



Local Environment

The International Journal of Justice and Sustainability

ISSN: (Print) (Online) Journal homepage: <https://www.tandfonline.com/loi/cloe20>

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To cite this article: Evan Boyle, Brian Ó Gallachóir & Gerard Mullally (2021): Participatory network mapping of an emergent social network for a regional transition to a low-carbon and just society on the Dingle Peninsula, Local Environment, DOI: [10.1080/13549839.2021.1936472](https://doi.org/10.1080/13549839.2021.1936472)

To link to this article: <https://doi.org/10.1080/13549839.2021.1936472>



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Participatory network mapping of an emergent social network for a regional transition to a low-carbon and just society on the Dingle Peninsula

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ABSTRACT

The paper develops a methodological approach that acts as a tool for active change agents working in community and just transition contexts to increase their capacity to engage a wider public in planning. An innovative contribution is made to the literature through the development of a participatory action research (PAR) based approach to social network analysis using a participatory mapping method with relation to sustainable transitions. The method comprises a participatory network mapping approach, adapted from the Net-Map toolkit, which is applied to a multi-stakeholder approach to realising a regional sustainability transition in the Republic of Ireland. *Dingle Peninsula 2030* is an initiative aiming to transition a geographic region in the South West of Ireland to a low-carbon society by 2030 across the sectors of energy, agriculture, transport, education, employment, marine and tourism. Due to the scope of the overall project, a diverse range of stakeholders are involved. The method developed is used to undertake a qualitative collaborative social network analysis. The paper focuses on method, by analysing and reflecting upon the use of this participatory approach, in the initial stages of the overall project, in addressing complex sustainability and just transition challenges as they are revealed through a multi-stakeholder approach. Within this, the themes of participatory justice, social learning and visualising complexity are explored; and benefits and future improvements are outlined through reflections from both the researcher and the participant community.

ARTICLE HISTORY



Received 29 July 2020
Accepted 11 May 2021

KEYWORDS


Participatory network mapping; method; social network analysis; transitions management; participatory action research

1. Introduction

This article positions itself as a contribution to the emerging field dedicated to action research on sustainable transitions (Wittmayer and Schöpke 2014; Wittmayer et al. 2014) through highlighting the use of a participatory mapping exercise for social network analysis of a collaborative transition project in the Republic of Ireland. Social network analysis “seeks to understand networks and their participants and has two main focuses: the actors and the relationships between them in a specific social context” (Serrat 2017, 39). It has been suggested as proving insightful when applied to a

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This article has been republished with minor changes. These changes do not impact the academic content of the article.

 Supplemental data for this article can be accessed <https://doi.org/10.1080/13549839.2021.1936472>.

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sustainability transitions context (Schaffrin, Nietgen, and Schrempf 2018). Despite this, there are limited examples of quantitative social network analysis found within the sustainability transitions literature (Hansmeier, Schiller, and Rogge 2021). On from this, there are no known examples of qualitative social network analysis found, even though innovation trajectories, such as those relating to sustainable innovations, are influenced by “the depth and breadth of social networks” (Köhler et al. 2019, 4). As more top-down approaches have to date proved inadequate in bringing about change (Eyre 2012), empirical case studies of bottom-up participatory processes with relation to project planning can help to inform understandings of how to effectively implement transitions at policy level, with a participatory approach to mapping for social network analysis developed and deployed in this context.

