University of Reading

Investigating the benefits of Participatory Scenario Planning for tackling social-ecological problems

PhD International Development

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Declaration

Declaration: I confirm that this is my own work and the use of all material from other sources has been properly and fully acknowledged.

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Abstract

Participatory scenario planning (PSP) is a method in which diverse groups of participants imagine alternative narratives of plausible future events, conditions and trajectories. Researchers and practitioners commonly regard PSP as a useful method for tackling social-ecological problems (SEPs) by incorporating the knowledges of different stakeholders in dialogue to help build a holistic understanding of them. However, within PSP practice in the field of social-ecological resilience the literature is imprecise on the benefits it may have for those whose knowledge it incorporates. Seminal critiques of participation indicate that the outcomes of participatory processes typically reflect the interests of those who initiate them. This doctoral research therefore investigated the benefits PSP may have for those whose knowledge it incorporates. My analysis focused on learning, given the emphasis in the literature on using PSP to facilitate dialogue between participants with different knowledges.

I collected data from: a critical review of 23 cases of PSP described in the peer-reviewed literature, semi-structured interviews with PSP practitioners, and two case studies of PSP processes. I analysed this data to explore: 1) the expected and reported benefits of PSP; 2) how and under what conditions learning occurs; and 3) how and why learning varies. To understand learning in PSP, I developed an innovative conceptual framework, built on a seminal learning theory, the 'Zone of Proximal Development'. This postulates that learning occurs through interactions between different participants, which enable them to push beyond their usual range of thinking.

My analysis indicates that learning is the most commonly expected and reported benefit associated with PSP. I reason that PSP stimulates learning by prompting focused discussions, which expose participants to different assumptions about the future. PSP thus encourages creative, focused thinking, that can help participants to push beyond their usual range of thinking. I found that learning varies according to participants' relative prior expertise in specific topics, social and economic backgrounds, previous experience (if any) of PSP, and the design of specific PSP processes. I reason that learning varies because of the relative extent to which different participants consider the knowledge encountered in PSP to be relevant to their interests, as well as developed through a fair and unbiased process. This perception is strongly influenced both by facilitators and the objectives of wider projects in which specific PSP processes are embedded. I conclude that, although PSP can be a useful method for learning, there is a need for more robust governance to ensure critical reflection and evaluation of the use of PSP in this context.

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For Toby the dog, whose love of the world inspired me to study it.

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Chapter 1 – Introduction

1.1 Introduction

The recent, influential review of participatory scenario planning (PSP), by Oteros-Rozas et al. (2015), indicates that in the past 25 years PSP has become increasingly popular as a method for addressing complex problems in social-ecological systems (SES), primarily by bringing diverse stakeholders into dialogue. Complex, uncertain and destructive problems have emerged because of unsustainable relationships between society and the environment, and require new ways of thinking and doing if they are to be tackled effectively. However, the actual benefits PSP may have for tackling complex problems in SES are poorly understood. In particular, although Oteros-Rozas et al. (2015) indicate PSP is for encouraging learning, there is limited understanding of what such learning entails, how it occurs, and how and why it varies between different stakeholders in PSP processes.

As Steffen et al. (2015) observe, industrialised societies have typically pursued rapid socio-economic growth at the expense of environmental sustainability. Human activities are therefore threatening the earth's ability to produce the services on which society depends (Boyd and Folke, 2012). Indeed, as warned by Rockstrom et al. (2009), global environmental change is occurring at an unprecedented pace and is likely to have catastrophic impacts on a global level, as the Earth's ability to support humanity is increasingly threatened. Crutzen and Stoermer (2000) suggest humanity has become such an influential force that the Earth has entered a new geological epoch, known as the 'Anthropocene'. In line with this recognition of humanity's extensive influence on the environment, Folke et al. (2010) argue that society and environmental systems should be understood as coupled social-ecological systems (SES).

Unsustainable and inequitable conditions in SES have created complex and uncertain problems, such as climate change, biodiversity loss, and food insecurity, which Wilkinson and Eidinow (2008) refer to as 'wicked problems'. Wicked problems, first conceptualised by Rittel and Webber (1973), are described by Balint et al. (2011) as large-scale, long-term problems, that combine multiple, compounding threats and uncertainties, with distinct, conflicting public values. I refer to these problems as social-ecological problems (SEPs) to distinguish my focus on problems in social-ecological systems.

If SEPs continue unchecked, they are likely to have severe, negative impacts for both humanity and natural environments, now and in the future. As such, these problems urgently

need to be addressed, but their complexity, compounded by uncertainty about the future, makes this particularly difficult. This has led to calls for new ways of tackling SEPs, which involve the participation of stakeholders with different types of knowledge. For example, Balint et al. (2011) argue that the complexity of SEPs, and the divergent ways of understanding them, call for participatory processes that facilitate dialogue between different stakeholders. Similarly, Wilkinson and Eidinow (2008) reason that to effectively tackle SEPs, approaches are required that take a holistic perspective to understanding SES, incorporate diverse knowledges and link knowledge with practical action at multiple spatial levels. This reflects the theory of change put forward by Lewin (1997), which posits that behaviour within a system is contingent on the general institutions in which groups and individuals are embedded. Thus, Lewin argues that building a holistic understanding of the broad context in which change is needed, is a prerequisite for developing and implementing specific actions towards that change.

'Futures thinking' tools, such as 'horizon scanning,' (Sutherland and Woodroof, 2009) 'Delphi technique,' (Mukherjee et al., 2015) and 'scenario planning,' (Wilkinson and Eidinow, 2008) are often posited as methods that can help facilitate dialogue between different stakeholders, by exploring how the future could turn out, with the aim of tackling SEPs. Participatory scenario planning (PSP), in particular, has received significant attention among researchers and practitioners, as a tool for helping to deal with SEPs. In their recent review of PSP, Oteros-Rozas et al. (2015) indicate that, in the authors' extensive collective experience, the rationale behind PSP is often to 'integrate different types of knowledge,' (p.33). They describe it as a process in which stakeholders collaborate on the development of alternative, plausible accounts of potential future events, conditions and trajectories. PSP is thus advocated as an effective method for incorporating the diverse knowledges of different stakeholders, thereby facilitating dialogue that can inform decision-making and action to create more sustainable conditions in SES.

However, as Patterson et al. (2017) contend, ideas about how sustainable futures should turn out are socially constructed, and therefore contested and political. As one prominent critic of participation, Kothari (2001) observes, participatory processes commonly reproduce existing social structures, which means they often privilege the knowledges of some actors over others. Cornwall (2008) thus states that the outcomes of participatory processes typically reflect the interests of those who initiate them. This has important implications for the use of PSP to help address SEPs. Patterson et al. (2017) highlight that questions regarding how sustainable futures might look, and who gets to decide this, are commonly overlooked in participatory processes

pertaining to help tackle SEPs. In this Doctoral thesis, I therefore set out to investigate the benefits PSP may have, for those whose knowledge it incorporates.

1.2 An introduction to scenario planning

1.2.1 Methods for thinking about the future

Scenario planning is one of a range of methods that can be used to aid structured thinking about the future, although it has become especially prominent in the past 25 years. It sits alongside other 'futures thinking' approaches such as: 'backcasting,' 'Delphi technique,' 'horizon scanning,' and 'visioning,' which are outlined in Table 1.1, below.

Table 1.1 Description of methods for structured thinking about the future that have been used to help tackle SEPs.

Futures thinking method	Description	Purported benefits
Backcasting (Robinson, 1982)	Developing steps towards achieving desirable future conditions, by working backwards from the future to the present.	Developing plans for how desirable futures can be achieved.
Delphi technique (Mukherjee et al., 2015)	Collection of experts' judgements on how a particular issue may develop in the future, using a structured questionnaire. Statistical analysis is conducted on the responses. Participants are then asked to review their responses. After several rounds of reviewing, the median of the responses is used to forecast the future development of the issue in question.	Collecting expert knowledge for use in assessing complex issues. Assumed to reduce influence of social pressures, because participants do not meet face-to-face.
Horizon Scanning (Sutherland and Woodroof, 2009)	Systematically looking for threats and opportunities regarding how a particular issue may develop in the future. Involves: scoping the issue, gathering information, identifying signals and observing trends, developing responses to how these trends will develop in the future.	Identifying foreseeable threats and opportunities. Selecting which threats and opportunities are most worthwhile studying and preparing for.
Scenario Planning (Van der Heijden, 1996)	Developing plausible narratives of future events, conditions and trajectories.	'Embracing' future uncertainty. Developing a more holistic understanding of complex systems and the relationships within them.
Visioning (van der Helm, 2009)	Developing ideological expressions of how desirable futures should look. Usually developed to contrast with undesirable elements of the present.	Developing visions of desirable futures is believed to help stimulate action towards achieving them.

Source: author construct

Scenario planning is not the only one of these tools to have been applied to tackling SEPs. There is evidence for the efficacy of backcasting (Robinson et al., 2011), Delphi technique (Mukherjee et al., 2015) horizon scanning (Stanley et al., 2015), and visioning (Sheppard et al., 2011). Additionally, there are cases in which combinations of scenario planning and other futures methods have been used, including: scenario planning with backcasting (Palacios-Agundez et al., 2013), scenario planning alongside visioning (Sheppard et al., 2011), as well as scenario planning in combination with Delphi technique and backcasting (Badjeck and Diop, 2011). However, as will be seen in Section 1.2.5, PSP has become particularly prominent. As such, it is the use of scenario planning that is the focus of this research.

1.2.2 Origins of scenario planning

Scenario planning (SP) was initially developed by the US military as a tool for planning potential strategies in the Cold War (Bradfield et al., 2005; Schoemaker, 1993). It was later adapted for use in corporate strategic planning, initially and most successfully by the Royal Dutch/Shell oil company, to help anticipate and respond to possible future threats and opportunities (Van der Heijden, 1996; Wack, 1985). Royal Dutch/Shell famously responded more successfully to the 1973 'Arab Oil Crisis' than their competitors, because they had already anticipated a similar eventuality using SP and considered how they would respond. As a result of this success, Bradfield et al. (2005) observe that the number of major corporations using SP doubled within just two years, and the approach became prolific in the business sector by the early 1980s.

In the world of corporate strategic planning, SP has purportedly been a highly beneficial method. According to the prominent SP scholar, Van der Heijden (1996), it is useful for helping organisations to react quickly and effectively to change. He suggests SP helps achieve this through helping organisations to develop a broader awareness and understanding of their environment, the causal relationships within it, and how well they fit into it. Another authoritative figure, Schoemaker (1991), explains SP is useful because it explores both the trends and uncertainties of an issue in a holistic and systematic way, rather than just predicting the most likely future. Likewise, Wack (1985) explains that SP helps to deal with uncertainty by breaking down the vast and complex array of future conditions into coherent narratives of alternative plausible futures. In a more recent review of SP, Amer et al. (2013) explain that this holistic and systematic approach helps organisations to appreciate drivers that may be considered insignificant, but

subsequently become highly influential. However, the apparent success of PSP in the corporate world, does not necessarily mean it has the same benefits in environmental contexts.

1.2.3 What is scenario planning?

In their review of SP techniques, Bradfield et al. (2005) point out that there is little consensus regarding definitions, characteristics and methodologies of doing SP. Indeed, a variety of definitions exist regarding what a 'scenario' is. In his influential paper on the conceptual foundations of SP, Schoemaker (1993 p.195) defines scenarios as 'focused descriptions of fundamentally different futures, presented in a coherent script-like, or narrative fashion'. Another prominent SP scholar, Van der Heijden (1996 p.195) defines scenarios as 'internally consistent and challenging narrative descriptions of possible futures'. Like Schoemaker, he views scenarios as narratives, but emphasises internal consistency and plausibility. Another influential voice in SP discourse, Schwartz (1998 p.4) defines a scenario as: 'a tool for ordering one's perceptions about alternative future environments in which one's decisions might be played out'. He thus emphasises the role of scenarios for decision-making.

Although these, and other, definitions each present scenarios in different ways, two commonalities can be found between them. Firstly, they all emphasise that SP considers *multiple*, alternative futures, rather than predicting a single, definitive future. Schoemaker phrases this as 'fundamentally different futures'; van der Heijden as plural 'futures'; and Schwartz as 'alternative future environments'. Secondly, they all highlight the importance of plausibility in scenarios. Schoemaker describes this in terms of coherence, whilst van der Heijden describes it in terms of internal consistency. Schwartz's emphasis on decision-making also implies a need for plausibility, so that the robustness of future decisions may be tested, realistically. In the context of this research, I therefore consider scenarios to be narratives of alternative, plausible, future conditions. However, this definition is quite broad and does not fully explain what scenario *planning* is. Defining SP is made more complicated by the array of different approaches that exist for practicing it. In the next section I consider four typologies of SP and then define what type of SP is of most interest for this research.

1.2.4 Types of scenario planning

Several scholars have developed typologies of different approaches. I examine four influential examples below, in the chronological order in which they were published.

i) **Types of SP suggested by Van Notten et al.** The typology developed by van Notten et al. (2003) is based on three broad themes that influence the design of SP processes. Firstly, they delineate SP according to the project objectives, which range from exploring what could possibly happen in the future, to testing the potential future implications of specific actions and policies. Secondly, they delineate according to the collection and use of data in SP, which ranges from qualitative data and participatory data collection to quantitative data and desk-based data collection. Finally, they distinguish between complex scenarios, featuring a wide range of interacting variables, and simple scenarios that focus on a niche subject.

ii) **Types of SP suggested by Bradfield et al.** Bradfield et al. (2005) frame their typology around three different schools of thought, in SP, that have developed at different times and in different places. First, they describe 'Intuitive Logics,' the original SP techniques developed by the US military and Royal Dutch/Shell. This involves constructing scenarios by exploring how drivers developed in the past, how they might develop in the future and how they might shape future events, conditions and trajectories. Second, they outline Probabilistic Modified Trends, which aim to account for the problem that extrapolating trends into the future does not account for what might happen if those trends are modified by unforeseen drivers and events. Finally, they describe *La Prospective*, which focuses on using computer-based mathematical models to inform public policy and shape the future in ways that are supposedly beneficial for society.

iii) **Types of SP suggested by Borjeson et al.** Like van Notten et al., Borjeson et al. (2006) base their typology around the theme of the project objectives, but they frame this in terms of the questions that underpin SP processes. Firstly, they suggest a category of 'predictive' SP, based on the question: 'what will happen?' These processes tend to use quantitative data and focus on the most likely future. Secondly, they propose SP may be 'exploratory,' based on the question of 'what could happen?' These processes commonly explore several, alternative futures. Finally, they suggest there are 'normative' SP processes, based on the question:

'how can a specific, desirable end-point be reached?' These can consider how current conditions may be preserved, or they may focus on how to make them more desirable.

iv) **Types of SP suggested by Wilkinson and Eidinow** Wilkinson and Eidinow (2008) focus specifically on SP in social-ecological contexts. They categorise approaches to SP into those focused on problems and those focused on actors. They suggest *problem-focused SP processes* assume that the future is knowable and that a more accurate understanding of the future is necessary to make better decisions. As such, they project historical trends into alternative futures. They describe *actor-focused processes* as dealing with the different understandings and relationships actors have regarding the environment. These processes subsequently involve the participation of multiple different actors to deliberate on a common issue. Wilkinson and Eidinow go on to argue that neither of the above categories pay sufficient attention to the epistemologies underpinning SP processes, for tackling SEPs. They therefore propose a new, integrated approach, which they call 'Reflexive Interventionist Multiple Actor' SP. They explain that this approach emphasises the inclusion of diverse epistemologies in SP and aims to change the way people understand how the future is created, rather than just responding to potential future events.

The literature on scenario planning for tackling SEPs typically shows limited engagement with these typologies. There is therefore much scope for critical reflection on how they could be utilised by practitioners of scenario planning. Such debates are beyond the scope of this thesis, but it is important, nonetheless, to clarify what types of SP are of most interest in this research. I therefore use these typologies to outline which types of PSP appear to be used for addressing SEPs, below.

Oteros-Rozas et al. (2015) explain that scenario planning for tackling SEPs is commonly used in a participatory way, with the aim of incorporating diverse knowledges. The participatory approaches described by van Notten et al. (2003), and the 'Reflexive Interventionist Multiple Actor' approach set out by Wilkinson and Eidinow (2008) are therefore of particular interest.

Star et al. (2016) indicate that scenario planning processes in the context of SEPs are frequently distinguished according to whether they take an exploratory approach or a normative one, according to the typology of Borjeson et al. (2006). As Star et al. (2016) point out, PSP

processes in this context increasingly incorporate both exploratory and normative elements. However, they are distinctive approaches. Exploratory, or plausibility-based approaches explore plausible future events, conditions and trajectories in an open-minded way, and analyse them to assess the consequences of different possibilities (Star et al., 2016; Wilkinson and Kupers, 2014). For example, Brown et al. (2016) take an explorative approach to explore how the future is anticipated from the perspectives of different stakeholders, and then test the robustness of different strategies for adaptation. Normative approaches, on the other hand, explore participants' preferred futures and identify actions that need to be taken to realise them (Star et al., 2016). For example, Palomo et al. (2011) developed normative scenarios to identify and develop steps towards desirable outcomes for participants. As Peterson et al. (2003) observe, scenario planning is regarded as most useful in situations of substantial complexity and uncertainty, such as SEPs, in which relying on predictions of the most likely future can lead to a false sense of certainty that is blind to variability and surprise. As such, I do not consider predictive scenarios in this research.

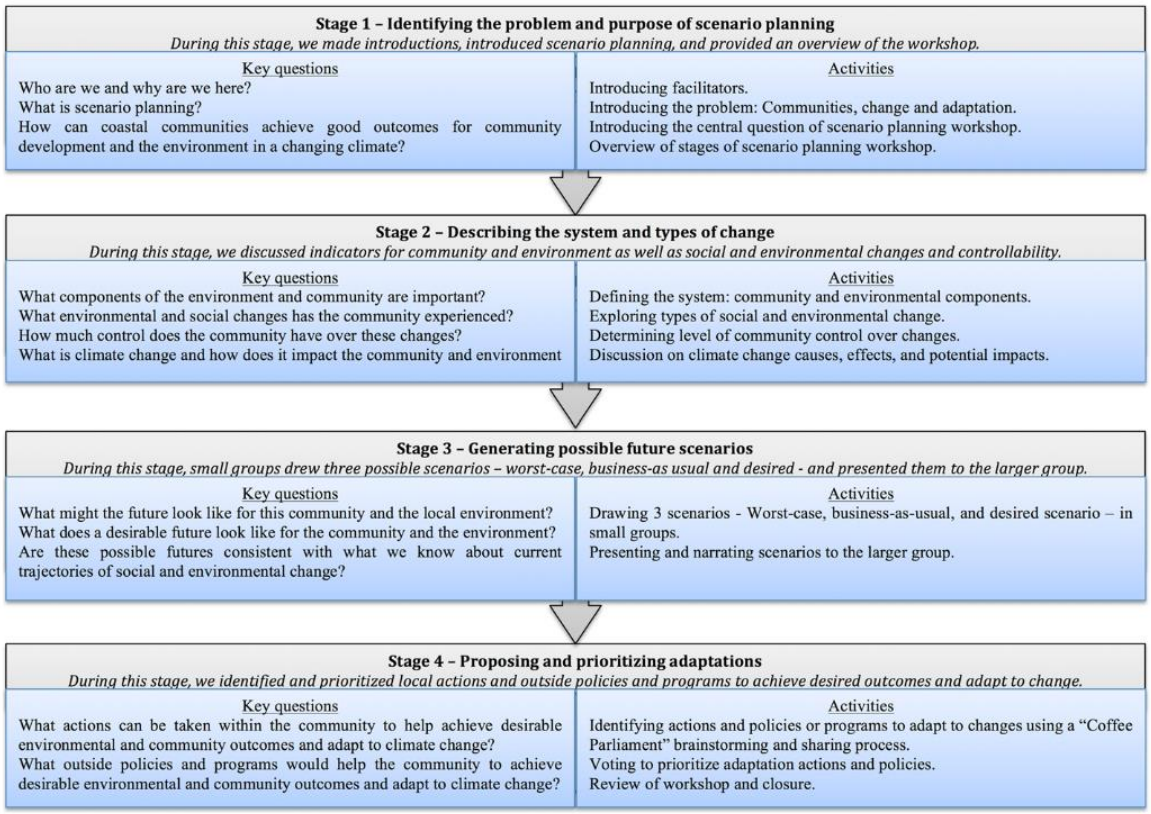
Johnson et al. (2012) indicate that the development of qualitative narratives is the aspect of scenario planning that enables the integration of different knowledges. However, as Oteros-Rozas et al. (2015) point out, scenario planning often incorporates qualitative and quantitative information. My main focus is, therefore, on processes that have qualitative narratives at their core, but I also include processes that incorporate quantitative data.

In the literature on scenario planning for tackling SEPs, there is little reference to the different 'schools of thought' described by Bradfield et al. (2005), which makes it difficult to select a particular 'school of thought' to focus on. However, most examples appear to develop scenarios based on how different drivers might develop in the future. For example, Palacios-Agundez et al. (2013) explore the development of drivers in ecosystem management, while Tschakert et al. (2014) consider how drivers influencing community-level adaptation to climate change, could develop. This most closely reflects the 'Intuitive Logics' approach.

To summarise, although a range of approaches to doing scenario planning exist, I focus on the types of processes that I identified in the literature on scenario planning for tackling SEPs. This appears to include approaches that are explorative, as well as those that are normative. This also includes participatory approaches that involve the construction of qualitative narratives, and that reflect the 'Intuitive Logics' approach. Hereafter, I refer to these types of SP as 'participatory scenario planning' (PSP). I consider PSP to be interactive processes in which diverse groups of stakeholders develop multiple, plausible, qualitative narratives of future events, conditions and

trajectories, with a focus on tackling SEPs. I acknowledge that, whilst my analysis is comprehensive, it does not account for absolutely every iteration of scenario planning that could be used to address SEPs. Figure 1.1, illustrates what a 'typical' PSP process consists of, taken from Bennett et al. (2016b), who provide a detailed description of the method they used for PSP. However, it is vital to note that, as Bennett et al. acknowledge, PSP is frequently modified, to fit individual contexts. Hence, this should be taken as a representative, but not definitive, example of PSP.

Figure 1.1 – Illustration of a 'typical' example of a PSP process



Source: Bennett et al. (2016b p.1777)

The figure shows that PSP usually involves: identifying the social-ecological problem to be tackled and the purpose of PSP; exploring social-ecological systems and drivers of change; developing scenarios of plausible future events, conditions and trajectories; and using the scenarios to assess responses to the futures they describe.

1.3 Scenario Planning for tackling complex problems in SES

Reviews of PSP indicate that it has increasingly been applied to thinking about SEPs and has become widespread over the past 25-30 years. However, there is a lack of clear information regarding when it started to become popular, and exactly how widespread it has become. Reviews of PSP provide largely vague accounts of when it started to be used in tackling complex problems in SES. For example, Oteros-Rozas et al. (2015) suggest scenario planning has increasingly been applied to different contexts in environmental research over the past 25 years, but provide no indication of how much it has increased, or how this increase was triggered. Alcamo and Henrichs (2009) describe how a multitude of environmental scenarios processes have emerged in the past 30 years but provide no indication of exactly how widespread these processes are, or why they have emerged, specifically, in the past 30 years.

In their description of the historical context of PSP, Rounsevell and Metzger (2010) suggest the application of PSP techniques to complex problems in SES emerged with growing concerns for the state of the global environment in the 1970s. Similarly, Wilkinson and Eidinow (2008) suggest scenarios processes have been applied to environmental contexts since the late 1970s, as a result of increasing environmental concerns like water stress, ecosystem degradation, and air pollution. Many authors, including Bohensky et al. (2009), Malinga et al. (2013), and Plieninger et al. (2013), cite the prominent Millennium Ecosystem Assessment (MA) as their inspiration for using scenario planning. In its assessment report, the MA itself makes reference to previous global environmental scenario planning processes (Carpenter et al., 2005). They cite the models used in the *Limits to Growth* by Meadows and Club of Rome. (1972) as the first example of scenario planning being applied to environmental concerns.

As Ramirez and Wilkinson (2016) observe, practice and scholarship on PSP are increasingly fragmented along differences in approach, success criteria, methods and techniques. This research speaks primarily to PSP practice in the academic field of social-ecological resilience, much of which stems from the MA, in which PSP is typically used by researchers with a view to explore the complex dynamics of SES, influence decision-making, and foster learning (Oteros-Rozas et al., 2015). Literature on the use of PSP in this context demonstrates that it has been applied to a wide range of SEPs, including: sustainable energy production (Rivard and Reay, 2012), ecosystem service management (Malinga et al., 2013), climate change adaptation (Tschakert et al., 2014), food and nutrition security (Vervoort et al., 2013), conservation (Waylen et al., 2015), and land-use management (Swetnam et al., 2011). PSP has been applied at a range of spatial levels, including global (Carpenter et al., 2006; Kok et al., 2016), regional (Vervoort et al., 2013),

national (Bohensky et al., 2006), and local (Mistry et al., 2014), and in locations across the world, including Western Europe (Reed et al., 2013), Eastern Europe (Hanspach et al., 2014), South America (Brown et al., 2016), South East Asia (Bohensky et al., 2009), Australia (Pearson et al., 2010), Sub-Saharan Africa (Chaudhury et al., 2012), and the Arctic Circle (Wesche and Armitage, 2014).

In this field, reviews of the benefits PSP may have for tackling SEPs are limited, despite its apparent widespread use. This indicates a relative immaturity in PSP practice in the field of social-ecological resilience. However, reflection on the benefits of PSP in this field appear to be receiving increased emphasis. Indeed, Waylen et al. (2015) call for greater reflection on the benefits PSP may have, as well as its strengths and weaknesses, whilst the review by Oteros-Rozas et al. (2015) claims to be the first to synthesise information on the benefits of PSP from across different cases, in which PSP was applied to SEPs. They find that PSP encourages learning about possible future developments in SES and enables a 'shared understanding' through sharing different knowledge. However, it is notable that all the authors involved in the paper were themselves involved in the cases they wrote about. As such, they arguably had an interest in portraying PSP as beneficial. In the paper, the authors do not explicitly reflect on whose knowledges and interests are reflected in the shared understanding they report, or indeed on the extent to which different stakeholders actually buy into it. Equally, the authors do not detail exactly what learning involves, or how it occurs in PSP. Admittedly, the authors may have found it difficult to include such detail in a review paper on the general benefits of PSP.

As indicated in Section 1.1, PSP processes could replicate existing social structures, thereby privileging the knowledges of some actors over others (Kothari, 2001). The outcomes may thus be defined by those who initiate them, not by the participants themselves (Chambers, 1997). It is therefore important for research to assess the benefits PSP may have, for those whose knowledge it is claimed to incorporate. In this study, I contribute to understanding the benefits of PSP, from an independent, critical perspective. I do so by addressing the research aim and questions, set out below.

1.4 Research Aim and Questions

Research Aim

- **The aim of this research is to assess the benefits participatory scenario planning processes may have for tackling social-ecological problems.**

Research Questions

1. **What are the expected and reported benefits of participatory scenario planning?**
2. **How and under what conditions does learning occur through participatory scenario planning?**
3. **How and why does learning vary in participatory scenario planning?**

1.5 Thesis Outline

In this thesis, I contribute to understanding the purported benefits of PSP in the field of social-ecological resilience. I focus specifically on learning, given the emphasis placed on using PSP to incorporate the knowledges of different stakeholders in dialogue about tackling SEPs. I approach the research from a critical perspective on participation. This is informed by Kothari (2001), who contends that participatory processes commonly reproduce existing social inequalities, such that different knowledges are privileged over others. My research is therefore motivated by a need to understand the benefits of PSP for those whose knowledge it is claimed to incorporate. The thesis is structured as follows:

In Chapter 2, I link the use of PSP to wider literature on social-ecological resilience. I highlight an assumption that bringing together stakeholders with different worldviews and fields of expertise can help encourage more equitable and sustainable conditions in SES. I then draw upon participation literature, which emphasises the importance of investigating the purported benefits of PSP. I develop a conceptual framework for understanding how learning occurs, and how and why it varies in PSP. This is underpinned specifically by the work of the cognitivist learning theorist, Vygotsky (1978). He asserts that people learn through interactions with others,

which enables them to 'enter' their 'zones of proximal development,' or to think 'outside the box.' I use the concept of 'boundary objects,' (Star and Griesemer, 1989) to explain how PSP can prompt discussion between different people, and the concept of 'scaffolding,' (Wood et al., 1976) to explain how facilitators of PSP can encourage learning, by helping participants to engage in PSP processes. To understand how and why learning varies, I draw on the credibility, salience and legitimacy framework, set out by Cash et al. (2003). This explains that people are most likely to learn when they encounter knowledge they consider to be based on valid evidence, relevant to their requirements and produced through a fair, inclusive and unbiased process. I link this to literature on power and adult learning, specifically Brookfield (2005), which helps to explain how power imbalances between participants, and between participants and facilitators can influence who learns what.

In Chapter 3, I set out the research methodology I used to explore learning in PSP. The focus on interactions between different participants, emphasised the importance of accounting for how different participants make sense of the knowledge they encounter in PSP. My methodology was, therefore, underpinned by a constructivist, qualitative approach that enabled me to explore how learning is shaped by the meanings and interpretations participants attribute to knowledge encountered in PSP. Data were collected from three sources: Firstly, I conducted a case review, analysing 30 cases reported on in the peer-reviewed literature, in which PSP is used to help tackle SEPs. Secondly, I conducted semi-structured interviews with practitioners (researchers, project coordinators, professional facilitators) of PSP. Thirdly, I undertook two case studies of specific PSP processes – 'Positive Futures for Southern Africa,' (PFSA) and 'Food Security Futures,' (FSF). I analysed data from these three sources and linked my analysis back to the conceptual framework. In doing so, I developed an understanding of the expected and reported benefits of PSP, how, and under what conditions learning occurs, and how and why it varies for different participants.

In Chapter 4, I describe the expected and reported benefits of PSP, as well as its limitations. I find that the use of PSP is typically underpinned by an assumption it can break down, or structure future possibilities into alternative narratives. This is understood to help participants explore the complexity and uncertainty of SEPs. However, this is not frequently reported as a benefit, because it is linked to, and sometimes acts as a precursor to other benefits. Learning is commonly expected as a benefit of PSP and is often, reportedly, achieved through bringing different participants together to deliberate on the future. However, I find that practitioners typically have limited theoretically-grounded understanding of how learning occurs and appear to

give limited attention to how and why learning varies for different participants. I also find that proponents of PSP commonly expect and report that it helps develop responses to SEPs and test them in alternative future conditions. Again, there is sparse evidence of these responses being implemented. This could be because of limited connection of PSP with long-term processes of policy-making and action. I conclude the chapter by highlighting a lack of provision for systematic evaluation of PSP processes, especially regarding its strengths and weaknesses compared to other methods.

In Chapter 5, I present my findings that explain how, and under what conditions, learning occurs in PSP. I show that learning occurs through interactions between participants with different worldviews, fields of expertise, and social and economic backgrounds. PSP can act as a 'boundary object' (Star and Griesemer, 1989) that prompts discussion between participants, and thus exposes them to different knowledges. PSP can thus stimulate creative, focused thinking about the future of SEPs, which encourages participants to push beyond their usual range of thinking In this way, PSP enables participants to enter their 'zones of proximal development,' as described by Vygotsky (1978). Facilitators can encourage participants to engage in creative, structured thinking, by explaining, and guiding them through, specific activities in PSP processes, and through using questions to prompt discussion. Conducive conditions for learning to occur in PSP include careful selection of participants who have relevant expertise and are willing to listen to, and deliberate on, the views of others, and skilled facilitation to ensure interactions between participants are constructive.

In Chapter 6, I show how learning varies between different participants, and explain the reasons for these variations. I find four distinct themes of learning in PSP: i) refining existing understanding on a topic of expertise, ii) learning new content about specific, unfamiliar topics, iii) identifying opportunities for tackling SEPs, and iv) learning about the value of PSP for thinking about the future. I find that learning can vary, according to participant's prior expertise, and ignorance, in specific topics, their social and economic backgrounds, their previous experience of PSP, the spatial levels at which they focus, and the design of specific PSP processes. I then show that learning varies according to the extent to which participants find the knowledge they encounter to be relevant to their interests, and produced through fair, unbiased processes. I also find that facilitators play a significant role in shaping learning by defining what is considered acceptable for discussion. Facilitators themselves are influenced by the objectives of wider projects, in which specific PSP processes are embedded.

In Chapter 7, I conclude the thesis by raising the question, if learning is shaped by facilitators, and the objectives of wider projects, then who and indeed what is PSP really for? I argue that greater critical reflection is needed, by practitioners, on the societal impact of PSP. I assert more robust governance is needed to ensure best practice and systematic evaluation of PSP processes in this context. Future research could thus usefully focus on if and how learning helps participants to take more informed decisions and actions to tackle SEPs. There is also a need for critical reflection on the role of facilitators, and for adequate training of those wishing to facilitate PSP. Greater understanding is also required, regarding the relative strengths and weaknesses of PSP, as compared to other futures-oriented, and narrative-based methods, for tackling SEPs.

Chapter 2 – Literature Review and Conceptual Framework

2.1 Introduction

In Chapter 1, I introduced participatory scenario planning (PSP) as interactive processes in which diverse groups of stakeholders develop multiple, plausible narratives of future events, conditions and trajectories. I showed that PSP has increasingly been used with the expectation, by researchers and practitioners, that it can help tackle social-ecological problems (SEPs) by bringing diverse stakeholders into dialogue to build a holistic understanding of them. In the first part of this chapter, I explore literature that reviews and explains the purported benefits of PSP for tackling SEPs. I show that PSP scholars consider it to be particularly useful as a tool for taking account of the knowledges of different stakeholders, and thus encouraging learning. However, research that assesses the benefits of PSP remains limited, especially regarding how, and under what conditions learning occurs, and how and why learning varies between different participants.

In the second part of this chapter, I explore how theory on learning can help explain how learning occurs in PSP. I reason that the cognitivist theory, the 'Zone of Proximal Development,' (Vygotsky, 1978) is useful for explaining how learning occurs through interactions between participants with different fields of expertise. I build on this by arguing that the process of PSP acts as a 'boundary object,' (Star and Griesemer, 1989) which prompts discussion between different participants. I also propose that the concept of 'scaffolding' (Wood et al., 1976) may be used to explain how facilitators can help participants to learn, through assisting them to engage in PSP processes. I then draw on the credibility, salience and legitimacy framework, set out by Cash et al. (2003) to explain that learning could vary based on the extent that participants find the knowledge they encounter to be credible, salient and legitimate. I use literature on learning and power (Brookfield, 2005) to show how paying attention to power imbalances between participants, and between facilitators and participants can help explain variations in participants' learning. Finally, I draw these theories together to propose a conceptual framework that can be used to study learning in PSP.

2.2 PSP, participation and social-ecological resilience

As indicated in Chapter 1, PSP is increasingly used with a focus on addressing the challenges posed by prevailing unsustainable and highly uncertain conditions in social-ecological systems (SES). However, there has thus far been limited assessment of how and why it is useful in this context. In their review of PSP, Oteros-Rozas et al. (2015) link the rationale for PSP to broader participation discourse, regarding perceived normative and pragmatic benefits of stakeholder participation in deliberating on the management of SES. They cite Stringer et al. (2006) who state that participation can encourage collaborative and democratic management of SES by facilitating the sharing of knowledge between different stakeholders. Stringer et al. thus explain that participation can enable learning and the development of 'shared understandings' of SES between participants. Similarly, Butler et al. (2015) argue that because complex problems span multiple spatial levels, and stakeholders at different levels have different knowledges and interests, the different stakeholders should be involved in planning adaptations to those problems. They find that planning processes involving the participation of stakeholders from multiple levels, encouraged knowledge exchange and learning between them.

As indicated by the experienced PSP practitioners Henrichs et al. (2010) there exist several modes of participation, and the one that is used depends on the purpose of individual PSP processes. Henrichs et al. explain that for processes aimed at research and scientific exploration, the role of participation is to include scientific experts from different disciplines, as well as stakeholders with relevant expertise, to draw on their insights in the field of study. In a process that aims to educate stakeholders, the role of participation is to include a wide range of different actors to enable discussions incorporating diverse perspectives, as well as to empower the voices of marginalised stakeholders. In processes aimed at supporting decision-making, participation is used to allow stakeholders to drive the process, with the aim of improving its relevance and legitimacy for key decision-makers.

The use of PSP to incorporate diverse knowledges reflects wider notions in contemporary literature on social-ecological resilience, which commonly assume that dialogue and collaboration between different stakeholders can help achieve 'transformations for sustainability,' or 'fundamental changes in structural, functional, relational, and cognitive aspects of socio-ecological systems, that lead to new patterns of interactions and outcomes,' (Patterson et al., 2017 p.2). Indeed the prominent resilience scholars, Boyd and Folke (2012) assert that such transformations require actors from across different levels and sectors to pool their knowledges and experiences of SES. This sort of thinking has resulted in a widespread assumption that

processes of knowledge exchange, or the development, sharing and use of knowledge, in different ways, for different contexts, are necessary for creating more sustainable conditions in SES (Fazey et al., 2013).

Recent literature on PSP therefore presents it as a method for integrating the knowledges of different stakeholders to help tackle SEPs. Indeed, Oteros-Rozas et al. (2015) indicate that in their experience, the rationale behind PSP is often to: 'integrate different types of knowledge,' (p.33). Similarly, Kok et al. (2016) state that it is a useful tool for taking account of the knowledges and perspectives of different stakeholders, whilst Bennett et al. (2016a) claim that it can help to consider diverse perspectives on how just and sustainable futures might look. It is evident then, that PSP is commonly viewed as a tool that can enable stakeholder participation, with the aim of tackling SEPs.

This reflects the theory of change proffered by the influential social psychologist, Lewin (1997). Lewin argues that societal problems are contingent on the general laws and institutions of the system in which they are embedded. He therefore posits that it is vital to understand the system as a whole, before specific decisions and interventions can be made to change it. Ideas about transformations to sustainability appear to reflect this in their assumption that including diverse knowledges in dialogue through PSP can help build a more holistic perspective of SEPs, and thus help identify opportunities to tackle them. I therefore find it useful to consider the benefits of PSP in relation to Lewin's theory of change.

However, as pointed out by Patterson et al. (2017), ideas about sustainability are socially constructed, and are therefore highly contested and political. The effects of change will be different for different actors and will thus produce winners and losers. They subsequently argue that insufficient consideration has been given to the power imbalances involved in tackling SEPs. To understand the benefits of PSP, it is therefore important to consider how power imbalances shape the benefits of PSP, and how they can reproduce the conditions that create winners and losers. It is therefore useful to consider some of the seminal critiques of participation that exist in the literature.

In one of the most influential critiques of participation, Kothari (2001) contends that, although participation often aims to include the knowledges of marginalised groups in the production of knowledge, knowledge is diverse, power-laden and socially constructed. Kothari therefore argues that processes purporting to include diverse knowledges are heavily infused with power dynamics, which can shape their outcomes. As I set out above, PSP is typically used with

the intention of incorporating diverse knowledges. The implication of Kothari's critique is that different participants, coupled with the knowledges they contribute, are privileged over others. This means the outcomes of PSP for different actors are likely to reflect the power imbalances between them.

The influential participation scholars, Cornwall (2008) and Chambers (1997) both highlight the important power imbalances between the actors who initiate and facilitate participatory processes, and those who participate in them. Cornwall asserts that participation has the potential to encourage collective action by participants that can foster social change. Similarly, Chambers supposes that participation can move research from a process of information extraction, to one that empowers participants, as well as creating useful outcomes for them. This is reflected in the assumptions in the resilience literature, that stakeholder participation can produce useful outcomes for tackling SEPs, through knowledge exchange and learning. However, Cornwall also contends that participatory processes are typically owned by whoever initiates them, whilst Chambers acknowledges that the facilitators of participatory processes ultimately have power over their outcomes. This means the actors who initiate participatory processes have significant power over shaping the discussions that occur within them, and the outcomes they produce.

It is evident then, that PSP is considered useful for taking account of the knowledges of different stakeholders, with the aim of informing approaches to tackling SEPs. However, the participation literature indicates that the benefits of PSP are shaped by the power of those who initiate and facilitate PSP processes, as well as by the intricate power imbalances between participants. It is important, therefore, to understand what the benefits are for those whose knowledges are purportedly included in PSP processes. I explore some of the perceived benefits of PSP in Section 2.3, below.

2.3 Perceived benefits of PSP

To develop an understanding of what exponents of PSP consider it to be useful for, I look first to the literature on the origins of scenario planning in corporate strategic planning. In his highly influential work, one of the founders of scenario planning, Wack (1985), describes how it is useful for expanding people's thinking. He explains that people construct their views of reality through the assumptions they hold about the world. Wack states that scenario planning helps to structure uncertainty by breaking down future possibilities into coherent narratives. In this way, he explains, scenario planning enables people to articulate and reflect on their assumptions about

the world, consider alternative perspectives, and thus develop a broader understanding of whatever system they are operating within.

Similarly, two other influential early scenario planning scholars, Schoemaker (1993) and Van der Heijden (1996), both indicate scenario planning can help people to expand their understanding of the world by structuring highly uncertain futures into manageable narratives. Specifically, van der Heijden states that it can help people to understand complex causal relationships between different drivers. In a more recent review of scenario planning, the Futures Studies scholars, Amer et al. (2013), also indicate that it can help people to think about complex systems in a more strategic way, by breaking down the complex array of uncertain possibilities into manageable storylines about the future.

The scenario planning specialists Ramirez and Wilkinson (2016) build on this earlier work to describe how scenario planning can be useful for enabling 'reframing' and 'reperception.' They describe reframing as a process of exploring alternative future contexts, or frames, which leads to an exchange of different perspectives, and thus the creation of new knowledge and shared perspectives, as well as consideration of different options for action. They describe reperception as the identification of new courses of action to be taken for achieving change. This links closely to Lewin's (1997) theory of change. Reframing can help groups and individuals to develop a more holistic understanding of the general system in which they are embedded, whilst reperception enables them to make decisions and act to deal with a specific situation.

This literature from the worlds of corporate strategic planning and Futures Studies is grounded in a different context to social-ecological resilience, but it provides a useful foundation for understanding what PSP may be useful for. As shown above, scenario planning is considered a useful tool for breaking down uncertain and unwieldy future possibilities into manageable sets of plausible narratives. This process is believed to enable learning, in terms of developing a broader understanding of complex systems. However, Wack, Schoemaker and van der Heijden refer explicitly to corporate organisations, and their managers as the beneficiaries of scenario planning. Ramirez and Wilkinson (2016) refer to a specific approach, referred to as the Oxford Scenario Planning Approach (OSPA). The approaches, beneficiaries, and perceived benefits of PSP in social-ecological contexts may be rather different.

Several attempts to explore the benefits and drawbacks, of PSP in SES exist, many of which were inspired by the influential Millennium Ecosystem Assessment (MA), mentioned in Chapter 1. For example, the academics who were involved in using PSP in the MA, Biggs et al.

(2007), and Kok et al. (2007) state that PSP is useful for exploring the future development of SES, identifying actions that may be taken to deal with future developments, as well as encouraging knowledge sharing and communication between different participants, particularly across different spatial levels. However, both papers indicate that it is difficult for PSP to remain relevant and legitimate to participants at different levels. Biggs et al. emphasise that PSP processes can easily become hijacked by the interests of stakeholders at a given spatial level, which can side line the interests of others. This emphasises the importance of understanding the benefits of PSP for different participants.

In the past decade, there has been a growing recognition in PSP practice in the field of social-ecological resilience that PSP is most useful as a tool for learning about social-ecological problems (Brown et al., 2016; Johnson et al., 2012; Oteros-Rozas et al., 2015; Varum and Melo, 2010). As described in Section 2.2, there exist different rationales for using PSP. Henrichs et al. (2010) describe these as: research and scientific exploration, education, and supporting decision-making. Henrichs et al. explain that, although each of these rationales has a different mode of participation, the participation of stakeholders in any form of PSP process can result in learning for those involved. Assumptions about learning are often linked to the idea that PSP can incorporate the knowledges of different stakeholders in deliberations on how to tackle SEPs. In their often-cited paper on PSP, Johnson et al. (2012) describe it as a 'vehicle for learning,' (p.10) because it enables people to learn through engaging with different perspectives on an issue. They indicate that PSP enables this by incorporating diverse knowledges into the narratives of future events, conditions and trajectories that it creates. The authors go on to assess whether learning occurred in a particular PSP process. They find that participants learned about others' perspectives, developed new social networks, and identified opportunities for tackling social-ecological problems. However, although Johnson et al. provide evidence that learning occurs in PSP, they do not provide a detailed analysis of how, or for whom learning occurs. They imply that learning occurs through the incorporation of diverse knowledges, but they do not explain how this can result in learning. Equally, they do not draw upon learning theories that could help to explain how learning occurs in PSP.

The importance of incorporating diverse knowledges for encouraging learning is reflected more recently by Oteros-Rozas et al. (2015). In their paper, they synthesise the outcomes of 23 cases in which the authors used PSP, to assess what its apparent benefits were. They find that it enhanced the engagement of participants with different knowledges, and that through it, participants learned about the impacts of global level changes on the local level and could better

understand the complexity of SES. They indicate that PSP is most likely to result in these learning outcomes when it is linked to objectives that are shared by both researchers and participants. However, as shown in the literature on participation, in Section 2.2, the actors who initiate and facilitate participatory processes usually maintain control over their outcomes. Indeed, Oteros-Rozas et al. acknowledge that their PSP processes were shaped by value judgements about sustainability that were at the core of researchers' and funders' motivations. It is important to question, therefore, the extent to which the objectives of the researchers were shared by the beneficiaries, and how this influenced the learning that occurred.

In the accounts of Johnson et al. (2012) and Oteros-Rozas et al. (2015), there is an implicit assumption that learning occurs through encountering different knowledges during PSP processes. However, they do not detail the specific attributes of PSP that can lead to learning. Furthermore, they show that learning may be shaped by the values of those who initiate and facilitate PSP. However, these dynamics have been given limited attention in PSP literature. In this research, I address these gaps in understanding, by exploring how learning occurs, and how and why it varies for different participants, in PSP. To do this, I draw on pedagogical theories, as well as literature on learning and power. I use these to develop a conceptual framework, presented in Section 2.6, to help study how learning occurs, and how and why it varies.

2.4 How can learning theories contribute to understanding how learning occurs in PSP?

In this section, I explore theories that can help to understand how learning occurs in PSP. I begin by exploring classical, cognitivist perspectives. In particular, I propose that the Zone of Proximal Development (ZPD), described by Vygotsky (1978), is a useful concept for explaining how learning occurs in PSP. Vygotsky explains that learning occurs through interactions between people. However, I go into more detail than just explaining learning as the result of interactions and explain how interactions are encouraged through the creation of 'boundary objects' (Star and Griesemer, 1989) in the process of creating and analysing scenarios, and through 'scaffolding,' (Wood et al., 1976) through which facilitators can assist participants to engage effectively in PSP processes. I explore these concepts further, below, but first it is important to define what I understand learning to be.

