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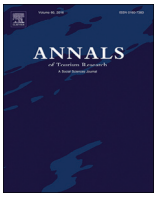

Participatory complexity in tourism policy: Understanding sustainability programmes with participatory systems mapping

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ABSTRACT

Linear logic models are insufficient to understand how interventions work in complex areas such as sustainable tourism. We present Participatory Systems Mapping (PSM), a novel method to develop shared understandings and collective management of complex policy issues among stakeholders. We use PSM with stakeholders in Barcelona to support the design of an upcoming evaluation of an existing sustainability programme. Discussion during workshops, and analysis of the PSM map produced, suggest sharing best practices and improving peer-to-peer learning are pivotal to improving sustainability. We show how a complex systems approach, implemented via PSM, can provide a more holistic understanding of the contexts and interactions of tourism policy. We offer learning and guidance on how the method can be used by others.

Introduction

Sustainable tourism policy plays a fundamental role in leading the uptake of sustainable practices by local businesses in a destination, yet it is complex because it is inevitably linked with other policies and changes at political, economic and socio-cultural levels (Guo et al., 2019) that affect tourism. Although significant efforts have been made towards understanding the tourism system, existing linear models are inadequate because they are developed from a rational paradigm that often neglects the turbulent nature of inherently complex systems like tourism (Baggio, 2008; Russell & Faulkner, 1999; Twining-Ward, 2002). Such models perpetuate a reductionist, simplified view of the world, ignoring important nonlinear dynamics and the potential negative impacts of, or adaptations to, interventions. They can also undermine efforts to engage with stakeholders meaningfully. To address the underlying conceptual and methodological issues of linear approaches, complexity science can help us take a more holistic view of the challenges of tourism policy making, a process that involves multiple social contexts with different value structures (Farrell & Twining-Ward, 2004). Taking a participatory approach to using complexity science can also help when considering social disputes and the normative valuations of specific social interactions.

This article applies the method of Participatory Systems Mapping (PSM), as developed in Barbrook-Johnson and Penn (2021), and Barbrook-Johnson (2019), to tourism policy evaluation for the first time and, in doing so, contributes to the limited number of case studies that apply a complexity approach in a participatory manner. Participatory and complexity approaches have been ap-

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plied separately in many fields (Byrne & Callaghan, 2013), and together in some areas, such as development studies (Mayoux & Chambers, 2005), sustainable consumption (Sedlacko et al., 2014) and energy policy (Barbrook-Johnson & Penn, 2021), confirming the value and relevant application of this methodology to sustainability studies. Most relevant to our aims here is the use of participatory causal loop diagramming to study the feasibility of developing sustainable tourism measurement systems (Crabolu, 2021), and to develop a framework to investigate the transition of the tourism sector towards sustainability (Tourais & Videira, 2021). Where these studies use a participatory modelling approach to frame transitions, we use it to frame evaluation and policy understanding in a complex system. It is also worth noting, although Tourais and Videira (2021) use the phrase 'Participatory Systems Mapping' with reference to causal loop diagrams, how we build and analyse system maps in this study is different.

The aim of this study is to showcase the method PSM and to discuss how it contributes to a participatory complexity approach to tourism policy evaluation. We do so by using PSM to raise lines of enquiry for the evaluation of the Sustainability Commitment programme implemented by the government of the province of Barcelona in Spain. The programme aims to encourage small and medium-sized tourism enterprises (SMEs) to make a voluntary public commitment towards implementing sustainability actions and to engage in a network learning and support system to deliver on their stated commitments. The methodological contribution of this study manifests not only in the ability of complexity methods to understand tourism policy making and evaluation issues in new ways, but also in the highly active engagement of the participants, which facilitates critical insight into multi-layered, context sensitive and, sometimes, politically divergent worldviews. The result is a nuanced understanding of the multi-faceted realities that constitute interconnected parts of the destination system. In this light, tourism policy making can respond to relevant issues with more awareness of wanted, and unwanted, outcomes.

Literature review

Tourism policy broadly refers to all governmental actions that seek to regulate the ecological, socio-cultural and economic impacts of the industry. This includes processes and negotiations associated with the formulation and enactment of policy (Stevenson et al., 2008). The role of government policy is shifting from acting for the public good towards facilitating and enabling more public management and collaborative policy development (Bramwell, 2011; Dredge & Jamal, 2015). Governmental management of sustainable tourism requires careful balancing of the potential conflicts of interest among stakeholders (Guo et al., 2019) via a process of continuous negotiation through power sharing that increases public and private partnerships (Bramwell, 2011; Dredge & Jamal, 2015).

Further research is needed to address the existing gap in our understanding of complex stakeholder relations (Saito & Ruhanen, 2017) and practical ways to help stakeholders to cooperate (Koens et al., 2021). Developing trust and cooperation among stakeholders is key to successful planning (Soulard et al., 2018). As tourism organisations are not independent from the formal and informal networks that exist in a destination, strategic development needs to align with the specific characteristics of a destination (Dredge, 2006). Collaboration might then come into play as an emergent modus operandi to increase social capital while facilitating strategic planning (Guo et al., 2019) and co-production of knowledge. As Phi and Dredge (2019) explain, collaboration can be helpful to tackle sustainability challenges that benefit from different perspectives and knowledge, as well as facilitating collective efforts towards action.

Tourism is a complex phenomenon that should be viewed as a complex adaptive system consisting of a large number of interdependent agents with the capacity to learn, adjust and evolve according to internal and external conditions (Baggio, 2008; Cilliers, 2002). System behaviour is often more than the aggregation of its individual parts, i.e., we cannot understand macro-level patterns simply by developing an understanding of individual components. This is because of properties such as: (i) non-linearity, i.e., changes happening in non-linear ways, such as with tipping points; (ii) emergence, i.e., higher system-level properties appearing in unpredictable ways from the interaction of lower-level dynamics; (iii) feedback loops, either reinforcing and accelerating change, or dampening change and creating inertia; and (iv) learning and self-organisation (Cilliers, 2002). Patterns and complexity emerge from the connections and interactions between actors, their adaptations and the layering of these at different scales across space and time.

Scholars have conducted a great deal of research into individual parts of the tourism system; however, there is a lack of understanding of the dynamic inter-relationships between them (Farrell & Twining-Ward, 2004) and how these complex relationships influence the process of sustainable tourism policy making (Font et al., 2021). Zahra and Ryan (2007) highlighted the relevance of complexity to tourism and provided examples of attractors, dampeners and feedback loops that limit change. Twining-Ward (2002) asserted that sustainable tourism development needs a comprehensive, systemic approach that is able to adapt to and accommodate complex, non-linear system behaviours. Yet, to date a rather limited number of tourism scholars have turned to complexity science as a potential lens of investigation or used complexity methods directly (Stevenson et al., 2009).

