be advantageous for encouraging participation and providing common basis for workshop discussions, however overall, they find that visualization is not essential for stimulating new ideas in workshops, and that some of the tools are not accessible to all groups conducting workshops.

It is important to note that this large variety of workshops shows that though futures workshops are quite common, there are no widely shared practices and/or guidelines when it comes to designing and facilitating such workshops (Nygren 2019). As a result, futures workshops can be adapted to their individual cases, however it does make it difficult for new practitioners who are beginning to apply these methods (Nygren 2019). Nevertheless, futures workshops are incredibly useful when it comes to climate adaptation, as they allow stakeholders to clearly articulate preferred futures, provide tools to plan and take action in realizing that future, and foster learning for the stakeholders involved (Bodinet 2018; Wollenberg et al. 2000).

5. Conclusion

It is clear that a variety of methods exist to encourage local stakeholders and decision makers to interact in order to find collective strategies for climate change adaptation and increasing adaptive capacity. Experts have been utilizing these methods to build on adaptive capacity for decades, and as climate change continues to progress, this field of study will continue to grow and become more relevant in academia. However, it is also clear there is no simple guide that exists to facilitate the design of workshops that employ these methods, nor are there guidelines to assist researchers in choosing which method works best for their project.

This literature review is indicative of the need for experts in climate adaptation workshops to come together and create a guide in order to make such workshops more accessible to academics and other relevant stakeholders currently in the process of building adaptive capacity. Nevertheless, the information collected in this literature review provides an adequate starting point in order to design the stakeholder workshop that will be facilitated in the fall of 2023 for C-LAND at the University of Winnipeg.

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