2.4.1 What is learning?

Unsurprisingly, definitions of learning vary according to different learning theorists. It is noted by De Houwer et al. (2013) that learning scholars are rarely explicit about how exactly they define learning. They observe there is a common assumption in learning literature, that learning is simply any change in an organism as a result of experience. Indeed one broad definition of learning, provided by Parker (2005), states that learning, at its most basic, is simply change on the part of the learner, as a result of external stimuli. However, De Houwer et al. (2013) contend that this definition of learning is too broad and learning should be defined more specifically.

A more detailed definition of learning is provided by the prominent learning theorist, Knud Illeris. He defines learning as: 'any process that in living organisms leads to permanent capacity change and which is not solely due to biological maturation or ageing' (Illeris, 2009 p.7). In this definition, Illeris also presents learning as change, as a result of external stimuli. However, he goes on to emphasise the importance of the internal cognitive processes through which people interpret their experiences. He therefore presents learning as more than just a simple reaction to external stimuli and indicates that the learner must make meaning out of them for learning to occur.

Another influential learning theorist, Peter Jarvis, presents a similar definition, and provides more detail on what making meaning out of external stimuli involves. He describes learning as a process, in which a person interprets an experience, then integrates it into their knowledge through practical, cognitive, and/or emotional transformation (Jarvis, 2005). Jarvis thus emphasises the importance of learners interpreting their experiences of external stimuli. He also emphasises that learners' interpretations are shaped by their social context. As I discuss in Section 2.5, the social context in which learning occurs is an important consideration for understanding who learns what, and why.

It is evident then, that two important themes exist in how learning is defined: change, and interpreting experience. In this research, I consider learning to be a change in a person's cognitive or physical capacity, that results from that person interpreting their experiences of external stimuli. With this definition in mind, I turn to explore two traditions of learning theory, and how they may contribute to an understanding of learning in PSP.

2.4.2 Traditions of Learning Theory

In this section, I begin by considering how behaviourist and cognitivist traditions of learning theory may help to understand learning in PSP. I argue that the behaviourist perspective is useful in so far as it highlights how changes in behaviour serve as indicators of learning. However, I find that the cognitivist perspective is more useful for explaining how learning occurs.

Behaviourist Learning Theory

Early protagonists of behaviourism, such as Skinner (1972), rejected assumptions that human behaviour was the result of character traits, emotions and states of mind. Instead, Skinner argues that human behaviour is shaped purely by environmental stimuli. The implication is that human learning occurs through the reinforcement or punishment of particular behaviours by these stimuli. People thus learn to behave in a way that avoids punishment, which in turn is rewarded by environmental stimuli. In the same vein, Skinner assumes that human learning is demonstrated through overt skills and behaviour. A study of learning, informed by behaviourism, would therefore need to identify and observe changes in the skills and behaviour demonstrated by learners.

However, Jarvis et al. (2003) contend that the behaviourist perspective leaves insufficient room for creativity and freedom on the part the learner. They contend that behaviourism implies that learners merely learn to conform to behaviours that avoid punishment and gain reward. I therefore reason that behaviourism does not adequately account for the potential role of hypothetical thinking about the future, in PSP. Nevertheless, Merriam and Bierema (2013) observe that behaviourist assumptions continue to underpin many approaches to learning to this day. Roessger (2012) attributes the continued prominence of behaviourist assumptions to the easily-measurable nature of changes in behaviour, which are taken as evidence for learning. As such, changes in behaviour could be useful indicators of learning in PSP.

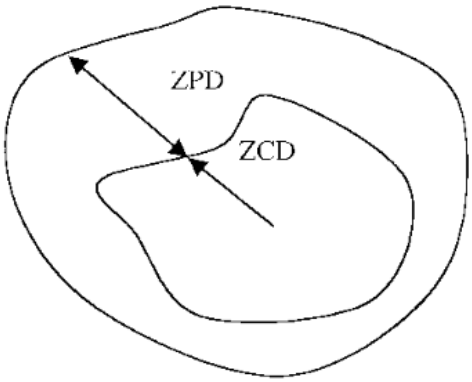
Cognitivist Learning Theory

Cognitivist perspectives on learning move away from behaviourism by focusing on the relationship between learning and the development of cognitive processing capacity. The pioneer of cognitivist perspectives on learning was Jean Piaget. Piaget (1929) developed a five-stage framework of cognitive development and associated learning from infancy to age fifteen. He proposes that children begin with basic sensory and motor skills then, ultimately, develop formal operational skills, which make them capable of abstract conceptualisation and applying abstract concepts to practice. Piaget assumes that the process of learning about a particular subject follows the process of cognitive development. As such, a learner may only develop abstract

concepts about a subject once s/he has progressed through the four preceding stages of development.

However, as Jarvis et al. (2003) contend, Piaget only theorised the stages of cognitive development up until age 15, yet development and learning continue well beyond childhood. On a different tack, Vygotsky (1978) critiques Piaget's theory on the basis that it assumes learning may only progress once a particular level of cognitive development has been attained. Instead, Vygotsky argues that learning occurs first and then leads to cognitive development. Vygotsky subsequently proposes his own influential learning theory, the 'Zone of Proximal Development.' In this, he distinguishes between *actual* cognitive development, or the level of capacity a person has for independent problem-solving, and the *potential* problem-solving capacity a person has when assisted by others. He refers to this potential capacity as the Zone of Proximal Development (ZPD). This is illustrated in Figure 2.1, below.

Figure 2.1 Illustration of the Zone of Proximal Development (ZPD) and Zone of Current Development (ZCD).



Source: Harland (2003 p.265)

Vygotsky assumes that an individual's capacity for learning increases when they receive assistance from others, who are more capable in the subject that is being learned about. When such assistance is provided, he refers to this as 'entering' the ZPD. This is illustrated in Figure 2.1, in which the ZCD, or 'Zone of Current Development,' represents what a person can learn through deliberating on a problem independently. The ZPD, or 'Zone of Proximal Development,' represents the potential learning that could occur through collaboration with more capable others. When the potential learning occurs successfully, the ZCD expands to meet the outer edge of what was the ZPD, whilst the ZPD expands further. In a more recent description of the ZPD,

Wals and Dillon (2013) explain the ZPD as the potential learning that can occur through interactions with other people. They indicate that such interactions can help people to understand things they would have been unable to, without being encouraged or challenged by another.

Vygotsky's Zone of Proximal Development has played a significant role in influencing how learning is understood and facilitated. For example, the use of the ZPD underpins Engestrom's (1987) expansive learning theory, and Wood's (1976) concept of 'scaffolding,' both of which are established approaches, in their own right, to understanding learning. However, Chaiklin (2003) warns that Vygotsky specifically intended for the ZPD to explain cognitive development in children, which he describes as the progression of an individual's capacity to cope with their social and environmental context. He therefore urges that careful consideration should be given when using it to understand learning in other contexts.

Vygotsky specifically states that learning occurs through interactions between learners and people who are more capable in a given field, or who have a more advanced level of cognitive development. In PSP, the participants and facilitators are typically adults, rather than children, and therefore have similar levels of cognitive development. The relevance of the ZPD for explaining learning in PSP could therefore be questioned. However, if PSP leads to participants encountering different knowledges, as indicated in Section 2.3, they are likely to encounter others who are more capable in different fields of expertise. If interactions with participants from different fields of expertise lead to learning that helps them tackle social-ecological problems, this equates to development of their capacity to deal with their social and environmental context.

For example, a smallholder farmer is likely to have more expertise about localised rainfall patterns in a village, than a climate scientist. Conversely, the climate scientist is likely to have more expertise in global atmospheric processes than a smallholder farmer. If both the farmer and climate scientist were asked to apply their knowledge to exploring the possible effects of increased climate variability, each participant would benefit from interactions with the other in learning about certain aspects of the problem. The smallholder farmer might learn about global atmospheric processes, and the climate scientist would learn about local rainfall patterns. I therefore reason that the ZPD helps to explain how learning occurs in PSP, and use it as the baseline for my conceptual framework, which I describe in more detail in Section 2.6.

2.4.3 Boundary Objects

As described above, the Zone of Proximal Development (ZPD) provides a useful way of understanding learning in PSP, as the result of interactions between participants from different fields of expertise. However, in this research, I aim to develop a detailed understand of the specific attributes of PSP that enable participants to 'enter' their ZPDs. One useful way to explain this is through the concept of 'boundary objects,' (Star and Griesemer, 1989).

The concept of boundary objects fits within wider discourse about 'boundary work.' Boundary work, as described by Guston (2001), involves processes that negotiate the exchange of knowledge between science and policy, and/or between different social worlds. Guston describes how such processes of negotiation are often carried out by 'boundary organisations,' that manage the tensions between research and practice by negotiating the exchange of knowledge, whilst maintaining accountability to both sides. White et al. (2010) describe how boundary organisations typically create spaces for the participation of different stakeholders and are facilitated by professionals who serve a mediating role between them. As White et al. go on to describe, boundary organisations also provide opportunities for the creation of boundary objects.

Boundary objects were first conceptualised by Star and Griesemer (1989) as material, or abstract objects, that occupy several interacting, intellectual worlds and remain relevant and outwardly acceptable to all of them. They explain that boundary objects thus facilitate effective communication between diverse actors, which helps them to cooperate despite their disciplinary, and other, differences. In this way, White et al. (2010) reason, boundary objects enable the negotiation and exchange of knowledge between different groups, whilst allowing groups to uphold their own, unique identities. An illustrative example would be if a farmer and a hydrologist are deliberating on the management of a river basin. To the farmer, the river basin is a source of water and nutrients for crop growth and, ultimately, income. Meanwhile, to the hydrologist it is a subject of scientific interest and a system in need of effective management, in which the farmer is a user. The creation of a boundary object, by the two actors, such as a land-use map, could enable them to exchange their knowledge about managing the river basin, whilst allowing the farmer to continue viewing it as a source of income, and the hydrologist to continue viewing it as a subject of scientific interest.

As Star (2010) clarifies, a 'boundary' in this context is not the physical edge of something. Instead, she states that it is a physical or conceptual space that is shared by actors from different social worlds. Star also emphasises that an 'object' is not necessarily a material thing, but can be a concept that people work towards and with. In correspondence with Chaudhury et al. (2012), I

propose that the process of imagining plausible futures in PSP, fits particularly well with this description of a boundary object. The inclusion of different knowledges in PSP means the scenarios are spaces that are shared by participants from different social worlds. Scenarios are also conceptual objects that participants work towards and with. Participants work towards the creation of scenarios, and then work with the scenarios to develop and test responses to social-ecological problems.

2.4.4 Scaffolding

Earlier in this section, I presented Vygotsky's Zone of Proximal Development as an especially useful way of understanding how learning occurs through interactions between participants with different fields of expertise. I also proposed that viewing scenarios as boundary objects helps understand how PSP encourages these interactions. However, when Vygotsky (1978) proposed the ZPD, he argued that that learners require *assistance*, not just *interaction*, for them to enter the ZPD and for learning to occur. Wood et al. (1976) suggests such assistance may come in the form of 'scaffolding,' which he describes as someone with more expertise than the learner, helping them to complete tasks they would not have been able to complete alone.

In Wood's conceptualisation of scaffolding, he describes it as a process in which experts control the elements of a task that are beyond a learner's existing capacity. Learners are thus gradually introduced to those elements and supported to complete them. For example, a driving instructor begins by introducing a learner to the basic skills of operating a car – starting the engine, using the pedals, moving the car forwards and backwards – before gradually introducing them to more advanced skills – making three-point turns, negotiating roundabouts and overtaking. The instructor supports the learner by giving instructions and demonstrations, and asking questions to prompt the learner's thinking.

A more recent description is provided by Van der Pol et al. (2010) in their review of scaffolding literature. They describe scaffolding as a three-stage process involving: 'contingency,' 'fading' and 'transfer of responsibility'. They define 'contingency' as tailoring the support, provided by an expert, to a learner's existing ability. For example, the driving instructor designs each lesson according to the learner's existing ability to drive a car. The first lesson focuses on operating the pedals, the second on negotiating roundabouts, and so on. 'Fading' is described as decreasing the level of assistance, as the learner becomes more competent. To begin with, the driving instructor will give frequent instructions and ask frequent questions, but as the learner

becomes more competent at negotiating roundabouts, this support will decrease. 'Transfer of responsibility' is described as transferring the responsibility for learning from the expert to the non-expert. In the example of the driving instructor, eventually they provide no guidance at all, for negotiating roundabouts, and the learner is expected to continue developing their skills independently.

However, Van der Pol et al. (2010) also critique this view of scaffolding because it assumes that what is learned is predefined by the expert. For example, the driving instructor defines that the learner will develop a particular set of skills and understanding that will enable them to safely drive a car. Instead, Van der Pol et al. argue that learners should be viewed as active participants, rather than recipients of knowledge, and scaffolding should be viewed as an interactive process, in which learners and experts create new knowledge together. This reflects the argument made by learning scholars, Fernández et al. (2001). Fernandez et al. point out that Wood views scaffolding as occurring between experts and non-experts, but they contend it can occur in peer-to-peer interactions as well. Specifically, they indicate that peer-to-peer scaffolding occurs when people engage in what they call 'exploratory talk.' They describe this as a process of people proposing new ideas, and then giving and receiving critical, but constructive feedback from others. This resembles the process of a group of writers writing a play together, if one writer suggests an idea, and the others give critical and constructive feedback on it, they collectively develop the events, characters and storylines that make up the play. In the same way, exploratory talk involves learners engaging critically and constructively with others' ideas. This enables them to develop new understandings, and in the process to drive the learning process forward.

In PSP, both expert-learner and peer-to-peer scaffolding are valuable for understanding how learning occurs. It is typically the case that one or more facilitators guide the participants through PSP processes. However, the role of the facilitator is something that appears to have received scant attention in PSP literature. Facilitators can be said to provide scaffolding that helps participants engage in, as well as learn through PSP. They provide 'contingency' through designing stages of PSP processes that gradually introduce participants to thinking about the future in a structured way, 'fading' through decreasing the amount of instructions they provide as participants become familiar with the process, and 'transfer of responsibility' as they leave participants to let their discussions run their course.

Scaffolding could also occur between different participants in PSP. As indicated in Section 2.2, PSP is commonly used to incorporate different knowledges. Different participants therefore have expertise in different aspects of a social-ecological problem. Equally, participants engage in

PSP as active participants in an interactive process. As such, they are more likely to receive peer-to-peer scaffolding from each other, as active participants, than to receive scaffolding from an expert. The concept of scaffolding is therefore useful for understanding how learning occurs through PSP.

In sum, I reason that learning in PSP can occur through interactions between participants with different fields of expertise, as explained by Vygotsky's Zone of Proximal Development. I add to this by combining the ZPD with the concept of boundary objects to explain how the process of developing and analysing scenarios creates triggers for discussion, which can encourage participants to 'enter' their ZPDs. I also draw upon the concept of scaffolding to help explain how facilitators provide assistance that enables participants to engage in PSP processes. In the next section, I explore literature that can help explain how and why learning varies between different participants in PSP.

2.5 What theories can help understand who learns what and why?

As I described in Section 2.2, the inclusion of different stakeholders in PSP does not mean they are included on an equal footing. Participants may not learn to the same extent, or at all. Different participants could also learn about different subjects. It is therefore important to understand how and why learning varies between participants in PSP. In this section, I consider how literature on adult learning, knowledge co-production, and power can help to explain how and why learning varies.

2.5.1 Criteria for encouraging learning

In their seminal book on adult learning, Knowles et al. (2005) present a list of criteria that need to be met for adults to engage in learning. First, they indicate that adults need to know why learning is valuable, in terms of improving their performance as workers and members of society, as well as improving their quality of life. Second, Knowles et al. argue that adult learners tend to be self-directed and self-motivated, which can hinder their willingness to learn, if facilitators of learning processes fail to respect this. Third, they specify that the extent to which adult learners are willing to engage in learning is strongly influenced by their diverse prior experiences. Fourth, they explain that adults are most likely to engage in learning when they can see how it will help them in their everyday lives. Hence, they emphasise that learning processes for adults are most likely to be effective when they are linked to real-life situations.

The above criteria presented by Knowles et al. indicate that adults are most likely to learn when they perceive new knowledge to be relevant, and when they consider learning processes to be sincere and appropriate to their needs and experiences. This corresponds closely with the credibility, salience and legitimacy (CSL) framework, set out by Cash et al. (2003). Cash et al. explain that the likelihood of people accepting new knowledge depends on the extent to which they consider it to be based on valid evidence, relevant to their requirements, and produced through a fair, inclusive and unbiased process. It therefore seems reasonable that PSP participants need to find the knowledge they encounter in their interactions with others to be credible, salient and legitimate for them to enter their ZPD, and thus, to learn.

However, as Hegger et al. (2012) contend, it is vital to acknowledge that different participants have different criteria and thresholds for what they consider CSL. This creates obvious issues, since what is considered credible, salient or legitimate by one actor may be considered invalid, irrelevant or unfair by others. Indeed, Cash et al. (2003) also acknowledge that CSL cannot always be achieved simultaneously for everyone. Moreover, they reason that enhancing one may have adverse effects on another. If the CSL of knowledge encountered in PSP is compromised for one participant, s/he may be less likely to enter their ZPD, and thus less likely to learn. To understand how and why learning varies, it is therefore important to consider the factors that influence what participants consider CSL. I therefore explore which factors might be important to consider, below.

2.5.2 Learning is shaped by social context

The most prominent explanation of how social context influences learning is presented by Bandura (1977) in his seminal work *Social Learning Theory.* Whereas earlier accounts described a unidirectional process, in which individuals learned through encountering social stimuli, Bandura argues that the influence of social context on learning is a reciprocal process. He suggests that the social context shapes what is learned by the individual, and the individual, in turn, shapes the social context, through what s/he has learned. Bandura supposes that learners select, organise and transform the stimuli they receive, in ways that are influenced by their social, economic and political characteristics. This indicates that what participants consider CSL and, thus, what they learn, can be shaped by their social context.

This resonates with the concept of 'knowledge coproduction,' developed in the field of *Science and Technology Studies* by Jasanoff (1996). Jasanoff argues that knowledge and social

organisation are coproduced. This means that the ways people come to know the world, and the ways people come to live in it, are closely entwined, such that a change in one will result in a change in the other. She indicates that, when studying the ways people develop knowledge, it is important to consider how they are shaped by the organisation of society.

The above works of Bandura and Jasanoff emphasise that what is learned by different participants in PSP is shaped by the social context in which it occurs. Considering the social, economic and political characteristics of individual participants, and the relationships between them, can thus help explain variations in what different participants learn. An important aspect of social organisation is the power imbalances that exist between people. I therefore turn to explore how power can influence who learns what.

2.5.3 Learning is shaped by power imbalances

As indicated above, variations in what is learned by different participants can be explained by the extent to which they consider the knowledges they encounter to be CSL. This may be shaped by the social context, in which specific PSP processes take place, including participants' social, economic and political characteristics, and the relationships between them. As I indicated in Section 2.2, different participants may not be included in PSP on an equal footing. It is therefore especially important to consider the power imbalances that exist in the relationships between different participants.

What is power?

Before moving on to consider the insights that studying power imbalances can provide to understanding learning in PSP, it is important to clarify what I mean by power. Literature on theories of power demonstrates it is conceptualised in multiple ways. Indeed, one prominent theorist of power, Lukes (2005) describes power as intrinsically contested. Avelino and Rotmans (2011) therefore argue that, rather than seeking an all-encompassing definition of power, a more important task should be to find a conceptualisation of power that works, in the context that it is used.

Early theories of power, developed by theorists such as Hobbes, Dahl, and Bachrach and Baratz focus on power as sovereignty, held predominantly by the state (Clegg, 1989). These theories were later built on by Lukes, who conceptualises power as an actor's capacity to ensure others consent to domination (Lukes, 2005). He thus indicates that power is exercised through shaping other's beliefs and desires, such that they consider domination to be positive. Power was

later reconceptualised by poststructuralist theorists, including Parsons and Foucault, who critiqued earlier views for their focus on power as prohibitive - in other words, the assumption that empowerment of one person, always leads to the disempowerment of another. Instead, Parsons (1967) argues that power is the capacity of actors to create order, through the use of social norms. The influential philosopher, Foucault (1975), built on this by arguing that power is always present and inescapable, but is not always prohibitive. Rather, he supposes that power is complex and exists alongside resistance. He indicates that power is manifest in actors' knowledge and practice and can be used to achieve strategic effects through disciplining non-conformity.

In this research, what is of most interest is not so much the power of the state in maintaining social order (although this may be implicated in PSP processes), but in the power relations between different participants, and facilitators in PSP. Equally, viewing power as prohibitive and inherently negative is likely to be inaccurate. As I show in Chapter 6, the facilitators of PSP processes have substantial power over what is learned in them, but this does not necessarily mean their use of this power is ill-intentioned. Since PSP is commonly used to take account of the diverse knowledges of different stakeholders, Foucault's view that power is complex and embedded in knowledge is particularly salient, as is the view of Parsons, that power is manifest in the use of social norms to create social order.

Avelino and Rotmans (2011) draw on Parsons and Foucault to build a definition of power they believe is useful for researching processes of multi-stakeholder dialogue for sustainability. They reason that such a definition must be flexible, to allow power to be discussed across different disciplines and epistemologies. Furthermore, they contend that, when thinking about sustainability, conceptualisations of power need to account for the possibility of long-term changes over time, and for diverse power relations between actors. As such, they broadly define power as: "the capacity of actors to mobilise resources to achieve a certain goal," (p.798). They also take a broad definition of 'resources,' as assets, including people, knowledge and money, that help actors to achieve certain goals.

Avelino and Rotmans go on to propose three types of power relations between actors. First, they explain that actors can have power over others. In other words, they can mobilise other people as resources. Second, they reason that some actors can have more power than others. In this case, they have a greater capacity to mobilise resources. Third, they state that different actors can have different kinds of power. For example, some actors have the capacity to create or discover new resources, others have the capacity to uphold the existing distribution of resources, whilst others have the capacity to transform it. They propose that analysing the power relations

between actors, can help explore how innovations that encourage sustainability can interact with existing paradigms. Moreover, they reason that studying power can help understand how actors' social positions influence their relations with others, as well as their ability to make a difference. I use Avelino and Rotmans' conceptualisation of power, and their framework of power relations to engage with the notion of power in this research.

How does power influence learning in PSP?

PSP fits particularly well with the concept of 'spaces of participation,' described by Cornwall (2004). Cornwall describes spaces of participation as spaces that bring together a heterogeneous set of actors, representing different knowledges and interests, to facilitate transformation on a given issue. PSP can be described as a particular type of space of participation, in that it creates spaces where heterogeneous sets of participants, are brought together to construct and deliberate on sets of alternative futures, with the aim of responding to SEPs. Cornwall draws on Lefebvre (1991) and Foucault (1975), to argue that spaces of participation are not neutral, but influenced by how and by whom they are initiated, the expectations and experiences that participants attribute to them, and the social context in which they take place. Cornwall thus supposes that spaces of participation can replicate existing institutions, and associated power imbalances, in wider social and political contexts.

This links to the critical perspective on participation, put forward by Kothari (2001). Kothari contends that participatory processes can, and all too often do, reproduce existing inequalities and serve the interests of actors who are already powerful. Similarly, Kapoor (2005) describes how the power embedded in social contexts can act as a self-surveillance mechanism, whereby participants feel afraid of acting and speaking in ways that contradict the roles expected of them by society or a particular social context.

This is reflected by the adult learning scholar, Brookfield (2005) who provides a detailed analysis of how power can influence learning. Of note is his discussion of power in collaborative, group learning processes. Like Kapoor, he argues that people commonly act in such a way as to conform to what the majority considers to be beneficial. In group learning processes, he indicates this fear of alienation can lead to conformity of participants' ideologies, or 'groupthink.' Brookfield specifies that when groupthink occurs, it typically reflects conformity to the agenda of the strongest voices in the group. Dissenting voices thus become viewed as obstructive to the agenda of the learning process and are subsequently marginalised. This has significant implications for studying learning in PSP. If the voices of dissenting participants are marginalised, the knowledge that participants encounter in their interactions is most likely to be that of the

most powerful voices. This could result in marginalised participants considering the knowledge they encounter to be less CSL, which could reduce their enthusiasm for the process. Moreover, it could limit their ability to enter the ZPD and thus to learn.

Another way that power could influence learning is through the power imbalances between the facilitators of PSP processes and the participants. As I stated in Section 2.2, the influential participation scholar, Cornwall (2008) contends that participatory processes are typically owned and defined by those who initiate them. Similarly, other participation scholars indicate that the outcomes of participatory processes are ultimately defined by the facilitators (Chambers, 1997; Kapoor, 2005). The learning scholar, Tett (2016) explains that facilitators of group learning processes have substantial power over what is learned through them. She describes how facilitators can advocate or oppose the contributions of participants, simply through acknowledging them, asking participants to expand on ideas, and instructing them to write things down. In this way, Tett explains, facilitators effectively signal and ultimately define what is considered acceptable for discussion, and what is not.

However, Cornwall (2004) asserts that spaces of participation can also be opportunities for subversion. She emphasises that participants can always use subtle techniques, like pretending not to hear, or understand, as well as deliberately using the normative roles they are expected to play (for example, feigning compliance), to control the direction of discussions in spaces of participation. It is therefore important to be aware of the complex ways participants can use and subvert power, to make their voices heard, and to contribute their knowledge to PSP processes.

This emphasises the importance of studying the influence of scaffolding, as described in Section 2.4. The above literature indicates that power is manifest in the scaffolding provided by facilitators to participants, and by participants to each other. These interactions shape what is considered an appropriate contribution to discussions, and what is not, which defines whose voices are privileged and whose voices are marginalised. This, in turn, influences the extent to which participants find the knowledge they encounter credible, salient and legitimate, the extent to which they enter their ZPD, and thus, both what they contribute and learn.

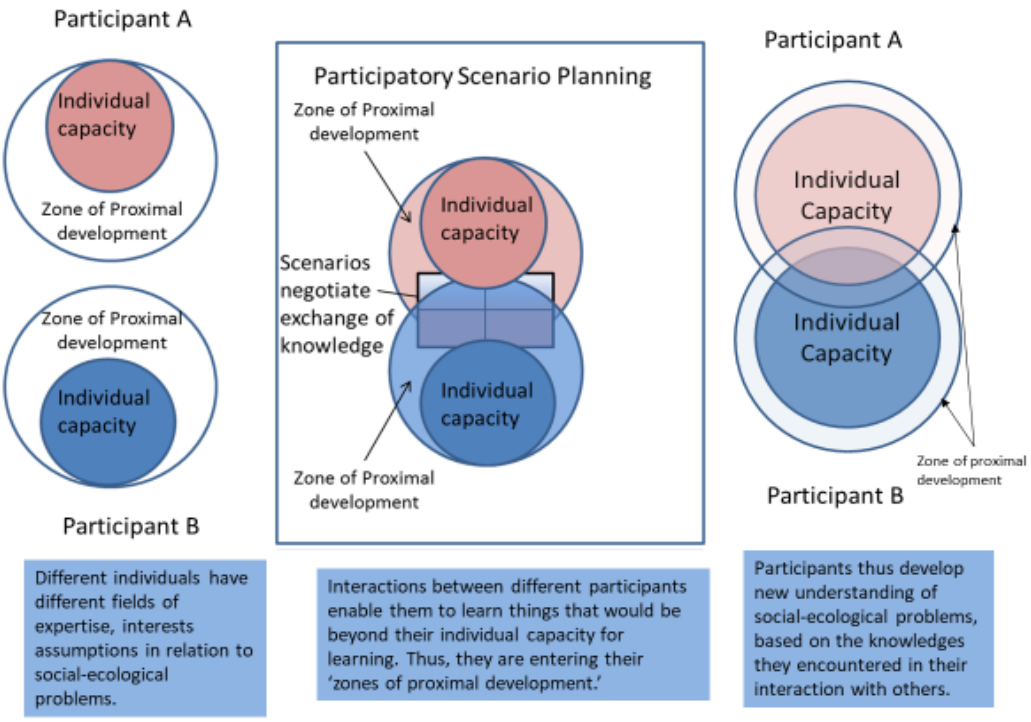
2.6 Conceptual Framework for understanding learning in PSP

In this section, I propose a framework for how learning occurs in PSP, centred principally around the concept of the Zone of Proximal Development. I add that PSP stimulates these interactions by creating boundary objects through the process of PSP. I also propose that facilitators provide scaffolding that enables participants to engage effectively in PSP. I conclude this discussion by illustrating how the power imbalances in PSP can help explain how and why learning varies between different participants.

2.6.1 The Zone of Proximal Development

To begin with, I propose that PSP enables participants to 'enter' their zones of proximal development (ZPD), through encouraging interactions between participants, with different fields of expertise. This can result in participants learning from the different knowledges they encounter. For instance, in the example of the smallholder farmer and the climate scientist, described in Section 2.4, the farmer learns from the scientist's knowledge of global atmospheric processes; conversely, the scientist learns from the farmer's knowledge of local rainfall patterns. I illustrate how PSP enables participants to enter their ZPD, and thus learn, in Figure 2.2, below.

Figure 2.2: How PSP enables participants to learn through interactions with others.

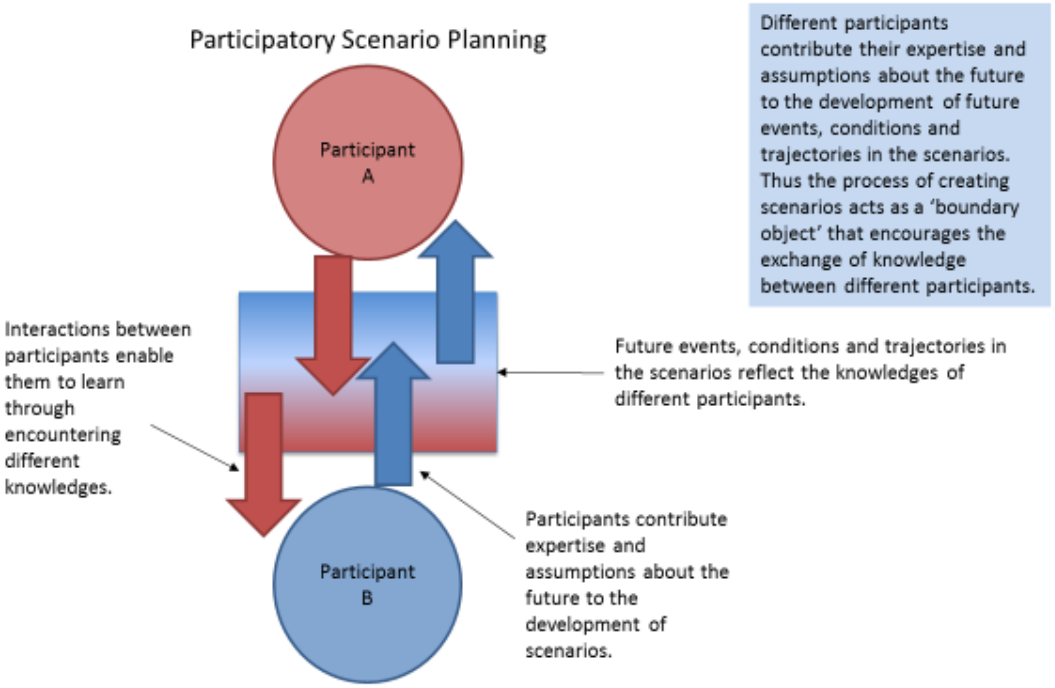


Source: author construct

2.6.2 Boundary objects

I reason that these interactions are enabled by processes of developing scenarios in PSP. Different participants contribute their expertise and assumptions about the future, to the development of future events, conditions and trajectories that constitute the scenarios. The process of creating scenarios therefore acts as a type of 'boundary object' that encourages the exchange of knowledge between different participants. This is illustrated in Figure 2.3, below.

Figure 2.3: PSP acts as a boundary object, by prompting discussion between different participants, through the process of creating scenarios.

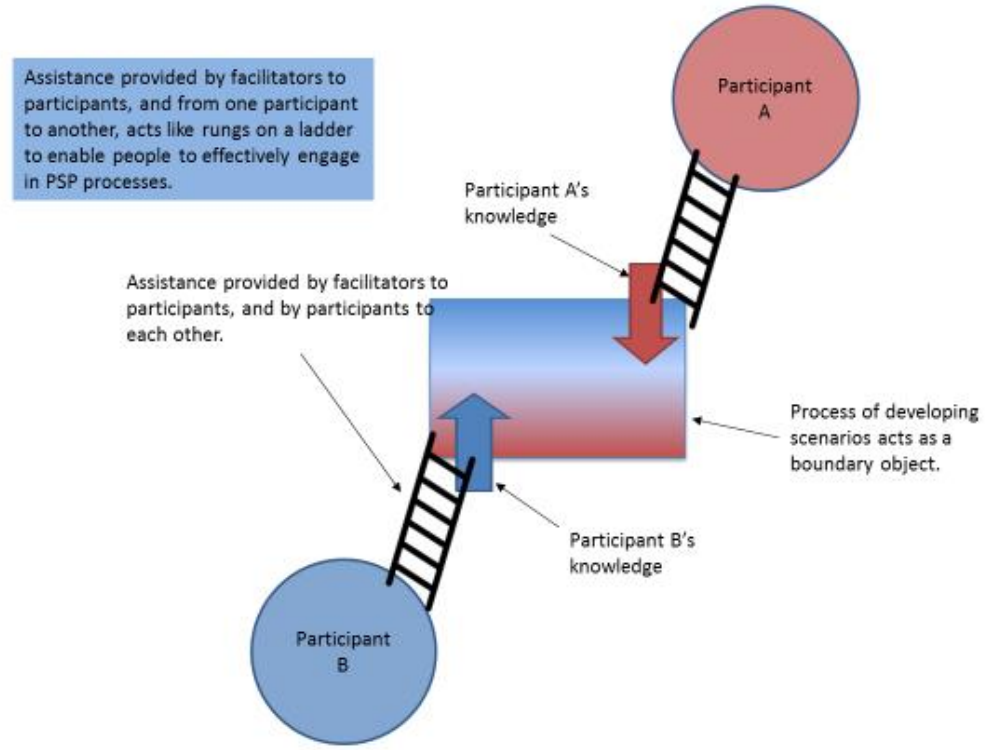


Source: author construct

2.6.3 Scaffolding

I reason that participants are enabled to engage in PSP processes through 'scaffolding,' or assistance, provided by facilitators to participants, and from one participant to another. This assistance acts like the rungs of a ladder, that help participants to engage effectively in PSP processes. It encourages them to contribute their knowledge to the development of scenarios, and to learn from the knowledges of others. I illustrate this in Figure 2.4, below.

Figure 2.4: Assistance provided, by facilitators to participants, and from one participant to another, helps participants to engage effectively in PSP.

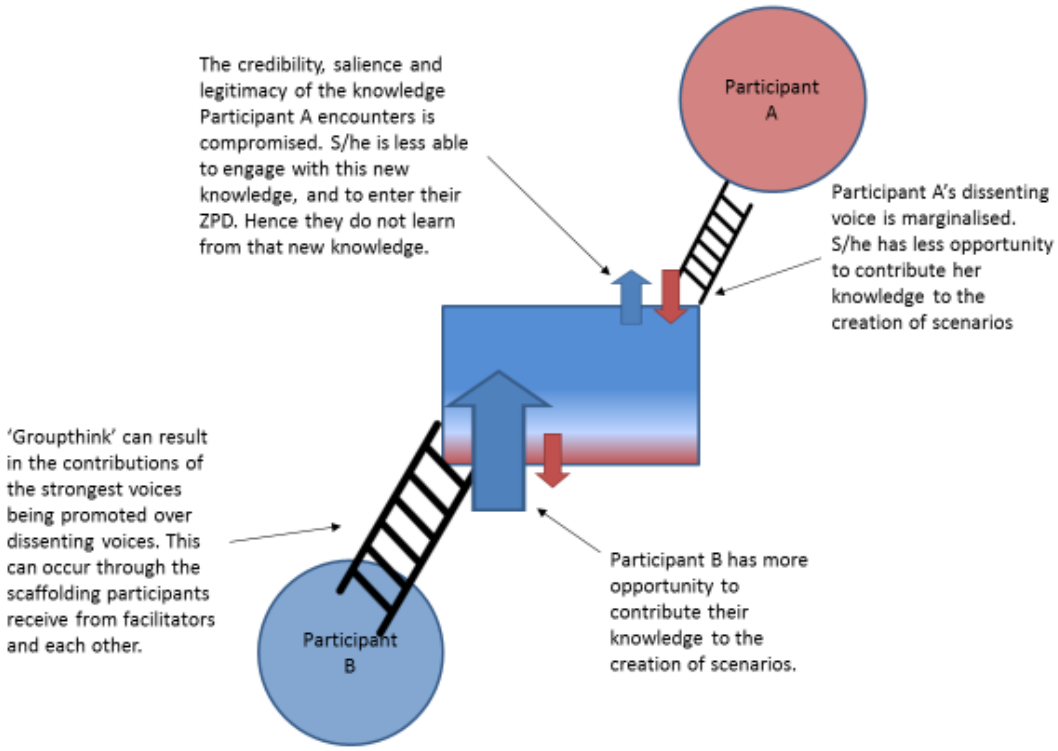


Source: author construct

2.6.4 Learning is shaped by power imbalances

In Section 2.5, I explored how considering the social context, and associated power imbalances of participants in PSP, could help to explain variations in what is learned by different participants. I reason that 'groupthink' can lead to the promotion of the strongest voices, that conform with the agenda set by those who initiate and facilitate PSP processes. This can lead to dissenting voices becoming marginalised because they are viewed as disruptive or irrelevant to this agenda. This can limit the credibility, salience and legitimacy of the different knowledges participants encounter, which limits their ability to enter their ZPD and learn from the knowledges of others. This is illustrated in Figure 2.5, below.

Figure 2.5: Power imbalances shape who learns what and why



Source: author construct

2.7 Conclusion

In this chapter, I began by highlighting the assumption that PSP can include the knowledges of different stakeholders in dialogue about tackling SEPs. I linked this to wider notions that the participation of different stakeholders is needed to help tackle SEPs. However, the socially constructed nature of what sustainable futures should look like, means there will inevitably be winners and losers. It is therefore important to understand the benefits of PSP for those whose knowledges it includes.

I then reviewed literature on scenario planning from corporate strategic planning, Futures Studies, and tackling complex social-ecological problems to explore why PSP is considered beneficial. It appears that PSP is considered most useful as a tool for learning about complex social-ecological problems, but there is limited detailed, and theoretically-informed analysis regarding how learning occurs in these contexts. Equally, there is scarce information and understanding regarding how and why learning varies between different participants.

I therefore used literature on cognitivist learning theories, social learning, power and participation, to develop a conceptual framework that can help build an understanding of learning in PSP. In this framework, I draw on Vygotsky's Zone of Proximal Development (ZPD) to explain that learning occurs through interactions between participants from different fields of expertise. I go further than simply saying that learning occurs through interactions, in that I explain how PSP stimulates these interactions, by encouraging participants to apply their knowledges to the development of future events, conditions and trajectories. In this way, PSP processes act as boundary objects. I also draw on the concept of scaffolding to explain how participants are enabled to engage effectively in PSP processes through assistance provided by facilitators and between participants. Finally, I reason that learning in PSP varies because of power imbalances between participants, and between facilitators and participants. These power imbalances shape the extent to which participants encounter new knowledge that is credible, salient and legitimate, and thus the extent to which they enter their (ZPD) and learn. The individual components of this framework are not, in themselves, ground-breaking, but I have brought them all together and applied them in an innovative way, to the context of PSP. However, to explore how well it explains learning in PSP, it is important to apply it to my empirical study. In the next chapter, I therefore use this conceptual framework to develop a research methodology for this research.

Chapter 3 – Research Methodology

3.1 Introduction

As indicated in Chapters 1 and 2, researchers and practitioners assume that participatory scenario planning (PSP) is useful for including the knowledges of diverse stakeholders in dialogue about responding to social-ecological problems. However, different knowledges are likely to be privileged over others, and the outcomes of PSP processes may be defined by those who initiate them. As such, there is a need for a better understanding of the benefits PSP could have for those whose knowledges it includes. I define PSP as interactive processes, in which diverse groups of people develop alternative narratives of plausible future events, conditions and trajectories. Literature on the benefits of PSP indicates that it could be most useful as a tool for learning, which I define as a change in understanding, as a result of some external stimuli. However, there is limited information regarding how learning occurs, or how and why it varies between different participants. In Chapter 2, I presented an innovative conceptual framework to help explain learning in PSP. In this chapter, I describe the methodology I used to apply this framework in my empirical study of learning in PSP.

In accordance with my conceptual framework, my methodology focused on exploring the interactions that occurred between different participants in PSP, the processes that encouraged them, and the social contexts that shaped them. I therefore took a qualitative approach, underpinned by a social-constructivist epistemology, that sought to understand participants' subjective experiences of PSP processes, and the learning that occurred through them. I expand on this in Section 3.2, below.

3.2 Research Approach

In my conceptual framework, I reasoned that learning occurs through interactions between participants from different fields of expertise, which exposes them to new knowledge. I also emphasised that learning is shaped by the social context in which it occurs. To study learning in PSP, it was therefore important to account for how learning was constructed, through participants' interpretations of the knowledges they encountered in PSP. Lincoln and Guba (2016) indicate that a constructivist methodology is suitable for exploring how people make sense of phenomena, including how they attribute meanings to them. They describe constructivism as a way of exploring the nature of knowledge, as well as the organising principles, and values, of

physical reality and society. They state that a constructivist perspective assumes that people's understanding of reality is not objective but constructed by the meanings and interpretations they attribute to it. Similarly, Bryman (2008) describes constructivism as a valuable way of understanding the roles played by social actors in the creation of knowledge about reality. Critics of constructivism often contend that, if taken to its extreme, viewing reality as entirely socially constructed and subjective is unhelpful. However, in this study, I considered it a useful approach for analysing subjectivity in the ways that learning occurs, and how it varies for different participants. I therefore adopted a constructivist approach in this research.

As described by Bryman, the implication of taking a constructivist perspective is that the ways people understand the world are viewed as social constructs. I therefore acknowledged that the phenomena I observed in the research were mediated by the experience of others, as well as my own frame of understanding. According to Lincoln and Guba, understanding socially constructed phenomena requires consideration of people's narratives of them. I therefore concentrated on exploring participant's narratives of PSP processes, including their expectations, their experiences of PSP processes, their interactions with others, and changes in their understanding of social-ecological problems.

Winchester and Rofe (2010) advise that understanding the processes through which social phenomena are constructed, is typically best approached using qualitative research methods. Quantitative methods were deemed inappropriate for the purposes of this research, because of the importance of capturing the details and subjectivity of individuals' experiences of PSP. I therefore used qualitative methods to explore learning in PSP. I describe how I applied this approach to a research design in Section 3.3, below.

3.3 Research Design

To capture a well-rounded account of learning in PSP, my research was designed around three different sources of data, gathered over 16 months, between August 2015 and December 2016. These were: i) a review of PSP cases in the academic literature, ii) interviews with practitioners of PSP, and iii) two empirical case studies of PSP processes. I describe each of these, and the rationale for selecting them, in Section 3.4, but first, I designate how each of these sources helped to gather information to address each of the research questions.

The case review focused primarily on the first research question, regarding the expected and reported benefits of PSP. It thus provided the basis of my research and directed my focus towards learning as the most commonly anticipated and reported benefit of PSP. The cases in the

review also provided some information that helped to investigate how learning occurred, as well as how and why it varied. The practitioner interviews contributed to all three research questions. They built on the case review by exploring practitioners' views on the expected benefits of PSP, and then investigating how learning had occurred, and how, in their experiences, it had varied. Similarly, the case studies contributed to all three research questions, but provided especially rich data regarding the details of how learning occurred, and how and why it varied in two specific PSP workshops. The connections between the different sources of data are illustrated in Table 3.1, below.

Table 3.1: How each source of data contributes to addressing the research questions.

Research Questions	**Information sought**	**Sources addressing Research Questions (in order of priority)**
What are the expected and reported benefits of participatory scenario planning?	Rationale for using PSP; Motivations for facilitating and/or participating in PSP; worldviews, social-economic backgrounds, disciplinary perspectives of facilitators and participants; Objectives of the project in which PSP is used	Case review of PSP processes reported on in academic literature; Semi-structured interviews with practitioners of PSP; Survey of participant expectations in case studies; Observation of PSP workshops in case studies
How does learning occur in participatory scenario planning?	Learning indicated by changes in understanding; Elements of PSP that led to learning; Interactions between participants from different fields of expertise; Role of facilitation in enabling engagement with PSP	Semi-structured interviews with participants in case studies; Observation of PSP workshops in case studies; Semi-structured interviews with facilitators in case studies; Semi-structured interviews with practitioners of PSP; Case review of PSP processes reported on in academic literature
How and why does learning vary between different participants in participatory scenario planning processes?	Content of learning by different participants; Content and nature of interactions in and around PSP workshops; Social context in which PSP occurs; Composition of participants in PSP	Semi-structured interviews with participants in case studies; Observation of PSP workshops in case studies; Semi-structured interviews with practitioners of PSP; Case review of PSP processes reported on in academic literature

Source: author construct

3.4 Research Methods

3.4.1 Case Review

As indicated in Chapter 1, PSP is frequently used by researchers, as part of wider research projects that aim to inform responses to SEPs. There exists, therefore, a substantial body of peer-reviewed, academic literature reporting on individual cases in which PSP has been used. However, reviews that assess the expected and reported benefits of PSP across these cases are scarce. I therefore interrogated and analysed the peer-reviewed, academic literature that reported on cases in which PSP was used specifically to help tackle SEPs. This predominantly helped to address my first research question, regarding the expected and reported benefits of PSP, and to highlight weaknesses in the existing evidence base for the benefits of PSP. The case review also yielded insights into how learning occurred and how and why it varied. The data from this review subsequently formed the basis on which the rest of the research was built.

The scarcity of previous reviews on the purported benefits of PSP, meant there was not a recognised method for me to follow. I therefore developed a suitable method for use in this research. My method differs from that taken in the subsequent review of 23 cases of PSP by Oteros-Rozas et al. (2015). Oteros-Rozas et al. review PSP from the perspective of practitioners who were, themselves, involved in the cases they interrogate. I conducted my review from the perspective of an independent outsider. As such, I was not influenced by an interest in portraying PSP as beneficial or successful in achieving its purported outcomes.

I began by defining criteria for the inclusion of cases, which I then used to identify and select relevant texts. As Haddaway et al. (2015) suggest, I ensured my selection of cases was rigorous by selecting literature from multiple databases, ensuring I was consistent in my selection and analysis of literature, and including a critical appraisal of the literature. I conducted a literature search using the databases: 'Web of Knowledge', 'Google Scholar' and the University of Reading's 'Summon' discovery service. Initially, I used the broad search term: 'scenario planning case studies.' This proved inefficient, however, as it yielded many results describing scenario planning in contexts like corporate strategic planning, business, technology and health, that were not relevant to this research. I therefore decided to narrow the search terms, to focus the results on cases in which PSP was used to help confront social-ecological problems. I therefore refined the search terms to: 'scenario planning social-ecological systems,' 'scenario planning sustainable development,' and 'scenario planning environmental management'.