Tourism policy making can be regarded as an open system influenced by changes in the social, economic and political environments of a destination (Farsari et al., 2011). Dominant approaches in public policy research, which are based on the rational paradigm, have been criticised (Pforr, 2005) because reductionist descriptions do not capture the context and dynamics of the environment where social processes take place. As Stevenson et al. (2009) explain, moving from a deterministic approach to a richer social science perspective can shed more light on the intangible, sometimes contradictory aspects of the relationships behind policy development and implementation. Furthermore, Sanderson (2000) highlights that we need a deeper understanding of how the contextual circumstances of policy implementation generate effects over time and how human agency and interactions

affect them. Collectively, all of the above has significant implications for tourism policy evaluation, which to date remains inadequately designed.

Numerous policy initiatives and interventions in sustainable tourism have been enacted at different levels. Yet, compared to other sectors, tourism lags behind in deploying adequate, widely accepted evaluation methodologies (OECD, 2012), as tourism lacks a tradition of evaluating policy interventions (Buckley, 2012; Dredge & Jamal, 2015). We believe it is useful to employ theory-based evaluation approaches (as opposed to purely experimental approaches, or narrow economic evaluation) in sustainable tourism policy development and evaluation. In theory-based approaches, developing 'theory' for interventions (whether high-level policy or lower-level programmes) typically involves the development of causal models, where the activities and inputs of the intervention are linked (causally) to intended outcomes and impacts. The evaluation of an intervention is then guided by the causal model (Rogers et al., 2000), with a core aim of the evaluation being to 'test' the theory developed.

Theory-based approaches are particularly useful when applied to interventions where experimental techniques are not appropriate to understand why something is working or not (Stame, 2004); this may be for a number of reasons but, often, is because it is not possible, practical or ethical to create control and intervention groups. Using a complexity lens in a social system such as sustainable tourism has historically led to two types of approach. First, it has encouraged researchers to take a formal or 'hard' modelling approach in which data and/or sophisticated models are used to look for patterns or characteristics of complexity (Barbrook-Johnson et al., 2021); second, it has encouraged researchers to accept and emphasise local knowledge, which, in turn, has increased the value of case-based studies (Stevenson et al., 2008). Here, we adopt the latter; a strong 'participatory complexity' approach.

Place-based research involves heterogeneous properties, variables, processes and behaviours. In order to evaluate an intervention at destination level, where outcomes are not the mere aggregation of initial inputs, Potter (2004) advocates the use of methodologies that are iterative, qualitative, participative and communicative.

Exploratory approaches can help us capture contexts and perspectives. A number of authors argue that the investigation of complex landscapes would benefit from exploratory rather than explanatory methods (Sanderson, 2000; Shaw, 2002). They assert that reality is constructed through human communication and interaction, suggesting that active participation is fruitful to developing reflexivity and understanding. Hence, adopting an exploratory, participatory approach can enable deeper consideration of the relationships and negotiations between the actors involved in tourism policy making and the feedback loops arising from cause-and-effect relationships. Building on the importance of stakeholder collaboration for sustainability (Bertella et al., 2021), participatory methods can help us to gain useful insight into the diversity and nuanced issues of complex systems (Aminpour et al., 2021; Voinov et al., 2018) such as sustainability and policy making by, for example, comparing worldviews, values and priorities through techniques like systems mapping.

Considering the strengths of these methods, some scholars have suggested that participatory mapping techniques lend themselves well to the issue of tourism policy (Farsari et al., 2011; Koutra, 2010). Importantly, the participatory element in policy evaluation can be used to gather knowledge and build consensus as well as to crystallise different priorities and potential gaps. Although only a handful of scholars in tourism have adopted a participatory method (e.g. Bertella et al., 2021; Crabolu, 2021; Pizzitutti et al., 2017; Stave et al., 2017; Tourais & Videira, 2021), these studies demonstrate the value of bringing together different stakeholder groups to improve destination management and collaborative planning, while fostering mutual understanding and conflict resolution.

Methodology

In tourism policy research there is not one specific methodology (Dredge & Jamal, 2015; Stevenson et al., 2008). Given our framing of sustainable tourism as a complex social system, it follows to adopt an approach that is complexity-appropriate and participatory. Systems mapping methods are a well-used approach to developing different types of systems models, including causal ones, in a participatory way. There are a wide range of systems mapping methods that can do this when being used to explore a system, or people's mental models of it, for example, PSM (Barbrook-Johnson, 2019; Barbrook-Johnson & Penn, 2021), fuzzy cognitive mapping (Kosko, 1986), rich pictures (Checkland, 1981), and causal loop diagrams and system dynamics (Sterman, 2000). While the method we use here is PSM, as developed in Barbrook-Johnson and Penn (2021) and Barbrook-Johnson (2019), the phrase PSM has also been used to refer to causal loop diagrams in other studies (e.g. Gruchmann et al., 2019; Kiss et al., 2018; Lopes & Videira, 2015; Videira et al., 2017).

As map building and analysis differ, the findings and implications will be different too. In construction, causal loop diagrams use positive and negative connections but do not include complex or unclear connections, as we do. Importantly, the focus in causal loop diagrams is always on feedback loops in a system, which is organised around a 'core system engine' defined during the construction of the map. In the PSM that we use here, we start with a few focal factors of interest and then build up from there, without a defined 'core' nor strong emphasis on feedback loops. As for map analysis, we use network analysis in combination with information from stakeholders to generate submaps that focus in on important parts of the map, rather than feedback loops only. For an overview of related methods and appropriateness, see Barbrook-Johnson and Penn (2021).

When used in a participatory mode, system maps are a representation of the reality that people perceive, and the level of simplification versus detail will depend on the matters explored, peoples' perceptions of them, and the purpose of the exercise. While the different methods differ in their approach to building and analysing maps, most system maps are made up of a network of interconnected factors ('nodes' in network terminology) and connections ('edges' in network terminology), causal or otherwise. Using maps to ask questions can help to create alternative scenarios (Tourais & Videira, 2021), reveal knowledge gaps and/or

drive future data collection. Other useful participatory modelling methods are presented in Voinov et al. (2018). Before showing how we applied PSM to sustainable tourism policy research, the next sections introduce PSM methodology and guidelines for designing a PSM workshop.

Participatory systems mapping

PSM is a modelling method developed by researchers at the UK ESRC Centre for the Evaluation of Complexity Across the Nexus (www.cecan.ac.uk) in recent years to support the use of a participatory complexity approach in applied research contexts (; Barbrook-Johnson, 2019; Barbrook-Johnson & Penn, 2021; CECAN, 2018). In map construction, PSM draws on elements of Kosko's (1986) fuzzy cognitive maps, using a semi-structured process to build simple causal models of specific systems, starting with system defining factors and factors of importance to stakeholders. It aims to elicit participants' knowledge, even when quantitative data is not readily available. Thus, the content and the structure of the mental models behind people's understanding of the system become explicit (Moon et al., 2019). PSM seeks to capture multiple qualitative viewpoints in one model and the resultant map emerges as a collaborative process of discussion and interaction, which can be helpful to identify connections. The participatory aspect is indeed essential to allow participants to compare their mental maps. Deliberating in a group can broaden everyone's thinking and, with this in mind, PSM emphasises the process of sharing and constructing knowledge collectively (Foxon et al., 2009).