Once I had selected an initial set of cases that met these search criteria, I used a snowball sampling technique to further populate the review. This involved browsing the titles and abstracts of papers cited in each of the cases, and of papers listed on 'Web of Science.' I selected titles that used words and phrases related to the search terms, rather than only including titles that matched the search terms exactly. For example, a title along the lines of 'identifying strategies for poverty reduction under climate change using future scenarios,' would be included, because the terms 'poverty reduction,' 'climate change,' and 'future scenarios,' are related to 'social-ecological systems,' 'sustainable development,' and 'scenario planning.' Articles were excluded if they did not show any relevance to the search terms. For example, a title along the lines of 'using scenario planning to map the long-term marketing strategy of a major corporation,' would be excluded, because although 'scenario planning' is mentioned, it is not in the context of confronting social-ecological problems.

By taking this approach, an initial total of 53 cases were included in the review. After some critical reflection, these were narrowed to 44, with nine of the cases excluded for several reasons. In some cases, examples of PSP were only mentioned in passing, as part of more general discussions on confronting social-ecological problems and did not provide enough detail for an analysis of their expected and reported benefits. For example, Twyman et al. (2011) refer to several examples of PSP in their discussion of managing 'dryland agro-ecological systems,' but do not provide a detailed description of any of them. In other cases, examples of PSP were mentioned only briefly, as part of wider projects. Additionally, several cases were described in multiple papers by the same groups of authors. In these instances, the information from the papers was synthesised to create just one case.

I subsequently conducted a critical appraisal of the papers to improve the transparency of the sample selection for the case review. I created a set of criteria that were focused on ensuring information-rich cases. Hence, I sought to include papers that provided clear descriptions of the objectives, rationale, benefits and challenges of PSP. I considered a description to be clear, if it provided explicit, detailed information on these aspects of PSP. Specifically, my criteria were:

1. Clear objective(s) for the project in which PSP was used.
2. Clear rationale for the use of PSP in the project.
3. Clear description of the role played by PSP in meeting the objectives.
4. Clear description of the purported benefits of PSP.
5. Clear description of the method used for conducting PSP.
6. Reporting any challenges that were encountered in the use of PSP.

Criteria 1 – 4 were considered vital for the study and, as such, any case that did not meet these four criteria was excluded from the review. Cases that did not meet Criteria 5 and 6 were kept in the review, but I made a note of their deficiencies. Following the critical appraisal, the sample of reviewed cases was narrowed to a set of 30 cases. These cases generally contained rich information on the PSP processes they described. This enabled a detailed analysis of what I considered to be a robust sample, of detailed and convincing literature on the expected and reported benefits of PSP.

However, I acknowledge that, because the final set of cases were selected based on their richness of information, there was an inherent bias towards well-reported cases, and they are not necessarily representative of all PSP processes. In the interest of fairness, it is also important to acknowledge that information in the excluded cases may have been absent because of editorial constraints, as explained by Baxter and Eyles (1997). The cases I excluded may have just been superficially reported, rather than poor examples of PSP. In the practitioner interviews, I therefore sampled practitioners from one of the cases that was excluded from the review, as well as those that were included, to give them an opportunity to provide more detailed insights. I discuss this further in Section 3.4.2, below.

The final sample of 30 cases included the use of PSP in a wide range of different topics including: energy, ecosystem services, community adaptation to climate change, food security, fisheries, forestry and biodiversity conservation. All the cases in the review date from the year 2000 onwards, since this was the period in which they were most frequently identified. Academic literature was the only form of literature included in the review, as there was insufficient time to conduct a thorough analysis of grey, and other, forms of literature in this research. I acknowledge that, although substantial, the review could not practically include every single PSP process that has been used to help confront SEPs. I also recognise that the papers in the case review were written by academics, who had been directly involved in the cases they reported on. It was therefore important to elicit detailed primary data on learning, and to analyse it from the perspective of an independent outsider.

3.4.2 Practitioner Interviews

In accordance with my conceptual framework, it was particularly important to find out about the interactions between participants from different fields of expertise, their engagement in PSP processes, and how participants were assisted to engage in them by facilitators and other participants. It was equally important to find out about the relationships and power imbalances between different participants and facilitators involved in PSP. Conducting in-depth interviews with people, can be a powerful way of understanding such detailed social interactions (Yeo et al., 2016). I therefore conducted semi-structured interviews with practitioners of PSP, since as indicated in Chapter 2, the people who initiate and facilitate participatory processes, typically have substantial control over what goes on in them and what the outcomes are. I considered a practitioner to be anyone with experience of coordinating and/or facilitating PSP processes, that aimed to help tackle SEPs. This included a mix of academic researchers, who had used PSP as part of research and knowledge exchange projects, as well as professional facilitators. I found that the distinction between researchers and facilitators was often blurred, in that academic researchers often acted as facilitators in processes they coordinated, and facilitators often acted as researchers.

I adopted a purposive sampling approach to select practitioners of PSP in social-ecological contexts. I began by contacting the authors of papers that were included in the case review. I also contacted authors of cases that were excluded from the review, to give them an opportunity to explain the cases they described, in more detail. This was so I could find out more about the expected and reported benefits of the PSP processes, in which they were involved, and their understanding of how learning occurs, and who learns what. I also selected some prominent figures in the field of PSP, by identifying the authors of highly-cited papers on social-ecological PSP, and through suggestions from my doctoral supervisors. Additionally, I selected two facilitators from the Food Security Futures case study, and one from the Positive Futures for Southern Africa case, who all had wide-ranging experience of PSP outside their respective case study. Finally, I selected one practitioner who I met at a futures-oriented conference, as she had substantial experience of facilitating PSP, and other futures-thinking tools, in social-ecological contexts. I contacted each of the practitioners by email and asked if they were willing to engage in a conversation about specific cases they had worked on, and their thoughts and experiences on PSP more generally.

In total, I interviewed 16 practitioners. Of these, 14 practitioners were academic researchers in fields including ecology and ecosystem services (n=5), geography (n=2), sustainable

energy (n=1), interdisciplinarity (n=1), sustainable development (n=1), food systems (n=3), climate change adaptation (n=1). The remaining two practitioners were both professional facilitators. Nine practitioners were from the cases in the case review, one was from a case that was excluded from the review, three were prominent figures in PSP discourse, and three were from my case studies. Only one of the practitioners I contacted actively turned down the opportunity to be interviewed, because of ill health, but nine others simply did not respond when I emailed them.

Most of the practitioner interviews took place by Skype or telephone, because the practitioners were located around the world. However, four of the interviews took place face-to-face, as the practitioners were available locally and suggested we meet in person. The interviews were designed to last around one hour, and most lasted between 50 and 75 minutes. To avoid taking too much of practitioners' time, I checked how much time they had available at the start of each interview and then again after about 45-50 minutes. All the practitioners I interviewed appeared happy to speak to me, were open to being questioned, and provided detailed and eloquent responses. The practitioner interviews thus yielded rich information about the rationale for using PSP, the benefits it was believed to have produced, and ideas about how learning occurred, what learning entailed and who learned what from whom.

The practitioner interviews were semi-structured to achieve both breadth of coverage and depth of information regarding the key topics of interest in the research (Yeo et al., 2016). As Yeo et al. suggest, to achieve this breadth and depth, I kept interview questions open-ended to encourage in-depth discussions, as well as avoiding leading participants to answer in certain ways. I also used responsive follow-up, or 'probing' questions to expand on, as well as explain interviewees' initial responses. Prior to commencing the practitioner interviews, I prepared one-page lists of discussion topics. These were designed to ensure that I covered the breadth of topics, and the depth of information required to address my research questions. I also sent the list of discussion topics to practitioners before their interview, so they could approach it with a clear understanding of my research and the subjects I wished to discuss. Additionally, I prepared more detailed interview guides, for myself, which contained a list of open-ended questions and discussion prompts designed to facilitate in-depth discussion of the topics needed to address my research questions. However, as Bryman (2008) advises, the interview guides were not definitive, and I remained flexible and responsive to following-up on leads, interesting points, and inconsistent responses. In practice, therefore, the precise questions and order of discussion topics sometimes diverged from the interview guide. An example of this interview guide can be found in Appendix 1.

I asked practitioners about a variety of topics. Firstly, I asked them to describe their experiences of PSP, including why they thought it was beneficial, or not, in the contexts in which it was used. This was to find out about what they considered the expected and reported benefits of PSP to be. Secondly, in Chapter 2, I reasoned that the agendas set by the people who initiate and facilitate PSP processes have a substantial influence on what is learned by different participants. I therefore asked about practitioners' professional and disciplinary backgrounds, and their reasons for using PSP, to help understand how they set their agendas, and what philosophies underpinned them. Thirdly, I asked them to describe cases in which they thought learning had occurred, focusing on how they explained it, and what had been learned by whom. Finally, to explore challenges and uncertainties in PSP, and ways it may be improved, I asked practitioners about the questions they thought needed to be addressed, and any changes they would like to see made to PSP practice.

3.4.3 Case Studies

The case review and the practitioner interviews provided useful information, but they still relied on post-rationalised accounts of PSP processes, by the people who were involved in them. It was therefore important to observe, first-hand, the interactions that took place in specific PSP processes, how they were encouraged, and how assistance provided by facilitators, and between participants, enabled learning to occur. It was also vital to elicit the experiences of participants in PSP, rather than relying solely on the accounts of practitioners.

Lewis (2003) suggests that where such in-depth, contextual information is required, case study research is a useful approach. Bryman (2008) describes a case study as an in-depth analysis of an apparently unique case. I therefore conducted two case studies of specific PSP workshops. I selected these case studies, based on the criteria that they: 1) met my definition of PSP as the development of alternative narratives of plausible future events, conditions and trajectories; 2) were participatory and included a range of different stakeholders; 3) encouraged knowledge exchange between different participants; and 4) focused on tackling SEPs. I found several PSP processes, globally, that met these criteria and were ongoing during the period of study. I selected two of these, which were the easiest to access, because of an existing contact held by one of my doctoral supervisors. Both workshops were part of wider projects that aimed to help tackle social-ecological problems. The first was a PSP workshop in Tanzania. This was part of the wider 'Food Security Futures' (FSF) project, which explored threats and opportunities for achieving food security under climate change. The second was a workshop in South Africa. This was part of

'Positive Futures for Southern Africa' (PFSA), an initiative that aimed to develop hopeful and innovative, but realistic ways of thinking about future relationships between human and environmental systems.

I chose to use two case studies so that a comparison could be made between them. Lewis (2003) advises that where multiple case studies are used, some degree of difference between them is inevitable. It was therefore important to decide upon and manage a level of consistency between them, to ensure they were comparable. PSP processes vary widely, in terms of their objectives, the way they are integrated into wider research and practical agendas, and the people who initiate, facilitate and participate in them. This makes it difficult to make any generalisable claims about learning in PSP. As such, I carefully selected the two case studies, such that there was a balance of similarities and differences between them. These similarities and differences are delineated in Table 3.2, below.

Table 3.2 Similarities and differences between the Food Security Futures and Positive Futures for Southern Africa case studies

	Food Security Futures	**Positive Futures for Southern Africa**
Similarities	Both complied with my definition of PSP in Section 3.1. Although their approaches differed, they still followed essentially the same logic – using present signals, trends and drivers to develop storylines of alternative futures.	
	Participatory process	
	Included a range of different worldviews, social-economic backgrounds, and disciplinary perspectives.	
	Actively encouraged knowledge exchange between different participants	
	Facilitators ranged in expertise and experience	
Differences	Exploratory approach to assess the implications of plausible futures on food and nutrition security in Tanzania.	Normative approach to explore what participants' preferred futures would look like and how they might be realised.
	'Matrix' Approach, including 'backcasting'	'Manoa' approach with addition of 'Futures Wheels' and '3 Horizons' methods
	Scenarios developed from existing drivers of change	Scenarios developed from 'weak signals' of the future in the present, in the form of 'seeds'
	National-level focus	Regional-level focus
	Aimed at informing policy	Aimed at learning about how 'positive futures might look, and how they may be reached
	Seemingly haphazard organisation	Organised strategically, well in advance
	Downscaled CCAFS 'East Africa' scenarios	Development of completely new scenarios
	Very little funding	Substantial funding
	Participants commuted to venue on both days	Participants stayed at the venue for the 3.5-day duration of the workshop

	Focused on specific social-ecological problem – food and nutrition security	Focused on social-ecological problems in the Anthropocene more broadly

Source: author construct

Food Security Futures

The first case study was a PSP workshop held as part of the 'Food Security Futures (FSF)' project, which explores threats and opportunities for food and nutrition security (FNS) at a European and global level. The workshop took place in Tanzania, as part of Food Security Futures' global-level interests. It focused on challenges and opportunities for ensuring FNS for school children in Dar es Salaam. The FSF workshop took an exploratory approach, based on a motivation to explore plausible scenarios and assess the consequences of different future possibilities for FNS in Tanzania. The organisers intended to have a direct influence on policy, through reviewing how Tanzania's second Five Year Development Plan (FYDP) might meet the future challenges of FNS under different scenarios. They therefore brought together 20 participants from a mixture of government institutions (n=10), NGOs (n = 2), education (n = 4), academia (n = 3), and the private sector (n = 1), all of whom were Tanzanian and worked and lived in Dar es Salaam. The workshop was facilitated by three academics, over two days, at the University of Dar es Salaam. The schedule of the workshop, including descriptions of the specific activities within it are described in Table 3.3 below.

Table 3.3: Food Security Futures PSP workshop process

Activities	Description
(Day 1) Introduction	Facilitators gave a presentation explaining workshop objectives and PSP. They subsequently explained each activity before it was undertaken. Participants were split into three groups, each exploring a different theme: i) issues directly affecting FNS, ii) capacity-building for FNS, and iii) cross-cutting themes. Participants selected their own groups but were all asked to mix the groups up halfway through Day 1.
Visioning	Participants constructed a vision of what they would ideally like the future to look like. These visions were based on specific policy objectives from the Tanzanian government's new FNS Policy. Each participant wrote their individual visions on post-it notes then presented their ideas to the group. The groups then discussed and decided on a collective group vision.
Backcasting	Participants developed concrete steps, backwards, from the point of achieving the vision in the future to the very first step that needed to be taken in the present to work towards it. The backcasts were presented as timelines of post-it notes on a horizontal piece of flip-chart paper.
Transcription of backcasts by facilitators	The visions and steps developed in the backcasts were typed-up, as they appeared on the post-it notes. The notes were then elaborated to develop coherent, detailed narratives.
Downscaling CCAFS 'East Africa' scenarios	The groups were each allocated one 'East Africa' scenario, which had been previously developed by the research program, CCAFS. Participants read their scenario and imagined what events, conditions and trajectories would be like in Tanzania in that scenario. Individuals wrote their ideas on post-it notes then presented them to their group for discussion. Each group then collectively developed a narrative of how Tanzania would look in their scenario.
(Day 2) Modelling comparison	The lead facilitator presented pre-developed quantitative models that corresponded to each of the 'East Africa' scenarios. Each group then compared their downscaled scenario to the model.
Causal mapping	The groups each decided on the three most important drivers in each scenario and then identified five other drivers that had the most influence on them. All the drivers were subsequently linked by drawing single-direction arrows, marked as positive or negative, between the post-it notes, according to the influence each driver had on another.
Scenario-based review of backcasts	Each group received all three plans developed in the backcasts and imagined they were trying to implement them in their group's scenario. The scenarios acted as parameters, within which the participants had to work out how to overcome challenges and successfully implement the plans.
Recommendations	The groups discussed and decided on what recommendations they would make for implementing each plan under their scenario. These recommendations were presented by each group in a plenary session at the end of the workshop. There was insufficient time for participants to give feedback on the recommendations produced by other groups. Instead, participants were asked to comment on the recommendations when they had been typed-up and distributed by the facilitators, but this did not happen until three months later.

Source: author construct

Positive Futures for Southern Africa

The second case study was a workshop in South Africa, organised as part of the 'Positive Futures for Southern Africa' (PFSA) project. PFSA part of is a global project, premised on the idea that human changes to the Earth are unsustainable, and have inadvertently induced a new geological epoch – the Anthropocene. However, there is a limited sense of how desirable, plausible alternatives might look. The aim of PFSA is therefore to develop narratives exploring how alternative, socially just and environmentally sustainable, or 'positive futures' might look, and how social-ecological systems may be transformed to create 'positive futures.'

According to the organisers of the workshop, the PFSA project is underpinned by a philosophy of change, that assumes transformations in SES often begin in 'shadow networks,' 'niches,' or 'transformation arenas,' which are peripheral to conventional spaces of decision-making. Hence PFSA assumes it is important to support the dispersal of transformations out of these peripheral spaces and into mainstream discourse and decision-making. As such, PFSA has been identifying and collecting a database of small-scale initiatives, or 'seeds' that could be described as supporting transformations to positive futures.

The PSP workshop in South Africa used these seeds to develop alternative narratives describing how a positive future might look for southern Africa, and how the seeds might be supported to bring these positive futures into being. In doing so, the PFSA workshop took a more normative approach than the FSF case study, in that it explored what participants' preferred futures would look like, and how they might be realised. However, although the scenarios were normative, they were built on logical reasoning to ensure their plausibility. The workshop brought together a diverse range of 23 participants, including a mixture of academics, practitioners and artists. It was facilitated by four academics and one professional facilitator. It took place over 3.5 days in a hotel in Cape Town. The schedule of activities in the workshop are outlined in Table 3.4, below.

Table 3.4: Positive Futures for Southern Africa workshop process

Activities	Description
(Introductory afternoon) Introductory presentation	Facilitators gave a presentation introducing the participants to the concept of the Anthropocene, and the objectives of the workshop.
'PRACTIS' (Platform for Research in Art, Culture, & Theory in Society) session	This involved using art to stimulate discussions about complexity, subjectivity, futures, and transformations to develop a 'shared language' for discussions in the rest of the workshop. The PRACTIS session was facilitated by one of the participants, who developed PRACTIS as a tool for stimulating thought about art, culture theory and society
(Day 1) Introduction to process	Participants were introduced to the method. The facilitators provided a general overview of the process, before explaining the first activity in detail, as they did for each subsequent activity. The participants were then split into three groups of six, and one group of five. The four groups each went into one of four 'break-out' rooms, where they engaged in the activities. Each group was allocated three diverse 'seeds,' including two seeds based in Southern Africa, and one global-level seed related to technology, which they used to build their scenarios.
'Futures Wheels'	The groups imagined what the seeds would look like as 'mature conditions,' or mainstream societal norms, in the future. They described these by writing 'mature conditions' on post-it notes. The participants then arranged the post-it notes in concentric circles, or 'wheels'. The central circle represented the direct 'primary' impacts the 'mature' seeds would have. The second circle represented the 'secondary' impacts, or the impacts of the primary impacts. The outer circle represented the tertiary impacts, or the impacts of the secondary impacts. For example, if I spilled tea on my laptop, the primary impact would be the laptop breaking, the secondary impact would be that I had to buy a new laptop, and the tertiary impact would be that I would have less money to spend on other things.
Cross-impact matrices	Each group explored how the seeds would affect each other. For example, one group explored how encrypted currency would affect a small, self-sufficient community. These connections were plotted on a table and connected by drawing lines between them.
Scenario skeletons	Each group created a general overview of what their scenario would look like, including general themes for the events, conditions, and trajectories that would constitute it. Each group then presented their 'scenario skeleton' to the entire workshop using a headline statement, three imagined statistics and an artistic expression.
(Day 2) 'Deep dive' into scenarios	Each group built on their scenario skeleton by adding detail to conditions, events and trajectories.
'3 Horizons'	Groups were asked to imagine three trajectories, or 'horizons'. 'Horizon 1' represented the dominant way things are in the present. 'Horizon 3' represented the way things are in the future scenarios, which could become dominant in the future. 'Horizon 2' represented the way things will be during the transition from Horizon 1 to Horizon 3. The groups imagined conditions, events and trajectories that defined the decline of Horizon 1, the rise of Horizon 3 and the transition between them.
Scenario presentations	Each group prepared and then gave a presentation that illustrated their scenario to the entire workshop.
Plenary discussion	After each group had presented their scenario, the participants and facilitators reconvened in plenary to discuss commonalities between the scenarios, what insights the scenarios provided into how a good Anthropocene might look, and what steps could be taken to create one.

Source: author construct

Pre-workshop questionnaires

As I showed in Chapter 2, the literature on power and participation highlighted the importance of considering the social context in which PSP occurs for understanding how and why learning varied for different participants. In the case studies, it was therefore important to find out about the participants, their worldviews, occupations, social and economic backgrounds, and their expectations and motivations for attending the workshops. To elicit this information, I asked participants in both case studies to complete a short questionnaire prior to the workshop. This consisted of five open-ended questions, concerning: participants' occupations, motivations for attending the workshop, and the benefits they expected it to have. The full questionnaire is included in Appendix 2. The questions were designed to be open-ended, to accommodate the variety of expectations participants may have had, rather than predefining the choice of answers available to participants.

In the FSF case study, I was unable to ask participants to fill in the questionnaire until they arrived on the first day of the workshop. This was because logistical constraints meant that most participants were invited at very short notice. However, because participants had to commute to the venue, and heavy traffic meant a lot of them arrived late, most participants did not have time to complete the survey. As such, the data collected from the survey was minimal. In the PFSA case, I distributed the survey five days prior to the workshop. This was so that participants had sufficient time to complete the survey, but also so it was close enough to the start of the workshop that it was on their minds and they would be more inclined to reflect on their expectations and motivations for attending it. In total, 10 of the 23 PFSA participants completed and returned the survey. Additionally, one participant indicated a preference for discussing his expectations and motivations in person. I therefore interviewed him at the start of the workshop, using the questions from the survey. The questionnaires thus provided useful contextual information, regarding who the participants were and what their expectations of the process were.

Observation of PSP Workshops

In my conceptual framework, I stated that learning in PSP occurs through interactions between participants from different fields of expertise. I conceptualised processes of creating scenarios as boundary objects, that facilitate the exchange of knowledge between different participants. I also reasoned that participants are enabled to engage in these processes through

assistance from facilitators, as well as other participants. It was therefore important to observe the interactions that occurred in the case studies, how they were encouraged by the process of creating scenarios, and how assistance from facilitators and other participants enabled participants to engage in them. It was also necessary to observe the interactions between different participants, especially how the power imbalances between them, and the 'scaffolding,' provided by facilitators, and by participants to each other, shaped what was learned.

McNaughton Nicholls et al. (2016) postulate that ethnographic observation is a useful method for gaining insights into social interactions, that can complement and triangulate the insights provided by verbal accounts. In the case studies, I therefore conducted an ethnographic observation of the workshops as they took place. As McNaughton Nicholls et al. state, observing anything and everything is both impossible and undesirable. They indicate that careful decisions thus need to be made, to focus on specific aspects of an activity. I therefore compiled observation guides before each of the workshops, to help focus on the aspects of PSP that were identified as important in the conceptual framework. These included the extent and type of interactions that occurred during the workshops, the role that developing and analysing the scenarios played in encouraging and shaping interactions, and how participants were encouraged to engage effectively in PSP, through assistance by facilitators and other participants. Detailed copies of the observation guides can be found in Appendix 3. The observation guides were not definitive, however, and, as advised by McNaughton Nicholls et al., I continually reflected on which phenomena I was focusing on, and why I found them interesting.

My observations began with communicating with the workshop organisers and facilitators (in both cases the organisers doubled-up as the facilitators), via email and Skype. This continued through face-to-face meetings prior to each workshop, and debriefing with them during and after the workshops. During these meetings I noted and asked questions about their preparations for the workshops, their aims and objectives, their method of doing PSP, and the participants they selected. After each workshop, I also asked them to reflect on how they facilitated the workshop and what they thought the outcomes had been.

At the start of both workshops the facilitators gave me chance to introduce myself, my research, and my intention to observe the workshop. Thereafter, I moved around the workshop space, watching, listening and speaking to participants and facilitators. I made detailed, written notes on the method, facilitation and interactions in the workshops. In both cases, it was impossible to observe every single participant and every single group constantly. I therefore had to split my time between different groups of participants. I moved from group to group and sat

with each group for between 10 and 20 minutes, listening to and watching their discussions. I tried to be as discrete as possible to avoid diverting participants' attention away from the workshop activities. During breaks in the discussions, I also asked participants to tell me a little about what they were discussing, at what stage they were in the process, and what they were finding easy/hard, interesting/boring etc. I also spoke to as many participants as possible during breaks, mealtimes, and informal settings outside the workshop space, and made notes afterwards.

Case Study Participant Interviews

To calibrate my observations with the experiences of participants, it was paramount to elicit their own accounts of the interactions that unfolded in the workshops, what they learned and how they accounted for this learning. As described in Section 3.4.2, in-depth interviews can be a powerful way of understanding detailed social interactions (Yeo et al., 2016). I therefore conducted semi-structured interviews with participants from the two case studies.

I sampled interviewees purposively to explore the accounts of participants with different worldviews, social and economic backgrounds, and disciplinary perspectives. To select interviewees, I initially contacted all the participants by email, and asked them to meet for conversation to reflect on the workshops. I then interviewed the participants who responded to my initial email, before reviewing which worldviews, social and economic backgrounds, and disciplinary perspectives I had captured, and which were still needed. I subsequently sent a second email to participants whose perspectives were still needed, to encourage them to meet me.

In the FSF case study I interviewed 13 of the 22 participants including 4 teachers, 2 academics (in development studies and economics), 2 junior government officials, 3 senior government officials, and 1 businessperson. Out of the 13 interviewees, 6 were male and 7 female, and the age range spanned from young to middle-aged adults. In the Positive Futures for Southern Africa case, I interviewed 13 of the 23 participants. Of these, 5 were practitioners, 6 were academics, 1 worked for an intergovernmental project and 1 was an artist. Of these, 8 interviewees were female and 5 male, and their ages ranged from young to middle-aged adults.

These interviews focused on several aspects of PSP. The first thing was to ascertain whether learning had occurred through the workshops. As stated in Chapter 2, I define learning as a change in understanding as a result of some external stimuli. I elicited this information directly

by asking participants if their understanding of social-ecological problems had changed through the workshops. Furthermore, most participants alluded to learning, unprompted, when I asked about other aspects of the workshops, including what they found most interesting and challenging, and about their interactions with others. The second focus was to find out about interactions between different participants, the role (if any) that these interactions played in enabling learning, and the activities that stimulated these interactions. I therefore asked participants about which aspects of the workshops, and which specific activities they attributed learning to.

The third focus was to explore how and why learning varied between different participants. I therefore asked participants to describe what they had learned through the workshops, what they had found particularly interesting, and why, how comfortable they had felt engaging in PSP, and interacting with other participants, how well the workshop had met their expectations, and anything they would have liked to have discussed in the workshop, but were not able to. I also explored variations in what was learned, by comparing the learning described by different participants, and considering whose voices and agendas this reflected. To explore this in the interviews, I asked about who participants interacted with most during the workshop and the discussions that they learned from. The information from these interviews was subsequently compared with my observations of participants' interactions in the workshops.

As I indicated in the conceptual framework, the literature on scaffolding and participation highlighted the important role of facilitation, for enabling and shaping learning. This meant it was also essential to interview the facilitators of the workshops, to explore how they assisted participants to engage in PSP, as well as what they thought participants had learned. Specifically, I asked them to describe specific instances where they had assisted participants to engage in PSP, how they had done so, and how well they thought it worked. I also asked about whether they were aware of theories and concepts like scaffolding. In the same way as in the practitioner interviews, I compiled a list of discussion topics that were sent to all the interviewees before the interviews, and a more detailed interview guide to help me focus the discussions on relevant topics. A copy of this can be found in Appendix 4.

3.5 Analysis

In accordance with the constructivist epistemology taken in this research, it was important to take an emic approach, that built knowledge from the perspectives of my research subjects. I therefore conducted my analysis in an inductive way, using subjects' observations and interpretations of their experiences to build knowledge from the bottom-up (Ormston et al., 2016). Admittedly, in the analysis of interview and observational data, I used a loose topic structure, to help focus on the broad aspects of PSP that were deemed important in the conceptual framework: interactions, creation of boundary objects, scaffolding, and power imbalances. In this sense, my analysis had a deductive element, but I allowed knowledge to emerge from the accounts of my participants regarding the details of interactions, boundary objects, scaffolding, and power imbalances, and remained open to considering issues that were not highlighted by the conceptual framework.

To build an understanding of learning in PSP from participants' observations and interpretations of their experiences, it was necessary to take an approach to analysis that focused on eliciting and interpreting meaning in their accounts of PSP. I therefore used a thematic analysis, which Spencer et al. (2016) describe as exploring and interpreting themes and patterns in what the data says. This involved reading, thoroughly, through the data and identifying themes in what was reported by the authors of papers in the case review, and what was said and done by the participants in my practitioner interviews and case studies. These themes were progressively combined and recombined to create higher-order themes to help address the research questions.

In the analysis for the case review, I began by thoroughly reading and re-reading the papers that described each of the cases. I thus compiled a detailed set of notes on each case. I organised these notes, using a template I devised, that structured them under the subheadings of 'objectives,' 'expected benefits,' 'methodological approach,' 'reported benefits' and 'challenges faced'. I then arranged the notes in a table to compare the cases with each other. Specifically, I compared their objectives, expected benefits, methodological approaches, reported benefits and challenges. I read and re-read the notes in the table multiple times and thus identified themes in the data, based on the frequency with which different objectives, expected and reported benefits, methodologies, and challenges appeared and how much prominence they were given in each respective paper.

The data from the semi-structured interviews were recorded on a voice recorder to enable me to concentrate on interacting with the participants and providing prompts and follow-up questions, rather than taking detailed notes of everything the interviewees said. I did take

some brief notes, however, to help keep track of what participants were saying and make it easier to think of follow-up questions. These were used to write brief 'interview summaries' of each interview, immediately after they had taken place. I transcribed the audio recordings as soon as possible after each interview had taken place, so the interview was still fresh in my mind. To save time, five of the practitioner interviews were transcribed by a professional transcriber, shortly after each interview. I subsequently read through these transcripts and calibrated them with the notes I took in the interviews. In the PFSA case study, the responses to the qualitative survey were all received via email and typed-up. In the FSF case, I typed up the few questionnaires that were filled in. The data from the workshop observations were recorded as written notes in research diaries for each case study. These notes were subsequently typed up as soon as possible after the workshops, while the observations were still fresh in my mind.

Once the interview, survey and observational data had been transcribed, I uploaded them into the qualitative analysis software, 'NVivo 11' (QSR, 2015). In NVivo, I initially read through the transcripts, and the interview summaries, multiple times, to refresh my memory on what the main topics of conversation were. Then I read through each transcript in more detail and created 'nodes' - or extracts from the data that provided information, relevant to the research questions. Initially these nodes were quite descriptive, and just showed what happened in participants' experiences of PSP, whether learning had occurred, and what the content of learning was. I then read through the nodes and categorised them into themes emerging from the data. For example, in the PFSA case study, I identified a theme in that participants described how they had been able to think 'outside the box.' All the nodes that provided evidence for this theme were thus organised in NVivo under the heading 'thinking outside the box'.

To create more analytical themes, I read through each of the themes and identified relationships between them. Specifically, this involved creating 'node matrices' in NVivo that compared different themes to identify where the same extracts of data were present in multiple different themes. I also created notes in Word documents that detailed how the different themes connected and influenced each other. For example, as will be explained in Chapter 5, I identified that in the Positive Futures for Southern Africa case study some participants attributed their ability to push beyond their usual range of thinking to the 'Futures Wheels' activity. I therefore noted that there was a relationship between the Futures Wheels activity and 'thinking outside the box.'

Reliability and Validity

As Lewis et al. (2016) describe, the concept of reliability of research findings is sometimes dismissed by qualitative researchers. Such critiques dismiss reliability because, since qualitative research typically focuses on understanding the complexity and contextualised nature of phenomena, it is naïve and irrelevant to think that findings could be replicated. I agree with Lewis et al. however, who contend that reliability is important in qualitative research to ensure the robustness of research findings outside their study sample.

Lewis et al. state that the reliability of research findings depends on the likelihood that key features in the data could recur in different samples, and that they have been analysed in a rigorous way. In this research, my dataset spanned across a wide range of different instances in which PSP was used, thanks to the inclusion of data from the carefully selected 30 cases in the case review, and the accounts of the 16 practitioners I interviewed. The fact my findings were gleaned from such a range of cases indicates that they would be likely to recur, if another set of PSP processes had been studied. To ensure that I analysed my data rigorously, I created research summaries immediately after each interview and observation, so what was said was still fresh in my mind. I listened carefully to the interview recordings, multiple times, to ensure that what I transcribed was accurate. During the thematic analysis, I read through the data and summarised my findings then read through the data again to check whether my initial interpretations were true to the data. I repeated this process several times. As suggested by Silverman (2014), I validated my findings through triangulation. This involved calibrating the results from my three data sources, the case review, practitioner interviews and case studies, against each other and identifying overlaps and discrepancies between them. I did this by summarising the contribution of each source to each of the research questions in a table. Furthermore, I linked the data to my wider reading of PSP literature, as well as theory on learning and power.

3.6 Positionality and issues faced

In accordance with the constructivist philosophy underpinning this research, it was important to consider not only the subjectivity in how participants constructed their experiences of PSP, but also the influence of my own positionality on participants' accounts of PSP. As suggested by Watson (2011), I prepared for my research by developing an understanding of the social and political contexts, in which the research was conducted, and my position in relation to

them. Specifically, I considered how my position as a young, white, male researcher could have influenced the accounts of my research subjects.

In the case review, my position was that of an academic researcher scrutinising the work of other academics. It was therefore important to ensure I represented the papers and their authors in a way that upheld acceptable standards of rigour. As described in Section 3.4, I maintained a high level of transparency and consistency, to ensure I conducted the review in a fair and robust way.

In the practitioner interviews, the participants were a mixture of academics and professional facilitators, from a range of social and cultural backgrounds. They all shared a vested interest in PSP, as their careers and reputations were reliant on it, to a greater or lesser extent. As a researcher providing an outsider's perspective on PSP, there was a distinct possibility I could indicate that PSP does not always deliver on some of its putative benefits. To protect these interests, practitioners may have shaped their responses to downplay, or avoid the weaknesses and challenges of using PSP.

To mitigate this issue, although Wiles et al. (2006) suggests interviewees could be given the opportunity to read interview transcripts, and remove anything that could cause harm, I considered this option inappropriate for maintaining an independent perspective. Instead, I clearly informed practitioners of the intentions of my research, and that I reserved the right to criticise PSP and its practice. I also made it clear that my research had the potential to suggest ways of improving the benefits of PSP to emphasise I was not just looking for its weaknesses. Given these clarifications, the practitioners I interviewed generally spoke openly and eloquently about both the benefits and drawbacks of using PSP.

The FSF case study in Tanzania, and the PFSA case study in South Africa, were both conducted within a context of historical exploitation by Europeans. As a white, British male I may have therefore been associated with social, political and economic privilege. In both case studies, participants may have also assumed I worked for the project - Food Security Futures or Positive Futures for Southern Africa - that coordinated the workshop. As a result, the research participants may have felt uncomfortable speaking openly to me about their experiences of the workshops. Indeed, in the FSF case study, only two interviewees voiced any strong criticism of the workshop. To ameliorate these issues, I clarified that I did not work for FSF or PFSA. Moreover, I stated that I was studying the workshops, as an independent outsider, for the purposes of my own doctoral research. I stated this during the workshops, in emails to participants, asking to arrange

interviews, at the start of interviews, and sometimes during the interviews, to reassure interviewees that they could speak their mind.

In the FSF case study, participants only spoke English as their second or third language, and I spoke hardly any Swahili. To deal with the language barrier I offered to arrange a translator prior to each interview, but the interviewees all declined this offer. I therefore made sure I spoke slowly and clearly, and gave them chance to seek clarification, to help them understand my questions. For example, in one interview the interviewee explained that he understood written English, better than spoken English. At his request, I therefore wrote out each question after I had asked it verbally. These measures generally worked well, as most interviewees provided detailed and eloquent responses to my questions.

In terms of the observations, as McNaughton Nicholls et al. (2016) point out, the researcher's presence often influences the very thing they are trying to observe. To avoid influencing the discussions, and associated learning, through my own contributions, I did not directly participate in the discussions in either of the workshops. However, in both workshops I joined participants in the breaks and at mealtimes. In the PFSA workshop, I also participated in the introductory 'PRACTIS' session (see Table 3.5). However, participants and facilitators reflected afterwards that this made me an 'affable' and 'non-threatening' presence, which helped them feel more comfortable with sharing their experiences, as well as their learning from the workshop, with me.

In both case studies, the research participants were aware that I spoke to other participants and facilitators, and that their responses would contribute to my thesis and subsequent publications, which could be read by others. There was therefore some danger of reluctance to discuss the interactions and relationships that unfolded with other participants and facilitators. To help participants feel comfortable discussing these issues, I reminded them they did not have to discuss anything they did not want to, that their responses were confidential and that they would not be named in the thesis, or any subsequent publications. Having been given these assurances, most participants did subsequently speak in detail about their interactions with other participants.

In general, I approached the research with humility and attempted to build rapport with the research participants. I asked interviewees to suggest a convenient time and comfortable location for interviews to take place. I gave participants the opportunity to ask me any questions for clarification throughout the research. In face-to-face interviews, I offered to buy participants

food and soft drinks out of respect for them taking the time to speak to me. I also checked how much time they had available to avoid taking up too much of it. Out of thanks to the workshop organisers for helping with my research, in both cases, I met with them at the end of the case study to brief them on my initial findings. The workshop organisers will receive a summary of my thesis, once complete.

As in all research, my research design had limitations, as well as biases. These are detailed in Table 3.5, below.

Table 3.5 – Limitations of my research design, implications for my findings, and the measures I took to minimise these issues.

Limitations of the research design	Implications for my findings	Measures taken to minimise the impact of limitations
Insufficient time to explore whether learning led to changes in decision-making and action.	Lack of understanding regarding the potential medium and long-term benefits of learning in PSP.	Asked case study participants if they believed what they had learned could influence their professional roles, and everyday lives. Asked practitioners if learning, through PSP, had resulted in subsequent changes in decision-making and action.
Definition of learning is based on my own interpretation, rather than that of participants	Case study participants could have had a different understanding of what 'learning' means.	Asked interviewees, specifically, about how their understanding of the SEPs covered in the workshops had changed.
Lack of information from grey literature, as well as PSP practitioners from governmental and non-governmental organisations.	My data is biased towards examples of PSP being used by academics.	Interviewed practitioners who also had experience conducting PSP processes for governmental and non-governmental organisations.
Papers in the case review were selected according to criteria that focused on their information-richness.	My data is biased towards well-reported cases of PSP.	Sought to interview authors of cases that were excluded from the review. Unfortunately, only succeeded in interviewing one such practitioner.
Focused on developing an in-depth understanding of learning in PSP, rather than comparing the benefits of other participatory processes for stimulating dialogue on tackling SEPs.	My research does not contribute to understanding the strengths and weaknesses of PSP as compared to different methods.	In Chapter 7, I consider how my contribution of a more detailed, theoretically-grounded understanding of learning in PSP, can inform future research on learning in other participatory processes.

Source: author construct

3.7 Research Ethics

I carefully considered and attempted to manage the ethical issues in this research. I aimed to not only mitigate potential negative impacts of the research, but to encourage opportunities for a net positive impact. I made every effort to ensure I conducted the research in an ethically sensitive and responsible way that accounted for my moral responsibilities to research subjects, gatekeepers, the wider communities in which the research took place, and the academic profession. My research was conducted with ethical clearance from the Research Ethics Committee at the School of Agriculture, Policy and Development, University of Reading.

Participants in the practitioner interviews and case studies were thus provided with an information sheet, clearly explaining the purpose, intent and process of the research. This was also explained verbally, prior to observations and interviews, to ensure it was understandable to the research participants, as well as to give them chance to ask for clarification. Participants were informed they had the right to request that any of their responses be excluded from recording and analysis, and to withdraw from the research at any point. Participants were subsequently asked to sign a consent form, or to provide recorded, verbal consent if they preferred. I ensured the confidentiality of participants' responses by attributing quotes to pseudonyms, rather than participants' real names. Electronic data was stored on a password–protected laptop, and backed up to the James Hutton Institute server, as well as my external hard drive. Data was stored and managed in accordance with the University of Reading's Data Protection Policy and the UK Data Protection Act.

3.8 Conclusion

In this chapter, I have outlined the methodology I used for studying learning in PSP. The research was underpinned by a constructivist philosophy and took a qualitative approach to explore the intricacies of interactions between different participants in PSP. I collected data from three sources: i) a case review of academic literature, describing cases of PSP, ii) semi-structured interviews with practitioners of PSP, and iii) two case studies of specific PSP processes, which included observations, semi-structured interviews, and qualitative surveys. Data were analysed using a thematic analysis, and triangulated across the different sources of data. I took every effort to ensure the research was conducted in an ethical way, and was sensitive to how both my positionality, as well as that of individual participants, could have influenced their accounts of PSP. The results I present in the following chapters are based on my detailed analysis of data, acquired through this methodology. In the next chapter, I begin the presentation of my results by

showing the expected and reported benefits of PSP, informed primarily by the case review, but also by the practitioner interviews and case studies.

Chapter 4 – What are the expected and reported benefits of Participatory Scenario Planning?

4.1 Introduction

In this chapter, I present my findings that show the expected and reported benefits of using participatory scenario planning (PSP). As defined in Chapter 1, PSP refers to interactive processes in which diverse groups of participants develop alternative narratives of plausible future events, conditions and trajectories. In Chapter 2, I showed that PSP has increasingly been used to include the knowledges of different actors, in dialogue that aims to help tackle social-ecological problems (SEPs) and thus create more sustainable conditions in social-ecological systems (SES). However, there is a need to understand the benefits PSP may have for those whose knowledge it includes. In this chapter, I explore the expected and reported benefits of PSP, drawing on insights from the case review, interviews with practitioners of PSP, and my two case studies, as described in Chapter 3.

This chapter is structured as follows: in Section 4.2, I show that practitioners' use of PSP is frequently underpinned by an assumption that structuring future possibilities into sets of alternative scenarios, could make it easier for participants to think about complexity and uncertainty in SES. This is not frequently reported as a benefit of PSP, because it is subsumed under more specific benefits, particularly learning, as well as developing and testing strategies for tackling SEPs. However, I also show that PSP does not always deliver on this benefit, because of a limited capacity to deal with surprise. In Section 4.3, I show that learning is the most frequently expected and reported benefit of PSP. However, I indicate that there is a lack of theoretically-informed understanding regarding how learning occurs, and limited consideration of how and why it varies for different participants. Then in Section 4.4, I demonstrate that PSP is also expected and reported to help develop strategies to tackle SEPs. However, there was a lack of concrete evidence for this leading to any change in practice, at least during or soon after PSP processes that could help tackle SEPs. In Section 4.5, I show that practitioners struggle to articulate the strengths and weaknesses of PSP, especially in comparison to other methods, and have limited opportunities to conduct and publish formal evaluations of the impacts of PSP.

4.2 *"It helps to break it down, step-by-step."* – Structuring future possibilities

4.2.1 Expected Benefits

As stated by Peterson et al. (2003), the world is highly complex, and the future holds infinite possibilities, making it highly uncertain. PSP is, they claim, a potentially useful method for thinking about such complex and uncertain futures. My data shows that the rationale for using PSP was frequently underpinned by just such an assumption. Complexity and uncertainty, although distinct, were often difficult to disentangle in people's accounts of the benefits they expected from PSP. This could be because of an assumption that complexity is a source of uncertainty. As Cilliers et al. (2013) describe, complexity is a characteristic of a system that arises because of dynamic interactions between a large number of its components. They state that it is impossible to understand a complex system in its entirety, because of the high volume of interacting components, and the variable nature of those interactions. This means that knowledge of complex systems is always limited. According to Rotmans and van Asselt (1999) variability of phenomena, as well as limitedness of knowledge about them, contribute to uncertainty. Complexity and uncertainty are therefore distinct yet closely linked phenomena.

My research revealed an assumption, by practitioners of PSP, that 'exploring,' 'clustering,' or 'structuring' future possibilities, through PSP, could help participants to think about complexity and uncertainty. This was most plainly evident in the case review, in which the authors of all 30 cases expected PSP to help participants think about complexity, by structuring future possibilities into a small set of alternative narratives. For example, Tschakert et al. (2014) expected that *'exploring a range of possible futures*,' could help participants think about: *'complex feedbacks across scales and between the social and the natural,'* (p.1052). In the case of Brand et al. (2013) the authors begin their paper by presenting PSP as a method that can: *'take into account the complexity of human-environment systems,'* (p.43). They go on to describe how it can: *'widen perspectives in the light of a variety of possible futures,'* (p.45).

In the case described by Vermeulen et al. (2013), regarding the use of PSP for food security under climate change, the authors do not explicitly mention complexity. Rather, they state that they expected processes, in which: *'uncertainties were structured to produce socio-economic scenarios,'* would help participants to *'explore unknown unknowns,'* and *'challenge assumptions about the future,'* (p.8360). In this instance, although complexity is not mentioned, the authors introduce their paper by describing the issue of achieving food security under climate

change as a complex problem, which requires consideration of future uncertainties. Indeed, they cite Stirling (2010), who emphasises that the complexity of the world demands consideration of uncertainty. This indicates an implicit assumption by the authors that structuring future possibilities could help account for the complexity of achieving food security under climate change, and explore the uncertainties surrounding it.

In the practitioner interviews, eight of the 16 informants explicitly indicated that they thought structuring future possibilities in PSP, could help participants think about complexity and uncertainty. One practitioner, Deborah, had extensive experience of using PSP in global and regional-level ecosystem assessments, including the prolific Millennium Ecosystem Assessment (MA), which made her insights particularly salient. She explained that:

> *"The planet is so vast, that it requires synthesis of a tremendous amount of information to understand any global trend, or pattern, or process… [in the MA] we felt that the scenarios would help make the global something we could think about more easily." (Deborah, 2015)*

This indicates an assumption that PSP could help participants to comprehend the immense complexity of global processes. When I subsequently asked her how she thought PSP could do this, Deborah responded:

> *"The number of ways the future could unfold is infinite... In a scenarios process, one is forced to cluster the possible futures into a manageable number of stories. [In the MA] we came up with four scenarios that we used to organise ideas about the future." (Deborah, 2015)*

It is evident then, that structuring future possibilities into sets of stories was expected to help participants to think about complexity and explore uncertainties.

My observations and interviews, in the two case studies, also indicate that structuring future possibilities can be a key motivation for using PSP. However, this was not always immediately obvious. For example, in the Food Security Futures (FSF) workshop I studied in Tanzania, which was part of a wider research project exploring threats and opportunities for food and nutrition security (FNS), there was evidence of an assumption PSP could help participants comprehend complexity, by structuring different possibilities into alternative scenarios. In the 'Description of Work' that FSF were required to submit to their funders, they detailed their rationale and planned activities. This document states that one of the main objectives of the overall project was to: *'capture the multidimensionality of FNS and the complexity of its drivers,'*

but it does not explicitly explain how PSP is expected to do this. However, in the introduction to the workshop in Tanzania, I observed one of the facilitators, Mike, describe PSP as a *"structured approach,"* to thinking about the future of FNS. He went on to explain that creating scenarios would enable the participants to: *"explore different possibilities."* From this, I infer that structuring different possibilities in PSP was expected to help think about the complexity of drivers in FNS.

In the Positive Futures for Southern Africa (PFSA) case study, the assumption that structuring future possibilities could help think about complexity and uncertainty was not explicitly obvious, but it was implicit in the facilitators' expectations. At the start of the workshop, the facilitators gave an introductory presentation, in which they emphasised the complexity of SES and the resultant uncertainty of the future. One of the facilitators, Jane, stated that *"multiple 'positive futures' could exist simultaneously,"* and then stated an interest in exploring and comparing what a 'positive,' or just and sustainable, Anthropocene meant, for different stakeholders. This demonstrates a recognition of uncertainty regarding what a positive future would look like, because of complexity in what it would mean for different people. I thus infer that structuring future possibilities in PSP was expected to help explore complexity and uncertainty, in what positive futures would be like.

The above evidence reveals an expectation that, by structuring future possibilities into sets of alternative narratives, PSP could make it easier for participants to think about complexity in SES and uncertainty. This assumption is not new. One of the early protagonists of scenario planning in corporate strategic planning, Pierre Wack, presents it as a useful tool for structuring uncertainty (Wack, 1985). Wack explains that it helps to break down the infinite array of future conditions into coherent narratives of alternative, plausible futures. More recently, in their review of scenario planning techniques, Amer et al. (2013) reason that structuring uncertainty in this way can help participants understand different drivers, as well as their potential future trajectories. These assumptions are reflected in the expectations shown in my data, that PSP structures the possible futures of SEPs into sets of alternative narratives, thus making it easier for participants to explore the interconnections between different components of SES. I explore whether these expectations were realised in Section 4.2.2, below.

4.2.2 Reported benefits

The above evidence shows that PSP is commonly used with the expectation that structuring future possibilities can help participants to think about the complexity and future uncertainty of SEPs. In my practitioner interviews, as well as my two case studies, this was only rarely reported as a benefit by my informants. For example, one practitioner, Barry, indicated that structuring future possibilities is inherently beneficial because it helps participants cope with uncertainty:

> *"People just go away learning how to think about the future… I think that's probably the biggest learning… At the end they are able to address uncertainty." (Barry, 2016)*

In the FSF case study, one participant, Fiona, clearly articulated how structuring future possibilities had helped her to think about complexity by highlighting 'steps,' or links between different components of SES. She described how she had found it useful to:

> *"start with the big thing then break it down step-by-step," because "after you give one aspect, it develops another step to another aspect." (Fiona, 2016)*

In the case review, though, none of the authors reported this as a benefit of PSP. I infer that this is because the benefits of structuring future possibilities are subsumed under more specific benefits. As I show in Sections 4.3 and 4.4, the most common benefits associated with PSP are: learning about SES and developing strategies for tackling SEPs. For example, in the case review, the case described by Tschakert et al. (2014) reportedly enhanced: *'recognition of interdependencies between environmental, socioeconomic, and governance processes.'* This indicates that structuring future possibilities helped participants learn about the interactions between different components in SES. In a different example, the practitioner, Nigel, described how structuring future possibilities had enabled researchers and participants to:

> *"Run project proposals and policy options through the scenarios to figure out which project option is the most robust." (Nigel, 2015)*

Thus, he felt that they had been empowered to make informed decisions in highly complex and uncertain situations. It is evident then, that, although structuring future possibilities was not often reported as a benefit, it was related to, and sometimes acted as a precursor to other reported benefits, particularly learning, and developing and testing strategies.

4.2.3 Limitations of PSP for structuring future possibilities

My findings indicate that PSP is useful, because it structures future possibilities into a manageable set of alternative scenarios, which helps participants to think about complexity and uncertainty, and can lead to learning and developing and testing strategies to help tackle SEPs. However, there was some evidence that PSP did not always deliver on this benefit. For instance, in the case described by Brand et al. (2013), the authors reflected that PSP was unable to adequately account for the complexity of the problems they were considering. They described how they, quite reasonably, limited the number of components they included in the scenarios to 20, but thought this did not fully account for the complexity of SEPs. Similarly, Rivard and Reay (2012) and Vermeulen et al. (2013) agree that the ability of PSP to consider the full complexity SES is limited. For example, Rivard and Reay state that PSP *'may not emphasise every parameter*,' (2012: p.373).

These limitations were also raised by the highly experienced practitioner, Deborah. She asserted that structuring future possibilities in PSP has a limited capacity to deal with surprise, even though, as shown in Section 4.2.1, she thought it could help participants think about complexity and uncertainty. She explained:

> *"So, the world is full of totally off-the-wall events, that nobody would ever foresee, but end up having substantial influence on how things unfold. But if you put them in a narrative, they seem incoherent, they seem made-up, and so scenarios are held to a standard of coherence that the world is not." (Deborah, 2015)*

This was reflected in a discussion with one of the Food Security Futures facilitators, Mike, who contended:

> *"Often scenarios [processes] claim to incorporate some discontinuity, but really, they do not, because they are just continuations of underlying trends, however weak those trends are." (Mike, 2016)*

This indicates a deficiency in the capacity of PSP to help participants think about complexity and uncertainty, because it based on the continuation of current trends.

It is not surprising however, that PSP is unable to incorporate every possible eventuality and every interacting component in SES. As Cilliers et al. (2013) contend, such a feat would be impossible. They state that a person can only ever learn more about a complex system, and can never understand it, in its entirety. Similarly, Rotmans and van Asselt (1999) state that uncertainty

can never be eradicated, because knowledge is always limited. One can only ever deal with uncertainty by learning about its sources. The importance of learning was reflected in my research, in which I found that it was the most frequently expected and reported benefit of PSP. I discuss this further in Section 4.3, below.

4.3 *"I learnt a lot… because my understanding was completely different."* - Learning

4.3.1 Expected benefits

As described in Chapter 2, PSP is commonly used to integrate the knowledges of different stakeholders, in dialogue on tackling SEPs (Oteros-Rozas et al., 2015). Many proponents of PSP, in my research, thus expected participant's exposure to different knowledges to encourage learning. As defined in Chapter 2, I consider learning to be a change in understanding as a result of some external stimuli. In 21 of the 30 cases in the case review, the use of PSP was underpinned by an expectation that bringing together actors, with different roles, interests, knowledges and worldviews, would encourage learning. As illustrated in Table 4.1, assumptions related to learning included 'understanding complexity in SES,' 'understanding links between ecosystem changes and human wellbeing,' 'understanding the impacts of local-level changes at the national level,' and 'incorporating information on environmental change from Indigenous and scientific knowledge.'

Table 4.1 – Evidence that learning was an expected benefit in 21 of the cases in the case review, based on my interrogation of the expectations in these cases in the peer-reviewed literature on specific cases of PSP.

Case of PSP in peer-reviewed literature	Evidence of learning as an expected benefit of PSP
Bohensky et al. (2006) - ecosystem services in Southern Africa	Expected to assist participants in understanding complexity in social-ecological systems.
Brand et al. (2013) - ecosystem services in the Swiss Alps.	Expected to develop a better understanding of current problems, as well as to generate more robust social knowledge.
Carpenter et al. (2006) the Millennium Ecosystem Assessment.	The MA scenarios aimed to gain a better understanding of ecosystem services in the future, the effects of changes in human systems on them, and the effects of changes in ecosystem services on human wellbeing.
Fisher et al. (2011); and Swetnam et al. (2011) - ecosystem service analysis in Tanzania.	Aimed to build an understanding of the links between ecosystem changes, and human wellbeing.
Malinga et al. (2013) - ecosystem service assessment in South Africa.	Incorporating a range of perspectives, through the participation of a range of stakeholders, to help understand complex changes in ecosystem services.
Mistry et al. (2014) describe a scenario planning process on ecosystem management in Guyana.	Aimed to foster 'social learning' on the implications of local-level developments, including indigenous populations, on the national scale and of national and international developments at the local scale.
Palacios-Agundez et al. (2013) - ecosystem management in Spain.	Incorporating the knowledges of diverse stakeholders to analyse changes in ecosystem services, as well as associated human wellbeing.
Plieninger et al. (2013) - ecosystem services provided by cultural landscapes in Germany.	Assumed PSP could help identify and mitigate threats to cultural landscapes.
Henly-Shepard et al. (2015) - improving adaptive capacity to hazards in Hawaii.	Assumed that PSP could facilitate 'social learning,' to encourage participants to anticipate, as well as adapt to potential hazards.
Ravera et al. (2011a); and Ravera et al. (2011b) - adaptation in Nicaragua.	Aimed to bring out different participant's visions of the future, to understand the effects of climate variability and socio-economic changes on livelihoods in the future.
Ravera et al. (2011a); and Reed et al. (2013) - environmental management and adaptation in UK uplands.	Explore different stakeholder's visions and desires for the future, to help them understand connections between different variables and evaluate complex indicators.
Tschakert et al. (2014) – climate change adaptation in Ghana and Tanzania.	Create spaces for 'co-learning,' in which participants could gain insights about the past, present and future, by combining knowledge from everyday experience with climate science. Hence, develop a more anticipatory understanding of SEPs.

Wesche and Armitage (2014) - environmental change in northern Canada.	To incorporate information on environmental change from both indigenous and scientific knowledge, and thus develop an understanding of community vulnerability to environmental change, as well as potential adaptation options.
Van Berkel et al. (2011) - rural development in Portugal.	Facilitate a deeper investigation of rural development options, by enriching understanding of local constraints and assets.
Vermeulen et al. (2013); and Vervoort et al. (2013) – food security under climate change.	Identify uncertainties, challenge existing assumptions about the future.
Badjeck and Diop (2011) - fisheries research in West Africa.	Help develop understanding of how different situations of climate change would affect the lives of the communities.
Bohensky et al. (2009) - options for ecotourism in Papua New Guinea.	Integrate different types of knowledge into alternative futures, to explore how different participants react to change, and develop understanding across spatial scales.
Palomo et al. (2011) - protected area management in Spain.	Build consensus between conflicting stakeholders, by co-developing new knowledge about the ecosystem.
Pert et al. (2010) - biodiversity conservation in Queensland, Australia.	Help understand drivers of change and evaluate the impacts of current trajectories.
Mora et al. (2014) - forestry in France.	Combine anticipatory learning on the impacts of climate change with land use planning.
Wollenberg et al. (2000) – 'adaptive co-management' of community forests.	Facilitate 'social learning' regarding system structures, long-term trends and potential uncertainties, by highlighting participant's assumptions and mental habits, through exposure to potential future trajectories.

Source: author construct

Table 4.1 thus shows a common assumption that, by bringing different stakeholders into dialogue, PSP could result in learning.

In one, specific example, Mistry et al. (2014) attribute the complex nature of SEPs to the different interests at stake: *'part of this complexity arises from different interest groups,'* (p.127), before arguing that: *'effective and more equitable management of social–ecological systems, therefore, requires analysis at multiple levels of governance, their inter-connections and the competing values and perspectives across scales,'* (p.127). They subsequently present PSP as a useful tool for conducting a: *'cross-scale, multiple perspective assessment of emerging social–ecological challenges*,' (p.128). This demonstrates an expectation that PSP could bring together these 'multiple perspectives,' to help learn about the complex values and perspectives of interest groups at different levels of governance.

In the practitioner interviews, 11 of the 16 informants also assumed that bringing different stakeholders into dialogue would enable learning about the complex and uncertain dynamics of SEPs. For example, Mary described a PSP process she conducted on upland conservation, which required input from both natural and social science research. She indicated that PSP was expected to bring these different disciplinary perspectives together:

> *"The approach that we took to scenario planning involved a lot of natural science research to understand some of the mechanisms behind the carbon dynamics, but we then combined that with social science research to try and understand the broader issues that participants were concerned about and the broader system." (Mary, 2015)*

This indicates an expectation that, by combining different disciplinary perspectives, PSP would encourage learning about different aspects of upland ecosystems. Another practitioner, Greg described how he had assumed PSP could help connect different sources of knowledge on environmental change:

> *"Science is not the only type of knowledge, and indigenous knowledge is very important to incorporate when we're thinking about how to adapt to environmental change… [PSP] just seemed like a very effective tool to be able to incorporate different sources of knowledge." (Greg, 2016)*

It appears then that PSP was expected to enable learning about different aspects of environmental change, by bringing together different types of knowledge.

In the FSF case study, the expectations were not entirely clear. In the 'Description of Work,' document, described in Section 4.2, learning is not explicitly put forward as an expected benefit. However, when I interviewed one of the facilitators, Thomas, he indicated that he expected the workshop to yield: *"information for stakeholders that will inform the planning process of the government."* Similarly, during the introduction to the workshop, Thomas explained that the aim of the workshop was to: *"build an understanding,"* of FNS in Tanzania. This indicates an assumption that learning would be a benefit of PSP. It was difficult to establish what the FSF participants expected the benefits to be, as only one of the 13 participants I interviewed, Tristan, had a prior awareness of PSP. Tristan described how he thought PSP would help learning:

> *"I thought it would add up on what I already [knew] because there is new knowledge every day, so somehow, someway I could learn something new." (Tristan, 2016)*

Learning was a particularly strong expectation in the PFSA case study. This was reflected in the aims set by the workshop organisers, which included learning about what a just and sustainable future might look like from the viewpoints of different actors. From the early stages of planning the workshop, the organisers viewed PSP as a tool for learning. In an email exchange, six months before the workshop, they explained that they conceptualised PSP as: *'a tool for generating awareness, with a view to building understanding,'* and as a *'learning exercise.'* When I attended their final planning meeting before the workshop, they described how they expected that bringing together scientists, artists, policy-makers and practitioners would enable the participants to learn from one another about how positive futures might be created. I also observed that they repeatedly emphasised this focus on learning and were keen to record participants' learning.

This was reflected by the expectations of the PFSA participants. In my pre-workshop questionnaire, all 10 of the respondents indicated they expected to learn, through their participation in the workshop. For example, Dillan indicated that he expected to learn about how participants from different fields thought in different ways:

> *"I am hoping to make new connections and to try and understand how thinking in their fields intersects with mine." (Dillan, 2016)*

Similarly, Penelope expected to learn about how different participants thought about the future:

> *"I hope to learn from diverse approaches to thinking about the future and to be able to work together to envision futures that go beyond the incremental."*
> *(Penelope, 2016)*

It is evident then, that practitioners and participants commonly expected PSP to encourage learning by bringing different stakeholders together, to deliberate on the futures of SEPs. I investigate whether PSP met these expectations in Section 4.3.2, below.

4.3.2 Reported Benefits

In the case review, learning was reported in 23 of the 30 cases. For example, Mistry et al. (2014) report that PSP helped local community members to improve their understanding of potential future *'processes of change and adaptation,'* (p.143). They illustrate this with a quote from one of their participants, which states they could *'see the interconnection of one another's visions,'* (p.143). This shows that PSP met the authors' expectations, described in Section 4.3.1, that it would help participants learn about interconnections between the perspectives of different stakeholders. Similarly in their paper, Plieninger et al. (2013) report that PSP successfully enabled scientific knowledge to be combined with local knowledge, which: *'provided rich insights, both for the researchers and the local actors, into local views and perceptions,'* (p.50). The authors report that these insights improved the ability of local actors to: *'successfully deal with landscape change and the resulting impacts on human quality of life,'* (p.50) and that the participants: *'felt better prepared for future developments,'* (p.50). This indicates that, through bringing different actors into dialogue, local actors learned about different knowledges, to cope with landscape changes and deal with the uncertainty of potential future developments. As illustrated in Table 4.2, similar descriptions of learning were widely reported, across the case review.

Table 4.2 - Evidence that learning was reported as a benefit in 23 of the cases in the case review, based on my interrogation of the outcomes of these cases in peer-reviewed literature, on specific cases of PSP.

Case Study using Scenario Planning	Evidence of learning as a reported benefit of PSP
Rivard and Reay (2012) - exploring the future of Malawi's energy sector.	Helped to identify key drivers and compounding factors in Malawi's future energy needs
Bohensky et al. (2006) - ecosystem services in Southern Africa	Participants were enabled to think outside their usual range of decision-making.
Brand et al. (2013) - ecosystem services in the Swiss Alps.	Helped stakeholders to 'broaden' their perspectives and helped to build consensus between them.
Carpenter et al. (2006) the Millenium Ecosystem Assessment.	Highlighted key analytical challenges, particularly the strong feedbacks between changes in human systems and changes in ecosystem services
Fisher et al. (2011); and Swetnam et al. (2011) - ecosystem service analysis in Tanzania.	Provided insights into the impact of ecosystem service change on human wellbeing
Malinga et al. (2013) - ecosystem service assessment in South Africa.	Helped identify trends, uncertainties and threats, as well as opportunities for communities to shape their own future.
Mistry et al. (2014) describe a scenario planning process on ecosystem management in Guyana.	Helped to reveal differences in perceptions of management schemes at different levels.
Palacios-Agundez et al. (2013) - ecosystem management in Spain.	Encouraged 'social learning'
Plieninger et al. (2013) - ecosystem services provided by cultural landscapes in Germany.	Comparison of general scientific knowledge and local contextual knowledge yielded in-depth insights into the perspectives held by different participants.
Gidley et al. (2009) - climate change adaptation in Australia.	Highlighted gaps in knowledge and encouraged 'social learning.'
Henly-Shepard et al. (2015) - improving adaptive capacity to hazards in Hawaii.	Facilitated 'social learning.'
Ravera et al. (2011a); and Ravera et al. (2011b) - adaptation in Nicaragua.	Researchers claimed to have developed a more in-depth understanding of drivers and uncertainties at different scales. Learning for participants is not reported.

Tschakert et al. (2014) – climate change adaptation in Ghana and Tanzania.	Co-learning was facilitated between scientists and local stakeholders, about factors beyond their usual field of understanding. Enabled interdependencies to be identified between different aspects of SEPs.
Wesche and Armitage (2014) - environmental change in northern Canada.	'Shared outcomes' were reportedly produced, through the incorporation of different knowledges, including 'anticipatory thinking,' in-depth understanding of the local environment, and awareness of different perspectives on the future.
Sheppard et al. (2011) - engaging local level stakeholders in climate change action and awareness.	Participants reported that their understanding of climate change and its impacts on the local area had substantially increased.
Van Berkel et al. (2011) - rural development in Portugal.	The process helped to raise and evaluate participants' assumptions and contradictions.
Vermeulen et al. (2013); and Vervoort et al. (2013) – food security under climate change.	Participants reported that they could take a more integrated, systems perspective, better understand challenges and develop responses to them, as well as identify new regional linkages and opportunities for collaboration.
Badjeck and Diop (2011) - fisheries research in West Africa.	Participants developed a broad, anticipatory understanding of the fisheries system.
Bohensky et al. (2009) - options for ecotourism in Papua New Guinea.	Participants were enabled to identify drivers they had previously not considered.
Palomo et al. (2011) - protected area management in Spain.	Participants considered themselves better able to understand trade-offs in environmental management.
Pert et al. (2010) - biodiversity conservation in Queensland, Australia.	Objectives regarding learning were, reportedly, met, but there is limited detail on what this actually means.
Mora et al. (2014) - forestry in France.	Enabled stakeholders to consider the non-forestry benefits of the forest.
Sandker et al. (2007) - protecting forests in Indonesia.	Generated ideas, encouraged 'shared understanding'

Source: author construct

Interestingly, although most of the cases in Table 4.2, were the same as those that expected learning (see Table 4.1), for some, learning was not explicitly anticipated. For example, Sheppard et al. (2011) reported that participants developed an increased understanding of the impacts climate change could have on their local area. On the other hand, cases like Ravera et al. (2011a); and Ravera et al. (2011b) indicated they expected learning to occur but did not report it as an outcome. They report what the researchers learned, as a research outcome, but not what, if anything, was learned by participants. It may be, therefore, that these cases did not consider participants' learning was to be a priority, at least for reporting in published works. The case of Sheppard et al. implies that learning was an unexpected side-effect, whilst the case of Ravera et al. either indicates that learning did not occur, for participants, or that there was little mandate for reporting it in their two papers. This emphasises the importance of considering who learns what in PSP processes, but as I show in Section 4.3.3, this appears to receive little attention.

In the practitioner interviews, all 16 of the practitioners I interviewed reported that PSP encouraged learning. Learning included: identifying interdependencies between different actions, variables, drivers and actors, new ways of thinking, and recognising the different roles, interests and worldviews of different actors involved in SEPs. For example, the practitioner, Greg, stated:

> *"It was a really effective way of bringing in scientific data on climate change, for example, and then also bringing in indigenous knowledge about how the environment is already changing and what the impacts are on people in the community." (Greg, 2016)*

This shows that PSP fulfilled his expectation, described in Section 4.3.1, that it would help connect different types of knowledge about environmental change. He went on to indicate that participants in the PSP had learned to:

> *"Conceptualise the future in a different way, and their role in that future… They learned about scientific information that people in the community may not have been aware of." (Greg, 2016)*

Similarly, another practitioner, Gavin, described the benefits of a PSP process that brought scientific researchers into contact with indigenous communities, which enabled the participants to learn about drivers, at global and regional levels. He described:

> *"[They found out about] what's happening at a global and broad regional scale, in terms of climate change and economic social cultural change, bio security, all sorts of things. And they said that really opened their eyes… It really forced them to think about these big drivers and surprises that could happen that might be just on their doorstep." (Gavin, 2016)*

In the FSF case study, 10 of my 13 informants also showed evidence of learning, especially about the interconnections between different components of food systems. For example, when I asked one participant, Tracy, a senior teacher with limited experience of thinking systematically about SEPs, what she had learned from the workshop, she stated she had identified new drivers, as well as interdependencies between them. For instance, she indicated that she had identified a link between technology and food poverty:

> *"Therefore, we [identified] the points that cause Tanzania to have food poverty, while we have got resources. For instance, there is poor management and we have got low science and technology. The technology is still primitive. It is primitive!" (Tracy, 2016)*

Similarly, when I interviewed another participant, Alan, who worked in social welfare, he also indicated he had learned about the links between different components of food systems, specifically between food production and nutritional value:

> *"The food composition, the food size, the food quantity, all these should be considered alike to ensure that you have quality, nutritional food." (Alan, 2016)*

In the PFSA case study, all the 13 participants I interviewed indicated they had learned through the PSP workshop. A particularly strong example of learning for PFSA participants, was about the role Artificial Intelligence (AI) could play in creating just and sustainable futures. AI was included as a 'seed' in one of the discussion groups. As outlined in Chapter 3, the 'seeds' were small-scale initiatives that could be described as conducive to creating just and sustainable futures. Each of the four discussion groups worked with three seeds, which they used to develop their scenarios. The discussion group who used AI, thus explored how it could be used to create more equitable and sustainable urban land use, and as a tool for environmental governance. When I interviewed them, several members of this group indicated, that they had learned

through thinking about AI. For example, Penelope, who had an interest in AI prior to the workshop, talked about how she had changed the way she thought about it:

> *"I was really challenged constantly on what does this mean? I learned a lot about people's concerns [about AI], and the other participants learnt a lot about the technology and what AI actually means." (Penelope, 2016)*

Similarly, another participant, Elliot indicated that his understanding of AI, as well as how it could be used, had changed because of his participation in the workshop:

> *"I learnt a lot around the AI stuff, because my understanding was completely different. I didn't realise that AI existed in as much as it does already, and that I'm using it every day." (Elliot, 2016)*

The above findings show that the expectation PSP can enable learning was commonly realised through bringing together different stakeholders and enabling them to engage with the knowledges of others. This corresponds with the wider assumptions that PSP is most useful for learning, described in Chapter 2. My results find particular resonance with Johnson et al. (2012) who describe PSP as a 'vehicle for learning,' (p.10) because it incorporates diverse knowledges into the narratives of future events, conditions and trajectories that it creates. My findings also resemble the results of the recent review by Oteros-Rozas et al. (2015), which indicate that through encouraging participants to engage with different knowledges, PSP enables them to learn about the complexity of SEPs, as well as the impacts environmental changes could have on them. This corresponds with the explanation of Ramirez and Wilkinson (2016) that scenario planning can encourage 'reframing,' whereby the exchange of perspectives through exploring alternative future narratives enables the development of new knowledge, as well as a more holistic understanding of wider contexts. I therefore reason that learning is a highly important benefit associated with PSP. However, I also found that practitioners struggled to articulate how learning occurs in PSP, and how and why it varies for different participants. I discuss this further in Section 4.3.3, below.

4.3.3 *"The thing I really would like is a stronger link to an underlying theory."* – Limited understanding of how learning occurs

My findings show that, although learning is a highly significant benefit of PSP, practitioners showed a lack of theoretically-informed understanding, regarding how learning

occurs. As shown in Section 4.3.2, it appeared that learning was linked to interactions between participants from different professional roles, disciplinary perspectives, socio-economic backgrounds, and worldviews. However, in the case review, not a single paper explicitly provides a theoretically-informed account of how learning occurs. The authors typically assume learning could occur, based on reports by other practitioners, rather than on theoretically-grounded explanations of learning in PSP. For example, Mistry et al. (2014) assume PSP could enable learning, based on a paper by Johnson et al. (2012). However, that paper itself does not offer a theoretically-informed account of how learning in PSP occurs.

In the practitioner interviews, all the informants I asked about their theoretical understanding of learning indicated that they had never had the mandate or the capacity to engage with learning theories. For example, Barry, who had extensive experience conducting PSP processes through a global research organisation, was a strong proponent of PSP as a method for learning. However, when I asked about his understanding of learning theories, he admitted he had: *"none whatsoever."* He explained that this was because his organisation focused on practice-based, rather than academic research:

> *"We're not an academic organisation, so we don't focus on learning theories and things like that… Of course, we know that people have learnt but we haven't taken a systematic approach to measuring learning." (Barry, 2016)*

This reflects the relative immaturity of PSP practice in the field of social-ecological resilience. Although the review paper by Oteros-Rozas et al. (2015) shows an increasing appetite for reflection on PSP in this context, my findings indicate that the mandate to link PSP to theory has thus far been limited.

However, the importance of developing a theoretical understanding of learning was emphasised by one highly-experienced practitioner, Terry, who had many years of experience facilitating PSP, and other futures-thinking methods. He argued that there is a need for a better theoretical understanding of learning in PSP, to assess its usefulness:

> *"It's not theoretically grounded, Scenarios is a practice-led discipline… The thing that I really would like, is a stronger link to an underlying theory, so that we can know when [PSP] is being done well, when it is being done badly, how we should be doing it." (Terry, 2016)*

In Chapter 5 of this thesis, I contribute specifically to developing such a theoretically-grounded understanding of how learning occurs.

I also found there was limited explicit information regarding how and why learning varied between different participants. In the case review, I typically found it difficult to distinguish who learned in the PSP processes that the papers described, and how learning varied between different participants. For example, Tschakert et al. (2014) indicate that learning occurred between *'local actors, external academics and NGO practitioners,'* (p.1053) but do not indicate which group of participants learned what.

That said, six of the 23 cases that reported learning, demonstrated some awareness of variation in learning, or at least the factors that could influence such variation. For example, Wesche and Armitage (2014) observed that, in their PSP with local-level indigenous communities: *'participants were more likely to identify local-level forces and direct effects of change on livelihood dimensions, whereas external forces and indirect impacts were likely underestimated,'* (p.1105). They attributed this to the fact their participants had limited formal education, and were unused to 'hypothetical approaches' of thinking about the future. This indicates that learning may be influenced by participants' level of formal education.

In another example, Palomo et al. (2011) described how, in their case, local-level participants had refused to consider how a particular, regional-level driver would influence their local-level scenarios, because they believed it was not relevant in the local context. The authors describe how this driver, concerning the role of new technologies: *'did not translate to [the local scenario] because the working group believed that it did not apply,'* (p.23). They go on to reflect that it would have been interesting to explore the influence of this driver in the local area, which implies the participants missed out on learning about it. In this instance, what participants learned appeared to be influenced by the fact they did not consider the information they encountered to be relevant.

The issue of how and why learning varies is an important consideration, however. As reasoned in Chapter 2, ideas about sustainability are socially constructed, and are therefore highly contested and political (Patterson et al., 2017). As such, there are inevitably power imbalances in any process professing to incorporate the knowledges of different stakeholders. This means the knowledge of some participants may be privileged over that of others (Kothari, 2001). It is therefore important to understand who benefits from PSP, as well as who does not. I discuss this further in Chapter 6, and indeed, show that learning is often shaped by power imbalances. Next, I consider another purported benefit of PSP, developing strategies to help tackle SEPs.

4.4 *"You can actually try those adaptations out, without having to wait until that future unfolds."* - Developing Strategies for tackling complex problems

4.4.1 Expected benefits

In their review of the use of PSP in public policy, Volkery and Ribeiro (2009) posit that it can enable stakeholders to develop innovative responses to anticipated future developments. Similarly, Hughes (2013) asserts that PSP can help stakeholders to consider short-term actions and policies in the context of their potential future consequences. These assumptions were reflected in the case review, in which 24 of the 30 cases expected PSP to help develop responses to SEPs. They all expected PSP to have this benefit through enabling participants to imagine and test responses to potential future conditions, challenges, and opportunities. This is demonstrated in Table 4.3, below.

Table 4.3 - Evidence that developing and testing responses to SEPs was an expected benefit in 24 cases, based on my interrogation of the expected benefits in peer-reviewed literature, on specific cases of PSP.

Case Study using Scenario Planning	Evidence of cases expecting PSP to help develop and test responses to SEPs
Rivard and Reay (2012) - exploring the future of Malawi's energy sector.	Exploring pathways to more efficient energy systems.
Brand et al. (2013) - ecosystem services in the Swiss Alps.	Developing strategies to deal with ongoing global changes, at the regional level.
Carpenter et al. (2006) the Millennium Ecosystem Assessment.	Exploring possible options and trade-offs for future management of ecosystem services.
Fisher et al. (2011); and Swetnam et al. (2011) - ecosystem service analysis in Tanzania.	Providing information on potential policy changes and their impacts in the future.
Malinga et al. (2013) - ecosystem service assessment in South Africa.	Identifying which ecosystem services were most important for local communities, and how they may be affected by future change.
Mistry et al. (2014) describe a scenario planning process on ecosystem management in Guyana.	Exploring the implications of different management strategies, at different spatial levels.
Palacios-Agundez et al. (2013) - ecosystem management in Spain.	Creating proactive strategies to work towards desirable outcomes, as well as improve overall decision-making.
Plieninger et al. (2013) - ecosystem services provided by cultural landscapes in Germany.	Identifying and mitigating threats to enable stakeholders to work towards renewal of 'cultural landscapes'.
Gidley et al. (2009) - climate change adaptation in Australia.	Assessing possible adaptation options.
Henly-Shepard et al. (2015) - improving adaptive capacity to hazards in Hawaii.	Developing more anticipatory adaptation strategies for community disaster planning.
Ravera et al. (2011a); and Ravera et al. (2011b) - adaptation in Nicaragua.	Exploring possible adaptation options.
Ravera et al. (2011a); and Reed et al. (2013) - environmental management and adaptation in UK uplands.	Preparing for potential threats and opportunities.
Shaw et al. (2009) - local level climate change adaptation.	Increasing capacity for climate change adaptation and mitigation.

Tschakert et al. (2014) – climate change adaptation in Ghana and Tanzania.	Investigating possible responses to change.
Wesche and Armitage (2014) - environmental change in northern Canada.	Exploring potential adaptation options and enable stakeholders to implement their own adaptation strategies.
Sheppard et al. (2011) - engaging local level stakeholders in climate change action and awareness.	Piecing together climate change information about local impacts and policy options. Then feed that into practical planning processes.
Van Berkel et al. (2011) - rural development in Portugal.	Exploring barriers and opportunities for rural development options.
Vermeulen et al. (2013); and Vervoort et al. (2013) – food security under climate change.	Testing potential strategies, policies and research to deal with future changes
Bohensky et al. (2009) - options for ecotourism in Papua New Guinea.	Exploring strategies to deal with a range of alternative situations in the future.
Brown et al. (2001) - marine protected area management in Tobago.	Assessing the impacts of different trade-offs.
Palomo et al. (2011) - protected area management in Spain.	Identifying practical steps to mitigate conflicts between conservation and economic development.
Pert et al. (2010) - biodiversity conservation in Queensland, Australia.	Identifying options for action.
Sandker et al. (2007) - protecting forests in Indonesia.	Examining the impacts of a large-scale conversion of forests to palm oil plantation.
Jessel and Jacobs (2005) – implementation of the European Water Framework Directive.	Exploring all the long-term impacts of implementing the Water Framework Directive.

Source: author construct

In one, specific example on encouraging sustainable ecosystem management, Palacios-Agundez et al. (2013 p.7) expected PSP to enable the: *'construction of proactive strategies to adapt management to possible future events.'* Specifically, they: *'analysed how ecosystem services and human well-being might change in a range of plausible futures.'* Furthermore, they: *'identified management strategies,'* aiming to: *'strengthen the link to policy making and achieve a real implementation of the research results in ecosystem management policies.'* Similarly, in the case of the CCAFS East Africa scenarios, described by Vermeulen et al. (2013 p.8360), PSP was expected to develop, and moreover, test national-level policies for food security in different potential future contexts. The authors described how the PSP process was: *'designed to provide multiple plausible, future contexts for decision makers to use in regional, national, and local planning.'* The authors went on to describe how they organised workshops with decision makers, to: *'develop and test adaptive planning actions across the different scenarios.'*

In the two above cases, the emphasis was on linking the responses identified in PSP to policy, but in some cases the focus was more on encouraging actors to adapt to complex problems at the local level. For example, Tschakert et al. (2014) describe a case in which PSP was expected to identify adaptation responses to climate change, in local communities in Ghana and Tanzania. They state that they expected PSP to: *'enhance participants' capacity to embrace change by exploring a range of possible futures, and jointly weighing possible responses,'* (p.1052).

In the practitioner interviews, seven of my 16 informants indicated they had expected PSP to help develop responses to SEPs, through identifying and testing them in different possible futures. For example, Nigel, who was a relatively inexperienced practitioner, stated it was expected to help inform a national government's negotiations for a 'payment for ecosystem services' scheme:

> *"They wanted to be receiving money to protect their forests to store carbon, so the land use change, and forest change was a big concern. So [we decided to think] about what might, realistically happen under different scenarios." (Nigel, 2015)*

He subsequently explained that the PSP was designed to:

> *"Help the government put together their arguments to take to Copenhagen, for negotiations, so they could get a good deal out of [payments for ecosystem services]." (Nigel, 2015)*

Hence, there was a strong expectation that PSP would help develop and test responses, to anticipated ecosystem change, which the government could use to support their negotiations.

In another example, Mary, an interdisciplinary researcher who had conducted PSP processes on upland conservation, expected PSP to both identify adaptation options, and then test them in different plausible futures. She asserted that PSP could help participants: *"adapt to whatever change might be coming."* When I asked her to explain how she thought PSP could help with this, she explained:

> *"Identifying different futures enables people to think up different adaptive options, that could help them to adapt in those futures… because you can actually try those adaptations out without having to wait until that future unfolds." (Mary, 2015)*

The aim of developing and testing responses to SEPs was particularly prominent in the FSF case study. The organisers expected the PSP workshop to help develop and test responses to food and nutrition poverty, with the intention of informing the Tanzanian government's Five-Year Development Plan (FYDP). When I interviewed one of the facilitators, Thomas, he showed an assumption that the workshop would inform the FYDP:

> *"This process will help the government to have the relevant information, to make a good plan." (Thomas, 2016)*

He then reinforced this in the final meeting between the facilitators, the day before the workshop, by stating that the workshop was intended to "*feed into*" the food and nutrition policy for the new FYDP. Similarly, when another facilitator, Mike, introduced the aims of the PSP on the first day of the workshop, he explained the aim was to create scenarios to *"develop and test strategies,"* for FNS to be included in the FYDP. However, as will be shown in Section 4.4.3, a failure to include influential government stakeholders in the workshop, meant this benefit was not realised.

In the PFSA case study, the organisers did not explicitly indicate that they expected PSP to help develop and test responses to SEPs. As I showed in Section 4.3, their emphasis was on learning about how positive futures might look for different participants. However, in five of the eight pre-workshop questionnaires that I received responses to, the respondents indicated they expected PSP to help them explore strategies for creating just and sustainable futures. For example, Barbara stated:

> *"It will help galvanize action and help us develop a strategy [to achieve just and sustainable futures]" (Barbara, 2016)*

This implies that, although the official expectations of the PFSA organisers did not include developing and testing responses to SEPs, there was an assumption among some participants that this would occur. I investigate how successful PSP was in meeting these expectations, in Section 4.4.2, below.

4.4.2 Reported Benefits

The above findings show that both practitioners and participants, expected PSP to help develop and test strategies, for tackling complex problems in SES. In the case review, 23 of the 24 cases, that expected PSP to help develop and test responses to SEPs, also reported this as a benefit. This is illustrated in Table 4.4.

Table 4.4 - Evidence that 23 cases reported that PSP helped develop and test responses to SEPs, based on my interrogation of the reported benefits in peer-reviewed literature, on specific cases of PSP.

Case Study using Scenario Planning	Evidence of literature reporting that PSP helped develop and test responses to SEPs
Rivard and Reay (2012) - exploring the future of Malawi's energy sector.	Identified possibilities for pathways to more efficient energy systems.
Brand et al. (2013) - ecosystem services in the Swiss Alps.	Helped anticipate future changes and develop strategies to deal with them.
Fisher et al. (2011); and Swetnam et al. (2011) - ecosystem service analysis in Tanzania.	Enabled a map of winners and losers under different scenarios to be produced.
Malinga et al. (2013) - ecosystem service assessment in South Africa.	Helped identify threats and opportunities for communities to shape their own future.
Mistry et al. (2014) describe a scenario planning process on ecosystem management in Guyana.	Enhanced understanding of different plausible trajectories.
Palacios-Agundez et al. (2013) - ecosystem management in Spain.	Enabled identification of policy options.
Plieninger et al. (2013) - ecosystem services provided by cultural landscapes in Germany.	Developed new ideas for facilitating and managing ecosystem services at the landscape-level.
Gidley et al. (2009) - climate change adaptation in Australia.	Identified a range of possible adaptation options.
Pearson et al. (2010) - sustainability planning in Australia.	Informed practical planning of development.
Ravera et al. (2011a); and Ravera et al. (2011b) - adaptation in Nicaragua.	Produced adaptation options.
Ravera et al. (2011a); and Reed et al. (2013) - environmental management and adaptation in UK uplands.	Facilitated adaptation to future change.
Shaw et al. (2009) - local level climate change adaptation.	Improved adaptive capacity and action on climate change.
Tschakert et al. (2014) – climate change adaptation in Ghana and Tanzania.	Created a space to explore responses to potentially harmful climate change.
Sheppard et al. (2011) - engaging local level stakeholders in climate change action and awareness.	Led to greater awareness of the response options available.

Van Berkel et al. (2011) - rural development in Portugal.	Produced a comprehensive analysis of the human and environmental barriers and opportunities for rural development options.
Vermeulen et al. (2013); and Vervoort et al. (2013) – food security under climate change.	A wide range of policy options under different scenarios were identified.
Bohensky et al. (2009) - options for ecotourism in Papua New Guinea.	Enabled investment in a range of strategies to deal with different alternatives.
Brown et al. (2001) - marine protected area management in Tobago.	Enabled a move towards decision-making, based on trust and community action.
Palomo et al. (2011) - protected area management in Spain.	Helped participants to identify practical steps to desirable outcomes.
Pert et al. (2010) - biodiversity conservation in Queensland, Australia.	Made the need for action clear
Mora et al. (2014) - forestry in France.	Help adaptation strategies to move away from single, technical solutions, to ones that can facilitate rapid social and institutional change.
Sandker et al. (2007) - protecting forests in Indonesia.	Facilitated consideration of the consequences of different possible actions.
Jessel and Jacobs (2005) – implementation of the European Water Framework Directive.	Helped to identify key challenges and resolve them, by identifying feasible management options.

Source: author construct

In one, particularly telling instance, Palacios-Agundez et al. (2013) state that PSP had a direct impact on policy, by including key policy-makers in the process: *'This local, participatory, scenario-planning process is already having a policy impact thanks to the involvement of public administration technicians and policymakers on the recently renewed strategic policy planning for sustainability,'* (p.20). They subsequently report that the outputs of the PSP would be used to inform guidelines for ecosystem management policies. Similarly, in the CCAFS East Africa scenarios, Vermeulen et al. (2013) report that participants were able to identify: *'adaptations expected to work under any scenario with appropriate adjustment, as well as scenario-specific options*,' (p.8360).

This was reflected in the practitioner interviews, in which all 7 of the practitioners who expected PSP to help identify and test responses to SEPs, reported that it did so. For example, the practitioner, Ronald, stated that participants in his PSP had identified strategies for adaptation to environmental change by reading through the scenarios and: *"picking out the opportunities and challenges."* He illustrated using an example in which the weather had become more variable in the scenario, so participants identified increased cooperation as a response:

> *"They were saying the weather has become more difficult to deal with, so it's going to be easier for those who are part of co-ops and community associations and things like that." (Ronald, 2015)*

Similarly, the experienced practitioner, Mary, explained how the information gleaned from the PSP she was involved in had been used to create:

> *"A project feasibility tool, [which enabled] farmers around the country to actually look at different scenarios in the context of their farm business." (Mary, 2015)*

This tool helps farmers to assess how much profit they could make from carbon storage, through peatland restoration, as well as what costs they might incur by doing so, under different scenarios. She explained this helped farmers to: "*make a decision that is as low-risk as possible, over the next thirty years."*

Another practitioner, Nigel, who I mentioned in Section 4.4.1, indicated that PSP had enabled stakeholders to identify responses to anticipated ecosystem change, which the

government used, to support its negotiations for a 'payment for ecosystem services' scheme. He stated that the responses were:

> *"Picked up directly by policy in Tanzania, and certainly helped [the government] in terms of carrying on formulating their policy management." (Nigel, 2015)*

Indeed, he claimed that the government negotiators had *"made a splash,"* in their negotiations, which implies they achieved a favourable deal. This highlights that, although PSP met stakeholders' expectations, it was clearly influenced by the government's interest in strengthening its negotiating position. The interests of some stakeholders could thus have been subsumed under the interests of the government. This emphasises the importance of investigating the factors that influence who benefits from PSP, which I discuss in Chapter 6.

The above findings correspond with the assumptions made by Volkery and Ribeiro (2009) and Hughes (2013), that PSP can help stakeholders develop responses to SEPs and test them in alternative possible futures. These findings may be explained by the dual concepts of reframing and reperception, as put forward by Ramirez and Wilkinson (2016). Reframing provides groups and individuals with alternative future contexts, in which to explore challenges and opportunities for change. This can lead to reperception, whereby participants develop new responses to better cope with challenges and maximise opportunities. However, to develop and test these responses is one thing, to implement them, is another. In Section 4.4.3 below, I investigate whether the responses to SEPs, developed in PSP processes were implemented.

4.4.3 *"I don't think the effect has lasted"* – Limited evidence for the implementation of responses, developed in PSP

The above evidence indicates that PSP is useful for developing and testing responses to SEPs. However, I found limited, detailed evidence for these responses being implemented in real-life. In the case review, none of the papers that report PSP helped to develop responses, indicated that they had been implemented. For example, Palacios-Agundez et al. (2013) report that PSP informed the creation of guidelines for ecosystem management policies, as described in Section 4.4.2. However, they do not indicate whether these guidelines were heeded by policy-makers. Similarly, although Vermeulen et al. (2013) report that participants identified adaptation options, they do not indicate whether any of these options were implemented. In fairness, it may be that the above responses were implemented, but only after the papers had been published.

Furthermore, it could be that the futures in which those responses could be necessary have not yet unfolded.

In the practitioner interviews, I therefore asked my informants to reflect on whether any responses, developed in specific PSP processes, had been implemented. Typically, they were only able to guess at what impacts might have happened after PSP took place, with the exceptions of Mary and Nigel, whose examples are described in Section 4.4.2, above. This was aptly illustrated by the practitioner, Greg who assumed that participants' learning in PSP had informed subsequent decision-making, but could not pinpoint any detailed examples of this:

> *"I don't know concretely, but I think now they have this information, and they've thought about what these adaptation options are. I don't think they suddenly went and implemented them all, but maybe those people are in decision-making positions, and they more readily have access to that information, and they've already thought about it before." (Greg, 2016)*

Similarly, Ronald, who reported that PSP had helped participants identify adaptation strategies, as described in Section 4.4.2, could not say if any of these strategies had been implemented:

> *"It's not like people would remember the scenarios and think 'yeah we read about the bed and breakfasts,' [as an opportunity for adaptation]. I can say that it had immediate positive effects but, I can't say that it's lasted now. It's not like it has completely changed the community, it was just a very positive experience for everybody to be part of." (Ronald, 2015)*

It is evident then, that although PSP helped to identify responses to SEPs, practitioners struggled to articulate whether they had been implemented in real-life.

In the FSF case study, there was no evidence that PSP delivered on the assumption that it would inform the FYDP. When I interviewed the facilitators, separately, two months after the workshop, none of them could provide any evidence for the workshop having contributed to the FYDP. However, one of the facilitators, Thomas, suggested that, through sharing the learning from the workshop:

> *"We will indirectly contribute to policy-making, but we won't have a direct influence." (Thomas, 2016)*

The other two facilitators, Mike and Harry also admitted the workshop had not been able to influence the FYDP, but Mike initially suggested the workshop might still influence food and

nutrition policy later "*down the line*." However, a conversation with him 18 months after the workshop indicated that it has had no discernible influence.