As the entry data for the PSM is the views of participants and group discussions, the design of these maps is not intended to be fully objective or comprehensive but, rather, it is an intersubjective process. Once a map is constructed, PSM interrogates that map with network analysis, causal flow analysis and subjective information from stakeholders to develop focussed 'submaps' (i.e. subsections of the full map). Submaps can be used to turn the potentially overwhelming complexity of a large map into something more digestible and understandable or, simply, can be developed to answer specific questions. PSM might help deliver answers to a question but often its real value is in raising new questions. It can also help participants to see potential unintended or intended consequences embedded in the map.

Barbrook-Johnson (2019) provide step-by-step instructions to conducting a PSM workshop and preliminary analysis. Normally, the PSM workshop is conducted in person, using pen and paper, and post-it notes. To begin with, creating a PSM map requires the facilitator and the participants to decide on a system definition and boundaries for the system. Discussions on purpose and boundaries are also often started in earlier planning meetings with key users of the map. Once a system definition is chosen, participants pick an important, focal factor (or a small number of factors) within the system as a starting point. All the factors in the map need to be variables; that is, it needs to make sense to talk about them going up and/or down, and they need to be quantifiable or have data associated with them. Next, participants individually brainstorm factors that influence, or are influenced by, the focal factor(s).

Once the brainstormed factors have been consolidated, causal connections between them can be drawn in whatever order participants want. Each connection must be labelled either as a positive (i.e. factors go up together, or down together), negative (i.e. factors move inversely to each other), complex or uncertain causal relationship. As each connection is discussed and drawn, reflection is encouraged as this can help develop deeper insight into the system and lead to early structural analysis by asking questions of the map. Finally, it is useful to sense check the output and verify the emerging narratives. We have outlined briefly the stages involved in map development, but they can be adapted and changed in many ways to suit each process. Further details are available in the workshop guide (Barbrook-Johnson, 2019), while a detailed account of our PSM workshop can be found below. How sessions are recorded depends on their purpose, context and sensitivity. Some sessions can be audio recorded and transcripts used as additional data; in others it may be more appropriate to have a dedicated note-taker present to record the content of discussions. Either way, the recordings can be important sources of prompts for reflections and analysis.

Map digitisation and analysis

Once a PSM map is built in a workshop, it can be digitised, analysed and its presentation and visualisation can be refined for wider sharing. Digitising the map allows for better data management since factors can be rearranged and displayed in different ways, and sub-maps can be extracted. The digital map can be readily distributed to other stakeholders for editing and analysis as an iterative process, allowing for changes to arise and be traced. Digitisation normally follows one of two processes: (i) drawing the map in diagramming software using standard 'point-and-click' functionality; or (ii) a map can be coded into a node list and edge list, which are spreadsheet files containing a list of the factors and their attributes, and a list of connections and their attributes, which can then be read by network analysis software.

There are a range of software options for digitising and analysing PSM maps. First there are dozens, if not hundreds, of diagramming software tools that make it easy to draw aesthetically pleasing maps, but have limited analysis capability. We typically use the free program 'diagrams.net' as our core diagramming software. Second, there are a smaller number of network analysis software packages that are useful for conducting analysis and, sometimes, for additional algorithm-led visualisations. However, they tend to be more difficult to use than diagramming software. We use the free and open source Gephi, and/or the Python package 'Networkx' as our network analysis tools. The choice of software is normally driven by a mix of purpose, familiarity with tools and a preference between using expert judgement (and thus preferring software with drawing ease) or layout algorithms (and thus preferring software focussed more on analysis) to drive visualisation and analysis.

The analysis of PSM maps uses network analysis and causal flow analysis in combination with the subjective information stakeholders provide on the map and topic. Together, these factors are used to identify starting points to extract and explore submaps, and to generate insights, address questions and challenge thinking. Network analysis concepts such as degree (i.e. total number of connections that a node has), in-degree (i.e. the number of incoming connections), out-degree (i.e. the number of outgoing connections), betweenness centrality (i.e. a measure of the number of paths between other nodes that a node is on), and closeness centrality (i.e. a measure of how close a node is to other nodes) are used as key starting points to identify 'system-suggested' important factors, namely, those that are heavily influenced or influencing, or those that lie between or close to other factors. Using network analysis software to identify nodes with interesting combinations of these network statistics can help identity patterns not clear to the naked eye. Information from participants is also used to identify 'stakeholder-suggested' starting points for analysis, such as which factors are important outcomes, interventions, important to stakeholders, controllable by them or vulnerable to change.

Once we have a starting point (i.e. a factor or set of factors of interest), from the network analysis and/or participant information, we can extract the following submaps: (i) **Upstream analysis of a factor**: this visualises only the influences on a factor from one, two or three steps back 'upstream' (i.e. flowing *into* it), and removes all other factors and connections. This shows what most directly influences a given factor. Seeing what feeds into an outcome can show what risks or changes may influence that outcome; (ii) **Downstream analysis of a factor**: this traces all the factors causally 'downstream' of a factor (i.e. flowing *from* it) within one, two or three steps. This shows what factors an intervention or change will probably influence; (iii) **Ego networks**: ego networks show everything that is related to a factor within one, two or three steps (both incoming and outgoing connections), and highlights trade-offs or synergies present in the system; and (iv) **Paths between interventions and outcomes**: here, only the causal paths (i.e. following connections and their directions) between intervention factors and outcomes factors are visualised, with surrounding factors removed. This can be useful for narrowing in on key causal pathways related to an intervention; these types of submap often look more like a traditional theory of change map (Wilkinson et al., 2021).

In practice, combinations of these basic submap types and starting points are used in an iterative and creative process. Later, we outline a few examples of how we approached analysis in the Findings section.

Sustainability commitment in Barcelona

The case we use in this paper is the "Sustainability Commitment" programme implemented in the province of Barcelona by the local supra-government, Diputació de Barcelona (DIBA). The theory of change behind this intervention is that increasing self-efficacy and mastery through a social network of like-minded individuals is a likely mechanism to trigger pro-sustainability actions. DIBA subsidises training events and consultants to mentor SMEs, and encourages an inclusive culture of learning from each other and mutual encouragement as mechanisms to promote engagement. In addition, those SMEs that are more advanced in terms of their sustainability commitments are encouraged to apply for a sustainability certification issued by the Institute of Responsible Tourism. The Sustainability Commitment programme has been accessed by over 600 tourism SMEs that are each committing to set their own sustainability targets and improve their sustainability practices.