In PFSA, although the emphasis was predominantly on learning, as I described in previous sections, five of the 13 interviewees did indicate that they were disappointed by the fact no implementable strategies were developed in the workshop. For example, Rachael, who was a social entrepreneur, and was therefore interested in quickly identifying and implementing actions, was frustrated by a lack of thought, in her group, about what everyday actions they needed to implement in the short-term. She queried the value of her group's scenario, saying:

> *"What does that mean on a Monday morning? Like next week, Monday morning, what does that mean? There was a tension between balancing what needs to be done now, versus a different future [that] we imagined." (Rachael, 2016)*

Similarly, Darren who was an artist, and also focused on practical actions, complained that there was a lack of focus on implementing the ideas from the scenarios. He also described the scenarios as 'haywire,' suggesting they were too avant-garde, to be practically useful:

> *"I think that's one thing that our conference lacked, was there wasn't any mention of [the scenarios] being applied in any way… So, you can go as haywire as you like, but if it's not implementable, even from tomorrow onwards, and you haven't imagined it in a way that is doable, and then what's the use of that?" (Darren, 2016)*

The above evidence demonstrates that, although PSP helps stakeholders identify and test responses to SEPs, there is limited evidence of these responses being implemented in real-life. This was explained by one practitioner, Carol, who had extensive experience linking the outcomes of PSP to policy. She stated that, for responses identified in PSP to be implemented, further work is needed, following PSP workshops, to connect them to real-world policies and actions:

> *"If you treat that one moment of scenario development and scenario-guided policy testing as the be-all and end-all of the exercise then yeah, there are weaknesses, but if you treat it as a process, so that various people have inputs, and you connect it to processes of policy-development, in the end you have policy impact." (Carol, 2016)*

This reflects the argument by Chaudhury et al. (2012), that careful efforts are needed to connect the outcomes of PSP processes with real-life policy and practice. They indicate that the results of PSP need to be perceived as credible, salient and legitimate by stakeholders for them to be implemented. Vervoort et al. (2014) also indicate that the link between PSP processes and real-life policy and practice can be strengthened through long-term engagements with PSP. They reason that PSP is most likely to lead to implementable responses when it is embedded in existing systems of decision-making, rather than when PSP processes are used as one-off interventions. Likewise, Brown et al. (2016) argue that for responses to be implemented in real-life, PSP should be used as part of ongoing community engagements, rather than as an isolated process. It is evident, therefore, that although PSP can help to develop responses to SEPs that are implemented in real-life, concerted efforts are needed, beyond just conducting isolated PSP processes, for implementation to occur.

An additional explanation was put forward by the experienced practitioner, Mary. She observed that responses developed in PSP processes are not frequently implemented, because practitioners do not systematically select participants with the capacity to implement them:

> *"One of the most important factors that influence the outcome of any participatory process is the composition of the group. So, stakeholder representation is crucially important… I believe this is a step that is very rarely included in scenario analyses." (Mary, 2015)*

This was reflected by another practitioner, Vera, who had several decades of experience as a professional facilitator of PSP, as well as other futures thinking tools. When I asked her what she thought was required for PSP to be successful, she replied:

> *"One of the key conditions is to have a group of people with the motivation and ability to act." (Vera, 2016)*

This emphasises the importance of including influential stakeholders in PSP.

The problem of not including stakeholders with sufficient capacity to implement responses was particularly apparent in the FSF case study. The organisers originally invited government stakeholders involved in the development of the FYDP, with the rationale that this would help directly link the outcomes of the workshop to policy. However, most of them were unable to attend, and the eventual participants lacked the capacity to influence decisions regarding the FYDP. As described in Section 4.4.2, the workshop therefore did not produce the

desired benefits in terms of informing government policy. Indeed, as the facilitator, Thomas described:

> *"To start with, we expected some people who could influence the FYDP, but unfortunately most of them did not come. That was one of the limitations." (Thomas, 2016)*

The above evidence demonstrates, that, even when attempts are made to connect PSP processes to real-world policies and actions, a failure to include influential participants can limit opportunities for responses to be implemented in real-life. This resembles the findings of Nieto-Romero et al. (2016) in their assessment of PSP processes in Eastern Europe. They explain that a lack of influential participants is an important barrier that reduces the likelihood of responses identified in PSP being implemented. Similarly, in a paper analysing the challenges of using PSP to influence climate change adaptation in the public sector, Rickards et al. (2014) explain that a failure to include stakeholders with the ability to implement the outcomes of PSP makes it more difficult to secure their 'buy-in'. This subsequently reduces the likelihood that responses, developed in PSP, will be implemented.

The apparent limitations of PSP for supporting real-world responses to SEPs emphasise the importance of considering the strengths and weaknesses of PSP, in different contexts, and comparing it to alternative methods for tackling SEPs. However, my data showed limited explicit discussion of this by practitioners. I investigate this issue further in Section 4.5, below.

4.5 *"I wasn't able to concretely follow up on it."* - Limited provision for evaluation of PSP

4.5.1 Limited consideration of the strengths and weaknesses of PSP

As the data presented in previous sections attests, the information provided by the authors of the papers in my case review is rich and insightful. However, their papers included limited information regarding the strengths and weaknesses of PSP, especially when compared to alternative methods for stimulating dialogue about tackling SEPs. Limitations of PSP were discussed in 25 of the 30 cases in the case review. In Sections 4.2 to 4.4, I described the limitations that were specifically associated with achieving the purported benefits of PSP. In addition to these, I found that two general limitations were identified across the cases: representation of

different stakeholders, and the time-intensiveness of PSP. For example, Brand et al. (2013) describe a process in which PSP was expected to help stakeholders develop a more 'systemic understanding' of ecosystem services, by including different stakeholder groups. However, the authors found that some stakeholder groups were underrepresented, and some participants did not have time to attend the whole process. Similarly, Van Berkel et al. (2011), indicate that the representation of some farming stakeholders was limited because they had other commitments and did not have time to attend the entire process. Swetnam et al. (2011), and Reed et al. (2013) also highlight the problem of PSP being very time-intensive.

The fact that multiple cases acknowledge these limitations shows that they are well-documented. Discussions regarding the limitations of PSP were typically only given short shrift, however, and typically consisted of anecdotal evidence and reflections by the authors, rather than the results of systematic evaluation processes. In five of the 30 cases, there was no explicit discussion of any limitations of PSP. Perhaps the most surprising of these, because of its prominence, was a paper regarding the use of PSP in the Millennium Ecosystem Assessment (MA). Carpenter et al. (2006) offer an overview of the scenarios process used in the MA, but they do not explicitly report on any limitations. The MA's overall report does include some consideration of limitations in the 'Lessons Learned' section (Carpenter et al., 2005). These include issues of making the global MA scenarios relevant at the local level, and to policy-makers, which reflects the limitations of PSP in contributing to the development of strategies to tackle SEPs, described in Section 4.4, above. It is evident then, that some limitations of PSP, in the MA, were considered, even though they were not reported in the overview paper by Carpenter et al.

Overall, however, any reflections on the limitations of PSP, and its relative merits and drawbacks, are poorly reported. This is presumably at least partially because of editorial restrictions, that impede the inclusion of lengthy discussions of limitations and failures. Indeed, as Baxter and Eyles (1997) explain in their seminal paper, editorial constraints typically mean that critical reflections on methods are left-out, to create space for presentation of research findings.

Another explanation revealed in the practitioner interviews is that limited provision is given for systematic evaluations of specific PSP workshops. This was particularly well-illustrated by the practitioner, Greg. He stated that, in his case, PSP had helped an indigenous community identify implementable actions that could help them adapt to environmental change. However, the funding for his project had ended before he was able to follow-up on the extent to which these actions were implemented:

> *"That was the end of the project that I had funding for and I wasn't able to concretely follow up on it. It would be a really good question to go back and see what had been adopted, what hadn't been adopted, but I don't have a very good sense of that." (Greg, 2016)*

This was explained by another practitioner, Gavin, who had extensive experience using PSP in several global and regional processes. Gavin explained he had, along with a colleague, conducted a study into the extent that practitioners evaluated the PSP processes they conducted. He described how their findings showed there was a lack of provision for evaluation:

> *"Very few of them did very much [evaluation], and most of them said the reason why, was that they ran out of money, or ran out of time." (Gavin, 2016)*

He went on to attribute the lack of provision to a limited mandate for evaluation of PSP processes, when they are conducted by academic organisations:

> *"If it's not happening, part of it is probably because people are working in contexts where there isn't such an impetus, or demand for showing impact." (Gavin, 2016)*

In my two case studies, there was limited evidence of any provision being made for evaluation. However, in both cases, the facilitators welcomed my research, because they saw it as an opportunity for evaluation by an independent researcher. For instance, in FSF, the facilitator, Mike, asked me directly if I could include evaluative questions for him, in my interviews with participants. I politely declined as this would have compromised my position as an independent researcher. In PFSA, I was asked to meet with the monitoring officer for their funding body, to discuss my ideas about how learning could be evaluated. In this case, I agreed, because it did not influence my interviews with participants. The keenness of FSF and PFSA for me to help them evaluate their PSP processes indicates there was a desire for evaluation to happen, but the projects themselves lacked the mandate, or the capacity, to do it themselves.

This indicates that, although practitioners acknowledge the limitations of PSP, and would welcome opportunities for more systematic evaluation, the context in which they work does not create either the mandate or the resources necessary for such evaluation to occur. When I asked Gavin why he thought this was the case, he suggested two reasons. Firstly, he stated that in this field of practice, the focus had historically been on producing scenarios as ends in themselves, rather than as means for achieving other outcomes. As such, the outcomes of PSP processes had been given limited attention:

> *"In the early projects that I was involved in, the scenarios were seen as the end point, not really what you do with them or what they might trigger." (Gavin, 2016)*

Secondly, he explained that whilst practicing scenarios in public-sector research, the mandate for evaluation had been much higher because of a public demand for accountability:

> *"More and more there is a push for us to be able to measure that and monitor it and evaluate it and report on that. We're not going to get supported to do this kind of work without being able to demonstrate that it is actually doing something good." (Gavin, 2016)*

In comparison, he posited that academic practitioners have not been subject to the same demand for accountability:

> *"Academic researchers think they might be able to get away with not demonstrating impact." (Gavin, 2016)*

Gavin's explanation alludes to both a relative immaturity and an isolation of PSP practice in the field of social-ecological resilience. Engagement with literature on the use of scenario planning in the more established field of corporate strategic planning shows that scenarios are emphasised as means through which to learn about the present, rather than as ends in themselves, for learning about the future (Ramirez and Wilkinson, 2016; Wilkinson and Kupers, 2014). However, Gavin went on to propose the practice of PSP in this context was beginning to mature, leading to an increased emphasis on evaluating the outcomes of PSP:

> *"I think the practice of scenario planning has evolved. Its maturing and it's going beyond just creating visions for the future, and talking about them but [thinking about] what are we going to do next? What do we do with them? How do we actually make something happen?" (Gavin, 2016)*

However, as I reflect on in Chapter 7, PSP practitioners in this field could usefully engage with more established fields of PSP in corporate strategic planning and futures studies to improve their evaluation and understanding of outcomes from PSP.

4.5.2 Limited consideration of alternative methods

The evidence presented in Section 4.5.1 indicates that the limitations of PSP are recognised by practitioners. Despite this, only three of the 30 cases in my case review showed any consideration for methods that could have been used instead. Palomo et al. (2011), compare PSP

to quantitative models, and indicate that PSP is better at accounting for uncertainty, in the development of conservation plans for a 'protected area': *'in contrast to predictions and models, scenarios explore the uncertainty of future events, and thus decisions based on scenarios provide greater resilience to surprise,'* (p.24). Bohensky et al. (2009) also compare PSP to quantitative modelling. They assume it is better for exploring opportunities and uncertainties, in the development of eco-tourism in Papua New Guinea: *'in such uncertain, uncontrollable situations, scenarios have an advantage over more quantitative models… in their flexibility, transparency and space for narrative to describe possible futures in their complexity,'* (p.2827). The third case, Wollenberg et al. (2000) compares PSP to 'Participatory Rural Appraisal.' They show an assumption that PSP is better equipped to enable learning, by highlighting different stakeholders' assumptions about forest management: *'scenarios focus on the analysis of uncertainties, drivers of change and causal relationships… to a greater extent than do these other techniques,'* (p.67). However, not even these three cases offer a direct comparison, based on empirical evidence, of PSP with any other method.

The absence of explicit, detailed discussions about the strengths and weaknesses of PSP, as compared to alternative techniques, could make it difficult for practitioners to make an informed choice regarding whether PSP is the most useful method, in the context in which they seek to use it. In the practitioner interviews, the highly experienced professional facilitator, Terry indicated that this judgement could mean the difference between whether a PSP process was successful or not. However, he stated that other practitioners often use PSP without making such an informed choice:

> *"Well methodology and process being good or bad, I think is dependent on informed choice, knowing why you want to do it, where and when it can be useful and when not… You find loads, and loads, and loads of people do scenarios because they think, somebody else has done it, so it sounds like a good idea." (Terry, 2016)*

Indeed, when I subsequently asked if PSP was just a fashion, Terry responded: *"Yeah! Absolutely!"*

Terry's assertion was reflected by the responses of another practitioner I interviewed, Greg. Greg had used PSP in his doctoral research, as a means of documenting indigenous knowledge about environmental change and connecting it with scientific knowledge. He admitted that his use of PSP had been strongly influenced by the knowledge it had been used, apparently successfully, by one of the lead scenarios coordinators on the influential MA:

> *"I was familiar with the scenario work that he had done. He had done some scenario work with communities and it seemed like it might be a good approach to use." (Greg, 2016)*

He went on to admit that, although he suspected other participatory methods could have helped connect indigenous and scientific knowledge, he had not considered them:

> *"To be honest, I didn't really go through a process of thinking about all of the different participatory processes that I could use, and the pros and cons of each… When I came across this method [PSP], it made sense in the context that I was working in, so I used it. I don't know how much more I can justify it." (Greg, 2016)*

Greg did show some consideration of why PSP was useful in the context of his work:

> *"It just seemed like a very effective tool to be able to incorporate different sources of knowledge, in a format that was accessible to people in the community, who had a range of formal education." (Greg, 2016)*

However, without any consideration of alternatives, it is difficult to say whether PSP was the most appropriate method to use, in this context.

The notion that PSP is a fashion is vindicated further by the example of the practitioner, Ronald. Like Greg, he used PSP in his doctoral research, which aimed to explore how different stakeholders used ecosystem services. In his case, PSP had already been written into the research proposal by his supervisors. The supervisors had previously been involved in PSP, through a process on dryland development, and through the MA. Ronald acknowledged that he had the option not to use PSP, but still chose to go along with it:

> *"Of course, I could have changed things round, so I could have chosen not to [use PSP], but it was already planned… They had an interest in the method and they wanted to explore it further… I thought it was really a cool idea. I think it's just intriguing, discussing and then exploring what can happen in the future, and drivers of change of today, and how to imagine them in the future." (Ronald, 2015)*

When I asked Ronald to compare the benefits of PSP, to those of other participatory methods, he responded:

> *"I haven't studied other methods, so I can't really say, I'm afraid. I can't compare the two because I have much more experience with scenario planning." (Ronald, 2015)*

In this instance, Ronald's use of PSP was undoubtedly influenced by his supervisors' past experiences, and by his own perception of it as a 'cool idea.'

In fairness, Ronald went on to show some evidence of considering alternatives, in that he compared the benefits of PSP for exploring ecosystem services, with key informant interviews. In fact, he reflected that PSP did not offer any additional value as a research tool:

> *"We could have just asked the experts that are working in the area." (Ronald, 2016)*

However, his comparison focused on the benefits of PSP for extracting information on ecosystem services, and not on how useful PSP was for the participants involved, or as a method for participants' learning, or indeed, developing strategies to tackle SEPs.

The above evidence indicates that the use of PSP in the context of tackling SEPs is currently fashionable. It also shows that, although practitioners tend to believe it is a good idea when they use it, they show limited consideration of its strengths and weaknesses as compared to other methods. This finding demonstrates further evidence of the immaturity of PSP practice in this field and emphasises the need for greater reflection on its benefits and limitations, especially in comparison to other methods, as called for by Waylen et al. (2015).

An important caveat to this conclusion was highlighted in my two case studies, in that they were both designed around a variety of specific techniques for doing PSP. Moreover, the processes were supplemented with added features, like 'backcasting,' 'Futures Wheels,' and '3 Horizons.' This was done with the aim of adapting the PSP processes, to the contexts, as well as the purposes, for which they were used.

In the FSF case study, the workshop included the use of visioning and backcasting alongside PSP. As shown in Table 4.1, each of the methods played a different role in contributing to the outcomes of the workshop.

Table 4.5 Specific tools and activities used to adapt PSP to the needs of Food Security Futures, and their purpose

Method	Purpose
Visioning	Exploring what an ideal future would be like if specific food and nutrition policy objectives were achieved.
Backcasting	Exploring the steps that would need to be taken for the ideal future to be realised.
Participatory scenario planning, using downscaled 'East Africa' scenarios	Exploring what Tanzania would be like in alternative plausible futures. Then assessing what challenges could be faced in taking the steps to achieve the ideal future.

Source: author construct

When I asked the highly experienced FSF facilitator, Mike, to compare PSP to the other aspects of the workshop, he explained that PSP was better at identifying challenges for policies than the backcasting method they used alongside it:

> *"The visioning and backcasting helps us know what we want to see, and how we can reach that point, but it doesn't show us what challenges we might face. Scenarios help us to identify the challenges." (Mike, 2016)*

It is evident then, that Mike had a clear understanding of the strengths and weaknesses of PSP, as compared to other methods, in that context.

In the PFSA case study, the workshop was designed around specific features, like 'Future Wheels,' and '3 Horizons,' with the aim of making the process of imagining just and sustainable futures more systematic. The role of each method is described in Table 4.2, below.

Table 4.6 Specific techniques, and tools used to adapt PSP to the needs of Positive Futures for Southern Africa, and their purpose

Method	Purpose
Futures Wheels	Imagining the possible impacts of 'seeds,' or small-scale initiatives that encourage just and sustainable conditions, if they were mainstream practices.
Cross-impact matrices	Investigating how the seeds could influence each other.
Scenario development	Exploring the events, conditions, and trajectories that would constitute the Anthropocene if the seeds were commonplace and influenced each other.
3 Horizons	Investigating the dominant way things are in the present, the way things will be, in the futures represented by the scenarios, and the events, conditions and trajectories that would define the transition between the present and the future.

Source: author construct

This shows that, at least in my two case studies, there was some consideration of the strengths and weaknesses of PSP processes. Furthermore, there was some attempt to tailor them to fit specific contexts, by mixing it with different activities. Overall, though, the case review and practitioner interviews indicate that practitioners struggle to articulate the strengths and weaknesses of PSP, especially in comparison to other methods. It appears, therefore, that PSP is often used without an informed choice being made regarding why, and in what contexts, it is beneficial, and without being subject to stringent evaluation. This is reflected by an apparent lack of evaluative papers in the PSP literature. Indeed, as far as I am aware, the review paper by Oteros-Rozas et al. (2015) is the first to formally assess the benefits claimed of PSP.

The lack of provision for systematic evaluations, could be indicative of a wider reluctance, by practitioners and funders to consider the potential drawbacks and failures of initiatives pertaining to tackle SEPs. Indeed, as Mosse (2005) contends, the perceived efficacy of any initiative is often defined by the prevailing view held by those who commission it, rather than by the intended participants. The prevailing view of practitioners, and their funders, appears to be that PSP is a useful method, for achieving the benefits described in this chapter. It thus appears there is limited motivation for evaluation that could expose the potential drawbacks and failures of using PSP. In Chapter 7, I thus argue that there is a need for more systematic evaluation of the strengths and weaknesses of using PSP to help tackle SEPs, and for comparison with other methods.

4.6 Conclusion

In this chapter, I have explored the expected and reported benefits of PSP for tackling SEPs. My findings show that the use of PSP is typically underpinned by an assumption that it can help participants deal with uncertainty by breaking down, or structuring, future possibilities into alternative narratives of possible future events, conditions and trajectories. Structuring future possibilities is subsequently believed to help participants explore the complexity and uncertainty of SEPs, through highlighting the interconnections between different components in SES. However, I found that, although some informants indicated that structuring futures possibilities was a valuable outcome in its own right, it was only rarely reported as a benefit of PSP. I reason that this is because it is linked to and is sometimes a precursor to other benefits.

I found that learning is commonly expected as a benefit of PSP. This expectation was often reportedly achieved through bringing together stakeholders with different professional roles, disciplinary perspectives, and worldviews. However, despite the prevalence of learning as

both an expected and reported benefit, I found that practitioners had limited theoretically-grounded understanding of how learning occurs and paid little attention to how, and why, learning varies between different participants. I propose that these issues should be given more consideration, to help assess whether PSP is being practiced effectively, as well as exploring who benefits from PSP, and who potentially loses out.

I also found that proponents of PSP commonly expected and reported that it would help develop responses to SEPs and test them in alternative futures. However, although I found some examples of these responses being implemented, evidence for PSP having an influence on real-world policy and action was scarce. I found two potential explanations for this: i) that PSP needs to relate to long-term processes of policy-making and action, rather than being conducted as a one-off intervention; and ii) that it requires the participation of influential stakeholders for responses to be implemented.

I also found limited evidence of practitioners considering the strengths and weaknesses of PSP, especially as compared to other methods for tackling SEPs. This could be because of limited provisions being made, by practitioners and their funders, for systematic evaluation of PSP processes. I therefore reason there is a need for greater critical reflection on PSP, its use and its benefits and limitations. Specifically, I argue there is a need for more stringent assessment of the strengths and weaknesses of PSP, and for comparison with other methods for tackling SEPs. In Chapters 5 and 6, I contribute to such an assessment, by investigating how learning occurs, and how and why it varies between different participants.

Chapter 5 – How and under what conditions does learning occur in Participatory Scenario Planning processes?

5.1 Introduction

In Chapter 4, I showed that learning is arguably the most important benefit associated with participatory scenario planning (PSP), that may help its practitioners and participants to tackle social-ecological problems (SEPs). However, I also found limited theoretically-informed information, regarding how learning occurs through PSP. As reasoned by one highly-experienced practitioner, Terry, PSP practitioners would benefit from a theoretically-grounded understanding of learning to help assess whether PSP is being used effectively. In this chapter, I contribute to such an understanding.

To do this, I draw on what insights could be gleaned from the case review, but as shown in Chapter 4, although the authors of the papers demonstrated an awareness of which aspects of PSP led to learning, a detailed, theoretically-grounded explanation was lacking. I therefore focus predominantly on findings from my practitioner interviews, as well as from my two case studies – 'Positive Futures for Southern Africa' (PFSA) and 'Food Security Futures (FSF). To interpret these findings, I draw on specific learning theories and concepts, the 'Zone of Proximal Development' (Vygotsky, 1978), 'boundary objects' (Star and Griesemer, 1989), and 'scaffolding' (Wood et al., 1976), as set out in my conceptual framework in Chapter 2. I understand learning as a change in understanding that occurs as a result of some external stimuli.

The chapter is structured as follows: In Section 5.2, I present evidence showing that learning in PSP occurs through interactions between participants from different worldviews, professional occupations, academic disciplines, and socio-economic backgrounds. Processes of learning in PSP can thus be explained as participants 'entering' their Zones of Proximal Development (ZPDs). In Section 5.3, I show how specific, structured activities in PSP processes can act as prompts for discussion. These encourage participants to make explicit their assumptions about the future, which exposes them to different ways of thinking about social-ecological systems (SES). Participants are thus encouraged to push beyond their usual range of thinking, which stimulates learning. PSP processes can thus act as 'boundary objects' (Star and Griesemer,

1989), that foster the exchange of knowledge between different participants, while maintaining their individual identities and disciplinary commitments.

In Section 5.4, I present evidence of three potential challenges, that can limit learning in PSP. Firstly, the types of discussions promoted by PSP processes, unsurprisingly, do not suit all participants, because they do not fit well with everyone's worldviews. Secondly, a lack of expertise in the topics of specific PSPs can limit learning about those topics, and a lack of diversity in participants' expertise, can limit their exposure to different knowledges. Thirdly, as in any participatory process, there are assertive personalities, as well as participants who are less willing to listen to the views of others. This can limit the contributions of less assertive participants. Moreover, it can lead to 'dead-ends' where tensions between participants, result in a break-down in discussions. These challenges highlight the importance of creating conducive conditions for learning to occur.

In Section 5.5, I present evidence showing that such conducive conditions can be encouraged by: Firstly, skilled facilitation can maximise opportunities for interactions, guide participants through specific activities, and ensure they interact in constructive ways. Secondly, careful selection of participants can increase the chances of including participants with relevant expertise, and who are willing to listen to, as well as learn from others. Thirdly, well-designed sets of activities help stimulate opportunities for interaction between different participants. The creation of conducive conditions for learning can also be assisted by holding PSP processes in a comfortable space, and by allocating sufficient time, human resources and, ultimately, funding to them.

5.2 *"The learning potential lies in interactions."* – Learning occurs through interactions between different participants

As indicated in Chapter 2, literature on PSP considers it useful as a method for incorporating the knowledges of different stakeholders on SEPs. There also appears to be an assumption that incorporating diverse knowledges is linked to learning. In their frequently-cited paper, Johnson et al. (2012) describe PSP as a 'vehicle for learning,' (p.10), because it can incorporate diverse ideas from different viewpoints. Similarly, in their review of PSP, Oteros-Rozas et al. (2015) indicate that PSP can expose participants to different knowledges, which enables them to learn about the interconnections between different components of SES. My findings

indeed show that learning can occur through interactions between participants with different worldviews, professional occupations, disciplinary perspectives, and social-economic backgrounds.

As described in Chapter 4, none of the papers in the case review provided a detailed, theoretically informed, account of how learning occurs. In 14 of the 30 cases, however, the authors appear to show an implicit awareness that learning was linked to interactions, specifically 'discussion,' 'collective thinking,' and 'knowledge exchange,' between different participants. This is illustrated in Table 5.1, below. In each of these cases, the authors subsequently report that learning occurred. I thus infer that learning is linked to these interactions, but this is not clearly explained in the literature. My findings from the practitioner interviews and case studies shed more light on this.

Table 5.1 – Evidence from the case review, that learning occurred through interactions between different participants.

Case of PSP	Evidence of interactions
Bohensky et al. (2006) - ecosystem services in South Africa	Creating links between different aspects of the scenarios encouraged discussion between participants at different spatial levels.
Brand et al. (2013) - ecosystem services in the Swiss Alps.	Discussions around consistency and surprise in potential futures occurred between participants from different disciplines and spatial levels.
Fisher et al. (2011); and Swetnam et al. (2011) - ecosystem services in Tanzania.	'Diverse' participants collectively deliberated on the development of trends and drivers in alternative futures.
Malinga et al. (2013) - ecosystem service assessment in South Africa.	Interactive workshops were held with stakeholders from different spatial levels.
Mistry et al. (2014) - ecosystem management in Guyana.	PSP created a 'platform for dialogue' (p.131) between participants with different worldviews.
Palacios-Agundez et al. (2013) - ecosystem management in Spain.	PSP encouraged interactions between participants with local, and specialised scientific knowledge.
Plieninger et al. (2013) - managing ecosystem services provided by cultural landscapes in Germany.	PSP encouraged discussion between scientists and local actors.
Ravera et al. (2011a); and Reed et al. (2013) -environmental management and adaptation in UK uplands.	Interactions occurred between participants with different knowledges.
Shaw et al. (2009) - adaptive action for climate change.	Inclusion of participants from different stakeholder groups expanded the amount of local-level information that was included and facilitated knowledge exchange.
Van Berkel et al. (2011) - rural development in Portugal.	Carefully selected stakeholders from different professional roles deliberated on challenges and opportunities for the future.
Vermeulen et al. (2013); and Vervoort et al. (2013) - climate change and food security in East Africa.	Different stakeholders explored uncertainties and considered how to overcome potential future challenges.
Schulz et al. (2015) - Payments for Ecosystem Services in Brazil.	Carefully selected participants, with different worldviews, deliberated on future threats and how they may be overcome.
Brown et al. (2001) - marine protected area (MPA) management in Tobago.	Different stakeholders deliberated on trade-offs in the future.
Wollenberg et al. (2000) - use scenario planning in adaptive co-management of community forests.	PSP encouraged knowledge exchange between different stakeholders.

Source: author construct

As I described in Chapter 4, all 16 practitioners I interviewed, indicated that learning is an important and highly desirable benefit of PSP. When I asked them to explain how they thought learning could occur in PSP, 10 of them indicated that learning occurred through interactions between different participants. This included interactions between: indigenous and scientific communities, local and national level stakeholders, smallholder and commercial farmers, and many more. In the other six, although they indicated learning occurred, they chose to focus their responses on other benefits of PSP. For example, one practitioner, Barry explained that he lacked a precise understanding of how learning occurred because:

> *"We're not an academic organisation, so we don't focus on learning theories and things like that…" (Barry, 2016)*

Arguably, understanding precisely how learning occurs would be beneficial, regardless of the fact the organisation is not academic. However, this example indicates that not all practitioners focused on learning as a benefit of PSP, nor did they all consider it necessary to understand how it occurred.

Of the 10 practitioners who explained that learning occurred through interactions between participants, one informant, Gordon, who had experience of conducting PSP in several high-profile global processes, articulated this particularly concisely. He stated that:

> *"The learning potential lies in interactions across disciplines, where people's assumptions are questioned in a respectful way… This leads to learning about different drivers and learning about different people's visions and desires for the future." (Gordon, 2016)*

Similarly, Gavin, another practitioner with a high degree of experience conducting PSP, explained that learning occurs through interactions between participants from different sectors and spatial levels. When I asked how he thought learning occurs, he responded:

> *"It is the interactions between stakeholders that are brought together. They are brought together, with people they don't normally interact with, across those different scales or across sectors, or areas of government, or industry." (Gavin, 2016)*

The above evidence shows then, that learning is believed to occur through the interactions between different participants.

In my two case studies, I found that learning occurred through interactions between a range of different participants, including civil servants, teachers and academics in FSF, and artists, academics, and activists in PFSA. In the PFSA case study, all 13 participants I interviewed indicated that learning occurred through the interactions they had with other participants in the workshop. One participant, Penelope, who also had experience of other PSPs, stated, in a particularly eloquent way, that she learned through discussions with other participants, prompted by PSP:

> *"I learned something from every single person in that group, and that was really, really powerful…there were lots of interesting discussions, and the workshop provided opportunities to have those." (Penelope, 2016)*

Another participant, Geoffrey, explained that interacting with different participants had exposed him to different 'angles' of looking at the future:

> *"[The workshop] brought together very artistic thinkers and creators, and academics, and us from intergovernmental processes, and civil society groups as well, and that enriched the dialogue in a lot of ways, because people were beginning to see and understand the whole forward-looking perspective from a different angle." (Geoffrey, 2016)*

He subsequently gave a specific example of how he had learned, through discussions with other participants, about the role artificial intelligence (AI) could play in creating just and sustainable futures:

> *"I sat in that group with a totally different understanding of what artificial intelligence meant. [To me it meant] we're going to be taken over by aliens, but through Penelope's explanations, I thought 'oh, this is what it actually means, okay!' It's not necessarily just a computer; it's also the digital learning and all these different dynamics." (Geoffrey, 2016)*

This provides a detailed example, in which interactions between two participants, who had apparently very different understandings of AI, resulted in learning about a specific topic. Indeed, the participants I interviewed commonly articulated particular points they had learned through interactions with others, or they thought others had learned from them. For example, Rachael recalled how she had learned about an interesting perspective on healthcare from another participant:

> *"Miriam was talking about this notion of why are we obsessed with [spending money on] health, because for one thing to grow, the other must die. If you were to buy into that philosophy, you would save money for somewhere else, because you are thinking cyclically. So that was really, really powerful for me." (Rachael, 2016)*

Another participant, Dillan, believed another participant, Lillian, had learned from his expertise on encryption technology:

> *"I felt I'd had an impact on Lillian, because she'd become a fan of [encryption]." (Dillan, 2016)*

His claim was supported by a conversation I had with Lillian during the workshop, in which she said she had found it interesting to learn about encryption. Furthermore, she had already started doing some online enquiry into it.

It was a similar story in the FSF case study. In FSF, six of the 13 participants I interviewed, articulated that they had learned through interactions with different participants in the workshop. For example, one participant, Tracy, who was a teacher, described how she had learned through interacting with participants from other professional occupations:

> *"There were lecturers here at the University and there were teachers in schools, and there were officers in the education department, and other officers in agricultural department, but we shared information… We are all giving points, someone gives one point, another gives the next point, there are other points, which I learned from my friends, and therefore I learned something." (Tracy, 2016)*

Similarly, Gerry, a participant who worked for the Ministry of Health, reported he had learned through interactions between participants from different professional occupations:

> *"People were interacting, because the group was having people from different areas, different angles. There were those from agriculture, representatives from primary schools and another from the University. Everybody was interacting… As a group, people were just contributing, we were asking ourselves what should be done to intervene for the issue and everybody contributed according to their experiences." (Gerry, 2016)*

Another participant, Sally, an academic researcher, described how she had learned from interacting with participants who had different expertise:

> *"I met with people's different expertise, nutrition specialists, policy makers, one person from the pressure group, from NGOs. Those participants shared their skills, their knowledge, their experience accordingly." (Sally, 2016)*

These findings show that learning in PSP occurs through interactions between participants with apparently different knowledges. These interactions create opportunities for participants to interact with different ways of understanding SEPs, which encourage learning. This corresponds with theory on the 'zone of proximal development,' (ZPD) as proposed by Vygotsky (1978). As I outlined in Chapter 2, Vygotsky reasons that people learn through interacting with others who are more capable in a specific field. He explains that, through these interactions, people draw upon the expertise of others, and are thus able to learn things that would normally be beyond their individual learning capacity. In Vygotsky's words, they 'enter' their ZPD. My findings indicate that PSP participants interact with participants who are more capable in different fields to their own, and thus, draw upon others' expertise to learn about ways of understanding SEPs that would be beyond their capacity to learn alone. In this sense, I reason, PSP enables participants to 'enter' their ZPDs.

However, this could arguably be said of any given participatory or educational process that brings participants with different knowledges into dialogue. It is therefore important to investigate if and how specific attributes of PSP stimulate learning. The data in the above paragraphs allude to attributes, such as questioning assumptions about the future, discussing common issues, and creating shared mindsets. I explore these, and other attributes in more detail in Section 5.3, below.

5.3 *"Giving people a structure to push beyond where their thinking would normally take them."* – PSP prompts discussion

In Section 5.2, I showed that learning in PSP occurs through interactions between participants with different knowledges. In this section, I focus on how the process of imagining alternative future possibilities encourages learning, through triggering and focusing discussions between different participants. This can create opportunities for participants to be exposed to the knowledge of others, and to 'push' their thinking beyond their usual capacity. In the case review, although information regarding how learning occurs is scarce, in 21 of the 30 cases the authors allude to specific aspects of their PSP processes that stimulated discussion. For example, Van Berkel et al. (2011) report that: *'The scenarios acted as prompts in the workshop discussions,'* (p.135). The authors explain that deliberating on the effects of specific events, conditions and trajectories on the futures of participants' local area, stimulated discussion about local development issues. For instance, they describe how a scenario that focused on restoring traditional agricultural practices, stimulated discussion about different types of tourism that could be promoted in the area. The authors report that, because of these discussions, participants developed a: *'richer understanding of rural development issues,' (p.136)* especially regarding acknowledging the interests of stakeholders from different sectors, including farmers, service-sector workers, and representatives from a national park. Evidence of PSP prompting discussions is prevalent in the case review. I illustrate this in Table 5.2, below.

Table 5.2 – Evidence from the case review that PSP 'prompted' discussions between different stakeholders

Case of PSP	Evidence of PSP 'prompting' discussions
Rivard and Reay (2012) - exploring the future of Malawi's energy sector.	Discussions encouraged by exploring 'structural uncertainties.'
Bohensky et al. (2006) - ecosystem services in South Africa.	Discussions prompted by creating links between different components of the scenarios.
Brand et al. (2013) - understanding ecosystem services in the Swiss Alps.	Discussions arose from exploring issues of consistency and surprise in potential future states.
Fisher et al. (2011); and Swetnam et al. (2011) - ecosystem service analysis in Tanzania.	Collectively thinking about the development of trends and drivers in alternative futures encouraged discussions.
Mistry et al. (2014) - ecosystem management in Guyana.	Creating a 'platform for dialogue' stimulated discussions between participants from different perspectives.
Palacios-Agundez et al. (2013) - ecosystem management in Spain.	Discussions arose from exploring plausible futures and thinking about how to avoid challenges.
Plieninger et al. (2013) – managing ecosystem services provided by cultural landscapes in Germany.	Discussion occurred through participants being provided with a structure, with which to explore future possibilities and responses to challenges.
Henly-Shepard et al. (2015) - improving adaptive capacity to hazards in Hawaii.	Discussions prompted by considering responses to challenges.
Pearson et al. (2010) - sustainability planning in Australia.	Discussions triggered through developing and testing responses to problems.
Ravera et al. (2011a); and Ravera et al. (2011b) - climate change adaptation in Nicaragua.	Discussions encouraged by considering adaptation options in different scenarios.
Tschakert et al. (2014) - climate change adaptation in Ghana and Tanzania.	Discussions arose from combining experiences of everyday life with climate projections and anticipatory views of the future.
Wesche and Armitage (2014) - understand environmental change in northern Canada.	Structured discussions occurred regarding the implications of different drivers, on livelihoods, in alternative scenarios.
Sheppard et al. (2011) - climate change action and awareness.	Visual methods helped stimulate discussions by making potential climate impacts seem real.
Van Berkel et al. (2011) - rural development in Portugal.	Scenarios 'prompted' discussions about rural development issues.
Vermeulen et al. (2013); and Vervoort et al. (2013) climate change and food security in East Africa.	Discussions encouraged by exploring how to overcome potential future challenges.
Bohensky et al. (2009) - ecotourism in Papua New Guinea.	Considering what would influence the outcomes of 'guiding questions' stimulated discussions between participants.
Schulz et al. (2015) - Payments for Ecosystem Services in Brazil.	Discussions arose through deliberating on challenges and responses to them.
Brown et al. (2001) - marine protected area management in Tobago.	Discussions stimulated by deliberating on trade-offs of different options in the future.
Palomo et al. (2011) - protected area management in Spain.	Discussions encouraged through exploring trade-offs between different options.
Jessel and Jacobs (2005) - planning for the European Water Framework Directive	Considering the effects of different policy options in different scenarios encouraged discussions between participants.

Source: author construct

The data from the case review thus indicates that specific attributes of PSP processes prompted discussions that enabled learning to occur. These attributes included exploring the potential future development of different components in SES, and the interconnections between them, as well as considering of responses to SEPs, and the challenges that would have to be overcome.

This was reflected in my practitioner interviews, in which the 10 informants with whom I discussed how learning occurred, all alluded to specific attributes of PSP processes that supported learning, by prompting discussion between participants. This included the future providing a point of focus for discussion between different participants. For example, the experienced practitioner, Gavin, explained that PSP stimulates learning by:

> *"Getting people together, from different places, around common issues. Everyone is interested in the future, right?" (Gavin, 2016)*

He thus indicated that the future, itself, is a common issue, that can bring different participants into dialogue. This was reflected in the response of another practitioner, Belinda, who had a wealth of experience conducting PSPs in global projects. She stated:

> *"Everyone has expectations, aspirations and anxieties with regards to the future, which they are forced to make explicit when they imagine scenarios." (Belinda, 2016)*

This evidence shows, that deliberating on the future is said to be a specific attribute of PSP, that provides a common issue, around which participants can discuss their assumptions. However, as I discuss further in Section 5.5, 'common' issues are usually contested. Careful management is therefore required to ensure discussions about them are constructive.

Another practitioner, Rick went into more detail, regarding how he thought learning occurred in a specific PSP process in which he was involved. He explained that learning occurred, specifically, through focused discussions on potential future developments, which encouraged participants to reflect on their existing assumptions about SEPs:

> *"through focusing people's minds on what they think are the most important developments and trends… People know it, but people don't necessarily have a chance to focus on it and pull it together." (Rick, 2016)*

In the FSF case study, eight of the 10 informants who stated they had learned through the workshop, explained that this learning had occurred through imagining alternative future possibilities in a structured way. The other two did not clearly articulate how learning had occurred for them. It may be that they had not reflected on how learning had occurred, but it is also notable that neither of them spoke English fluently, which could have limited their ability to articulate how they thought learning had occurred.

One of the participants, Alan, who did explain how he had learned, indicated that the structured way of thinking about the future in PSP had helped him to learn about different aspects of food and nutrition security. He also stated he had never participated in PSP before, and that this focused way of thinking about the future was completely new to him. The novelty of this way of thinking about the future is an important factor in how learning varies between different participants, which I discuss further in Chapter 6. Alan stated:

> *"The methodology of using scenarios, and the planning by using the backcasting, that was the most interesting part because really it was new to me… It facilitates somebody to go step-by-step… It is difficult to miss something, to overlook something." (Alan, 2016)*

The above evidence indicates then, that PSP encourages learning by providing a point of focus, around which participants can reflect on their assumptions about the possible future development of SEPs. Furthermore, I found evidence that PSP creates opportunities for participants to think outside the box, or to 'stretch' their thinking. This was particularly evident in the PFSA case study, in which nine of the 13 participants I interviewed indicated they had learned through thinking about future possibilities in a creative, but focused way. For example, one participant, Penelope, stated, fluently:

> *"I think imagining different futures, or different realities, is really powerful, because you're starting from a place of possibilities. When you are thinking of different futures like that, when you're doing scenarios, you're provided an opportunity to be creative… scenario planning provides an opportunity to be strategic, to be creative, and to start from a place of possibilities." (Penelope, 2016)*

Another participant, Gareth said a similar thing, but emphasised the importance of PSP for providing a structure within which to focus participants' creative thinking:

> *"It helped people to 'think outside of their boxes,' but within some particular parameters." (Gareth, 2016)*

Likewise, the participant, Elliot, enthusiastically stated that imagining the future, together with other participants, had inspired creative thinking:

> *"We were allowed the space to be in an imagination, in a collective imagination, to let go of those conditionings [that constrain our thinking]. The scenarios methodology allows for using that part of your brain that sometimes gets 'cobwebby,' that you don't turn on the lights very often. It helps with that space where inspiration comes from." (Elliot, 2016)*

In both the PFSA and FSF case studies, I also observed examples of how the specific activities and framings of the two workshops stimulated this focused, creative thinking. This is illustrated in Table 5.3, below.

Table 5.3 – Examples of specific activities and framings of the case study PSP processes, that stimulated creative thinking

Specific activities and aspects of the case studies	Explanation of how they appeared to stimulate learning
'Future Wheels' activity in PFSA	On Day 1 of the workshop, participants imagined desirable future conditions in which small-scale initiatives (or seeds) were 'mature conditions,' or mainstream ways of doing things. Participants identified the direct 'primary' impacts of these initiatives as mature conditions, and then the more indirect 'secondary' and 'tertiary' impacts. These conditions were presented as 'wheels' with the initiatives at the centre and the impacts spreading outwards (see Table 3.4 on p.60 for a more detailed explanation). Imagining desirable future conditions in the Futures Wheels provided the initial stimulus for participants to think creatively. For example, in one discussion group, the participants imagined a future in which the division between rural and urban spaces became blurred. In another group, the participants imagined how the effects of gene technology on human health could ultimately lead to immortality. The ideas generated in the Futures Wheels were subsequently expanded on and developed, in the later activities. The creative thinking, they fostered was maintained throughout the rest of the workshop.
Linking the 'Seeds' in PFSA	As outlined in Chapter 3, the 'seeds' were small-scale initiatives that can be described as conducive to creating just and sustainable futures. Each of the four discussion groups worked with three such initiatives, which they used to develop their scenarios. One thing I observed was that connecting the initiatives, and imagining the effects they could have on each other, helped participants to think creatively. For example, one discussion group connected an initiative involving artificial intelligence (AI) with another promoting more equitable and inclusive access in urban spaces. This led to them imagining 'fluid infrastructure,' in which urban infrastructure could physically change shape, to meet different purposes and, thus, encourage more equitable and sustainable use of space.
Testing responses to food and nutrition poverty in FSF	A key objective of the FSF workshop was to explore plausible future conditions and identify challenges and opportunities for food and nutrition security (FNS) in Tanzania. I observed that this aspect of the workshop prompted participants to think creatively about challenges and opportunities for FNS, as well as responses to them. For example, one discussion group came up with the idea of a 'taskforce' to help foster cooperation across different sectors dealing with food and nutrition issues.

Source: author construct

The observations I outlined in Table 5.3 corresponded with the responses of the participants I interviewed. One PFSA participant, Penelope, spoke about how imagining desirable futures in the 'Futures Wheels' had provided a stimulus for focused, creative thinking:

> *"It gave people a structure to push beyond where their thinking would normally take them… we did, in some ways, get beyond the standard ways of thinking about how things will evolve. It was a genuine shift in my understanding of what is possible." (Penelope, 2016)*

Another PFSA participant, Dillan, indicated that imagining how different seeds could influence each other to bring about preferred outcomes, had enabled him to think creatively about possibilities for developing sustainable communities:

> *"I was working with [a sustainable community initiative] that already exists, it is a little community. So, if you bring in a digital currency, and bring in that thinking there, you could probably use that as a springboard for similar communities." (Dillan, 2016)*

The participant, Paul, indicated that the creative thinking fostered by these specific activities had been sustained throughout the workshop. He stated that this had been achieved through continuously adding to ideas about how the seeds could develop in a desirable way in the future:

> *"We would start with these seeds and then end up with complete scenarios. [For example] with the 'Artificial Meat,' we started off thinking about something in a test tube, and then we ended up resolving world hunger. So, something as small as that, could end up with major repercussions." (Paul, 2016)*

In the FSF case study, two of my informants, Sally and Fiona, indicated that exploring plausible challenges, as well as responses to them, with others, had encouraged them to think creatively. Specifically, they described how they had identified the idea of a 'taskforce' to overcome the challenge of a lack of cooperation:

> *"We were in a scenario, whereby there was no cooperation. So, when we discussed about the implementation of health programmes in schools, we discovered there was no cooperation, so we had to design a committee, which would be responsible to create that cooperation… There are challenges, but with ideas given by others then you get through." (Fiona, 2016)*

> *"We said we need the task force to include different people with different backgrounds, from different sectors, because the issue of food security and nutrition is a cross-cutting issue." (Sally, 2016)*

Another FSF participant, Tracy, also indicated that discussing how to overcome challenges in the scenarios had enabled her to think creatively. Specifically, she indicated that creative thinking had been stimulated by identifying responses to food poverty. She explained:

> *"[We thought about], what are the causes of food poverty in Tanzania, and how will those problems be overcome? Now what should we do to overcome those problems? We have to change the policy developments to create political will, so that food production and food security can be given the first priority. If the government will give first priority to the food production, then it would overcome that problem." (Tracy, 2016)*

The above evidence shows that imagining future narratives of SEPs can provide a point of focus for discussions between different participants. This can take the form of both imagining how future conditions could develop in a desirable way and exploring plausible challenges and responses. This point of focus provides opportunities for participants to reflect on their assumptions about the future of SEPs, as well as to encounter the knowledges of others. PSP processes thus fit well with the concept of 'boundary objects.' As outlined in Chapter 2, these are phenomena, first proposed by Star and Griesemer (1989), that occupy several interacting worlds and remain relevant and outwardly acceptable to all of them. They can thus help to facilitate effective communication between diverse actors, as well as encourage the exchange of knowledge between them. As described by Star (2010), boundary objects can be concepts that people work towards and with, rather than material objects, or completed products.

My findings thus correspond with the assertion of Chaudhury et al. (2012), that PSP processes are boundary objects. PSP processes can provide a point of focus that stimulates communication between different participants. If each participant contributes their assumptions to imagining plausible events, conditions and trajectories, or to preferred conditions, PSP

processes can incorporate multiple identities and therefore remain outwardly acceptable to different participants. They can thus create opportunities for participants to exchange knowledge with each other. I therefore reason that PSP processes can represent boundary objects that encourage learning, through exposing participants to different knowledges, and encouraging them to reflect on their assumptions about the future.