At the time of the research, DIBA was at the early stage of designing an evaluation method to assess the effectiveness of the programme, so our first level analysis intended to consider the policy context of the programme and draw possible lines of enquiry to understand what kind of evaluation was needed, what questions it should include and what areas needed to be prioritised. To begin this collaborative evaluation, the PSM workshop aimed to map the existing sustainable tourism policy system and investigate the relationships between its perceived focal factors. PSM was chosen for several reasons. First, it prompts stakeholder engagement and ownership. Second, the method is flexible and easy to use, yet it can capture a whole system with multiple components. Third, it allows the user to analyse the maps using network analysis and stakeholder information, without going into full quantification of the map or turning it into a dynamic simulation (though this is still possible, if wanted).

Workshops

With the assistance of DIBA, we organised two online PSM workshops in July 2020. Due to the COVID-19 pandemic, we hosted the workshops online, which presented advantages and disadvantages, as discussed later. Each four-hour workshop involved seven participants (destination managers, policy makers and one academic). Typically, a maximum of twelve participants is suggested for PSM workshops (Barbrook-Johnson, 2019; Barbrook-Johnson & Penn, 2021), however, we decided to reduce this, as we felt a smaller number was required to make an online workshop feasible. Although the participants worked together regularly, group dynamics could have been unpredictable so it was the facilitator's role to encourage dialogue and cooperation while managing potential conflicts. The participants were briefed via email that the purpose of the event was to examine the policy context from the point of view of the policy makers and destination managers, with a view to highlighting key factors and relationships in the system, and identifying what areas the evaluation might prioritise over others. The online platform 'Systems Mapper' was used as a digital canvas to build the map, which was analysed, using the Gephi software.

The two workshops were conducted in Spanish and the original map was produced in Spanish; only the final map was translated into English. In the first workshop, participants were asked to reflect on the objectives of the sustainability commitment programme, what main factors influenced, or were influenced by, them and how. We started with only one factor on the map, named 'sustainable practices of SMEs'. This was chosen by the workshop moderator because the policy aims to promote such practices. It was then explained what could constitute a factor, i.e., something that could increase or decrease. Participants seemed

to attribute lots of agency to specific stakeholders but they less so used to reflecting on the interconnection between actions and potential knock-on effects. Next, we asked participants to connect the factors, inviting them to explain, in turns, what kind of relationships they saw between the nodes, and why. In addition, the group was asked to select which factors could be controlled by them and which ones could be assigned to stakeholders they have relationships with. By the end of the first workshop, most of the factors were connected.

In the second workshop, other destination managers were introduced to the Systems Mapper platform and briefed on the output from the first workshop. Only one of the participants from the central office joined both sessions. Two separate workshops were run to enable involvement of as many regions as possible without incurring the difficulties of facilitating one big group. Once the factors were consolidated and connected, it became apparent that positive influences were the easiest to identify, so group members were prompted also to consider and add negative influences, i.e. how a factor may decrease others. Checking the map at this stage allowed the group to replace some direct links with indirect causal chains, revealing middle steps. Additionally, basic network analysis was conducted via group discussion to extrapolate some initial narratives of the most influential variables or processes, and the relationships between focal, controllable and external factors. The questions guide (Appendix A) for the workshops was created based on Barbrook-Johnson's (2019) instructions. At the end of the workshops, participants were also invited to give feedback in an informal group reflection on the overall process.

Findings

As the paper aims to showcase the method, we present four maps (produced with Gephi) as illustrative examples of what users can do with PSM and how to interpret the outputs. Fig. 1 helps users to see the underlying network structure, while Fig. 2 is an example output that we may obtain if we ask a certain question to the map. Based on network analysis, Fig. 3 illustrates an influential factor in the system with implications for areas to be evaluated. Lastly, based on stakeholder suggestion, Fig. 4 offers insights into multiple connections and useful considerations for strategic planning.

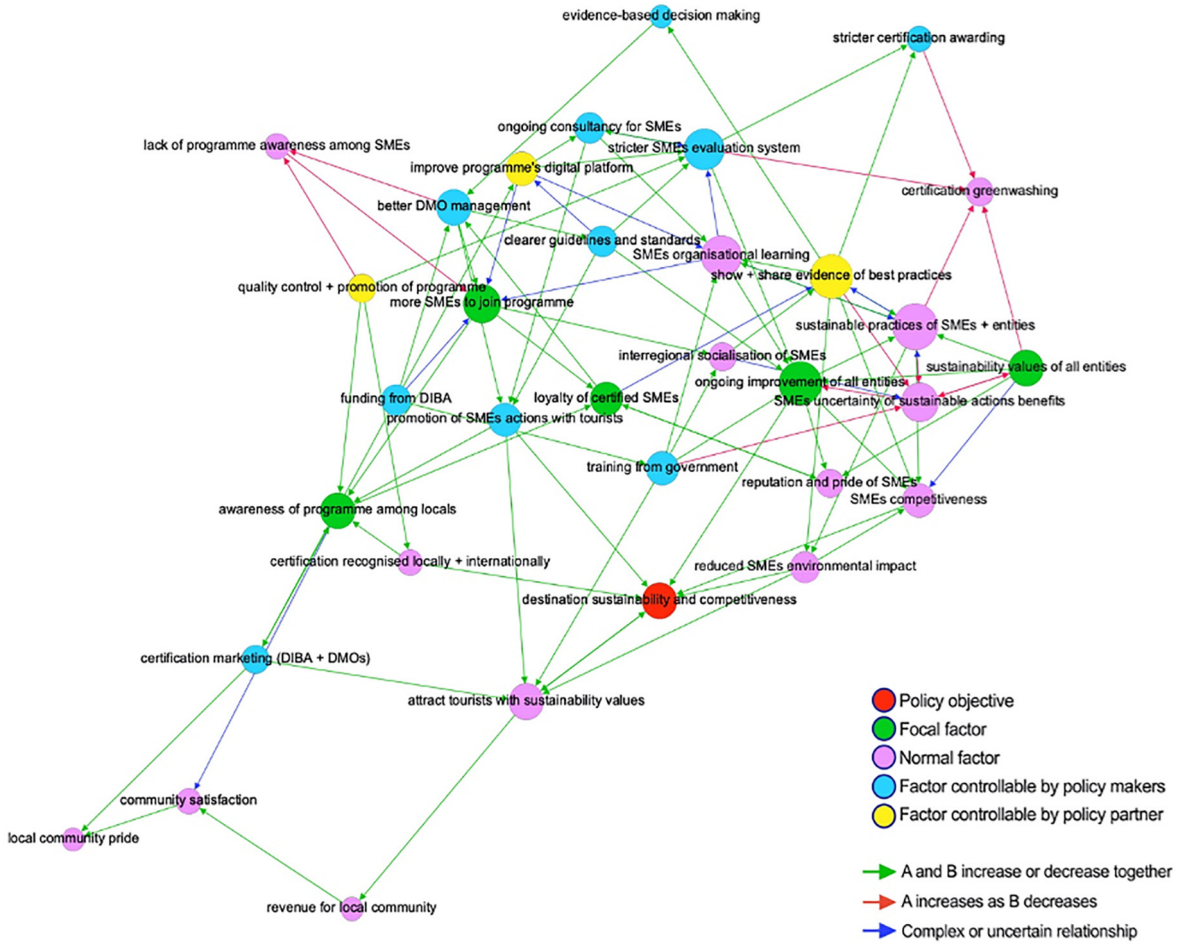

Fig. 1. Full map (force-directed layout).