My two case studies show that boundary objects in PSP can take different forms, depending on the framing of the workshops. In PFSA, the boundary object was the creation of scenarios that were mutually desirable for the participants involved. In FSF the boundary object was the creation of scenarios that included the assumptions and expertise of different participants regarding plausible developments in FNS. In both cases, opportunities were created for participants to exchange knowledge with each other, but in PFSA this occurred through participants contributing their ideas about how just and sustainable futures would look, whereas in FSF, it was through participants contributing their assumptions about plausible future developments in FNS.

My findings also show that PSP can stimulate creative thinking about the future, especially when it includes specific, carefully-designed activities that help to prompt and focus such thinking. As shown in the case studies, such activities can include exploring the development of initiatives that could help create just and sustainable futures, as well as deliberating on how to overcome potential future challenges. PSP can thus enable participants to 'push' their thinking beyond where it would normally go.

This links to the Zone of Proximal Development (ZPD), proposed by Vygotsky (1978). In Section 5.2, I showed that PSP can encourage interactions between different participants. The evidence presented in this section indicates that PSP can go further than just enabling interactions, because it provides a stimulus for focused, creative thinking. Thinking about the future in this way can thus galvanise participants to push beyond their usual range of thinking, which enables them to learn things that would normally be beyond their individual capacity. I therefore propose that, by stimulating focused, creative thinking, PSP processes can help participants to enter their ZPD. However, the prominence of specific activities, like the Futures Wheels in PFSA, highlights the importance of carefully designing PSP processes, such that they include different tools for creating and supporting structured, creative thinking. Facilitators can thus play an important role in learning, by designing and guiding participants through PSP processes.

My case studies indicate that this creative thinking can occur in both normative and exploratory approaches, but in slightly different ways. In the PFSA workshop, participants engaged in structured, creative thinking through imagining how small-scale initiatives could develop to produce desirable, just and sustainable future conditions. In the FSF workshop, structured, creative thinking was fostered through participants exploring responses to plausible challenges to FNS in Tanzania. It is evident then, that there are different ways in which structured, creative thinking about the future can be encouraged in PSP. As I discuss further in Chapter 6, the framing of the two case studies as either normative or exploratory influenced what participants considered relevant, as well as how facilitators directed participants' discussions, with potential repercussions for what is learned.

I also found evidence that learning occurred simply by being introduced to the concept of PSP. As I discuss further in Chapter 6, 12 of the 13 participants I interviewed in FSF stated they had learned a new way of thinking about the future, through being exposed to PSP for the first time. Equally, in Chapter 6, I also show that some PFSA participants learned just by becoming aware of others' perspectives on their fields of expertise. It therefore appears that these participants learned, without necessarily engaging in the creative, focused thinking, described above. Hence, it could be the case that, although this way of thinking stimulates learning, participants can still learn without it, through other aspects of PSP processes. This emphasises the importance of exploring how, and why, learning varies, which I do in Chapter 6.

5.4 Scaffolding

My findings, in Section 5.3, indicate that PSP can provide opportunities for focused, creative thinking. It can thus help participants 'enter' their ZPDs. However, Vygotsky (1978) adds that people require assistance from others, not just interaction, to effectively enter their ZPDs. I found that participants in PSP were helped to engage in focused, creative thinking about the future, through assistance from facilitators.

The authors of papers in the case review, typically gave little attention to the role of facilitators in the cases they described. However, in five cases, the authors indicated that facilitators designed PSP workshops to help participants engage in focused, creative thinking about the future. For example, Plieninger et al. (2013) state that: *'the workshops were prestructured regarding their form and central aims, but remained completely open for the*

participants regarding content,' (p.44). Hence, the facilitators appear to have focused participants' thinking, by providing a template, which the participants filled in. In another case, Bohensky et al. (2009) describe how the facilitators began the workshop by helping participants think of a 'guiding question' (p.2828). Participants were subsequently prompted by facilitators to think about the components of SEPs, that could influence this guiding question. The authors state that the guiding question was developed by the participants, but it is likely to have been influenced by the aims of the workshop, set by the facilitators. The influence of facilitators on shaping learning is explored further in Chapter 6.

In the practitioner interviews, 13 of my 16 informants, acknowledged the importance of facilitation for guiding participants through PSP processes. One practitioner, Vera, who was a highly experienced professional facilitator of futures-thinking methods, emphasised that facilitation is a key condition for learning in PSP. She acknowledged that participants can find it difficult to think about the future, in the way that PSP proposes, which means facilitators need to help ease them into it:

> *"The challenge is to get people to engage with these scenarios… The important thing is to get participants to at least entertain the idea [of thinking about possible futures] and play with it. The role of the facilitator must be to pick up on what incremental changes people are willing to consider in the future, and build on those." (Vera, 2016)*

Another practitioner, Rick, described a specific example of how he had helped different participants to engage with PSP in a project he facilitated. He emphasised the importance of designing PSP processes to include different strategies that could help diverse participants engage in PSP:

> *"I think having different methods of engaging people is really important. So, you try to capture different kinds of knowledge that are within the different ways that people think… The visual methods helped [because] sometimes people can't express things in words, but they can do that in visual forms… So, using a whole load of methods helps to bring more information." (Rick, 2016)*

The role of facilitators in supporting participants to engage in PSP was demonstrated strongly in my two case studies. In PFSA, Mavis, the lead facilitator, provided a particularly good example of how a facilitator could guide participants through a workshop. She was a highly experienced facilitator of futures-thinking methods, and had designed the structure of the PFSA

workshop, in collaboration with the other facilitators. During the workshop, she assisted participants in two main ways: Firstly, she provided an overview of the entire process, before explaining each activity, in turn. This included providing visual demonstrations of the activities. For example, when she demonstrated the 'Futures Wheels' activity, described in Section 5.3, she used an example of how the primary, secondary and tertiary impacts of 'Solar Tiles' could develop in the future. Similarly, when she described the '3 Horizons' activity, described in Table 3.4 (p.55), she illustrated the process, using a diagram that visualised the trajectories of the different 'Horizons.'

In my interviews with PFSA participants, they indicated that these explanations had helped them engage in the process. For example, Dillan explained:

> *"[The activities] were nicely set out, so you understood where you were going to, clearly… It was good to have it just in bitesize chunks." (Dillan, 2016)*

Similarly, Geoffrey described how he had felt confused prior to the workshop, but Mavis' explanations had helped him engage in it:

> *"Initially I was a little bit lost. When I read the outline of what we were going to do, I didn't get a clear sense, until we met in person. We then had this outline that Mavis made and that schematic. I think that schematic helped me get a much better sense of what was expected and what exactly was needed in the scenario planning process." (Geoffrey, 2016)*

Secondly, in addition to explaining the process, Mavis roamed between the four discussion groups, providing clarification and advice on the activities, to help participants progress through the workshop. For example, I observed an instance when one of the discussion groups were unsure whether to connect the 'Futures Wheels' with another activity, the 'Cross-impact Analysis,' (described in Table 3.4 on p.55) in which they explored how different initiatives could connect to and influence each other. The group were concerned about losing the connections they had already made, between different aspects of the Futures Wheels. Mavis suggested they do the 'Cross-impact Analysis' separately but explained how they would link the activities together at a later stage. One participant, Gareth, who had been in that group, thus explained that Mavis helped: *"calm things down when it got confusing."*

The fact that Mavis explained and clarified the process made it easier for the other facilitators to concentrate on encouraging discussions between participants, in the discussion groups. I observed that they did this by asking questions and prompting participants to discuss

specific points. For example, the facilitator, Pamela, asked participants to think about where people would live, and how, in the world described by her group's scenario. This helped the participants to imagine future conditions in great detail. Another facilitator, Doris, encouraged participants in her discussion group to consider the divide between rural and urban spaces, and how it might change in their scenario. This prompt helped to stimulate the creative thinking about 'blurring' the urban-rural divide, described in Table 5.3.

The role of the facilitators was reflected in my interviews with participants. For example, one informant, Miriam highlighted how the facilitator in her group had prompted discussions by asking questions about how the 'seeds' could develop:

> *"She was just bringing questions in, like: 'okay what's next, and what's next, and what's next?' 'What are the limits of this?' 'Do you think this is bad?'" (Miriam, 2016)*

Miriam thus indicated that the facilitator created a *"space for discussion."* It is evident then, that the PFSA facilitators provided assistance that helped participants to engage in the PSP process. Mavis explained and clarified the specific activities, while the other facilitators stimulated discussions between participants, using prompts and questions.

In the FSF case study, although the facilitators played essentially the same role as in PFSA, they were limited by only having three facilitators, as compared to five in PFSA. This meant the lead facilitator, Mike, had to play multiple roles, including: explaining the process, prompting discussion in one of the discussion groups, and roaming between the groups to check on progress and provide clarification. He was also constrained by the lack of time available for the workshop, which meant he had to explain things very quickly and was unable to provide demonstrations like Mavis in PFSA. At the end of the workshop, he reflected to me that it had been the least-funded, shortest workshop he had ever done. He felt that this had limited his ability to roam between groups and make sure they were engaging with the activities. Indeed, when I interviewed one participant, Fiona, she explained that not having Mike roaming around had sometimes been frustrating, because it took a while to get help when they required clarification on specific activities:

> *"But he was so busy, of course he apologised to us sometimes [because] he could not come in time." (Fiona, 2016)*

Another challenge for the facilitators in the FSF workshop was that one of the three facilitators, Thomas, had never facilitated a PSP process before. Thomas would therefore have

benefited from more input from a more experienced facilitator, but because Mike had little time to roam around and provide clarification, it was difficult for him to provide this support. Thomas' discussion group therefore appeared to regularly become confused and struggle to make progress on the workshop activities. Two of the participants I interviewed, Keith and Mark, had both worked in two discussion groups (as the groups were mixed-up half-way through the workshop), including the one facilitated by Thomas. They reflected that Thomas had been limited by his inexperience. Keith explained that Thomas had thus been less able to encourage participants to contribute their knowledge to the discussions:

> *"I think facilitator matters. I know the other facilitator, he is very much experienced, so he knows how to 'pick' things from out of people, but in this group, you could see, he is not much experienced of scenario-creating things." (Keith, 2016)*

It is evident from the above findings that skilled facilitation can help participants to engage in PSP processes. The support provided by facilitators to participants can be explained as 'scaffolding,' a concept put forward by Wood et al. (1976). As I set out in Chapter 2, Wood describes scaffolding as assistance, provided by experts in a given topic, to help non-experts achieve learning. The idea of scaffolding is commonly linked to the zone of proximal development (ZPD) (Vygotsky, 1978). Fernández et al. (2001) explain that scaffolding structures and guides participants, through tasks that help them to push their thinking 'outside the box,' in a controlled way. This helps participants to enter their ZPD and achieve learning they would not have achieved alone.

The learning scholars, Van der Pol et al. (2010) state that scaffolding typically occurs in three stages: contingency (tailoring support to learners' existing ability), fading (decreasing the level of assistance as the learner becomes more competent), and transfer of responsibility (for learning from the expert to the learner). This is evident in the assistance provided by Mavis to the participants in PFSA. She provided contingency by designing, as well as explaining the activities to participants, in a way that corresponded with their existing ability to engage in PSP. She then provided fading, by clarifying the activities and advising participants on how best to tackle them. Ultimately, she decreased the level of assistance, until participants had responsibility for their engagement in each activity. Assisting participants to engage in carefully-designed sets of activities, can thus stimulate focused, creative thinking about the future, which encourages learning.

As Fernández et al. (2001) explain, scaffolding can also occur in the form of 'exploratory talk,' which typically occurs between peers, rather than between an expert and a non-expert. In exploratory talk, people propose new ideas and receive critical and constructive feedback from others. My observations of the two case studies show that facilitators proposed new questions and ideas to get participants thinking and discussing. These prompts and questions could be viewed as attempts to stimulate such exploratory talk. In this sense, the facilitators provided scaffolding as peers involved in the discussion with participants.

I conclude, therefore, that facilitators of PSP processes play an important role in enabling learning, specifically by providing scaffolding. This includes explaining and guiding participants through carefully-designed sets of activities in PSP processes, and prompting discussions. In this way, facilitators can enable learning, by helping participants to engage in creative, focused discussion. However, even with assistance from facilitators, there exist several challenges and pitfalls that can limit participants' engagement in PSP processes, and thus hinder learning. I explore these further in Section 5.5 below.

5.5 Conducive conditions for learning in PSP

As Henrichs et al. (2010) state, in their guide concerning how to set-up PSP processes, there is no definitive approach to conducting a PSP process. Instead, they assert that individual processes should be designed according to their specific contexts, objectives, and participants. Nevertheless, Henrichs et al. set out some general principles that they believe should be considered in PSP processes, to ensure a range of outcomes. In this section, I also lay out a set of conditions that my data indicate are important considerations in PSP processes. In contrast to Henrichs et al., however, I concentrate specifically on the conditions that appear most conducive for learning.

5.5.1 *"Everyone felt very sharply distinct"* - Diversity of participants is conducive to learning

In Sections 5.2 and 5.3, I showed that learning in PSP can occur through interactions between different participants. Collectively thinking about the future can expose participants to different knowledges and encourage them to reflect on their assumptions about the future. Unsurprisingly, therefore, I found that learning is encouraged by including a diverse cohort of

participants in PSP. As I stated in Chapter 4, 23 of the 30 cases in the case review assumed that bringing different participants together to deliberate on the future could enable learning to occur. Similarly, in the practitioner interviews, there was an assumption, implicit in my informants' responses, that the diversity of participants was an important enabler of learning. For example, Gordon stated that learning was stimulated by: *"interactions across disciplines."* Terry stated it was encouraged by: *"sensitisation to multiple perspectives."* Gavin indicated it was catalysed through: *"bringing people together, with people they wouldn't normally interact with."* Vera, who had decades of experience facilitating PSP processes, described: *"including a diverse range of perspectives,"* as a key condition for learning to occur.

A particularly clear example, of how a high degree of diversity can stimulate learning, was provided by the highly experienced practitioner, Deborah. She attributed learning in a major global PSP process, in which she took a lead role, to disagreements that arose between participants from different academic disciplines:

> *"We had close to a day of pretty acrimonious disagreements, especially among some of the younger ecologists with the young economists. [Another facilitator] and I had to just have a series of individual conversations with people that said 'hey, cool it,' we all need to work together to get this done… But actually, when there is a genuine disagreement among experts that generally means that there's a real uncertainty there that should be noted." (Deborah, 2016)*

This description shows that the differences between the participants were valuable for learning, in that their disagreements could result in the identification of uncertainties. This indicates that the greater the diversity of participants, the more likely they are to learn through exposure to different knowledges.

This was especially evident in the PFSA case study. All 12 of the informants, who claimed to have learned through the workshop, indicated their learning had been encouraged by the diversity of participants. For example, one participant, Geoffrey, stated that the diversity of participants had encouraged learning, in a way that other participatory meetings he attended had not:

> *"I go to a lot of meetings and it's not always such a diverse group… in my opinion, the more we include people that we normally don't talk to, the better… because what that did was to challenge our everyday understanding of these issues." (Geoffrey, 2016)*

Similarly, the participant, Penelope, who had prior experience of other PSP processes, indicated very clearly, that distinctions between the participants had encouraged learning, for her. She reflected:

> *"Everyone felt very sharply distinct… I learned from every single person in that group."*

> *"The organisers should be commended, for trying to bring together people that do have different views, and I don't think these processes are very valuable if everyone can just be happy and jolly and all get along." (Penelope, 2016)*

It is evident then, that a diverse cohort of participants is believed to encourage learning, by increasing the different knowledges, to which participants are exposed. This corresponds with Henrichs et al. (2010), who assert that the participation of a wide range of stakeholders is vital for PSP processes that aim to produce learning. They emphasise that, when designed and facilitated effectively, processes that include diverse participants can foster learning about the complexity, as well as the dynamics of social-ecological systems.

However, as indicated by the practitioner, Deborah's example, including a diverse cohort of participants also has pitfalls, which can limit or even prevent learning in PSP. She indicated that, although differences between participants ultimately resulted in learning, this required careful management by facilitators, and a willingness to cooperate by participants. As I discuss in the following sub-section, disagreements between participants can become counterproductive.

5.5.2 *"We hit a dead stop."* – Challenges of including diverse participants

In the practitioner interviews, three of my informants described how they had conducted PSP processes in situations where there was a significant amount of conflict between different participants. In these instances, the practitioners each chose to keep different groups of participants separate, to avoid exacerbating the existing tensions between them. The respective practitioners therefore created scenarios in separate workshops, with different groups of

participants, and then synthesised them to create scenarios that represented the inputs of different groups. One of these practitioners, Greg, justified this, saying:

> *"You know, if you put people who have very different perspectives together, I don't think that's a problem. It's just more about, there are some tensions and some divisions in that community and I didn't want to exacerbate those… I wanted people to express their perspectives in a way that they felt free and not under fire and not judged… [If they had been in the same room], I don't think that people would talk freely. They would be very concerned with what they say to each other… I think people were free to talk with just me listening." (Greg, 2016)*

Similarly, Ronald justified keeping participants separate, in his case, by saying:

> *"I mean we didn't bring them together in the same room, because to draw on their experiences and integrate them, and treat their values and perspectives equally would have been difficult if they had been together." (Ronald, 2016)*

Greg and Ronald clearly believed that the conflicting interests of different groups would have created counterproductive tensions, if they had interacted face-to-face. As such, they thought participants would have been unable to make their assumptions about the future explicit, which could have limited learning.

This was reflected in one instance in the PFSA case study, in which disagreements in one of the discussion groups appeared to result in counterproductive tensions, that hindered learning. Three of the four informants I interviewed from that group complained that their interactions with other participants in the workshop had been too intense. One participant, Morty, was especially vocal about this. He stated that the intensity of the interactions had left him feeling exhausted, and at one point he had been forced to withdraw from his discussion group for a rest. He therefore indicated that he would have maintained a higher degree of enthusiasm for the workshop if there had been more time for individual reflection:

> *"It was just too much! Too much talking time and not enough integrating time… I would have, for practical, and for process reasons, I would've had more alone time." (Morty, 2016)*

Another participant, Dillan, who had been in the same discussion group as Morty, indicated that the interactions had been too intense. He explained that this intensity had led to

the group becoming 'fatigued,' which resulted in tensions between the group members. He went on to explain that these tensions brought the discussions to a complete halt:

> *"I think towards the end, we were really fatigued, and that's when tempers started boiling. We were not getting anywhere. We had just come to a dead stop." (Dillan, 2016)*

The fact that discussions came to a 'dead stop,' implies that the interactions in that group were not conducive to the creative, focused thinking that appears to stimulate learning. Interestingly, I observed that the participants in that discussion group were all very forceful in the way they articulated their ideas. They were also prone to criticising the ideas of others on a very detailed, technical level, which became contentious. It could therefore be the case that these interactions were less conducive to learning, because the disagreements became counterproductive. Indeed, another participant from the same group, Darren, reflected:

> *"Within our group, I thought that, at times, the disagreement was counterproductive… Sometimes people were so insistent in what they believe and what they do, that they were not very good at listening, and I think there was a lot of missed opportunity, because people were so headstrong." (Darren, 2016)*

This example appears to correspond with the assumptions of the practitioners, Greg and Ronald, that disagreements can be counterproductive to learning in PSP. In the guide set out by Henrichs et al. (2010), the authors also recognise that the different interests of participants can lead to conflict. Furthermore, they indicate that conflict can limit the achievement of desired outcomes. This seems at odds, however, with my findings in Sections 5.2 and 5.3, that exposing participants to different knowledges is integral to learning. Hence, there appears to be a tension between exposing participants to different knowledges and avoiding counterproductive tensions.

However, the fact discussions in the above discussion group came to a *"dead stop,"* was, arguably, just as much about the personalities in the discussion group, as it was about the disagreements between them. Indeed, in the account of Darren, he states that participants were *"not very good at listening,"* and were very *"headstrong."* This reflects another challenge, associated with including diverse participants, that some participants are, inevitably, more vocal and assertive than others.

This was demonstrated in the PFSA case study, in that not even one of the participants mentioned the plenary sessions, when I asked about which aspects of the workshop had

encouraged learning. One participant, Paul, who described himself as an introvert, explained this, when I interviewed him. He indicated that interactions in plenary, were difficult for more introverted participants, because the plenary sessions tended to be dominated by the most assertive participants:

> *"When we were all together again, certain people would always be talking. I mean, not always, but there were always certain voices, and then the more introverted people would speak more in their [discussion] groups… In the large group, you start to hear the same things being repeated." (Paul, 2016)*

Similarly, another participant, Penelope, complained that the plenary discussions had been dominated by radical ideas from the most assertive participants that 'shut down,' the discussion:

> *"I did find it challenging in the larger group discussions, when some participants would be very strong on ideas, in a way that threatened to throw the process away. That whole digression, I felt like [it] shut down the interesting direction that conversation could have gone in terms of thinking about the future, and instead made it into a polemic." (Penelope, 2016)*

This indicates there was less opportunity for participants to contribute and be exposed to different knowledges, and thus less opportunity for learning to occur.

It is evident, therefore, that learning in PSP can be hindered by assertive participants, creating counterproductive tensions, especially if facilitators are not alert to this. Hence, it seems that certain types of interactions are more conducive to learning than others. Diversity and disagreement appear to be important, but can become counterproductive, if they are not managed effectively. This links to learning literature, regarding 'exploratory talk.' As described in Section 5.4, Fernández et al. (2001) describe exploratory talk as a form of scaffolding, that can help people enter their ZPDs, and thus learn. Fernandez et al. emphasise that any criticism of others' ideas should be constructive for such exploratory talk to occur. Similarly, Barnes (2008) highlights that for exploratory talk to be effective, it is vital that learners feel at ease, and not in danger of being aggressively, or disrespectfully criticised for the ideas they express. The importance of respectful interactions is also acknowledged by Henrichs et al. (2010). They advise that, to avoid counterproductive tensions in PSP, it is vital that facilitators carefully manage interactions between diverse participants. The importance of facilitators, in this respect, is reflected in my findings. I explore this further, in the next sub-section.

5.5.3 *"You need a very good facilitator to come in and make sure that everyone has a voice."* - Importance of facilitators for managing interactions

The evidence presented in this section thus far, indicates that interactions between different participants need to be carefully managed, if they are to result in learning. As I set out in Section 5.2, the experienced practitioner, Gordon, specified that learning occurs through participants questioning each other's assumptions *"in a respectful way."* As indicated above, skilled facilitation is, thus, required to ensure interactions between participants are 'respectful.'

In the case review, I did not find evidence of the role played by facilitators in managing interactions between participants. This may be because editorial constraints meant they were unable to discuss this in their papers, rather than because they did not consider it an important issue. Indeed, in the practitioner interviews, 10 of the 13 informants, who discussed the role of facilitation, acknowledged that facilitation was vital for managing interactions between different participants. For example, one practitioner, Barry, who had a wealth of experience conducting PSP processes with diverse groups of stakeholders, emphasised the importance of facilitation for ensuring different participants are able to contribute in PSP:

> *"When it comes to doing the participatory work, that's when you need a very good facilitator to come in and make sure that everyone has a voice, because there's always going to be people who dominate." (Barry, 2016)*

An example of effective facilitation was provided by the experienced practitioner, Deborah, in which effective facilitation, apparently turned potentially counterproductive disagreements into valuable learning points. She described how her role, as a facilitator, had helped with this:

> *"My job was a mediator, basically [I said] 'look guys, I realise there's a disagreement about how to do this, but the alternative is, we can either make a decision and do something, or we can do nothing, and doing nothing looks like a really bad idea so, let's find a way to muddle through here.' We had few disagreements we really had to manage, and we managed it, so in the end it came out well." (Deborah, 2016)*

In this instance, the facilitators reportedly encouraged divergent participants to work together, rather than allowing a complete break-down in discussions. The facilitators appear to have

encouraged participants to question each other's assumptions, in a respectful way, which enabled learning to occur.

Another experienced practitioner, Mary considered facilitation to be a *"hugely powerful"* tool for managing interactions between different participants. In contrast to Deborah's success story, Mary illustrated the importance of facilitation, using an example in which poor facilitation resulted in a complete break-down of discussions. In this instance, the organisers had been unable to hire the professional facilitator they originally approached, forcing them to use someone else. When the workshop started, the facilitator did not effectively manage the relationships between different participants. This led to a situation where the disagreements between participants just led to counterproductive arguments:

> *"The process started, and she just stood there, she didn't say a word, she just stood box-still and let all these people argue with each other, and people were getting upset, people were shouting at each other, voices raised. It was all the same old arguments coming out. The break time went, the break time was over, and they were still arguing, people were getting upset, you know, someone had stood up now and was shouting at someone." (Mary, 2016)*

It is evident then, that practitioners recognise that skilled facilitation is required, to ensure interactions in PSP are respectful. However, the three above accounts came from the practitioners who facilitated the very workshops they described. It is therefore possible they emphasised the importance of their own roles, as facilitators. My interviews with participants in the two case studies provided valuable insights on facilitation, from the perspectives of the participants.

In the PFSA case study, I observed that the facilitators did not begin the workshop with conventional, formal introductions. According to the lead facilitator, Mavis this was *"deliberately engineered,"* to avoid participants introducing themselves based on their titles and the organisations they represented. They expected this would help encourage more equal interactions between participants and avoid domination by the participants with the highest credentials, or from the most influential organisations. In six of my interviews with participants, they indicated that this had worked. For example, Penelope indicated that this made it easier for participants to interact with each other:

> *"I think one of the best things that the organisers did, is that they didn't have this whole thing of telling everyone who you are, focusing on your credentials,*

> *or creating power imbalances. It was like, throw everyone in a room who know almost nothing about each other and just go for it, and that, I think was an immense strength, because it meant that we could connect to participants on a human level." (Penelope, 2016)*

This indicates that the PFSA facilitators effectively enabled participants to interact in a respectful way. However, this does not appear to correspond with my findings, presented earlier in this section, that the plenary discussions were dominated by the most assertive participants. Equally, it is at odds with my finding that one discussion group was hindered by counterproductive arguments that resulted in a 'dead stop.' Indeed, Dillan, who had been in that group, thought the facilitator had been too weak:

> *"I think she was maybe not strong enough to keep everyone in check. I felt sorry for her in our group. Sometimes I just wanted to stand up and say: 'enough now! Just listen!' She certainly had her hands full with us." (Dillan, 2016)*

My findings from the FSF case study also showed that the facilitators were instrumental in managing the interactions between participants. Four of the FSF participants who I interviewed, reflected that the facilitators had prevented the discussions from being dominated by any individual, or group of, participants. For example, when I asked Tracy about whether she thought any participants had contributed more than others, she responded:

> *"The facilitator made sure every one of the members of that group participated. Therefore, I can say that he did not segregate. He was just helping all of us. That is why it is very difficult to find the one who contributed most, and the one who contributed least. So, everyone contributed well." (Tracy, 2016)*

This indicates that the facilitators' approach of encouraging every individual to contribute, helped to minimise the domination of discussions by any individuals, or groups of, participants.

It is evident then, that facilitators play an important role in managing the interactions between different participants. This matches the assertion of Henrichs et al. (2010), who state that skilled facilitation is needed to moderate discussions, as well as encourage effective participation by all participants. They emphasise, specifically, that facilitators need to deal effectively with assertive participants, and capitalise on diversity in participants' worldviews, whilst ensuring that discussions remain constructive. The importance of skilled facilitation is also

reflected on by Reed (2008) in his paper on best practice in participatory processes for environmental management. He contends that the facilitation of a participatory process is critical in determining whether it achieves its desired outcomes. He specifically states that facilitators need to be capable of managing conflicts and dominant participants, all the while ensuring that the interactions between different participants remain constructive. This, in addition to the role of facilitation in providing 'scaffolding,' as described in Section 5.4, emphasises the vital role played by facilitators, in enabling learning. It is concerning, therefore, that there was limited information in the case review regarding the role of facilitators.

5.5.4 *"Scenario does not exist in Swahili."* – Some participants are less able, or willing to engage in PSP

In the above sub-sections, whilst the data show that learning can be hindered by counterproductive disagreements, they also demonstrate that the types of interactions, that unfold in PSP, are not conducive to the learning of all participants. As described above, the apparent intensity of the discussions, in PFSA, seems to have contributed to the counterproductive disagreements, in at least one discussion group. Equally, the plenary discussions seem to have lent themselves to domination by more assertive participants. This could be because some participants found certain types of interactions more conducive to learning than others.

This was illustrated strongly by an example provided by the experienced practitioner, Mary. She described a situation in which three participants arrived at a PSP workshop, uninvited:

> *"We'd invited 12 people, but actually there were 15 people. There were three guys sitting at the end of the table who I didn't know. I made the mistake of not working out who they were and either chucking them out, or at least trying to get a handle on who they were." (Mary, 2016)*

When Mary asked the participants to engage in an activity, involving writing things on posters, the three uninvited participants did not do so. She went on to describe how these three participants had explained they were unable to engage in the task, because they were illiterate:

> *"So, we did that, and these three guys just weren't doing it, so I went and said: 'so you do this and this, and then you stick it there,' and they said 'yeah, we get it'. So, I said 'why are you not doing it?' At this point, all eyes were on these*

> *three guys because they still hadn't done it and I was asking them 'why can't you do it?' And one of them admitted 'we are illiterate, we can't read and write.'" (Mary, 2016)*

In this instance, the participants were unable to engage in in a specific activity in PSP, because of their level of education.

In the PFSA case study, in which most participants had a similar level of education, one participant, Gareth, indicated that he had been more comfortable with certain types of interaction than others. Specifically, he stated he had learned more, through interactions in the informal periods, like tea breaks and meal times, than the focused discussions in the workshop itself. He explained that he had learned about how a particular initiative could develop, in the future, to assist marine conservation:

> *"I found out about the benefits of the gene technology, like it could help to resurrect destroyed ecosystems, like coral reefs. But that came up in a discussion with another participant, at dinner, not in the group discussion itself." (Gareth, 2016)*

In this instance, the informal discussions appeared to be more conducive to Gareth's learning than the focused discussions in the workshop. However, it is unlikely that the informal conversation, leading to this learning, would have happened if Gareth had not been engaging in a PSP process that involved imagining the development of initiatives like gene technology. Gareth's learning was arguably stimulated by the focused, creative thinking in PSP, even though he attributed it to an informal conversation.

In FSF case study, I found evidence that some participants were less able and/or willing to engage in PSP overall, because it represented a new and unfamiliar way of thinking about the future. In one instance, I observed that a participant, Erica, raised moral objections to the process. She contended, during the first day of the workshop, that PSP equated to *"gambling."* She misinterpreted the role of PSP, as making definitive decisions, based on predictions, rather than exploring alternative, plausible futures. The facilitators tried to reassure her that the idea was not to predict the future, but Erica remained unconvinced. She did not attend the second day of the workshop, which could indicate she was unwilling to continue with the process. Unfortunately, due to illness, she was unavailable for me interview and hence, I was unable to ask her about this.

In the FSF workshop, it took noticeably longer for the participants to grasp the process than it did in PFSA. In the workshop, I observed how the facilitators had repeatedly to explain the

idea of PSP, to confused participants. Four of my interviewees also reflected they had found it difficult to understand. For example, Diane reflected that PSP had been *"unclear,"* to her, while Keith stated, he had found it *"difficult."* The other 10 interviewees did not explicitly state they had found it difficult, but this may have been because they did not want to be critical of the organisers.

The difficulties that FSF participants appear to have faced in engaging with PSP, may be explained by one participant, Sally, who indicated that PSP was a very new and unusual activity for the participants:

> *"It is a paradigm shift! Scenario planning is new to us." (Sally, 2016)*

Indeed, when I asked one of the facilitators, Thomas, about challenges in the workshop, he indicated that the concept of 'scenarios' did not even translate into the local language:

> *"Some words are not there in Swahili, like 'scenario.' 'Scenario' does not exist in Swahili." (Thomas, 2016)*

It is evident, therefore, that the way of thinking required by PSP was very unfamiliar to participants in FSF, which made it difficult for them to engage in the process.

In complete contrast, one PFSA participant, Barbara, indicated she had been less engaged in the PSP process because she was *too* familiar with it. She was an academic who specialised in thinking about future social innovations, and was thus accustomed to thinking about different possible futures in processes including PSP. She therefore stated that she had not learned through her participation in the workshop:

> *"You know Sam, this is my job. I do this every day. It was a great event, but it hasn't been an eye-opening experience for me… This is what I do in life." (Barbara, 2016)*

However, Barbara was not the only PFSA participant who was familiar with PSP. In fact, Penelope also had prior experience engaging with scenarios, but enthusiastically indicated that she had learned much from the workshop. Barbara therefore appears to have been less open to engaging in the specific PFSA workshop than other participants. I explore why this might be the case in Section 5.5.5, below.

The above evidence shows that some participants are less able, or willing, to engage in PSP processes than others. Henrichs et al. (2010) also acknowledge that different groups of

participants have different levels of capacity to think in an open-minded way about the future. They subsequently advise that facilitators should make efforts to enable all participants to engage in PSP, through clearly explaining the process and building trust with participants. However, in FSF I observed that, despite the facilitators' best efforts, the discussions in one group appeared to marginalise some participants. In this group, there were three female participants, who were younger than the other members of the group. They were mostly very quiet and only spoke, briefly when they were asked to. Hence, they appeared quite marginal to the group's discussions. This may be because of traditional gender roles in Tanzania, that mean women typically remain quiet in the presence of older men (Verma, 2001). This indicates that, despite the best efforts of facilitators, some participants were still less comfortable, perhaps largely because of cultural reasons, with engaging in the types of interactions that unfolded in the workshop.

It is therefore likely that the effectiveness of PSP as a method for learning, varied between different participants. This raises important questions regarding for whom PSP is meant to be beneficial. Is the main intention for everyone to learn from it? Alternatively, as implied in Chapter 4, is the primary intention to elicit stakeholders' knowledge, for research purposes, with learning as a secondary objective? One further issue, that can affect the efficacy of PSP for different participants, is the extent to which participants have relevant expertise. I explore this further below.

5.5.5 *"I want to be operated on by a surgeon."* – The importance of relevant expertise

In the practitioner interviews and the two case studies, my data show that to encourage learning, it was important for participants to have relevant expertise in the topics that specific PSP processes focused on. One practitioner, Mary, emphasised the importance of carefully selecting participants with relevant expertise. She was an academic, with expertise in participatory processes of knowledge-sharing across different groups of stakeholders. She described a PSP process, in which she had conducted a 'stakeholder analysis,' to help select participants with expertise and influence regarding particular SEPs:

> *"We used these matrices, where you're asking for a level of interest and influence, which you might rate as high or low. To ensure that we were representing each of the different categories, and to identify the groups that were most marginal to the network and ensure that they were included as well." (Mary, 2016)*

She was confident that, in doing so, she ensured participants had diverse, but relevant expertise with regards to the SEPs considered in her project. Indeed, she went on to critique other projects for not doing likewise:

> *"I believe it [stakeholder analysis] is a step that is very rarely included in scenario analyses, and bizarrely is rarely included in any participatory process. People think they've done it, but it's very rarely systematic." (Mary, 2016)*

The importance of ensuring participants have relevant expertise was emphasised by one participant, Barbara, in the PFSA case study. When I asked her about what she had found challenging in the workshop, Barbara, an accomplished social innovation scholar, bemoaned what she perceived as a lack of expertise among the other participants:

> *"What I found most challenging was, to deal with the ignorance. By that, I mean technically, literally ignorance, not in an offensive way. I mean, at times, you have to strike a good balance between the diversity within the group, and the knowledge… When it comes to knowledge, I want to be operated on by a surgeon, who knows exactly what she or he is doing. I don't think we should have equal say when it comes to certain things. A lot of people [in the workshop] perceived that all opinions have the same weight, and everything is equally important, and often this is not the case. You either know something, or you don't. You cannot fabricate it. Managing the trade-off between the democratic participation in the process, and the knowledge-driven part of the process is not easy, so it needs to be carefully managed." (Barbara, 2016)*

Barbara clearly felt the 'knowledge-driven' part of the workshop had been compromised by participants with limited technical expertise. However, she later appeared to undermine this assertion by stating the workshop had been valuable for her to gain feedback from experts on her ideas about the future. She illustrated this with an interesting example about pizza-making:

> *"It's like if you know how to make pizza, and then you meet another pizza guy, and you share a lot of notions that, even if you knew how to make pizza really well, you know even better now, because a couple of tips have come out of that conversation." (Barbara, 2016)*

To get 'tips' on pizza-making, the other 'pizza-guy' presumably needs to have some technical expertise in making pizza. Barbara's argument that the other PFSA participants all lacked relevant expertise may have thus been inaccurate.

The data from the FSF case study indicates that the relevance of participants' expertise is important. My interviews with FSF participants and facilitators indicated that participants' lack of expertise was a significant constraint on the process. For example, one of the facilitators, Thomas, showed some frustration with the level of participants' expertise:

> *"Yeah, in the group I would say that… they needed a lot of guidance, these people… There was a lot of knowledge limitation… In terms of participants who had little knowledge, of course I had to educate them, I had to elaborate theories, [so that] they were able to engage in the discussions." (Thomas, 2016)*

Similarly, three of the FSF participants I interviewed, also stated that they found other participants' lack of expertise to be a challenge. Two of them, Beth and Tristan, worked for government ministries. The third participant, Sally, was a doctoral student who was studying international development. All three had substantial technical expertise in food and nutrition security. Tristan contended that the discussions in the workshop had been compromised by other participants' lack of expertise on food security:

> *"I just came to realise that a lot of people are talking about food security, but are not really grounded in food security… People [didn't] understand a lot about food security, because even when I was trying to talk about food availability, accessibility and utilisation, people [didn't] understand… So, if people were grounded really in food security, the discussion could have even been alive." (Tristan, 2016)*

This was echoed by Sally, who indicated that the lack of expertise slowed the discussion down, which made it less intellectually stimulating:

> *"Some of the members were trainees… they were not informed much with the prevailing situations… It slowed it down, because we had to explain to each other at least 'what do we mean by this?'" (Sally, 2016)*

This shows that the inclusion of participants with relevant expertise is an important factor in enabling learning. This echoes the finding, presented in Chapter 4, that including relevant participants is vital for implementing responses to SEPs. This finding also corresponds with the guidance of Henrichs et al. (2010), who advise that participants should be selected such that they represent the interests and worldviews of broader stakeholder groups, who are affected by the topic that is deliberated on. Reed (2008) goes further than this, to contend that participants should be selected systematically using specific tools like 'stakeholder analysis.' He reasons that such systematic selection can ensure participants have expertise that is relevant to the SEPs being considered.

However, although three informants thought that the FSF workshop had been limited by a lack of relevant expertise, the evidence presented in Chapter 4, and earlier in this chapter, indicates that learning still occurred. The relevance of participants' expertise thus appears to impact on the learning of individuals, but not necessarily on whether learning occurs overall. The participants who complained about a lack of expertise may have learned less, or learned something different from what they expected, because they did not consider the different knowledges they encountered relevant to their interests. This emphasises the importance of considering how and why learning varies, which I discuss in Chapter 6.

5.5.6 Space, time and resources

The final 'conducive conditions,' for learning in PSP, concern the physical space, time, human and financial resources available for specific PSP processes. To do this, I compare the FSF and PFSA case studies. The physical space in which the workshops took place differed significantly. I illustrate this in Table 5.4, below.

Table 5.4 – Comparison of space, time and resources available in the Positive Futures for Southern Africa and Food Security Futures case studies

Conditions	Positive Futures for Southern Africa	Food Security Futures
Physical space	Four large, well-lit, well-ventilated rooms in a five-star hotel. Participants and facilitators also had access to the extensive hotel grounds, swimming pool, and sports facilities. The pleasant setting helped participants engage in the workshop.	Single, cramped, uncomfortable room. Resulted in discomfort for participants and facilitators, which made it difficult to focus on the workshop activities.
Time	Four-day workshop, which provided adequate time for participants to complete the workshop activities and have plenty of time for breaks.	Two-day workshop, which meant everything was rushed, especially as participants had to commute from home to the workshop venue.
Human and financial resources	Sufficient funding to arrange accommodation in a pleasant environment. This allowed participants to socialise and continue discussions in an informal setting. Having five facilitators enabled one of them to roam between different discussion groups and guide them through the process, whilst each discussion group had a facilitator to help prompt discussions.	Insufficient funding to pay for participants' accommodation at the workshop venue, which meant they had to commute. Facilitators were short-staffed, meaning the lead facilitator was unable to roam between different discussion groups as much as he wanted.

Source: author construct

As indicated in Table 5.4, the FSF workshop was conducted in far less comfortable conditions than PFSA. This appeared to have a negative effect on participants' concentration on the workshop activities. Indeed, during the FSF workshop, one of the facilitators, Mike, suggested to me:

> *"The heat could be an issue. It's less comfortable for people to work and less conducive to thinking." (Mike, 2016)*

One participant, Keith, even left the workshop early, on the second day, complaining that the cramped and stuffy conditions were making him feel unwell:

> *"Yeah, it was very hot! People were feeling tired. I was not feeling well." (Keith, 2016)*

Another participant, Beth complained that the noise of other participants was distracting, because they were in such close proximity:

> *"There was an issue of movement, and also noise, people are discussing and they're a bit close, so your attention would be drawn at times when it's not necessary." (Beth, 2016)*

Nine of the 13 FSF participants, I interviewed, also complained that the workshop had been too short. For example, one participant, Alan reflected:

> *"The time was so short because there was so much to do, to make sure that all the things to be done [in the workshop] have been taken on board. So, by the time we had begun to understand what is to be done and to start implementing it, we were running short on time." (Alan, 2016)*

Similarly, Tristan, compared the time available for the FSF workshop with a larger PSP process he had participated in previously:

> *"In the other one, it was not under pressure, we were having ample time to do the thing." (Tristan, 2016)*

In contrast, two of the PFSA participants I interviewed, Dillan and Elliot, commented on how the pleasant setting had helped them to engage in the workshop:

> *"For me it was taking time out of my reality and hustle and bustle, and just stepping out into an environment where everything is taken care of. It lends itself to people being able to just focus and concentrate on what we had to do." (Dillan, 2016)*

> *"Being in a space of such luxurious comfort, made it feel like a different dimension, which helped to concentrate on the workshop activities." (Elliot, 2016)*

It is evident then, that the conditions in the PFSA workshop were far more conducive to participants focusing their energy on engaging in PSP. This means they were more able to engage in focused, creative thinking, and reflect on their assumptions about the future. Indeed, the importance of having ample time and funding for PSP processes is well-acknowledged. Henrichs et al. (2010) advise that PSP processes should encompass a minimum of two workshops, each of one or two days, to enable in-depth discussions, and indeed learning, to occur. They recognise

that this requires sufficient funding to pay for participants' travel, food, and accommodation. This suggests that, for learning to occur, PSP processes require ample time as well as funding. However, it is notable that learning occurred through the FSF workshop, despite the sub-optimal conditions. The influence of space, time and resources on learning may therefore be relatively small. I thus conclude that, although a comfortable space, sufficient time, as well as adequate human and financial resources, encourage learning in PSP, learning can still occur in their relative absence.

5.6 Conclusion

In this chapter, I have contributed a theoretically-informed explanation of how learning can occur through PSP, focusing primarily on PSP practice in the field of social-ecological resilience. Additionally, I have set out specific conditions that can help make PSP conducive to learning. I argue that learning occurs through interactions between participants with different worldviews, professional occupations, academic disciplines, and socio-economic backgrounds, who are actively and purposively brought into dialogue with each other. The process of PSP can act as a 'boundary object,' (Star and Griesemer, 1989) that encourages participants to make explicit their assumptions about the future, and exposes them to different knowledges. It can also prompt discussion, and focused, creative thinking about the possible futures of SEPs. PSP therefore helps participants to enter their 'zones of proximal development,' (Vygotsky, 1978) and thus to push beyond their usual range of thinking. Participants can be assisted to engage in this focused, creative thinking, by facilitators. Facilitators provide 'scaffolding,' (Wood et al., 1976) by explaining and guiding participants through specific activities, and by using prompts and questions to stimulate discussion.

I found that PSP is most conducive to learning when it includes a diverse group of participants, with relevant expertise. However, careful facilitation is vital for ensuring that the interactions between diverse participants are respectful, and lead to learning. Conducting PSP in a comfortable space, with adequate time, and sufficient human and financial resources, can also help make it more conducive to learning. However, as indicated in Section 5.5, the interactions that occur in PSP are not always favourable to every participant. Some participants are less able or willing to engage in PSP than others. Equally, the engagement of some participants can be hindered if they perceive others to lack relevant expertise. It is therefore important to investigate how and why learning varies between different participants, which I turn to in Chapter 6, below.

Chapter 6: How and why does learning vary between different people in participatory scenario planning processes?

6.1 Introduction

In Chapter 4, I identified learning as the key outcome of participatory scenario planning (PSP), that can help people to tackle social-ecological problems (SEPs). In Chapter 5, I showed that PSP encourages learning by bringing different people together, to deliberate and reflect on their assumptions about the future. Learning can therefore occur, through participants being exposed to different knowledges, which pushes beyond their usual range of thinking. However, I found that practitioners of PSP have limited explicit understanding of and how and why learning varies between different participants. This is an important consideration since, as shown in Chapter 5, some participants appear less able to engage in PSP processes than others, which could affect their learning. In this chapter, I investigate how and why learning varies in PSP. I draw primarily on data from my case studies - Positive Futures for Southern Africa (PFSA) and Food Security Futures (FSF) (described in Chapter 3), because they enabled me to explore the learning of different individuals, as well as groups of participants in detail. Moreover, I draw on my case review and practitioner interviews, to explore general themes in what was learned by whom.

This chapter is structured as follows. In Section 6.2, I present evidence showing who learned what in PSP. All the participants I interviewed in my two case studies appeared to have learned something through PSP, but different participants learned different things. The section is organised around the different themes I identified in what participants learned. Firstly, I show that some participants refined their existing understanding of specific aspects of SEPs, through being exposed to others' views on them. These participants were those who had existing expertise in the topics they deliberated on. Secondly, I demonstrate that most participants in both case studies learned new content about specific topics, especially those who were unfamiliar with a specific topic. The topics about which participants learned, varied depending on their individual fields of expertise, and on the aims of the process in which they participated. Thirdly, my findings illustrate that most participants also identified opportunities for tackling the problems on which they deliberated. The specific opportunities also varied according to participants' existing fields of expertise. Finally, I observed that some participants learned about new ways of thinking about the

future. This was particularly prominent in the FSF case study, in which PSP was a new experience for most participants. In PFSA, although most participants had prior experience of PSP, some participants learned to think differently about the future, through the specific PFSA process.

In Section 6.3, I provide evidence that helps to explain why learning varies between different participants. My findings indicate that learning is shaped by the extent to which participants consider the different knowledges they encounter to be relevant to their interests. I found that learning is strongly influenced by power imbalances. Participants can be marginalised by the roles expected of them in everyday social contexts. Moreover, marginalisation can occur if participants fail to comply with the views of the majority. Furthermore, I show that facilitators of PSP processes can shape learning by defining what is considered acceptable for discussion. I find that facilitators are themselves often influenced by the objectives of wider projects, in which specific PSP processes are embedded. These power imbalances can limit the extent to which participants consider PSP processes to be fair and unbiased. I draw on literature on knowledge co-production and adult learning, to explain that participants are less likely to accept the knowledge they encounter in PSP, if they do not find it to be credible, salient and legitimate (Cash et al., 2003). Hence, they are less likely to push beyond their usual range of thinking which means they are less likely to learn.

6.2 Who learned what?

In this section, I explore who learned what in PSP. The findings that I present, show four different themes in participants' learning: 1) refining existing understanding on specific topics of expertise; 2) new content about specific topics; 3) identifying opportunities for tackling SEPs; and 4) new ways of thinking about the future. I draw primarily on data from my two case studies, but also include data from the few papers in my case review that accounted for variations in what was learned by whom, as well as the practitioner interviews. Table 6.1, below, illustrates the different learning themes, and which participants showed evidence of learning about them. In the following sub-sections, I expand on this table by describing who the participants in each theme were, beginning with those who appeared to refine their existing understanding regarding specific aspects of SEPs.

Table 6.1 Who learned what in the two case studies, based on participants' responses in my interviews. The headings refer to learning themes I identified in my analysis.

	Refining existing understanding on specific topics of expertise	**New Content about specific topics**	**Identifying opportunities for tackling SEPs**	**New ways of thinking about the future**
Positive Futures for Southern Africa	Barbara, Morty, Zak, Paul, Penelope	Darren, Dillan, Gareth, Rachael, Paul, Penelope, Geoffrey, Tabitha, Elliot	Dillan, Gareth, Mirriam, Rachael, Paul, Penelope, Geoffrey, Tabitha, Elliot, Facilitators	Dillan, Gareth, Zak, Rachael, Paul, Penelope, Geoffrey, Tabitha, Elliot
Food Security Futures	Alan	Fiona, Sally, Edmund, Mark, Christina, Alan, Tracy	Fiona, Sally, Mark, Christina, Alan, Tracy	Beth, Keith, Fiona, Sally, Edmund, Mark, Karla, Christina, Diane, Alan, Gerry, Tristan, Tracy

Source: author construct

In both the FSF and PFSA case studies, the organisers invited participants from a range of different professional and disciplinary perspectives. The backgrounds of the participants I interviewed are shown in Tables 6.2 and 6.3, along with the specifics of what they learned. I expand on the information in these two tables in the Sub-sections, 6.2.1 – 6.2.5, below.

Table 6.2 – PFSA participant backgrounds, based on how they described their occupations and interests to me, compared with what participants learned, based on their responses in my interviews. The table shows how learning is linked to participants' backgrounds.

Name	Professional and disciplinary expertise	Learning identified by participants in my interviews
Darren	Artist	Synergies with others, especially on the benefits of small-scale governance
Zak	Academic – climate change adaptation and PSP	Learned about how participants did not consider climate change when thinking about the future, and about the value of the arts for making the future seem more real.
Barbara	Academic – social scientist, innovative governance	Refined existing understanding of SEPs, through exposure to the views of others
Paul	Academic – social scientist, conservation	Value of structured thinking about the future, the role of participatory governance, other participants' views on taking an 'ecocentric ethic' and the potential role of 'artificial meat' in resolving food crises.
Penelope	Academic – social scientist, natural resource governance, futures thinking, artificial intelligence (AI).	Refined understanding of AI, through other participant's views on it, specifically their concerns about its human implications. Learned about a potential opportunity, for AI to contribute to creating just and sustainable futures
Morty	Activist - small-scale urban development, disciplinary background in humanities	Refined understanding of small-scale initiatives through others' views on them. Was concerned that participants saw them as a dogma, and had started thinking of measures to avoid this
Dillan	Activist - user and proponent of encrypted currency	Learned about the roles played by academics, in creating more just and sustainable futures; identified an opportunity for encrypted currency to help contribute to just and sustainable futures.
Gareth	Activist – equitable urban spaces, using artistic methods	Learned about the role gene technology could play in resurrecting coral reefs, about the diversity of perspectives and about the complexity of SEPs
Mirriam	Activist – alternative education and food	Learned about how nurturing and connecting small-scale initiatives, could help create just and sustainable futures
Elliot	Activist - sustainable food	Learned new content about AI, as well as how it could help create just and sustainable futures.
Rachael	Social entrepreneur and academic – disciplinary background in economics	Learned about the importance of supporting environmental causes, and the value of PSP for thinking about the future.
Geoffrey	Practitioner – global environmental governance	Learned new content about AI, the value of thinking about the future in this way. Moreover, he started thinking about including different stakeholders in planning processes.
Tabitha	Practitioner – futures thinking	Learned about AI, as well as possibilities for creating just and sustainable futures in Southern Africa, such as the relative lack of existing infrastructure.

Source: author construct

Table 6.3 – Food Security Futures participant backgrounds, based on how they described their occupations and interests to me, compared with what participants learned, based on their responses in my interviews. The table shows how learning is linked to participants' backgrounds.

Name	Occupation/Disciplinary Background	Learning identified by participants in my interviews
Fiona	Schoolteacher	Value of PSP, importance of bottom-up governance, task force for coordination, as a means of tackling food poverty.
Edmund	Schoolteacher	New content about nutrition.
Diane	Schoolteacher	Value of PSP for thinking about the future.
Tracy	Schoolteacher	Technology as a driver of food security, and other drivers. Value of PSP for tackling SEPs.
Sally	Academic – agriculture and food systems	Value of PSP for tackling SEPs. Moreover, she expressed a desire for further training in it. Improving cross-sector coordination, as a strategy to improve food security.
Karla	Academic – economics	Value of PSP for thinking about the future
Beth	Government Intern – Finance	Value of PSP for thinking about the future
Mark	Government officer – Agriculture	Value of PSP for thinking about the future, importance of including different stakeholders in processes of governance, PSP as an opportunity to help tackle SEPs.
Christina	Government Intern – Finance	Value of PSP for thinking about the future, taskforce for coordination as a response to food poverty.
Alan	Government Officer - Social welfare	Value of PSP for thinking about the future, understanding of nutrition as a driver of development, and new content about the influence of different aspects of the food system on nutrition.
Gerry	Government Officer - Health	Value of PSP for thinking about the future
Tristan	Government Officer - Agriculture	Conditions that encourage successful PSP processes.
Keith	Businessperson – small-scale food processing operation	Value of PSP for thinking about the future

Source: author construct

6.2.1 *"It was a good exercise for re-organising thoughts that I've had for many years.'* - Refining existing understanding in topics of expertise.

One participant in the PFSA case study, Barbara, indicated that her participation in the workshop had not led to a significant change in her understanding of SEPs. As a professor, with substantial experience of thinking about innovative ways to create just and sustainable futures, she thought the discussions in the workshop replicated ideas she was already writing about:

> *"I don't mean to sound patronising, but the scenarios that we came up with, you're going to see a book of mine published, with the stuff behind it, it's the same story. It's exactly the same." (Barbara, 2016)*

However, although she thought her understanding had not changed significantly, she indicated that she had refined her existing understanding of how to create just and sustainable futures. She explained that she had refined her understanding through receiving feedback on her ideas from other participants:

> *"Certainly, for me it was a good exercise for re-organising thoughts that I've had for many years. It was a useful exercise, because I got to share my thoughts, and I got a bit of feedback, and I came out even more convinced that the work I do is relevant." (Barbara, 2016)*

This was reflected in the interviews I conducted with the other academics who participated. Each of them indicated that they had refined their existing understanding of their relative fields of expertise. For example, Penelope was an academic researcher with expertise in environmental governance, as well as artificial intelligence (AI). She reflected that she had refined her understanding of AI's human implications:

> *"I'm quite interested in technology, and how it affects things, but I sometimes find it difficult to think more deeply about the human implications of that, and I think this workshop helped me to do that." (Penelope, 2016)*

Similarly, Penelope indicated she had learned about the other participants' views of local-level governance:

> *"[There was] this idea that the local is inherently good, and that no matter what it is, whether it's urban policy, whether it's food, or whatever, it should be local. And, as someone who's worked a lot on things like global governance and large-scale institutions, I found it interesting that there was almost this unquestionable idea that the local was good." (Penelope, 2016)*

It was not only academics that refined their existing understanding of topics in which they were experts. One activist, Morty, who had extensive professional expertise in local-level governance, described how he had refined his understanding of those topics. He reflected:

> *"What I realised, is that… people worship small-scale, and localism as well. It's become this kind of dogma. And, interestingly, we had this whole discussion where I was trying to point out the fact, that people might still get marginalised [in local-level governance]. And people not accepting that, made me realise that actually, we have to be really careful, because people are investing too much in this as a utopian concept." (Morty, 2016)*

It is evident then that Morty learned more about other participants' perceptions of local-level governance and recognised the dangers of it becoming a dogma. In this sense, he refined his existing understanding, by considering others' views, on his field of expertise.

In contrast, learning of this nature was not prevalent in FSF. Indeed, as I highlighted in Chapter 5, most FSF participants lacked specific expertise in food and nutrition security (FNS). Only four of my informants had expertise directly linked to FNS: Sally, who was an academic, studying international development, Mark, who was a government officer working on adapting agriculture to climate change, Gerry, who was a nutrition expert, and Tristan, a government officer, who focused on food systems. None of them indicated they had refined their existing understanding in their fields of expertise. Instead, as indicated in the following sections, they learned new content about specific topics, about opportunities for tackling complex problems, as well as new ways of thinking about the future. This could be explained by a quote, given by Tristan, when I interviewed him. He complained that other participants had lacked expertise in FNS:

> *"I think that people didn't understand a lot about food security, because even when I was trying to talk about food availability, accessibility and utilisation, people didn't understand." (Tristan, 2016)*

As I showed in Chapter 5, interacting with participants who have relevant expertise is an important condition for encouraging learning. This indicates that because other participants' levels of expertise were apparently low, there may have been little these four experts could learn from them regarding FNS.

In PFSA, I found that the facilitators also refined their understanding of their fields of expertise. In the week following the workshop, they met to share what they had learned. In this meeting, they all demonstrated they had learned, through being exposed to others' views on how just and sustainable futures could be created. In particular, they indicated they had learned that diverse groups of participants had similar ideas about how just and sustainable futures might look. These ideas included decentralised, bottom-up governance, an 'ecocentric ethic,' and an emphasis on interconnections between humans and nature.

In the practitioner interviews, one of the 16 practitioners, Gavin, also explained that facilitators had learned in processes in which he had been involved:

> *"We want to learn from participants as much as they might learn from us. And often what happens is we learn more from them than the other way around." (Gavin, 2016)*

These two examples illustrate that, as well as encouraging learning for participants, PSP processes can also encourage practitioners to refine their understanding of their fields of expertise, through learning about the views of participants. Indeed, as Gavin stated, PSP processes may be more valuable for the learning of practitioners than for participants. This highlights the question I previously raised in Chapter 5, regarding who PSP processes are really for. The finding that practitioners may learn more from it than participants indicates that the learning reflects researchers' needs for knowledge to develop a more holistic understanding of SES, as according to Lewin's (1997) theory of change. The question remains as to what extent PSP in this context enables participants to take specific actions to intervene in SEPs. This emphasises the importance of exploring how the aims of PSP processes influence what is learned by whom. This will be explored further in Section 6.3.

In contrast, there was no evidence that the FSF facilitators had refined their understanding of FNS through their PSP workshop. As pointed out by the participant, Tristan, most of the FSF participants had limited expertise that was directly relevant to FNS. Indeed, when I interviewed one facilitator, Thomas, he complained that the participants had limited understanding of the issues being discussed:

> *"There was a lot of knowledge limitation… People do not read a lot… They don't know about issues." (Thomas, 2016)*

If interacting with participants who have relevant expertise is a condition for learning, as indicated in Chapter 5, the lack of participants' expertise could have hindered facilitators' learning.

6.2.2 *"I learned a lot around the AI stuff."* – Learning new content about specific, unfamiliar topics

In both case studies, a common learning theme, was that participants learned new content about specific topics, in which they were not overtly experts. In PFSA, nine of my 13 informants indicated they had learned new content about the topics discussed in the workshop. For example, Elliot, an activist for sustainable food, asserted that he had learned new content about AI:

> *"I learned a lot from Penelope around the AI stuff, because my understanding was completely different. I didn't realise that AI existed in as much as it does already, and that I'm using it every day." (Elliot, 2016)*

Similarly, another PFSA participant, Paul, who was a researcher, specialising in conservation, indicated he had learned new information, regarding 'artificial meat' technology, as well as how it could help tackle food crises:

> *"With the artificial meat you, start off with something in a test tube and then you could end up with resolving world hunger, or the water crisis, for example. I'm oversimplifying it, but something as small as that, food in a test tube, could end up with major repercussions." (Paul, 2016)*

In FSF, seven of my 13 informants demonstrated they had learned new content about specific topics. For example, Edmund, Mark and Alan, all learned new content about nutrition. Alan, who represented a government social welfare programme, described:

> *"Really, I was enlightened on the importance of nutrition as a driving factor of development… It should start from the farming stage. They choose the right soil, the right seed, the right manure, and all those things." (Alan, 2016)*

Similarly, Mark, who worked on climate change adaptation, indicated he had learned about the different nutritional requirements of school children at different ages. He described:

> *"You have to consider the age, because if you have class 1 - 7, the requirement for Class 1 might not be the same as the requirement for Class 7. Their nutritional requirement is quite different." (Mark, 2016)*

Learning varied according to the unfamiliar topics participants encountered

In both case studies, the specific topics about which participants learned, varied according to their existing fields of expertise. In the above examples, Elliot was not an expert in AI, nor was Paul an expert in artificial meat. In the FSF example, Mark and Alan did not have prior expertise in nutrition. It is evident then, that the specific content of what different participants learned, was shaped by their existing fields of expertise and encountering knowledge about topics that were unfamiliar to them.

My case review also showed that the content participants learned about, varied according to participants' fields of expertise. Most of the 30 papers in the review did not explicitly include a discussion of who learned what, but of the five that did, one, Palacios-Agundez et al. (2013), indicated that learning varied between participants from different professions:

> *"Public administration personnel explained to NGO members the different aspects regarding the pace and proceedings of the administration, while the NGO members expounded on relevant aspects that should be considered in ecosystem-based management," (Palacios-Agundez et al., 2013 p.18).*

This shows that, through interacting with each other, participants from the two professions learned about aspects of the others' roles and expertise, which they were previously unaware of.

Learning varied according to the design of the workshops

The specific content of participants' learning also varied according to the discussion groups in which participants worked, as well as the design of the overall workshops. In PFSA, as outlined in Table 3.4 (p.60), participants were asked to deliberate on initiatives, or 'seeds' that could be described as promoting just and sustainable futures. Each of the four discussion groups were given three initiatives as discussion prompts and were asked to imagine how they might develop and interact with each other in the future. I found that all four of the PFSA participants who said they learned about AI had been in a discussion group in which participants were asked to deliberate on the potential development of AI. The eight informants who did not indicate that they had learned about AI had not been in groups that deliberated on it. Similarly, the participant who learned about artificial meat, Paul, had been in a discussion group in which participants were

asked to deliberate on the possible future progress of artificial meat. In FSF, participants, who did not have prior expertise in nutrition, learned about it because the workshop aimed to explore food and nutrition security.

It is evident then, that participants in PSP commonly learned new content about specific topics in which they were not overtly experts. The specific topics about which participants learned varied according to their existing expertise, in that they learned when they encountered knowledge about topics they were unfamiliar with. This form of learning may thus be explained as reframing, as described by Ramirez and Wilkinson (2016). According to Ramirez and Wilkinson, scenario planning provides opportunities for participants to explore different perspectives and assumptions about the future, often including expertise in topics that are unfamiliar to them. This enables the development of new knowledge.

The topics about which participants learned also vary according to the topics that specific PSP processes deliberate on. This emphasises the importance of facilitation, as well as the aims of specific PSP processes in shaping what was learned by whom. This will be explored further in Section 6.3.

6.2.3 *"It might apply new sets of relations between humans and ecosystems."* - Identifying opportunities to tackle social-ecological problems

My findings in Section 6.2.2, above, indicate that participants in PSP were able to learn new content about unfamiliar topics, which I have characterised as reframing, according to Ramirez and Wilkinson (2016). As I described in Chapter 2, reframing can lead to reperception, which involves participants exploring the challenges and opportunities they could face in alternative future contexts, and then identifying responses to them. Correspondingly, another theme in participants' learning involved identifying opportunities for tackling SEPs. In PFSA, 10 of my 13 informants indicated they had learned about such opportunities. In FSF, I found that six of my 13 informants had learned about opportunities for tackling SEPs. I present evidence for this, and how this type of learning varied, below.

Variation aligns with participants' existing fields of expertise

The specific opportunities identified by participants appeared to align with their existing fields of expertise. For example, one participant, Penelope, who had some expertise in AI, described how she had identified the possibility for 'fluid infrastructure' as a means of improving

the sustainability of urban land-use. This was an idea I observed her group developing in the workshop. It developed from an idea put forward by the participant, Tabitha, that in the future urban infrastructure could be constructed from small, solar-powered 'Lego-blocks,' the composition of which could be changed through small electrical signals. The idea was that this could create opportunities for more sustainable and equitable composition of urban spaces. When I asked Penelope what she had learned, through the workshop, she reflected:

> *"I think this idea of fluid infrastructure was a super-interesting way that I hadn't really thought about things. And this idea that the whole of the built environment might radically shift into something quite different, that might apply new sets of relations between humans and ecosystems, like the collapse of the rural and urban distinction." (Penelope, 2016)*

Penelope appears to have learned about an opportunity involving AI, because it aligned with her existing interests and expertise.

Similarly, Morty, who had expertise in local-level governance, reflected on how he had changed his thinking on local-level initiatives, to account for their potential limitations:

> *"We have to be really careful because people are investing too much in this as a kind of utopian concept... that was actually really important and we've [subsequently] had a lot of conversations about how we promote this, without selling it as a panacea." (Morty, 2016)*

This emphasises the importance of relevance for explaining variations in learning, as will be explored further in Section 6.3.

Conversely, in FSF there was little evidence that the opportunities participants identified, directly aligned with their fields of expertise. This is likely because most participants lacked expertise in topics related to FNS. One participant, Tracy, who was a schoolteacher, described how she had learned that FNS could be encouraged by improvements in science and technology:

> *"If we have improved science and technology, it means that all the land will be used, water we have would be used, and then we can cultivate more, and we will harvest more. Therefore, food poverty would be overcome in Tanzania." (Tracy, 2016)*

It may be that he thought he could encourage improvements in science and technology, through his role as a teacher, which would indicate this learning was relevant to his field of expertise.

However, since he did not explicitly say this, there is no obvious link between his learning and his existing expertise.

This could also be explained by the fact that the FSF workshop had a less normative framing than PFSA. The opportunities identified by PFSA participants could have aligned with their fields of expertise, precisely because they viewed them as conducive to their own preferred future conditions. In FSF, on the other hand, participants focused on opportunities to deal with plausible challenges to FNS, rather than how to achieve their own preferred futures. Normative preferences were therefore not explicitly implicated in the opportunities participants considered, and thus what they learned. This emphasises the influence of the workshop design in shaping what is learned.

Learning varied, based on the topics for discussion, set by facilitators

The opportunities identified by participants in FSF were predominantly aligned with the challenges they deliberated on, rather than their existing fields of expertise. As I set out in Table 3.4 (p.60), each discussion group was given a set of parameters, within which they had to try and achieve goals for FNS. Participants identified opportunities to overcome the challenges, posed by certain parameters. For example, participants in one discussion group identified opportunities to overcome the challenge of disjointed governance on FNS. Accordingly, the three participants I interviewed from that group, Fiona, Sally and Christina, all indicated that they had identified the creation of a taskforce, to encourage cross-sector coordination, as a strategy to improve FNS. Indeed, Sally stated:

> *"We said we need a task force to include different people with different backgrounds, from different sectors, because the issue of food security and nutrition is a cross-cutting issue, so we need different groups of people to be involved." (Sally, 2016)*

Likewise, Fiona described:

> *"We discovered there was no cooperation, so we had to design a committee, aside, which would be responsible to create that cooperation." (Fiona, 2016)*

I also found evidence in the PFSA case study, that the opportunities participants identified, varied between different discussion groups. For example, one participant, Paul, recognised how an initiative his group discussed, could be developed into a form of participatory democracy:

> *"We ended up with this 'Hot Democracy' where everybody counts, where everybody's voice matters. So, as you govern, you learn, and as you learn, you govern." (Paul, 2016)*

These two examples from the two case studies show how learning reflected the specific topics that facilitators prompted participants to deliberate on. Again, this emphasises the important influence that the aims of specific PSP processes have, on shaping what is learned by whom. This will be explored further in Section 6.3.

Learning varies according to participants' social and economic background

In PFSA, one participant, Rachael, demonstrated that the opportunities she learned about for tackling SEPs, had been shaped by her own social and economic background. When I interviewed her, she described how she hailed from an ethnic group that was typically associated with poverty and disempowerment in South Africa. She explained that this had influenced her attitude towards environmental, or 'green' causes:

> *"Some could debate, in this country it's a luxury to become green. The real cause is how to feed our stomachs. Someone could argue: 'why are we investing in the green economy, when people are dying?'" (Rachael, 2016)*

She reflected that, through participating in the workshop, she had learned about the importance of environmental causes:

> *"I see this is an important cause now, as well… I would invest my money in green causes, whereas before I wouldn't, I'd take all my money and put it on developing small businesses. Now I would say 'okay, these small businesses have to thrive, but if I don't contribute to the green cause, there will be no world for them to participate in.'" (Rachael, 2016)*

Rachael thus learned about the importance of green causes, because she came from a background where those causes were not considered important. This indicates learning, about opportunities for tackling SEPs, can vary according to participants' social and economic backgrounds.

Learning varied according to the spatial levels at which participants work

In the case review, three of the papers that explicitly describe differences in participants' learning, demonstrate that learning about opportunities for tackling SEPs can vary between participants at different spatial levels. In one of these cases, described by Mistry et al. (2014), the

authors specify that the opportunities participants learned about, varied between global and regional level, and local level participants. Regional level participants predominantly identified opportunities relating to policy: *'At the global and regional scales, we see a strong focus on policies influencing society and the environment,'* (Mistry et al., 2014. p.140). In contrast, the authors report that local level participants' learning was more about the actual implementation of strategies in practice: *'This focus on policy is not reflected at lower scales where the uncertainties lie around practice; issues around the actual operationalisation and implementation of effective development and environmental management,'* (Mistry et al., 2014. p.141). This indicates learning about opportunities for tackling SEPs can vary according to the spatial level at which different participants focus.

In my two cases studies, however, the spatial level at which participants focused, did not appear to influence their learning. As demonstrated in Tables 6.4 and 6.5, below, participants in both case studies worked at a range of different levels, but the differences in what they learned do not appear to be linked to this. In PFSA, individual participants from both the regional and local levels learned new content about different aspects of SES, as well as opportunities to create just and sustainable futures. In FSF, participants from both the national and local levels learned new content about specific aspects of FNS, as well as about the value of PSP as a tool for thinking about the future.

Table 6.4 - Spatial levels at which Positive Futures for Southern Africa participants focused in their work, compared with what they learned. The table shows that differences in participants learning do not appear to be linked to the spatial level at which they work.

Name	Spatial level of working	Learning identified by participants, in my interviews
Barbara	Global	Refined existing understanding of SEPs, through learning about the views of others.
Penelope	Global	Learned about other participant's views on AI, specifically their concerns about its human implications, and on local-level governance. Learned about a potential opportunity for AI to contribute to creating just and sustainable futures.
Dillan	Global	Learned about the roles played by academics, in creating more just and sustainable futures; identified an opportunity for 'encrypted currency' to help contribute to just and sustainable futures.
Geoffrey	Global	Learned new content about AI, learned about the value of thinking about the future in this way, learned to think about including different stakeholders in planning processes.
Tabitha	Global	Learned about AI, and other possibilities for creating just and sustainable futures in Southern Africa.
Darren	Local	Learned about the views of others on the benefits of small-scale governance.
Zak	Local	Learned about how participants did not consider climate change, when thinking about the future, and about the value of the arts for making the future seem more real.
Morty	Local	Learned about others' views on small-scale initiatives and was concerned that participants saw them as a dogma.
Gareth	Local	Learned about the role gene technology could play in rejuvenating coral reefs, learned about the diversity of perspectives and about complexity in SES.
Mirriam	Local	Learned about how nurturing and connecting small-scale initiatives could help create just and sustainable futures.
Elliot	Local	Learned new content about AI, as well as how it could help create just and sustainable futures.
Rachael	Local	Learned about the importance of supporting environmental causes, as well as the value of PSP for thinking about the future.
Paul	Local/regional	Learned about the value of structured thinking about the future, the role of participatory governance, other participants' views on taking an 'ecocentric ethic' and the potential role of 'artificial meat' for resolving food crises.

Source: author construct

Table 6.5 - Spatial levels at which Food Security Futures participants focused in their work, compared with what they learned. The table shows that differences in participants learning do not appear to be linked to the spatial level at which they work.

Name	Geographical level of work	Learning identified by participants in my interviews
Keith	Local	Value of PSP for thinking about the future
Fiona	Local	Value of PSP for thinking about the future, importance of bottom-up governance, task force for coordination as a means of tackling SEPs.
Edmund	Local	New content about nutrition.
Diane	Local	Value of PSP for thinking about the future.
Tracy	Local	Technology as a driver of food security, and other drivers. Value of PSP for tackling complex problems.
Sally	National	Value of PSP for thinking about the future, desire for further training in PSP as a tool to help tackle complex problems. Coordination taskforce.
Karla	National	Value of PSP for thinking about the future.
Beth	National	Value of PSP for thinking about the future.
Mark	National	Value of PSP for thinking about the future, importance of including different stakeholders in processes of governance, PSP as an opportunity to help tackle complex problems in SES.
Christina	National	Value of PSP for thinking about the future, taskforce for coordination.
Alan	National	Value of PSP for thinking about the future, understanding of nutrition as a driver of development, and new content about the influence of different aspects of the food system on nutrition.
Gerry	National	Value of PSP for thinking about the future
Tristan	National	Conditions that encourage successful PSP processes.

Source: author construct

These two tables indicate that although learning varied between different participants, there was no discernible link between the spatial levels at which participants focused, and what they learned. However, it is important to note that the two workshops focused on different levels overall. As I set out in Table 3.2 (p.57), PFSA focused on the implications of local level initiatives at the regional, Southern African level, while FSF focused on the influence of national and regional-level drivers at the national level. This emphasises that the differences in learning varied according to the different processes, rather than between participants from different levels. This indicates, therefore, that learning tends not to vary according to differences in participants' spatial level of focus, within the same workshop. However, learning does appear to vary between different workshops that focus on different levels.

6.2.4 *"Scenario planning is a panacea!"* - Learning about new ways of thinking about the future

The final learning theme I observed in my data was that participants learned about PSP as a new way of thinking about the future. This was a particularly strong theme in FSF, in which 12 of my 13 informants, including a variety of different participants, indicated they had learned about the value of PSP. A particularly strong example of this was Sally, who went as far as saying:

> *"Scenario planning is a panacea." (Sally, 2016)*

Sally subsequently explained she thought PSP was a useful tool to help her prepare for future challenges. She also emphasised her newfound enthusiasm for PSP by talking, enthusiastically, about her desire for further training in using it:

> *"Now we need to plan, because now the situation is not determined, it is not determined. That's why I'm saying we need to adopt scenario planning. We then have the information of the present situation and then we can forecast the future, informed by the prevailing situation currently… Now I'm eager to understand more about scenario planning! I've started to read some of the articles and publications, with regards to scenario planning." (Sally, 2016)*

Another participant, Mark explained that he had learned about the potential value of PSP for government planning:

> *"It was very beneficial to me as I'm working on the level of policy making… So, using the way of scenario analysis can be used to prepare certain strategies, or certain plans." (Mark, 2016)*

Similarly, the participant, Fiona, also indicated she was enthused by the value of PSP, for tackling complex problems:

> *"For me, that was a very good method of tackling many things. And I'm still interested to know more about how to make use of the method." (Fiona, 2016)*

Tellingly, none of the 12 informants who indicated they had learned about the value of PSP had previous experience thinking about the future, in the structured way proposed by PSP. Indeed, Sally strongly indicated this way of thinking about the future was new to her and the other FSF participants:

> *"It is a new paradigm. We are not used to scenario planning." (Sally, 2016)*

Similarly, when I asked Fiona if she had ever encountered this way of thinking about the future before, she responded:

> *"Never! Never before! This was a new experience." (Fiona, 2016)*

It is evident then, that the participants who learned about the value of PSP as a mode of thinking about the future did so, because this way of thinking was a new experience for them.

Indeed, the one participant who did not indicate he had learned about PSP, Tristan, was unique among the FSF participants, in that he had previously participated in another PSP process:

> *"I participated in the food security and climate change scenario building work in Nairobi." (Tristan, 2016)*

Participating in PSP was therefore not a new experience, which could explain why he apparently did not learn about it. However, Tristan went on to compare the FSF workshop unfavourably with the one he had participated in previously:

> *"Well, I could say that the other one was not under pressure, we [had] ample time to do the thing, and participants to the workshop were gathered in a place where we were just working on that, so we were confined to a space where your mind is just on the workshop, and nothing else." (Tristan, 2016)*

In doing so, he showed he had learned about the importance of having sufficient time to conduct PSP, and of being in a space that helped participants focus on the workshop. He therefore, arguably, did learn something about PSP. Specifically, about the conditions that make PSP more conducive to learning.

In the PFSA case study, all but four of my 13 informants indicated they had learned about new ways of thinking about the future, through participating in the workshop. The four participants who did not indicate they learned this had experienced this way of thinking before. For example, when I interviewed Barbara, who had substantial previous experience of participating in PSP processes, she opined that structured thinking about the future was a mundane experience for her:

> *"This is my job. I do this every day... So, this is bread and butter, you know" (Barbara, 2016)*

Another participant, Darren, described how focused thinking about the future had not been new to him, because he often did so in his role as an artist:

> *"The imaginary part of the future is something I do daily anyway. And I think that's the difference between the creative bunch that was there, and the academics, it's that we do that kind of interpretation every day." (Darren, 2016)*

Of the nine informants who indicated they had learned about new ways of thinking about the future, six had not previously encountered PSP. For example, the participant, Gareth, stated:

> *"I have never experienced this scenario planning before." (Gareth, 2016)*

When I asked if he would participate in a PSP process again, he stated he would, and indicated he had learned about the value of focused, creative thinking about the future:

> *"Yes, I would do it again. It was useful, because it helped people to think outside of their boxes, but within some parameters." (Gareth, 2016)*

The participant, Elliot, also described how he learned about the benefits of PSP for creative, but structured thinking about the future:

> *"To be allowed the space to be in an imagination, in a collective imagination, in a space that wasn't all fun and visioning… It was critical. So, that was really interesting." (Elliot, 2016)*

It is clear then, that participants who had not previously encountered PSP learned about its potential value for thinking about the future in a creative, focused way.

However, I also found that three of the nine participants who indicated they had learned about new ways of thinking about the future, did have prior experience of PSP. The most pertinent example of this was Penelope, an academic, who had previously studied and used scenarios in her research. She explained that she had learned about aspects of the PFSA process that she thought could improve PSP practice:

> *"I'd been involved in a number of scenarios processes, and often I've found the things that came out [of them] reinforced the society we live in, or certain ways of doing and thinking… And I think one thing that was really distinct with this process, was there were guidelines [to direct us] through the process, but there was that ability to go much further 'out there' than a lot of other processes… That was quite empowering." (Penelope, 2016)*

In this instance, Penelope evidently learned about the value of being able to think 'outside the box' for exploring more than just incremental change. This characteristic was new to her, even if PSP was not, as the PSPs she had previously encountered, had not featured such imaginative thinking. It is evident then, that although the majority of participants who learned about PSP had been new to it, the participants who had experienced it previously could also learn about new ways of thinking about the future in specific processes.

In the practitioner interviews, one informant, Rick, indicated that learning about the value of PSP had varied according to the spatial level at which PSP was conducted. He described how national-level policy-makers had learned about the value of thinking beyond their immediate futures:

> *"[They said] it was really useful just to think about what could change in the future, because they don't really think so much about that… It was very much the day-to-day of the present, and fire-fighting everything that's going on, rather than having time to sit and reflect on what the future could bring." (Rick, 2016)*

This was in contrast with what the local level participants in his example had learned. As described in Section 6.2.3, local level participants learned more about the 'internal workings' of their community.

This was reflected by another practitioner, Greg, who had also conducted PSP with local level indigenous participants. He indicated that engaging in systematic thinking about the future had been difficult for the elder members of the community. Greg stated:

> *"I think it was easier for younger people who had had a more diverse exposure beyond their community, so to different ways of thinking and doing things than for the elders… [The elders] didn't have as much facility to speculate or to think about things in a hypothetical way." (Greg, 2016)*

This demonstrates that local level, indigenous participants found it difficult to engage with PSP as a way of thinking about the future, especially elder participants who had less exposure to the world outside their community. As such, they may not have found as much value in PSP, as did the younger participants. As I explain further in Section 6.3, the extent to which participants find value in the knowledge they encounter has a significant bearing on what, if anything, they learn.

The evidence presented in this section shows that learning in PSP can be split into four themes: 1) refining existing understanding on a topic of expertise; 2) learning new content about specific, unfamiliar topics; 3) identifying opportunities for tackling SEPs; and 4) learning about the value of PSP for thinking about the future. It is evident that learning can vary, according to participant's level of prior expertise in specific topics, their social and economic backgrounds, their previous experience of PSP, the spatial levels at which they focus, as well as the design of specific PSP processes. In Section 6.3, below, I draw on literature regarding knowledge coproduction, and power, to explain why learning varies in these ways.

6.3 Why does learning vary?

In this section, I explore potential explanations for why learning varies in the ways described in Section 6.2, based on my data, combined with insights from literature on knowledge co-production and power. In their paper on exchanging knowledge in PSP, Chaudhury et al. (2012) reason that participants are unlikely to engage with the knowledges they encounter in PSP if they do not find it credible (based on valid evidence), salient (relevant to their requirements) and legitimate (produced through a fair, inclusive and unbiased process). They draw on the work of Cash et al. (2003), who explain that credibility, salience and legitimacy are key conditions for participants to consider new knowledge. This implies that, if PSP participants do not find the knowledge they encounter to be credible, salient and legitimate, it is unlikely that being exposed

to it will encourage them to enter their 'zone of proximal development' (Vygotsky, 1978) and push beyond their usual range of thinking. As I reasoned in Chapter 5, these are the critical aspects of PSP processes that enable learning.

In this section, I show that salience and legitimacy are especially important in shaping who learns what in PSP. Credibility did not emerge as strongly in my research. This could be because PSP is commonly used to integrate different types of knowledge, as observed by Oteros-Rozas et al. (2015). It may therefore be that practitioners and participants in PSP buy into an idea that all knowledges are equally valid. Indeed, as described in Chapter 5, one PFSA participant, Barbara, emphasised precisely this when she complained about the technical ignorance of other participants.

I begin by showing that learning varies, according to the extent that participants find knowledge relevant to their interests. I then explain that learning varies, according to power imbalances between different participants, which can limit the engagement of individuals. Furthermore, I show that facilitators of PSP processes have considerable power over the engagement and contribution of different participants, through defining what is considered acceptable for discussion in PSP processes. Facilitators themselves are influenced by the aims of wider projects, in which specific PSP processes are embedded.

6.3.1 Learning varies because of the relevance of information for different participants

As mentioned in Section 6.2, only five of the 30 papers in my case review explicitly addressed variations in the learning of different participants. In one of these cases, Ravera et al. (2011a) describe:

> *"Frustrations of higher level stakeholders (e.g. public administration at the regional level) emerged because there was a mismatch between the scale at which the models operated (i.e. plot, household level) and the scales at which information was requested by these stakeholders." (Ravera et al., 2011a p.448)*

This indicates that learning, by regional level stakeholders, was limited, because they considered the information discussed in the scenarios irrelevant.

In the practitioner interviews, all seven informants, who explicitly discussed variations in learning, specified that learning varied between participants from different professional and

socio-economic backgrounds. In these cases, the variation was apparently linked to the extent participants found knowledge to be relevant to their interests. For example, the practitioner, Greg, described a PSP process he facilitated with indigenous communities, which aimed to explore possible future threats and opportunities for their livelihoods. He indicated that specific participants, who he described as 'community leaders,' learned more than others:

> *"We had a few community leaders, in the project, so they were probably more engaged than the average workshop participants… We did a survey with all the participants [and] the signs were that change was most evident among those community leaders." (Greg, 2016)*

In this instance, the 'community leaders' likely had a responsibility, as leaders, to understand the threats and opportunities to the livelihoods of their communities. In this sense, the knowledge they encountered in PSP was particularly relevant, which could explain why they were more engaged, and why learning was subsequently more evident for them than for others. However, as these leaders were in a position of authority, the other participants could have been marginalised, and thus less engaged in the discussions. This highlights the role power can play in shaping learning, which I discuss further in Section 6.3.2.

Another practitioner, Rick, explained that in PSP processes exploring different stakeholders' priorities for ecosystem services, he had found differences between the learning of national level policy-makers, and local level indigenous communities. The local communities learned more about the *"internal workings of their community,"* whereas the national level policy makers learned about the value of using PSP to think about the future. In this case, learning about the actual process of PSP was more salient for the national-level policy-makers, because they recognised how it could help them in their professional roles. In contrast, the local-level participants found the elicitation of micro-level information about their own communities more relevant.

The issue of relevance at different spatial levels was emphasised by two practitioners, Lizzie and Gordon, who both had extensive experience conducting PSP across different levels in the Millennium Ecosystem Assessment (MA). Lizzie emphasised the difficulty of making global level knowledge relevant at the local level, and vice versa:

> *"How you try to balance the top-down contextualisation and the bottom-up, local information remains a huge challenge." (Lizzie, 2016)*

Gordon also indicated that making global level information, relevant to participants at the local level had been a challenge in the MA:

> *"There was a whole range of scenarios, and that was why there was so much discussion on how we bring these different scales together. How related do they have to be to still be consistent with the global scenarios, but still salient enough to say something meaningful, or to support learning going on for the people who are building or using these scenarios, at a particular scale, for the question at that particular scale?" (Gordon, 2016)*

It is evident, therefore, that the relevance of knowledge encountered in PSP can vary between participants at different spatial levels. This corresponds with literature on PSP by Kok et al. (2007). Kok et al. reason that the relevance of knowledge varies, because participants at different levels are likely to be affected by the development of different aspects of SEPs in diverse ways. As Gordon indicated, the knowledge encountered in PSP needs to be relevant for it to *"support learning."* The relevance of knowledge, for different participants, could therefore have important implications for who learns what.

This was reflected in the PFSA case study. As described in Section 6.2, the participants, Penelope and Morty both identified opportunities for tackling complex problems that were related to their own fields of expertise (artificial intelligence and small-scale, localised urban development, respectively). This implies that they identified those opportunities specifically because they were relevant to their own professional roles. Similarly, in FSF Alan, who learned about the importance of nutrition as a driver of development, did so because he identified the connections between nutrition and his own work promoting social and economic development:

> *"Our side, we are trying to ensure that there is reliable income in a particular household… It's linking together! So, if we have healthy people, everybody will be contributing to the economy." (Alan, 2016)*

It is evident, therefore, that participants in PSP processes learn when they encounter new knowledge that appears relevant to their interests. This corresponds with the argument of Cash et al. (2003), that people are more likely to engage with knowledge they consider to be credible, salient and legitimate. The above evidence indicates that the issue of salience is especially important, for encouraging participants to consider the knowledges they are exposed to. My findings also show that, as Hegger et al. (2012) contend, different participants have different criteria for what they consider relevant. These differences appear especially significant between

participants at different spatial levels. In PSP processes including diverse groups of participants, it is inevitable that not all of them will find all the knowledge they encounter relevant to their interests. Variation in learning is therefore likely to reflect the knowledge that participants find most relevant.

This could be explained by the learning scholars, Knowles et al. (2005), who outline a framework delineating the necessary conditions for adults to learn. They argue that adult learners need to know why the knowledge they encounter will be useful to them in their everyday lives. Knowles et al. also reason that an adult's ability to engage with different knowledges depends on their prior life experiences, as well as their motivation. This indicates that participants are most likely to learn when they encounter knowledge that is relevant to their interests, and when it appears acceptable, based on their prior life experiences.

I therefore reason that learning in PSP varies according the relevance of different knowledges, to participants' diverse interests. This appears to be influenced by differences in participants' worldviews, particularly between participants at different levels, and their professional roles and responsibilities. This resonates with the argument of Bandura (1977), who argues that people select, organise and transform the knowledge they encounter in ways that are shaped by their social, economic and political characteristics. The social context thus shapes what individuals learn. Indeed, as Jasanoff (1996) explains, knowledge and social organisation are 'coproduced' such that the ways people come to know the world, and the ways that they live in it, are closely entwined.

In her influential critique of participatory processes, Kothari (2001) contends that the socially constructed nature of knowledge, means processes bringing different knowledges together are heavily infused with power imbalances. She thus argues that these power imbalances can shape the outcomes of such processes. It is therefore important to investigate how power imbalances shape learning in PSP. In Section 6.3.2, I present evidence showing that power imbalances between participants themselves, as well as between participants and facilitators, can influence the legitimacy of knowledge encountered by different participants in PSP.

6.3.2 Learning varies because of power imbalances

In Chapter 5, I explained that learning can occur through interactions in which participants are exposed to different knowledges, through PSP prompting discussions between them. It follows that learning could vary according to participants' relative engagement in these discussions. Following on from Section 6.3.1, which highlights the importance of relevance in shaping who learns what, in this sub-section I show how power can shape participants' engagement in PSP, and how this subsequently influences the legitimacy of the knowledge they encounter. As I set out in Chapter 2, I follow the broad definition of power, proposed by Avelino and Rotmans (2011), as: 'the capacity of actors to mobilise resources to achieve a certain goal' (p.798). In this definition, resources are viewed as assets, such as people, knowledge and money, that help actors to achieve certain goals. I begin by exploring the influence of power imbalances, between participants, which typically reflect power as having greater capacity than others to mobilise resources.

In one of the papers in my case review, Ravera et al. (2011a) describe how the voices of marginalised participants, like women and young people, contributed less than others in PSP workshops on climate change adaptation. The authors state: *'The voices of powerless people, such as workers, women and young people, had less influence in the formal decision-making spaces,'* (Ravera et al., 2011a p.449). The less powerful participants thus had less capacity to contribute their knowledges, so the knowledges that participants encountered were more likely to reflect the contributions of powerful participants. Indeed, in another case described in the same paper, Ravera et al. (2011a) show that the initial phases of a PSP process in upland conservation were: *'dominated by more formally educated stakeholders, which left some participants feeling uncomfortable,'* (Ravera et al., 2011a p.450) This indicates that the knowledge participants encountered was more likely to reflect the perspectives of more powerful participants. Moreover, the marginalised participants appear to have been less likely to engage, enthusiastically in the PSP process.

This was reflected in my practitioner interviews, in which all 16 of my informants indicated that power influenced learning in PSP. One practitioner, Barry, had substantial experience conducting PSP with diverse groups of participants. He provided a detailed account of how PSP workshops are often dominated by certain types of participants:

> *"I've noticed in the groups that I've facilitated, people who are more senior, [especially] older men tend to dominate… Or if you have a table where government agencies are represented, an NGO and private sector, it is most likely that the government agency and the private sector would dominate over the voice of [someone from] an NGO." (Barry, 2016)*

When I asked Barry to explain how these power imbalances could influence learning, he reasoned that the domination of PSP processes by individuals or groups of participants could create what he described as 'bias' in discussions:

> *"You need to make sure that everyone has a voice, because there will always be people who dominate, and that's where you have that power issue… I think legitimacy is where the power issue comes in, because that is all about [people being able] to legitimately participate… If certain people will keep speaking up, they will probably create a bias, in their decisions on developing the scenarios." (Barry, 2016)*

This indicates that the knowledge to which participants are exposed is more likely to reflect the knowledge of powerful participants. If other participants thus fail to consider this knowledge to be legitimate, they may be less likely to learn from these discussions.

Two practitioners, Danielle and Mary, both highlighted one characteristic that could influence power imbalances and therefore learning, which was participants' command of language. Danielle, a highly experienced practitioner, reflected on a PSP process she was planning at the time, in which she intended to include participants from different ethnic backgrounds. She expressed a concern, about engaging participants with different first-languages:

> *"I'm quite worried, because I don't know how much language capability we can build into the project, [and] doing it all in English seems like a big problem." (Danielle, 2016)*

When I subsequently asked Danielle to explain what the influence of language might be, she responded by raising the important question:

> *"Well, what's lost in translation?" (Danielle, 2016)*

Indeed, if participants cannot fully understand the discussions that occur, their engagement and their learning are highly likely to suffer.

This was demonstrated in a different way, in a case described by the experienced practitioner, Mary. As I set out in in Chapter 5, Mary reflected on a situation in which some participants had been unable to participate fully, because they were illiterate. The participants had been asked to complete a task that involved writing on posters, but the illiterate participants had not been able do so. As such, they were unable to contribute their own ideas to the workshop. The other participants therefore inevitably missed out on learning from their knowledge, and their inability to engage limited their own learning.

In the PFSA case study, the influence of power on learning was illustrated by the relative engagement of the artists in the workshop discussions. In my own observations from the workshop, I noted that the artists were often quieter and more reserved during the discussions than other participants. One of the participants who I interviewed, Gareth, who was not a professional artist, but engaged with the arts to a large degree in his professional and personal life, showed a concern that the artists had not felt comfortable engaging in the discussions:

> *"I wondered if some of the artists felt a bit uncomfortable in the workshop space, because it was all about speech and discussion, whereas they are used to expressing themselves through the body and dance." (Gareth, 2016)*

This was reflected by one of my informants, Darren, who was an artist. He reflected that he, along with the other artists in the workshop, had been less comfortable than other participants in articulating idea through verbal discussions:

> *"I'm not very good at debating, or arguments and stuff. I'm just not [used to] that kind of environment… I think that the strength of the artists there was really good for the scientists, but I personally don't know if the artists felt completely that they contributed their best." (Darren, 2016)*

When I subsequently asked Darren what he had learned, he indicated his learning was limited, especially in terms of informing his own work:

> *"I don't think there was anything that could directly inform my practice… There wasn't like a couple of 'a-ha' moments for me." (Darren, 2016)*

The structured discussions, therefore appear to have limited the engagement of participants from an artistic background. This corresponds with my finding in Chapter 5, that PSP is not necessarily conducive to the learning of all participants.