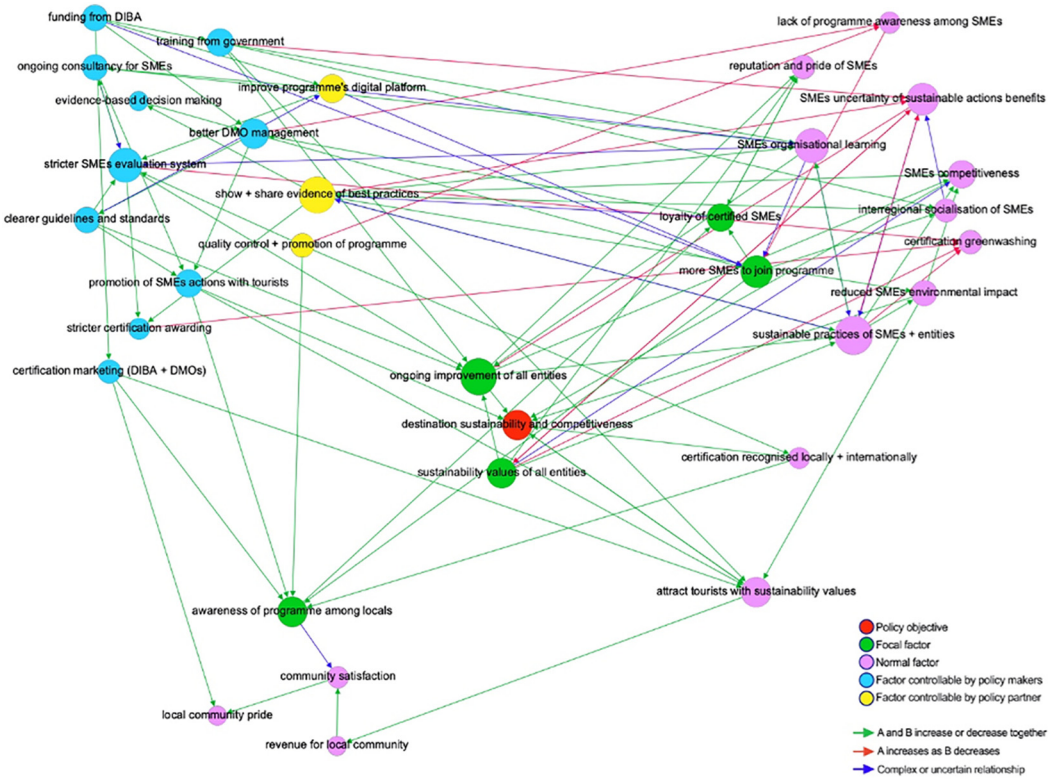

Fig. 2. Full map edited.

Reflecting on the full map

The system map was produced following the steps described in Methodology. Green nodes represent focal factors, i.e., the most important variables perceived by the participants, as opposed to less focal factors defined as 'normal'. Blue nodes are factors perceived within the policy makers' range of control, while yellow nodes are attributed to control by

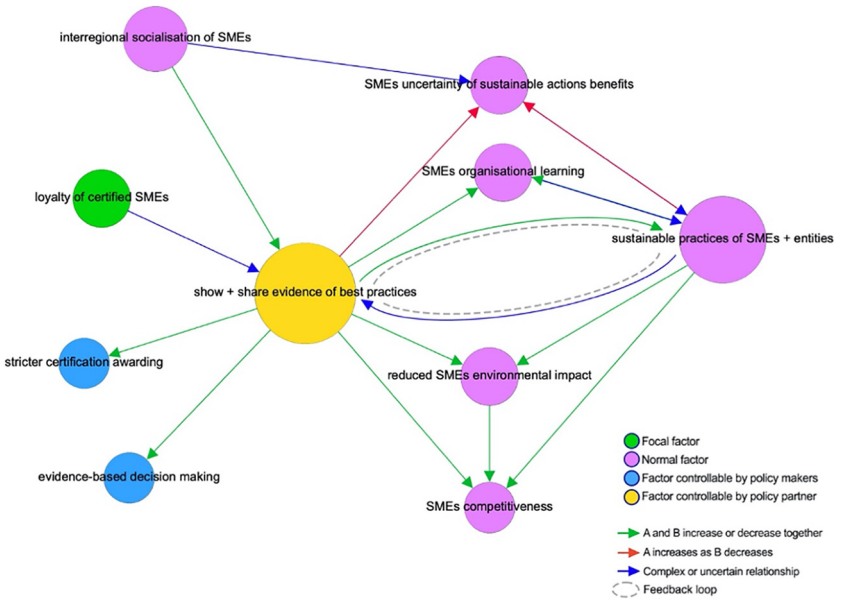

Fig. 3. One-step Ego network of 'Show and share evidence of best practices'.

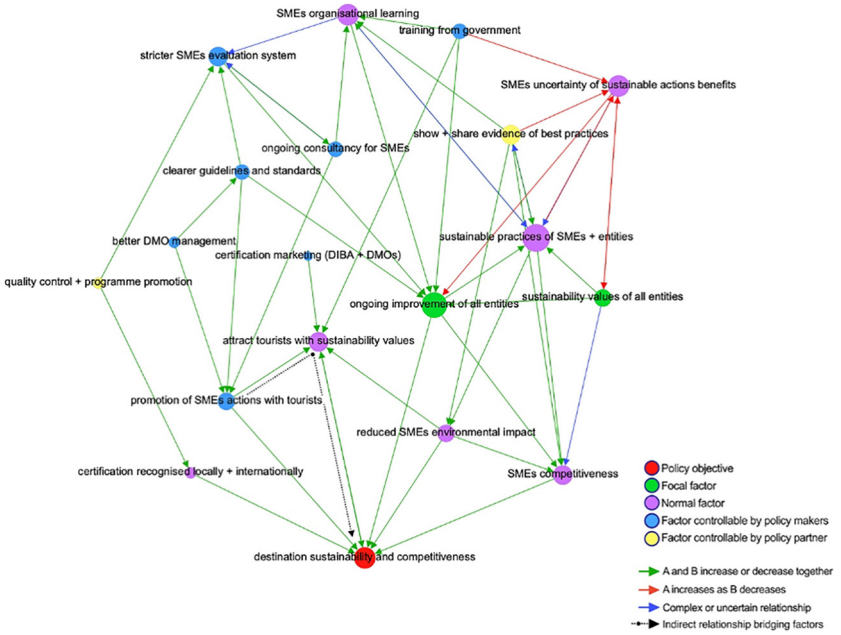

Fig. 4. Two-step upstream analysis of policy objective.