In the FSF case study, I observed there was a certain discussion group in which the discussion was dominated by a small group of men, and the younger, female participants appeared quieter and more subdued. Indeed, Harry, the facilitator for that group reflected:

> *"I had this group with this really vocal group of guys… They were really emphasising one thing, which we had already discussed, and that really slowed the process down." (Harry, 2016)*

He described how, although he encouraged the participants to move on, they still slowed the process down. He explained that the effect of this was:

> *"we didn't have time to go into so much detail at the end." (Harry, 2016)*

The young women were likely influenced by Tanzanian culture, in which women typically stay quiet in the presence of older men (Verma, 2001). The dominant, male participants thus appear to have focused on what they found most relevant, which meant the female participants were unable to focus on topics, that might have been more relevant for them. The knowledge discussed in the group could therefore have had limited the legitimacy, and thus learning, for the young, female participants. Indeed, when I interviewed Christina, a young, female intern, she struggled to articulate what she had learned through the workshop.

It is therefore evident that, as indicated in Chapter 5, the interactions that take place in PSP are not always appropriate for all participants. This is especially the case when participants are not fluent in the language used in specific PSP processes, when they are not used to verbal expression and debate, and when they are already marginalised in everyday life. These participants can thus become side lined in PSP processes, which can limit their learning.

In the PFSA workshop, one of the scientists, Barbara, indicated she had felt excluded at a certain point in the workshop. Interestingly, I did not expect this because she was an accomplished professor with substantial expertise in her field and was very vocal and assertive in her contributions during the discussions. However, I observed that she often appeared to be side-lined during breaks and mealtimes, in that other participants did not interact with her during these periods. During the plenary discussion at the end of the workshop, Barbara made a very impassioned speech, in which she took a rather revolutionary tone about actively *"disrupting institutions,"* and stating that *"the present system must collapse!"* The other participants quickly changed the direction of the discussion, away from Barbara's spiel and turned to thinking about more incremental changes. When I interviewed Barbara and asked her what she had found most

challenging about the workshop, she complained that her contributions in the plenary had been ignored, in this instance:

> *"There was an opportunity for changing people's attitudes and it was just kind of brushed away by this very generic, collective conversation we were having." (Barbara, 2016)*

In this instance, although Barbara had a lot of expertise and appeared vocal and assertive, her voice seemed to be marginalised by the other participants. This emphasises that, as Kothari (2001) contends, power imbalances in participatory processes are complex and manifest themselves in multiple ways. Barbara's voice appears to have been marginalised, not because she was less able to engage in the PSP process, but because her speech about disruption did not fit with the direction of other participants' collective thinking. Barbara therefore appeared not to have found much of value in the 'generic' discussion that occurred in the workshop. This could explain why, as described in Section 6.2, she stated that the workshop had merely helped her reaffirm her existing ideas about creating just and sustainable futures and did not indicate she had learned anything new.

As Kothari argues, participatory processes can, and often do, reproduce existing inequalities, and serve the interests of the powerful. My findings show that this is reflected in PSP processes. Participants who are already marginalised in everyday life can also be disengaged in PSP processes. Similarly, participants can become marginalised if they are not fluent in the language in which specific PSP processes are conducted, and if they are not comfortable with the modes of expression it requires. Another participation scholar, Kapoor (2005), emphasises that power imbalances can act as a self-surveillance mechanism, which means participants feel incapable of acting and speaking in ways that oppose the roles expected of them in society or in a particular social context. This is evident in the example of Barbara in PFSA. She did not act in such a way that the other participants thought was conducive to the prevailing discussion, and thus appears to have been alienated.

The work of adult learning scholar, Brookfield (2005) offers an explanation for the influence of these power imbalances on learning. He contends that in group learning processes, power imbalances can lead to conformity in participants' ideologies, or 'groupthink.' He explains that groupthink typically reflects the interests of the most powerful members of a group. The knowledges of less powerful participants can thus become excluded, especially if they dissent from what the majority considers beneficial. The consequence of groupthink is that PSP participants are most likely to be exposed to the knowledges of the most powerful participants.

This can reduce the legitimacy of the knowledge that participants encounter. It is therefore less likely, that their exposure to it will encourage them to push beyond their usual range of thinking, which means they are less likely to learn.

Facilitation and power

In Chapter 5, I showed that facilitation plays a vital role in enabling learning by explaining and guiding participants through PSP processes, as well as by prompting discussion, and managing interactions between participants. I also found that because of these roles, facilitators have a significant influence on who learns what. Power, in this context, typically takes the form of the capacity to mobilise people, in that facilitators can influence who speaks at what point and whose contributions are considered acceptable, and whose are not.

As I stated in Chapter 5, the papers in the case review typically did not reflect on the role of facilitators in specific PSP processes. Accordingly, I did not find any evidence of a reflection on how facilitators influenced learning in the case review. This could be because of editorial constraints on what could be incorporated into the papers (Baxter and Eyles, 1997), but also indicates a lack of mandate for reflection on the role of facilitators.

In the practitioner interviews, six of the seven informants who talked about how learning varied recognised that facilitation could play an important role in shaping what was learned. One way in which facilitation can influence learning is through shaping the discussions that occur in PSP. This was aptly demonstrated in an example described by one practitioner, Rick. The PSP processes he described had been facilitated by a team of academics from a range of different disciplines including himself, a human geographer. When I asked him about the challenges he faced in that process, he reflected on how another facilitator had tried to push the process in a certain direction, whilst he had wanted to keep the process more open:

> *"In the scenario work, the person who joined me to help facilitate, was very [keen] on being quite rigid and setting the boundary of the scenarios, so in the scenarios they must just think about conservation. And I thought, no, because actually, everything affects everything, so why does it have to be focused on a particular topic?" (Rick, 2016)*

As I described in Section 6.2, local-level participants in the process described by Rick learned about the 'internal workings' of their communities, rather than solely about conservation, as the other facilitator desired. This indicates that the less rigid approach, advocated by Rick, enabled participants to concentrate on discussing what was most relevant to them. If the other

facilitator in this example had succeeded in focusing the process exclusively on conservation, the learning would likely have been different. Indeed, when I asked Rick how taking a more rigid approach might have affected learning, he mused that participants could have identified more opportunities for action on environmental problems:

> *"If it was much more focused then you could potentially have much more specific action linked with it." (Rick, 2016)*

It was unclear, however, whether the eventual learning was more useful, and for whom, than would have been the case if the process had been more 'focused.' The PSP process described by Rick, was intended to identify ways that local conservation strategies could be supported by national and regional-level policies. The less rigid approach clearly detracted from identifying specific actions for supporting local conservation strategies, even though it gave participants more freedom to deliberate on their own interests. This highlights the important question of who the benefits of PSP are intended to be for, which I return to in Chapter 7.

Another practitioner, Nigel described how he had controlled what was considered plausible in a PSP process in which he was involved, because he later had to translate the scenarios into spatial models:

> *"What happened was that, as the person that got to implement it in the spatial modelling, I had to look at [the scenarios] and go 'look, this is not going to be practical, I can't implement that…' I then went back [to the participants] and said 'okay this is what you gave us, this is how we've interpreted it in terms of it being a tractable modelling response, and you've got to remember, it's got to be practical when you're modelling.'" (Nigel, 2016)*

In this instance, by iteratively refining what participants considered feasible, Nigel shaped what was considered an acceptable contribution to the discussion.

Similarly, the highly-experienced practitioner, Deborah, described a situation, in which two participants started suggesting ideas that she considered disruptive to the prevailing direction of thinking in the workshop. As a result, she took these participants aside and reined them in:

> *"We had a couple of economists who just flipped out and became communists on us, and it was near the end and I remember thinking like 'what the hell, these guys have gone off the deep end!' And [we] had to go off into a smoke-filled room with them and get things settled down. They were really advocating for a centralised economic solution, which was really not something anyone considered a viable mechanism for addressing the problem." (Deborah, 2016)*

These participants were therefore prevented from exploring that particular avenue. Hence, their exploration of possible futures was directed towards what Deborah, and the other facilitators considered more constructive.

The above three instances show that facilitators can define what is considered an acceptable contribution to discussions in specific PSPs, and what is not. In this way, they inevitably privilege some voices and marginalise others. This could influence the legitimacy of knowledge produced in PSP. If participants do not find this knowledge to be legitimate, it is less likely they will learn through their exposure to it.

It is important to note, however, that in each of these examples the facilitators were aiming to meet the objectives of specific projects. For example, the process Rick described aimed to explore how community responses to environmental change might fit in with global conservation initiatives. He explained that this objective allowed him to take an open-minded approach:

> *"I think for what we wanted to do, in terms of just exploring what would happen, whether local solutions would fit into the future, I think keeping it broader was better." (Rick, 2016)*

The process Nigel referred to, aimed to inform a national government's negotiations for carbon storage payments. He explained that this meant the process needed to be focused and realistic to capture policy-makers' attention:

> *"We were definitely aiming for realistic, because this was not a research exercise that was out in blue sky, this was about delivering things that could be presented in Copenhagen at the REDD negotiations." (Nigel, 2016)*

These differences in the project objectives, inevitably influenced what the facilitators deemed appropriate for discussion. In fact, Nigel indicated a particular trend had become quite a

prominent issue in Tanzania, but had only been considered briefly in the workshop, because it was considered too unrealistic:

> *"It's no good [thinking about] 'just as a surprise, why don't we just sell off the whole of the country to China,' which, interestingly, is something that we did look at a little bit and has actually become quite an issue." (Nigel, 2016)*

In this instance, the fact that selling off land in Tanzania was not considered in the workshop, meant that participants were not able to learn as much about it as they might have if a more exploratory approach had been taken.

The influence of specific process aims was clearly visible in the PFSA workshop. The overall 'Positive Futures' project aims to encourage learning about what just and sustainable futures would look like for different participants, as well as to explore how these futures could be created. In the workshop I observed in South Africa, the facilitators pushed this normative framing right from the start, by emphasising the themes of transformation, creativity, and positivity. Indeed, the introductory session began with a presentation by one of the facilitators, Doris, which highlighted present unsustainable conditions in SES, and emphasised the importance of thinking about opportunities for positive change:

> *"Meeting the challenges of the 'Anthropocene' requires complete transformation." (Doris, 2016)*

This shows that the facilitators primed the participants to consider significant changes towards more just and sustainable conditions, as well as to focus on imagining future conditions they considered desirable. This subsequently shaped participants' discussions and thus what they learned.

The facilitators continued to emphasise these themes throughout the workshop, by prompting participants to think creatively about transformations and complexity in their discussions. For example, I observed one facilitator, Tina, encouraging participants to make sure they were thinking about *"really innovative,"* links between different seeds. This emphasised the need for participants to consider new ideas about how change could happen. Similarly, Nichola emphasised, in her discussion group, that participants needed to focus on *positive* futures, when they were beginning to think about dystopian ideas. In doing so, she stressed the normative framing of the workshop to consider positive futures. In this way, the PFSA facilitators shaped what was discussed in the workshop, and, thus, what participants learned.

Another way the facilitators shaped discussions in PFSA, was through acting as a scribe (writing notes on flipchart paper, as participants spoke), and encouraging participants to note things down. During the discussions, I noted how each of the facilitators listened to the discussions that were occurring in their groups and noted down summarised points on sticky-notes, which were then used to record participants' thinking. I also noted that they regularly suggested participants write their ideas down themselves. Indeed, one participant, Elliot, described how the facilitator in his group, Tina, had encouraged participants to write down points she thought were important:

> *"[She would say]: 'okay guys, that's great, but write it down.' So, we would write it down." (Elliot, 2016)*

The facilitators, therefore determined what was committed to paper, according to what they considered most relevant in the discussions. In this way they inevitably advocated some contributions over others, which shaped what was discussed, and thus, what was learned.

Indeed, the facilitators' influence was evident in the types of opportunities participants identified, for creating just and sustainable futures. As described in Section 6.2, one discussion group deliberated on how artificial intelligence could help encourage just and sustainable futures. This same group was the one the facilitator, Tina encouraged to be 'really innovative.' Accordingly, the participants I interviewed from that group indicated they had identified opportunities including 'fluid infrastructure' where artificial intelligence was used to help make urban land use more sustainable, and the possibility of using robots to rebuild coral reefs. This demonstrates the emphasis placed on innovation led to the identification of highly innovative and imaginative ideas, rather than more incremental solutions.

The PFSA facilitators were also influenced by the aims of the overall 'Positive Futures' project. In this case, the facilitators told me, the overall aims set by the funders of the project, were to improve their selection of small-scale initiatives to fund. They expected the PFSA project to yield information on how small-scale initiatives could be supported to enable positive change. The influence this had on the facilitation of the workshop was demonstrated most strongly in the discussion group facilitated by Nichola. The group had been exploring how the possibility of 'gene technology' could result in immortal human beings, and thus, the possibility of interplanetary travel. Nichola became concerned this idea was too radical, despite the emphasis on creativity and innovation. As such, she directly explained to the participants that the funders required practical information about how specific initiatives could develop. In doing so, she encouraged the group to consider more plausible possibilities that could be more palatable to the funders, but

discouraged participants from exploring particular future possibilities, which inevitably influenced what they learned.

However, although the PFSA facilitators evidently influenced learning by emphasising the aims of the process, three of my informants commended them for not imposing their own views on the discussions. For example, one participant, Miriam reflected, that the facilitator in her group had openly indicated strong views on a discussion point related to genetic engineering. However, he commended her for not trying to push her views on the participants:

> *"Besides the fact she was completely pro-genetic modification, she realised the group was going in the opposite direction, and she didn't try to resist. You know, she was challenging us by asking questions, but she never pushed the discussion according to her own values." (Miriam, 2016)*

This indicates that, although the facilitators promoted the aims of the process by prompting participants to think about positive and creative ways to create just and sustainable futures, they did not try to promote their own personal views.

In the FSF case study, I also observed that the facilitators played an important role in shaping what was discussed, and thus what was learned. The FSF workshop took an exploratory approach to exploring challenges and opportunities for food and nutrition security (FNS) in Tanzania. In doing so, it aimed to contribute to the Tanzanian government's 'Five-Year Development Plan'. Accordingly, I observed that the facilitators regularly prompted participants to explore a wide range of different aspects of FNS, as well as to consider how they were linked to policy. For example, I observed how one of the facilitators, Harry, prompted participants to think about the implications of different policy objectives, and kept asking them to think about whether there were any factors they had not yet considered. This encouraged participants to explore wide-ranging, plausible event, conditions and trajectories, as well as their implications for FNS.

I also observed how the FSF facilitators engaged individual participants by posing questions directly to them. For example, I noted one moment where a facilitator, Mike, asked one participant, Edmund, to describe how his everyday role would look in the scenario he was imagining. In doing so, the facilitators aimed to encourage a more even contribution from different participants. Indeed, six of the 13 participants I interviewed indicated that the facilitators had encouraged an even contribution of participants across the groups. For example, one participant, Tracy, described how the facilitator, Mike, had used questions to encourage the contributions of each and every participant:

> *"He tried to make sure that everyone has given points. He asked questions to this one, you answer, this one you answer. Everyone was asked a question and answered it." (Tracy, 2016)*

In contrast, another facilitator, Thomas, allowed each participant to make a short speech about their contribution, and then moved on to the next person, rather than prompting discussion by asking short, punchy questions. When I discussed these different facilitation styles with Mike, he suggested that Thomas's style was sub-optimal:

> *"Letting everyone make a little speech takes a long time and leads to people getting bogged down on one particular point, which leaves less time to deal with a range of different issues." (Mike, 2016)*

However, because they were under-staffed, Mike had difficulty facilitating his own facilitation team and guiding the less experienced Thomas, simultaneously. He was therefore unable to change Thomas's facilitation style. If participants thus did not find the points they got 'bogged down on' to be relevant and legitimate, it is unlikely they would learn from those discussions. This could explain why, as shown in Section 6.2, only one of the participants who had been in Thomas's discussion group, Mark, indicated he had learned new content and identified opportunities for tackling complex problems.

In the same way as in PFSA, I observed that the FSF facilitators actively influenced learning through synthesising and summarising the discussions that occurred. In the FSF workshop, I observed how Mike and Harry regularly summarised participants' discussions and asked them to write down their ideas. For example, I observed one point in Mike's group when he decided that the scenario participants were creating was becoming too negative, so he encouraged them to consider positive points and asked them to write them down, rather than the negative ones. The facilitators thus defined what was considered an acceptable contribution and what was not.

The above evidence shows that facilitators of PSP processes have significant power over what is discussed in them. Facilitators can influence what is considered a valid contribution, and thus, who contributes what knowledge. This corresponds with the findings of learning scholar, Tett (2016). Tett demonstrates that facilitators of group learning processes have a significant influence on what is learned. She argues that facilitators can advocate or oppose the contributions of participants simply through acknowledging them, asking participants to expand on ideas, and instructing them to write things down. This closely mirrors my findings, that facilitators can set the tone of the workshops they facilitate and can privilege the contributions of

some voices over others. Facilitators can thus create 'groupthink' as described by Brookfield (2005), in that shaping what is an acceptable contribution can result in participants conforming to certain ways of thinking.

If participants thus fail to consider PSP to be a fair, inclusive and unbiased process, they may not consider the knowledge they encounter to be legitimate. Participants may subsequently be less likely to engage with the knowledges they encounter, which means they will not push beyond their usual range of thinking and will be less likely to learn. I therefore reason that learning varies because of facilitators' power to influence what is considered a valid contribution to discussions, and what is not.

However, it is also evident that facilitators are influenced by the objectives of wider projects in which specific PSP processes are embedded. Indeed, in their review of PSP processes, Oteros-Rozas et al. (2015) acknowledge that PSP processes are typically designed to meet research objectives, rather than learning objectives. As such, what facilitators consider to be acceptable for discussion in PSP, is shaped by their obligations to wider projects, including their funders. This resonates with the critique of participation by Cornwall (2008), that participatory processes are typically owned by those who initiate them. Likewise, another participation scholar, Chambers (1997), contends that the facilitators of participatory processes ultimately have power over their outcomes. The objectives of projects in which specific PSP processes are embedded thus seem to have a significant influence on how learning varies between different participants.

6.4 Conclusion

In this chapter, I explored the question of how and why learning varies between different participants in PSP. I found four discrete themes of learning. Firstly, participants can refine their existing understanding of specific topics. These participants are typically those who have existing expertise in the topics discussed by specific PSP processes. Secondly, participants commonly learn new content about specific topics, such as artificial intelligence, governance, and nutrition, in which they are not, overtly experts. The specific topics about which participants learn vary according to their existing levels of expertise and ignorance in the topics discussed, and according to the design of specific PSP processes. Thirdly, participants can identify opportunities for tackling SEPs. The sorts of opportunities they identify vary according to their fields of expertise, their social and economic backgrounds, and the design of specific PSP processes. Finally, participants can learn about new ways of thinking about the future. This is especially common in participants,

for whom PSP represents a new way of thinking about the future. However, participants who are familiar with PSP can also learn from new ways of doing it, in different specific processes.

In the second half of this chapter, I explained that these variations in learning are shaped by the relevance of knowledge to participants' interests, and the extent they consider it to be produced through fair and unbiased processes. The extent to which participants find knowledge to be relevant is shaped by whether they consider it useful to their interests. The extent to which participants find knowledge to be legitimate is influenced by power imbalances, which can lead to conformity in participants' thinking, or 'groupthink.' Moreover, facilitators of PSP processes have significant power to define what is considered acceptable for discussion in specific PSP processes. If participants do not find knowledge to be salient and legitimate, it is unlikely that being exposed to it will encourage them to push beyond their usual range of thinking, and thus, to learn.

It is important to note that the ways in which facilitators design and facilitate PSP processes are themselves shaped by the aims of wider projects in which PSP processes are embedded. It is therefore vital to consider the question of for whom, and indeed at what level PSP is intended to result in learning. Do those who design and use it just intend to elicit different knowledges to inform a macro-level understanding of SEPs, as Lewin (1997) argues is a vital prerequisite for intervening to tackle them? Or, do they go further and intend for it to help stakeholders identify specific actions at the micro-level, as per the reperception aspect of Ramirez and Wilkinson's (2016) framework? If the knowledges discussed in PSP are defined by broader project objectives, to what extent is it really intended to enable learning for participants? I discuss this further in my concluding chapter below.

Chapter 7 – Conclusion

7.1. Thesis Overview

Participatory scenario planning (PSP) - interactive processes in which diverse groups of participants develop multiple, plausible narratives of future events, conditions and trajectories - has increasingly been applied to tackling social-ecological problems (SEPs) in a variety of global locations, at different geographical levels, and by a mixture of academic, governmental and third-sector organisations. As Oteros-Rozas et al. (2015) show, PSP is commonly used to incorporate the knowledges of diverse stakeholders in processes of dialogue on tackling SEPs. This reflects assumptions in wider literature on social-ecological resilience, that dialogue and knowledge exchange between different stakeholders, can help promote changes towards more sustainable conditions in social-ecological systems (SES) (Boyd and Folke, 2012). However, as indicated in the influential critique of participation, Kothari (2001), processes that claim to incorporate different knowledges, typically privilege the knowledges of some participants over others. Indeed, as argued by Chambers (1997) and Cornwall (2008) the outcomes of participatory processes are typically owned and defined by those who initiate them. This research was therefore motivated by a need to investigate the benefits of PSP for those whose knowledges it incorporates.

As indicated in the recent review of PSP by Oteros-Rozas et al. (2015), PSP may be particularly useful for learning. I therefore focused on exploring learning, as a potential benefit of PSP. I structured my research around a conceptual framework, that I developed, informed by learning theories. I used the cognitivist theory of the 'zone of proximal development,' (Vygotsky, 1978) to explain that learning in PSP occurs, through interactions between participants with different fields of expertise. I used the concept of 'boundary objects' (Star and Griesemer, 1989) to explain how PSP prompts discussion between different participants. I also drew on the concept of 'scaffolding' (Wood et al., 1976) to explain how facilitators can assist participants to engage in PSP processes. I then used theory from adult learning, knowledge co-production, and participation to explain variations in what participants learned through PSP processes.

I designed my research around three sources of data. I began by conducting a case review of 30 carefully selected cases in the peer-reviewed literature in which PSP had been used to help tackle SEPs. I built on this by conducting semi-structured interviews with PSP practitioners, and investigating two case studies of carefully selected PSP workshops, as they occurred. This methodology enabled me to elicit rich, qualitative data, which I analysed to explore the expected

and reported benefits of PSP, how, and under what conditions, learning occurs, and how and why it varies in PSP. I present a summary of my findings in Section 7.2, below.

7.2 Research Findings

7.2.1 What are the expected and reported benefits of participatory scenario planning?

The first set of findings from my research concern the expected and reported benefits of using PSP to tackle SEPs. These findings are presented in Table 7.1, below.

Table 7.1 – Summary of research findings, regarding the expected and reported benefits of PSP processes, based on my analysis.

Expected and reported benefits of PSP	Details
Helping participants explore complexity and uncertainty in SEPs	The use of PSP is typically underpinned, by an assumption that it can break-down, or structure, future possibilities into alternative narratives of plausible future events, conditions and trajectories. This is believed to help participants explore the complexity and uncertainty of SEPs. This is not frequently reported as a benefit, because it is linked to, and sometimes acts as a precursor to other benefits.
Learning	Learning is commonly expected as a benefit of PSP. It is often reportedly achieved through bringing different participants together to deliberate on the future. However, practitioners have limited theoretically-grounded understanding of how learning occurs and appear to give limited attention to how and why learning varies for different participants.
Developing and testing responses to SEPs	Proponents of PSP commonly expect, and report, that it helps develop responses to SEPs, as well as test them in alternative future conditions. However, I found limited evidence of these responses being implemented. This could be because PSP needs connecting with long-term processes of policy-making and action. Moreover, it requires the participation of influential stakeholders, to encourage the implementation of the responses it helps identify.
Limited provision for evaluation of PSP	There is limited evidence of practitioners considering the strengths and weaknesses of PSP, especially compared to alternative methods for encouraging dialogue for tackling SEPs. This could be explained by limited provision being made by practitioners and ultimately their funders for systematic evaluation of PSP processes.

Source: author construct

7.2.2 How and under what conditions does learning occur in Participatory Scenario Planning?

My second set of findings explain the attributes of PSP processes that enable learning to occur. They also describe the conditions that can make PSP more conducive to learning. I present these findings in Table 7.2, below.

Table 7.2 – Summary of research findings regarding how and under what conditions learning occurs in PSP processes, based on my analysis.

How and in what conditions learning occurs	Details
Learning occurs through interactions	Learning occurs through interactions between participants with different worldviews, professional occupations, and social and economic backgrounds.
PSP prompts discussion between different participants	PSP can act as a 'boundary object,' (Star and Griesemer, 1989) that encourages participants to make explicit their assumptions about the future. It therefore exposes participants to different knowledges. Hence, it can prompt discussion, as well as creative, focused thinking about the future.
PSP enables participants to push beyond their usual range of thinking	PSP therefore helps participants to enter their 'zones of proximal development,' (Vygotsky, 1978) and hence, to push beyond their usual range of thinking.
Facilitators assist participants to engage in PSP	Facilitators of PSP processes can help participants to engage in focused, creative thinking, by providing 'scaffolding,' (Wood et al., 1976). This involves explaining and guiding participants through specific activities, as well as stimulating discussion using prompts and questions.
Conducive conditions	PSP is most conducive to learning when it includes a diverse group of participants with relevant expertise. Careful facilitation is required to ensure interactions are respectful and constructive. Conducting PSP in a comfortable space with adequate funding, time and human resources can also make it more conducive to learning. However, some participants are inevitably less able and/or willing to engage in PSP processes than others.

Source: author construct

7.2.3 How and why does learning vary in participatory scenario planning processes?

The third and final set of findings from my research concern how learning varies between different participants in PSP, and why these variations occurred. These findings are presented in Table 7.3, below.

Table 7.3 – Summary of research findings, regarding how and why learning varies for different participants, based on my analysis.

How and why learning varies	Details
Refining existing understanding.	Participants with existing expertise in the specific topics, deliberated on in PSP processes can refine their understanding of those topics.
Learning new content about specific topics.	Participants most commonly learn new content about specific topics, in which they are not experts. The specific topics vary, according to their existing fields of expertise, and according to the design of specific PSP processes.
Identifying opportunities for tackling SEPs.	The opportunities participants identify vary according to their fields of expertise, social and economic backgrounds, and the design of specific PSP processes.
New ways of thinking about the future.	Participants for whom PSP is a new experience can learn about its potential value as a way of thinking about the future. Participants who are already familiar with PSP can learn about new ways of thinking about the future in different specific PSP processes.
Learning varies according to relevance of knowledge.	Variations in learning are influenced by the extent to which participants encounter knowledge they consider relevant to their interests. As Knowles et al. (2005) explain, people need to understand how knowledge can help them in their everyday lives for them to learn from it.
Learning varies according to legitimacy of knowledge.	Variations in learning are influenced by the extent participants consider knowledge to be legitimate. This is shaped by power imbalances that can create conformity in participants' thinking, or 'groupthink' (Brookfield, 2005)
Facilitators shape learning	Facilitators also have significant power to shape learning, through defining what is considered acceptable for discussion. However, facilitators are influenced by the objectives of wider projects, in which specific PSP processes are embedded.

Source: author construct

7.3 Original Contributions

As shown in the above three tables, my research has contributed to understanding on PSP in several ways. Firstly, I have contributed to previously limited understanding regarding the expected and reported benefits of PSP. The review by Oteros-Rozas et al. (2015) provides a detailed analysis of the expected and reported benefits from 23 cases of PSP. However, the authors of the review are all practitioners who were directly involved in the PSP processes they analyse. My research represents the first analysis, that I am aware of, which investigates the expected and reported benefits of PSP processes, from an independent perspective. My findings show that learning is the most significant benefit associated with PSP, which corresponds with the findings of Oteros-Rozas et al. However, my findings go further than Oteros-Rozas et al., in that I reveal a lack of explicit, theoretically-informed understanding of how learning occurs. Furthermore, I show that little attention has thus far been paid to how and why learning varies for different participants.

My findings, presented in Chapter 5, contribute a theoretically-grounded understanding of how learning occurs, that was previously absent in PSP practice in the field of social-ecological resilience. My findings correspond with the assertion of Johnson et al. (2012), who reason that PSP encourages participants to engage with different knowledges. However, my findings go further than those of Johnson et al., in that I explain the specific attributes of PSP that can prompt discussion between participants, as well as stimulate creative, focused thinking. I also delve into the cognitive processes through which learning occurs, by linking my findings to a specific learning theory, the 'zone of proximal development' (Vygotsky, 1978). In doing so, I show that the creative, focused thinking, stimulated by PSP helps participants to push beyond their usual range of thinking, thus entering their zones of proximal development. As Terry, a highly experienced practitioner, indicated, such a theoretical understanding of learning can help practitioners to understand when PSP is being done well, and when it is not.

My research also contributes to previously limited understanding of the roles played by facilitators in PSP. Some PSP scholars, like Bennett et al. (2016b), and Rounsevell and Metzger (2010), have alluded to the importance of skilled facilitation in PSP processes, but do not analyse the roles that facilitators can play, in a detailed manner. My findings show that facilitation is especially important for providing assistance to participants that enables them to engage in discussions, and thus, to push beyond their usual range of thinking. Facilitators also have an

important role to play in selecting participants who have relevant expertise. The importance of skilled facilitation is not a new finding, in its own right. Indeed, skilled facilitation is highlighted as a key condition for successful stakeholder participation in processes of dialogue for tackling SEPs (Henrichs et al., 2010; Reed, 2008; Wittmayer and Schäpke, 2014). However, my findings focus specifically on the role of facilitation in encouraging learning through PSP, whereas others have focused on a range of outcomes from participatory processes in general. Furthermore, by linking the role of facilitation to learning theory on 'scaffolding' and the zone of proximal development, I emphasise that facilitators are vital for helping participants engage in creative, focused thinking, and thus, to push beyond their usual range of thinking.

As described in Chapter 6, my findings show that facilitators also play an important role in shaping who learns what in PSP. They do so through defining what is considered acceptable for discussion in PSP processes, something which influences the extent that participants encounter knowledge they consider relevant and legitimate. Facilitators are themselves influenced by the objectives of wider projects in which specific PSP processes are embedded. This links to wider debates about power and participation. Indeed, the influential critic of participation, Chambers (1997) contends that facilitators ultimately control the outcomes of participatory processes. My findings appear to support and add to these critical assertions about participation, by showing that the facilitators, and predefined objectives of PSP processes, have a significant influence on who learns what.

The previous lack of theoretically-informed understanding, regarding how learning occurs, together with the lack of information in the literature, regarding who learned what, and the paucity of reflection on the role of facilitation in enabling and shaping learning, indicates there is a need for greater critical reflection on the use of PSP. As I showed in Chapter 4, practitioners struggle to articulate the strengths and weaknesses of PSP, especially as compared to other methods. My findings, from the practitioner interviews and case studies show there is limited provision for systematic evaluation of PSP processes, and that limited consideration is given to alternatives. Indeed, as one practitioner, Terry, opined, the use of PSP for tackling SEPs is a fashion, that occurs with insufficient critical reflection.

7.4 Implications for practice and future research

The apparent lack of critical reflection, described above, could be indicative of a wider reluctance by practitioners and funders to consider the potential drawbacks, as well as the failures, of participatory initiatives pertaining to address SEPs. Indeed, as Mosse (2005) contends, the perceived efficacy of any initiative is often defined by the prevailing view held by those who commission it, rather than by the intended beneficiaries. The predominant view of PSP appears to be that it is beneficial for enabling learning that can help develop a more holistic understanding of SEPs.

My research supports this assumption, but given the significant role played by the design and facilitation of specific PSP processes in defining what is learned by participants, my research also highlights the importance of considering for whom learning in PSP is intended, as well as the level at which learning in PSP is intended to focus. Are PSP processes primarily intended to extract participants' contextual, local, and disciplinary knowledge to add to a more holistic understanding of SEPs, according to Lewin's (1997) theory of change? Or are they also intended to encourage micro-level learning about specific responses to SEPs, as in the reperception aspect of Ramirez and Wilkinson's (2016) framework? My findings in Chapter 6 indicate that participants' learning is predominantly directed towards end-points that are predetermined by the objectives of wider research projects.

This point emphasises the importance of considering the role of power in tackling SEPs. As Patterson et al. (2017) point out, changes that can lead to more sustainable conditions in SES are highly contested, and will inevitably result in winners and losers. Indeed, they contend that questions regarding what a sustainable future should look like, as well as who gets to decide this, are deeply political. However, they contend that these questions are not often addressed directly in sustainability research. Indeed, as Olsson et al. (2014) point out, power has typically been underplayed by scholars who are thinking about tackling SEPs. They emphasise that redistribution and sharing of power are key conditions for encouraging sustainability. However, they also contend that initiatives purporting to encourage sustainability are often top-down, pre-packaged, standard solutions, rather than innovations adapted to local contexts. Similarly, Lang et al. (2012) observe that participatory processes for addressing SEPs are typically owned by researchers rather than participants. My findings support this, in that learning in PSP processes appears to be heavily influenced by those who initiate them.

I therefore argue there is a need for more robust governance of PSP practice in the field of social-ecological resilience to ensure best practice and encourage critical reflection. Improved

governance should include greater provision for systematic evaluation of the societal impacts PSP processes may have. Indeed, as Lewin (1997) argues in his theory of change, whilst general systems need to be understood holistically to explore possible conditions and outcomes, knowledge of specific situations is needed to take action, and evaluation is needed to evaluate its success, once implemented. As explained in Chapter 4, systematic evaluation of PSP has previously been hindered by a lack of mandate for evaluation in the field of practice in social-ecological resilience. The practitioner, Gavin, attributed this to a focus on scenarios as end-points, rather than means to achieving other outcomes, as well as a lack of accountability for impact among academics practicing PSP. This highlights the relative immaturity of PSP practice in the field of social-ecological resilience.

However, as this field matures there is increasing commitment to critical reflection on the benefits and limitations of PSP, as shown by Oteros-Rozas et al. (2015), Waylen et al. (2015), and indeed this thesis. Equally, there have been some recent attempts to link PSP to theory. For example, Duckett et al. (2017) study the role of power dynamics in PSP by applying Habermas' theory of communicative action. As the practitioner, Terry, alluded to, developing closer links to theory could improve governance of PSP by helping practitioners to understand when it is being done well and when it is not. Practitioners of PSP in the field of social-ecological resilience could also usefully draw to a greater extent on the wealth of theory and experience that exists in more established fields of PSP practice, such as corporate strategic planning and futures studies. For example, governance could be improved by encouraging sharing of excellence and best practice through practitioners' seeking membership of the Association of Professional Futurists (APF, 2018).

My emphasis on improved governance of PSP in this field echoes wider calls for improved evaluation regarding the effectiveness of participatory processes purporting to encourage dialogue on tackling SEPs. For example, Lang et al. (2012) emphasise that evaluating the societal impact of such participatory processes is a key condition of participatory, transdisciplinary research for tackling SEPs. Similarly, Wiek et al. (2014) point out that the emphasis of participatory processes on enabling change for sustainability calls for evaluation of their effectiveness. Wiek et al. thus propose a framework for evaluating the societal effects of participatory processes, which includes assessing participants' learning, as well as how it may enhance their capacity to tackle SEPs. My research can be used to support such an evaluation by helping to identify the causal links between specific aspects of PSP (as well as other participatory processes) and learning.

In any evaluation of PSP processes, it is important to remember that, as Henrichs et al. (2010) point out, different processes have different purposes, which influence the mode of participation that is used, and indeed what learning is intended to involve. For instance, in a PSP process for research and scientific exploration a successful learning outcome would involve experts gaining insights into the topic of study. In contrast, for a PSP process with the aim of educating people, successful learning would involve a wide range of stakeholders challenging their assumptions about the future and learning from the perspectives of others. In a process aimed at supporting decision-making, learning could be considered successful if key decision-makers were enabled to identify new, implementable strategies. Henrichs et al. therefore argue it is vital for the purpose and goals of a PSP process to be clearly defined from the start. They add that, as a minimum standard, PSP practitioners should ensure they conduct a thorough analysis of the wider context in which PSP is to be used, as well as engage relevant stakeholders throughout the process.

Wiek et al. (2014) also highlight the importance of evaluating the efficacy of usable products (like technologies and publications), network effects (like increased trust and new contacts), and structural changes and actions (like implemented policies and actions), which were beyond the scope of this research. Indeed, future research could usefully explore the effectiveness of PSP for achieving these outcomes. As Lang et al. (2012) point out, such an evaluation is complicated, because the effects of participatory processes are often delayed and diffuse, which creates difficulties in attributing them to specific interventions. In Chapter 4, I showed there is limited evidence for responses to SEPs, identified in PSP, being implemented in practice. However, as indicated by one practitioner, Greg, learning may be linked to diffuse impacts, such as an increased capacity to make better informed decisions. Future research that evaluates PSP, and other participatory processes, could therefore use learning as a starting point, and track how it may inform subsequent decision-making, as well as action.

My research highlights the importance of facilitation in supporting as well as shaping learning as an outcome of PSP. It is therefore vital that future evaluation of PSP processes includes a critical reflection on the roles played by facilitators. This links to ongoing debates in sustainability research regarding the role of researchers in participatory processes that aim to tackle SEPs. Scholars, including Miller (2013), and Pohl et al. (2010), enthusiastically encourage researchers to take an active role in facilitating such participatory processes. This is reflected in my research, in that all but two of the practitioners I interviewed, were academic researchers.

However, Wittmayer and Schäpke (2014) take a more cautious approach, questioning the suitability, as well as the level of appropriate training, researchers have for facilitation. They subsequently encourage researcher-facilitators to give themselves space for self-reflection, and adequate training, to ensure they have the necessary skills for facilitation. They also call on universities and funding bodies, to give institutional space for researchers to acquire appropriate training. Indeed, as Ramirez and Wilkinson (2016) contend, there is presently no requirement for practitioners to attain any form of qualification before using PSP. As this field of PSP practice matures, practitioners could be encouraged to uphold best practice by receiving a professional accreditation before using PSP. I argue that facilitators of PSP processes should engage with facilitation guides, like the 'sourcebook' of facilitation best practice by Chambers (2002), as well as the wealth of online resources for facilitation, and facilitation training programmes.

My findings can be used to guide facilitators, and ensure they are adequately prepared to support learning in PSP. My analysis highlights the importance of creative, focused thinking that enables participants to push beyond their usual range of thinking. This emphasises the importance of enabling participants to 'enter' their 'zones of proximal development,' as explained by Vygotsky (1978). Facilitators can achieve this through: designing PSP processes around specific activities, like 'futures wheels,' that stimulate discussion and creative thinking; explaining and guiding participants through specific activities; prompting discussion; and managing interactions between carefully selected participants. They could also usefully engage more systematically with the extensive learning and educational psychology literature that stems from the ZPD (Chaiklin, 2003).

In Chapter 4, I revealed that there is limited information in literature on PSP, regarding its relative usefulness, as compared to other methods for dialogue on tackling SEPs. This creates difficulties for assessing whether PSP is more, or less beneficial than other such methods. As shown in my practitioner interviews, this can make it difficult for practitioners to take an informed decision, regarding whether PSP is the most appropriate method to use, in specific contexts. A useful line of inquiry, for future research, could therefore be to compare PSP against other methods. This could involve comparing it to other futures thinking tools, like Delphi technique (Mukherjee et al., 2015), or Horizon Scanning (Sutherland and Woodroof, 2009). It could also include comparing PSP to other participatory methods, that centre around the development of narratives, such as participatory theatre (Brown et al., 2017), or participatory video (Mistry et al., 2016). A 'pure' comparison of the extent and content of learning using different methods would be impossible, unless the different methods were utilised in identical contexts, which is unlikely.

Comparisons of PSP against other methods should therefore focus on the extent to which it stimulates the creative, focused thinking that can encourage learning.

7.5 Conclusion

Participatory scenario planning is a useful method for stimulating learning about social-ecological problems. It can enable learning by prompting discussion between different stakeholders, which can encourage creative, focused thinking about the future. In doing so, it can push participants to push beyond their usual range of thinking, or to 'enter' their 'zones of proximal development.' Learning can be supported by facilitators, through assisting participants to engage in such creative, focused thinking. The type and content of learning in PSP varies, according to the extent participants encounter knowledge they consider relevant to their interests, and to be produced through a fair and unbiased process. Facilitators have significant power to shape what is learned in specific PSP processes, by defining what is considered acceptable to discuss. Facilitators are themselves influenced by the objectives of wider projects, in which specific PSP processes are embedded.

There is therefore a need for stringent governance of PSP processes for tackling SEPs. This should include greater critical reflection regarding who learning in PSP is primarily intended to be for. This could include further research into the societal impacts of PSP, especially regarding if and how learning helps participants to take more informed decisions, as well as actions to tackle SEPs. There is also a need for critical reflection on the role of facilitators, and for adequate training of those intending to facilitate PSP processes. Greater understanding is also required, regarding the relative strengths and weaknesses of PSP as compared to other futures-oriented, and narrative-based methods, for tackling SEPs.

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Appendix 1 – Interview guide for practitioner interviews

Discussion topics

1. Experiences of using scenario planning.
2. Disciplinary background
3. The approach taken to using scenario planning.
4. Motivations/rationales for using scenario planning. The intended benefits of using scenario planning for the management of wicked problems.
    a. The theory underlying these intentions and rationales.
    b. The objectives for using scenario planning.
5. The reported outcomes of using scenario planning for the management of wicked problems.
    a. The learning outcomes of scenario planning processes.
    b. The relationship (if any) between the learning outcomes and the management of wicked problems in practice?
6. The evidence they used to justify the reported outcomes of SPPs.
7. The challenges they experienced in using scenario planning.
8. Discussion on the results of my case review, including the specific projects they were involved with, where appropriate.

Questions to discuss

Informal, factual, ice-breakers

1. Approximately how many scenario planning processes have you been involved in?
    a. What role(s) did you take in each of them?
2. Can you tell me any interesting anecdotes? For example, are there any particular scenario narratives, or scenario planning processes that have really stuck in your mind?

3. Tell me a bit about your disciplinary background. How did you end up practicing scenario planning?
4. Did you receive any formal or informal training in how to facilitate scenario planning processes?
    a. Could you describe what this entailed?
    b. How did this inform the way you facilitated scenario planning?

Lead into more meaty questions on the core research

5. How do think your disciplinary background has influenced your role in facilitating scenario planning?
6. Can you describe your rationale for using scenario planning?
    a. What were your expectations regarding the benefits scenario planning could achieve?
    b. Why was scenario planning selected over other methods?
    c. How did you come to form these expectations? Where did you get the idea that scenario planning might be beneficial?
7. Thinking specifically about the processes you have been involved in, what would you say were the benefits achieved by using scenario planning?
    a. To what extent did scenario planning processes influence participants' understandings of the wicked problem(s) being addressed? If so, how?
    b. Was there any variation between different participants in terms of the outcomes scenario planning had for them?
        i. Could you describe this variation?
        ii. Why do you think this was?
    c. How would you describe the roles played by different participants in the scenario planning process?

i. Could you describe the relationships that developed between different participants over the course of the process?

ii. What do you think influenced the development of these relationships?

d. What tangible impacts have scenario planning processes achieved in practice?

i. What were the mechanisms by which these impacts resulted from the scenario planning process?

ii. What was the relationship between the tangible impacts and the internal dynamics of the scenario planning process itself?

8. Can you justify these claims?

a. What concrete evidence do you have for these outcomes?

b. What methods and criteria have you used to assess the outcomes of scenario planning processes?

9. Could you tell me about any challenges you have faced in the use of scenario planning?

a. Why do you think these challenges came about?

b. How do you think these challenges could have been avoided, and could be avoided in the future?

Appendix 2 – Pre-workshop questionnaire in the case studies

Hello, my name is Sam Poskitt. I'm a PhD student from the University of Reading, UK. I'm studying learning in workshops that use scenario planning techniques to help explore possible future social and environmental conditions. I have been kindly invited to explore learning in the creative visioning workshop: 'Envisioning Good Anthropocenes in southern Africa,' which is being held by the Centre for Complex Systems in Transition in November 2016. I will be observing the workshop as it happens to get a sense of how the workshop is structured, how participants engage with it, and how it might encourage learning. I am very interested in finding out about what you learn in the workshop, and would be very grateful if we could arrange to meet in the weeks afterwards, to chat about what you learned from it.

Samuel Poskitt

This short survey is designed to help me, the coordinators of the workshop, and you, yourself to come to the workshop with a clear understanding of your expectations and aspirations for what you want to get out of it. The survey should only take around 15 minutes to complete and consists of 5 open-ended questions about you, your reasons for attending the workshop and what you expect the outcomes will be.

The information you choose to provide in the survey is confidential and will be accessed only by me, my research supervisors and the organisers of the workshop.

Thank you very much for your time and effort in taking part in this survey!

About you

Name:

Organisation(s):

May I contact you after the workshop to chat about what you learned?: Yes/No

If 'Yes' please provide details through which I may get in touch:

Telephone number:

Email address:

1) How would you describe what you do for a living?

2) What are the reasons you are interested in attending this workshop?

3) What do you expect the benefits of the workshop to be?

4) What topics do you think are important to consider in imagining the future of southern Africa?

5) What are the reasons you think these topics are important to consider when imagining the future of southern Africa?

Appendix 3 – Interview guide used in the case studies

1. Icebreaker – questions to ask me? Did my presence as an observer affect their experience of the workshop? If so, how?
2. Participant's expectations of the workshop.
    a. A little bit about participant's background and reasons for attending the workshop.
    b. What they expected the benefits of the workshop to be.
3. Participants' experiences of the workshop
    a. How well participants understood the objectives of the workshop.
    b. How easily participants were able to carry out the tasks set for them by the facilitators
    c. What participants found interesting, challenging, easy, difficult about the process?
    d. What participants thought about the location and layout of the workshop space? – How comfortable did they feel, how did the space affect their participation?
    e. What participants felt they, and others contributed to discussions in the workshop and to what conditions, events and trajectories were eventually included in the storylines.
    f. Participants' interactions with other participants. – Who they spoke with most, the extent to which they felt included in group discussions, who they thought was most vocal and who was more of an active listener, what they thought about the characteristics of their group (argumentative, cooperative, friendly, relaxed, hostile, imaginative, pragmatic, analytical).
    g. Participants interactions with facilitators – how they helped participants carry out the tasks to engage with the process, how well the time was managed, how well they managed the group discussions and the interactions between different participants.
    h. Observations as prompts – "I noticed you seemed to be having an interesting discussion with *x,* could you tell me some more about that?"
4. What participant's think were the benefits of imagining future conditions of human-environmental systems.
    a. What do they think were the benefits of imagining alternative futures of social-ecological conditions?

b. Has the way they imagine alternative futures of social-ecological systems changed? If so, how? – What topics, problems, opportunities, relationships has the workshop flagged up for them?
c. What aspects of the workshop encouraged learning to occur? – What sorts of processes do they feel help them to learn?
d. What participants felt were the most important outcomes for them – what they learnt, how they think the workshop will affect them in their everyday activities, any opportunities for new actions, roles and relationships to help encourage more sustainable and socially equitable future conditions in social-ecological systems.
e. Anything they thought could have been better about the process. – What else would they have liked to learn about? What else do they think it would have been important for others to learn about? What would have helped further encourage learning?
f. Would they take part in a participatory scenario planning exercise again in future? What are their reasons for this?