the policy partner. The policy objective, destination sustainability and competitiveness, is shown in red. Figs. 1 and 2, above, show two versions of the same full map, each with 33 factors and 94 connections but with different layouts. Fig. 1 uses a 'force-directed' algorithmic layout (nodes with connections are brought closer together while those not connected are pushed apart); this layout helps users to see the underlying network structure. The upper half of the map shows nodes closely connected to each other. It appears that focal factors (in green) are highly connected to multiple types of nodes and stakeholders, especially 'more SMEs to join the programme' and 'ongoing improvement of all entities'. A large number of incoming arrows suggests that change is complex because it is subject to multiple influences, synergies and trade-offs that have to be managed simultaneously in order for these factors to increase.

In Fig. 2, the nodes have been regrouped manually by types of factor and stakeholders affected by the policy, while the desired outcomes at destination level are in the middle of the map. Arrows have not changed but the rearrangement makes the map easier to interpret. The main groups are policy makers (and their partner Institute of Responsible Tourism) in the top left corner and SMEs in the top right corner. There are a number of actions aimed at reducing 'SMEs uncertainty of sustainable actions benefits' and 'certificate greenwashing'. This calls for more effective communication and marketing efforts, and they also raise questions around: (i) the SMEs' motivations for joining the sustainability certification programme, and (ii) areas of concern that policy makers need to mitigate. Bringing stakeholders together to discuss the processes within a system can develop their capacity for reflection, decision making and action. Usually, focusing on smaller sections at a time facilitates the reading and understanding of multiple parts of the system. From the full map we extracted two submaps to offer an example, first, of *system-suggested network analysis* starting from a factor that is structurally important and, second, of *stakeholder-suggested network analysis* starting from a factor selected by the participants.

System-suggested network analysis

As previously stated, 'system-suggested' analysis uses network analysis to identify potentially interesting submaps to extract. Fig. 3 shows the ego network of the node with the highest number of outgoing links in the system; all incoming and outgoing connections that are one step away from the factor are shown. This submap demonstrates that 'show and share evidence of best practices' is potentially one of the most influential factors in the network. This node also has high betweenness centrality, meaning it can act as a 'causal bridge' between many parts of the system.

Even a small map centred on one node can show complexity in the chain of cause and effect relationships. For instance, we can see that sharing best practices will probably increase their uptake by other SMEs (a green arrow), but the existence of 'sustainable practices of SMEs' does not necessarily lead to an increase in the sharing of their evidence (noted by a blue arrow). As there is a direct feedback loop between these two factors, one could ask, how may we turn this into a positive feedback loop?

In part, increasing the sharing of best practices is part of the theory of change for the commitment programme, which aims to gather data on the actions taken and spread this knowledge across the system. At the same time, experiencing the benefits of

learning best practice from peers might inspire SMEs to share more of their own actions or initiate change. However, organisational learning does not automatically imply that SMEs will change practices (a blue arrow), due to lack of time, finances or commitment. Therefore, the path from knowledge acquisition to application needs to be further explored.

Keeping in mind that the policy objective is destination sustainability and competitiveness (shown previously in full map), Fig. 3 shows that many of the factors present in the ego network act as potential synergies towards that, both on a policy-making level (evidence-based decision making, stricter certification awarding and loyalty of certified SMEs) and at an organisational level (SMEs' organisational learning, competitiveness, sustainable practices and reduced environmental impacts). Interestingly, SME practices and organisational learning are affected both by formal and informal connections. Facilitating interregional socialisation among businesses is considered useful towards spreading best practices, which in turn increases learning capacity. SMEs may use peer knowledge as a source of innovation to enhance their performance, as well as to steer corporate change and proactivity towards long term sustainability attitudes (Lozano, 2009). Sharing best practices through peer-to-peer socialisation of learning could be effective because trust can strengthen long-term relationships. Thus, these are likely key themes in the future evaluation.

During the workshops several participants indicated that 'SMEs uncertainty of sustainable actions benefits' is one of the bottlenecks stopping many businesses from signing up. Looking at Fig. 3, this node seems to be a key step as it takes in the influences of 'interregional socialisation' and 'show and share best practice', and is one of only three links into 'sustainable practices'. To turn this uncertainty from a potential vulnerability in the system into a positive drive, interregional socialisation could be used to strengthen group belonging and encourage SMEs to learn from each other. Strengthening social bonds between stakeholders could create positive feedback loops between 'organisational learning' and 'ongoing improvement of all entities', and between 'improvement of all entities' and 'sustainability values'.

Stakeholder suggested network analysis

Now we illustrate an example of a submap generated through a two-step upstream analysis (i.e. all the things that are within two causal steps going *into* a factor) of a node chosen by the stakeholders. Fig. 4 shows the upstream analysis of what the participants identified as the key objective of the programme, 'destination sustainability and competitiveness'. It highlights what factors and connections feed into it at the bottom of the figure.

This is quite a large submap representing over a third of the full map, which makes clear how many things are causally close to this key outcome. Going one step up from the objective (destination sustainability and competitiveness), we can trace the six factors that are perceived as the most proximate influential factors. Here, we can cross reference the submap with what stakeholders said about who has influence over certain factors. Apart from 'promotion of SMEs' actions with tourists', all the factors closest to destination sustainability and competitiveness were perceived to be outside the central government's control. Importantly, key intermediate relationships can emerge from submaps. While there is a direct link from 'promotion of SMEs' actions with tourists' to the objective of 'destination sustainability and competitiveness', there is also an indirect link that goes from 'promotion of SMEs actions with tourists' via 'attract tourists with sustainability values' to the objective. This is worth considering because without such a middle step the destination may be environmentally sustainable but not economically sustainable. Looking one step further up, the size and interconnectedness of the submap suggests that a wide range of conditions may need to be satisfied before destination sustainability and competitiveness can be achieved. This is a reflection of the complexity and challenge of creating a culture of sustainability at a systemic level rather than at an operations or local level.

Discussion

Although the application of complexity theory and methodology in tourism remains limited to date (Crabolu, 2021; Stevenson et al., 2009; Zahra & Ryan, 2007), it lends itself well to tourism policy as this field exhibits many of the hallmarks of complex systems. For example, tourism involves a large number of people and organisations that interact and negotiate with each other, within rules and conventions that shape relationships, opportunities and constraints, and it reinforces the importance of social capital (Soulard et al., 2018), manifested through trust, leadership and engagement, to promote sustainable tourism (Moscardo et al., 2017). Tools like PSM allow researchers and participants to dive into complexity in a practical and accessible way, rather than avoiding it. Understanding the patterns and complexities emerging from the connections and interactions between factors can increase and deepen our understanding of the relationships between different areas of the tourism system (Farrell & Twining-Ward, 2004).

To explain this point in more detail, the identification of five focal factors (shown in green) resulted directly from a series of normal factors outside the control of the programme (shown in pink), but they were equally influenced by a series of factors controllable by the policy makers (yellow and blue), which could be leveraged more easily to achieve the programme's overall objective. The networked approach also showed the potential channels through which change could be initiated. For instance, attempts to pump prime 'ongoing improvements by all entities' could be achieved through a variety of policy mechanisms, such as marketing directly to consumers or peer recognition, but it could also be influenced by the provision of clearer guidelines and a stricter evaluation system.

The interconnectedness of the network reveals implications for governance. First, governments cannot manage the complex system of tourism on their own, which confirms the need for public sector policy to shift from centralised control towards collaborative policy development (Bramwell, 2011; Dredge & Jamal, 2015). Second, when multiple stakeholders come together it is

necessary to balance potential conflicts of interest (Guo et al., 2019), so the public sector should continue to play a key role in shaping strategic direction and sustainability innovation within the fragmented industry of tourism. Third, this proposed model of governance and policy implementation, with more shared power and shared responsibility, may help sustainable tourism to progress beyond formal policy making processes (Koens et al., 2021) into the realm of operational implementation, while at the same time, strengthening connections and collaborations between the public and private sectors. Of course, this would require sustained commitment from both sides and ongoing public relations campaigns to raise awareness of the common objectives.

Our study showcased a new methodology to aid the process of making sense of a policy. We investigated tourism policy making from the perspectives of the people involved in the process to deepen understanding about its relational and contextual aspects. With the policy evaluation process in mind, we used PSM at a scoping stage, not to fully evaluate the policy but to understand the policy context and draw possible lines of enquiry to highlight what the evaluation should include. Creating a visual map of the system perceived by the stakeholders can aid participatory evaluation by making mental models and relationships more explicit (Barbrook-Johnson & Penn, 2021; Moon et al., 2019); thus, helping stakeholders to find paths conducive to the adoption of sustainable practices, as well as to address obstacles in the system. This can also help policy makers foresee what knock-on effects one intervention may have on the rest of the system, or set the grounds for iterative learning loops (Crabolu, 2021; Tourais & Videira, 2021).

Researchers and participants can use the system map as a visual tool to reflect on whether certain factors are directly connected or if middle steps need to be made explicit. Even though each map generated by a group is subjective to that group and not an objective truth (Barbrook-Johnson & Penn, 2021), they are effective at creating a shared understanding, which is essential to minimise potential conflicts of interest (Guo et al., 2019). This is particularly relevant to fields like sustainable tourism, where strategic interventions require stakeholder collaboration and consensus (Dredge & Jamal, 2015; Font et al., 2021).

In this study, discussions around 'clearer guidelines' and 'stricter evaluation' generated consensus in the group as everyone acknowledged them as important steps towards the policy evaluation design. Both the ego-network analysis of 'show and share evidence of best practices' and the upstream analysis of 'destination sustainability and competitiveness' indicated that informal, social connections play an important role in the system. The ego-network submap highlighted how multiple factors that might seem disconnected in separate conversations actually contribute simultaneously towards destination sustainability and competitiveness. The upstream submap emphasised the need to go beyond operational changes, as a mindset of sustainability values precedes the unfolding of sustainable practices. Complex relationships affect the delivery of interventions and the latter cannot ignore social norms, values and incentives. This understanding is an opportunity, or lever, for effective intervention. Shedding light on social dynamics and values can increase the impact of interventions (Holtz et al., 2015). Peer-to-peer learning can be a powerful mechanism to facilitate the adoption of green values and practices so that guidance does not need to come only from the higher levels (Garay et al., 2017). Policy makers may want to investigate how the transition from knowledge acquisition to behavioural change happens, and how social interactions and norms can be leveraged to create positive, reinforcing feedback loops. These are examples of new, valuable questions that methods like PSM can help to raise.

Considering the importance of stakeholder involvement in achieving sustainability (Bertella et al., 2021), we posit that PSM facilitates a collaborative mindset, by deepening discussions around sustainability learning and creating a common language for shared understanding (Holtz et al., 2015). By gaining more nuanced accounts of complex realities through participatory methods (Aminpour et al., 2021), stakeholders come to share, explain, exchange and learn about each other's challenges, priorities and values. Thus, crucial elements for sustainability, such as collaboration, change, and empowerment (Bertella et al., 2021) might be emphasised through the process, supporting the co-creation of effective research and evaluation (Fotino et al., 2018), while potentially encouraging subsequent actions and contributing to successful destination design (Koens et al., 2021). As co-creation and cooperation are based on trust and strong relationships (Phi & Dredge, 2019), policy designers may want to focus on building collaboration and social capital (Guo et al., 2019; Soulard et al., 2018) at destination level. Innovative, reflexive governance with an emphasis on co-creation and co-evaluation can support systematic adoption of sustainability practices through experiments, learning and adaptation (Rotmans & Loorbach, 2008).

The PSM approach draws attention towards the importance of interactions and communications between people as policy is developed and enacted, and is designed to encompass complexity, multiple perspectives, contradictions and change (Font et al., 2021). This approach can be an entry point for a shift towards more complexity-appropriate analysis and system management, by means of making complexity explicit, and providing space for new thinking (Sanderson, 2000; Shaw, 2002). Participants mentioned that thinking about causal thinking in a detailed and explicit way was new to them. Although it was challenging to identify interactions and causal relations between factors, they found the process useful to understand potential systemic changes and influences. This offered them a new lens to read and analyse the policy system. As actors in an adaptive system, they can learn and evolve not only in response to the environment, but also by actively improving interventions to achieve sustainability. In addition, group discussions allow participants to give and receive feedback, building on each other's ideas, which is not possible with individual interviews or quantitative methods (Arnkil et al., 2002; Potter, 2004).

Drawing on a causal map that captures the wider societal features that shape the environment, policy makers and analysts have a better chance of meaningfully evaluating the potential effectiveness of current and future interventions. By teasing out lines of enquiry and establishing what aspects shall be prioritised over others, the formulation of mid-range theories can help researchers and policy makers clarify what a policy evaluation should include. The positive feedback received from the participants indicates that this methodology can be helpful in structuring and understanding the tourism policy system, as well as potential evaluation foci (Farsari et al., 2011; Koutra, 2010). We have shown how to use PSM at an evaluation planning stage; however, it can be used also for mid-term evaluation or post intervention, adapting the activities and enquiry focus accordingly

(Barbrook-Johnson & Penn, 2021). There are other modes and potential purposes of using PSM, for example to involve other stakeholders and bring added knowledge to the evaluation, or to directly inform a theory of change (as in Wilkinson et al., 2021). Other types of mapping will be appropriate in different contexts; for example, where feedback is critical, we may want to use causal loops diagramming as in Tourais and Videira (2021).

As briefly mentioned before, hosting the workshops online presented both challenges and benefits, as also observed by Crabolu (2021) in the consultation of sustainable tourism measurement methods. On one hand, the lack of physical proximity may have affected the interaction between researcher and participants (and between participants themselves). Different types of communication, such as visual cues, auditory modulation and kinaesthetic awareness might change others' interpretations of meaning when filtered through screens. In live workshops, passive time, like coffee breaks, can be used to gather extra information, while the online format removes that opportunity. Advantages of virtual workshops include obvious things like the possibility to connect from any location, with reduced time and travel costs, but it also brings some benefits to the map building process.

Drawing the map directly onto a digital canvas has functional advantages; compared to working with paper, pens and post-its, it is easier to reorganise factors and connections in the map at any point, and to relabel them. Online workshops can be supported by communication tools, such as chats and shared documents, which can be used to record suggestions, questions and reflections more readily than in-person settings. As such, online workshops may be better at recognising and discussing differences between stakeholders instead of seeking consensus among all of them, as 'agreement' between participants in live workshops is often the result of silencing those stakeholders with less power (Arnkil et al., 2002). Thus, virtual workshops may be better at balancing conflicts of interest (Guo et al., 2019; Phi & Dredge, 2019).

Rapport building is crucial for online activities, where attention span, body language and social cues may be more limited than in person. Using the participants' native language in groups discussions puts them at ease and if participants already each this can also help discussions to flow quite easily, despite occasional interruptions due to the remote office/home environment. However, it is hard to determine to what extent this may affect engagement levels. Individual brainstorming exercises where participants contribute information anonymously may allow shy participants to share views without being put 'in the spotlight' (arguably difficult to avoid in a live setting); this can mitigate potential power dynamics. On a practical level, facilitators may find it easier to justify strong moderation of the workshop because of the difficulties in online group discussion.

Logistical caveats such as digital communication platforms and a shared, digital canvas had to be carefully addressed. However, hosting the workshop hands-free came with the advantage of accessing files on the computer as well as taking notes without distracting people (Crabolu, 2021). It would also be easy for researchers to record online interviews, which provides a perfect record of the discussions. Despite having articulated various advantages, the methodology is not free from limitations. With more time, it would have been useful to have a third workshop with all the participants for sense checking and validation. Showing the output to other stakeholder groups such as residents might also have been useful to gather further inputs.

Conclusions

This study makes a methodological contribution to the research and evaluation of sustainable tourism interventions by applying complexity theory and methods in a participatory manner. Building on the need to reconceptualise tourism advanced by Farrell and Twining-Ward (2004), we propose PSM as a novel methodology to analyse complex systems such as sustainable tourism policy with stakeholders. We argue that this allows researchers to apply in practice, not only conceptualise, a complexity-appropriate approach to study, and to conduct, tourism policy evaluations. A range of system mapping methods (e.g. Tourais & Videira, 2021) can be useful to inform the creation of causal models that take into account multiple factors, stakeholder relationships and non-linear, emergent behaviours resulting from interactions happening in the system. Such models can contribute to richer intervention theory because they accept and represent the complexity of real-life contexts (Wilkinson et al., 2021). This paper also contributes to the limited literature on tourism policy evaluation (Font et al., 2021) as well as tourism research using participatory methods (Crabolu, 2021).

We have applied PSM to tourism policy evaluation and, in doing so, have demonstrated the flexibility of the method and the potential it holds for remote, synchronous collaboration, which brings particular value to geographically dispersed research fields like tourism. Workshops can be conducted at regional, national or wider level, in line with the topic explored at different stages of a policy evaluation and the stakeholders involved. Current findings suggest that sharing best practices and peer-to-peer learning are key areas of enquiry. Group discussions with a focus on meaning, shared views and contextual data can be integrated with in-depth interviews to gain insight on the heterogeneity of different regions. So, this tool can be used to promote inclusivity and empower stakeholders. These dialogues serve not only as data collection but also as hypothesis testing and real time intervention, so that the researcher and the stakeholders remain simultaneously engaged in a process of self-evaluation. We have presented advantages and challenges of online PSM and offered reflections on rapport building when working virtually. Thus, the study also makes a contribution to the nascent literature on adapting system mapping, and other participatory methods for online use.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Questions guide for PSM

Workshop 1

1. 1.What is/are the most important factor(s) that characterise the Sustainability Commitment and why? For example, the intervention aims to promote 'sustainable practices of small and medium-sized enterprises', so it is on the map. Do you agree? Are there intervention goals that you can identify?
2. What factors impact the focal factors or are strongly impacted by them?

These can be from different domains e.g. technical, social, economic, political, ecological etc. They can be quantifiable, e.g. prices, or qualitative e.g. social attitudes. All factors should be able to increase or decrease.

3. Are there factors that are repeated or overlapping? What might be redundant or might be grouped together? Remember this model focuses on the most important factors, as it is impossible to include absolutely everything. You can take turns in editing factors and discuss with the group to reach a common understanding to consolidate factors.
4. How do these factors influence each other? Starting from the focal factor(s), which ones directly influence it either positively (green) or negatively (red)? Or are there complex/unsure connections (blue)?

When you finish or if you feel stuck, move to a new factor and repeat the process. What connections go to or from this factor? Make sure you cover all factors. Some participants may disagree about the presence or nature of particular links, so please discuss the rationale for each link.

Workshop 2

5. What do you think about the current map? Are there important factors that may have been left out and you think should be added? If so, please also discuss how they are connected to the rest of the map.
6. Which factors do you think DIBA and DMOs have control over? Which ones are controllable by your partner (the Institute of Responsible Tourism)?
7. Can you go over all the factors again and check if there are important connections missing? It is usually easier to think of positive relationships (factor X and Y increase together). Can you think of how XYZ might increase if other factors decrease?
8. Analysing the map, what relationships seem interesting to you? How are goals, focal factors, controllable factors and external factors interacting with each other? What might this imply?
9. Reflecting on the whole map once again, can you validate the factors and relationships that emerged? is there anything you would like to change (how and why)? Is there any alternative connection or scenario you would like to discuss?

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