Dingle Peninsula 2030 is a multi-stakeholder regional transition project seeking to decarbonise the Dingle Peninsula in the South-West of Ireland (Boyle et al., 2021). The project is facilitated through a “collaborative committee”, consisting of community, industry, and research partners. A participatory action research (PAR) approach has been taken here to the analysis of the social network emerging around this multi-stakeholder project, using a participatory mapping method, adapted from the Net-Map toolkit (Schiffer and Hauck 2010). The toolkit was developed (Schiffer and Waale 2008) for use in development contexts to assist in clarifying different stakeholder views in the development and implementation of projects, leading to increased social learning between participants with different areas of expertise and interest. Examples can be found in relation to water management, environmental governance, and agriculture (Bell et al. 2013; Hauck et al. 2015; Ngigi et al. 2011). The Net-Map process takes place in a focus group, workshop setting, whereby a range of participants work together to map out the social network around the project they are collaborating on. A mapping exercise has been completed with key community (or bottom-up) representatives working on the project. At the early stage of the project, an initial mapping exercise has been completed with key community (or bottom-up) representatives working on the project. Through mapping the emergent network around a sustainable transition project, including organisations, linkages and goals of participants, the research presented here aligns with the process of social network analysis whereby a focus is given to outlining actors and the relationships between them within a particular social context (Serrat 2017, 39), and the principles of PAR whereby participants and researchers seek to improve upon the practices in which they participate (Baum, MacDougall, and Smith 2006) in this case with relation to the achievement of goals established with relation to a regional sustainability transition. This paper outlines the application of this participatory mapping method as a means through which to undertake social network analysis in a participatory action research manner. (Figure 1).

2. Participatory action research & social network analysis

The UN Conference on Environment and Development, in Rio (1992), outlined the importance of participation of all concerned citizens at the relevant level with relation to environmental issues. Citizen participation and engagement in climate actions were included as an explicit goal within Principle 10 of the convention. More recently, the Intergovernmental Panel on Climate Change (IPCC) Special Report outlined the importance of public participation in climate change to enhance the capacity of dealing with the challenges faced (IPCC). In the Irish context, the need for community engagement has been recognised, both within academia (Watson et al. 2020) and policy, through the Climate Action Plan (DCCAE 2019) whereby citizen engagement was outlined as a core consideration with relation to building engagement, capacity and enabling local action.

Community engagement centres on the involvement of community members in policy and project planning, delivery, or evaluation processes (Bice, Neely, and Einfeld 2019). The implementation of such an approach conflicts with established institutional structures which create divisions between lay citizens and policymakers or scientific experts. Citizen engagement, of which community engagement is a form, has been suggested as a means through which to expedite and scale up the ambition of the technological, social, political and economic changes required with relation to



Figure 1. The Dingle Peninsula highlighted in red on map of Ireland.

climate change mitigation and adaptation through expanding participation beyond the status quo (Kythreotis et al. 2019).

Participatory Action Research (PAR) is one of many approaches that can build community engagement within research practice through a process of participation. It seeks to “understand and improve the world by changing it” with a “self-reflective inquiry that researchers and participants undertake, so they can understand and improve upon the practices in which they participate and the situations in which they find themselves” (Baum, MacDougall, and Smith 2006, 854). While much confusion exists within the literature (Chevalier and Buckles 2019, 12), with distinctions increasingly blurred, an understanding of the self-reflective nature of PAR for both researchers and participants is important within the context of this research. PAR is aligned with a social learning approach. Social Learning theory states that learning occurs through the interaction between different actors. New knowledge, practises and perspectives are established through dialogue between actors with different viewpoints, coming together around a common problem (Bandura and Walters 1963). It can be defined as “an interactive and dynamic process in a multi-actor setting where knowledge is exchanged and where actors learn by interaction and co-create new knowledge in on-going interaction” (Sol, Beers, and Wals 2013, 37), and has been illustrated as playing an important role in process-orientated approaches to sustainability transitions (Wittmayer and Schöpke 2014).

PAR is defined by the importance of continuous interactive cycles of research and action (McNiff 2013). Within this, the co-evolving nature of PAR, through interaction between participants and researchers, underscores the need for a flexible approach (Badham and Sense 2006). Central to a PAR approach is the need for an action group to be established which consists of participants and researchers, collectively determining objectives, questions and methodologies (Campos et al. 2016).

The collaborative committee, as part of *Dingle Peninsula 2030*, acts as this action group (Boyle et al. 2021). In the initial phase of the formation of the group, before formalisation, a general

feeling emerged about the need for an intervention that brought together different organisations to discuss individual goals within the broader vision of the project, at the grassroots level. The participatory network mapping exercise was designed, in part, due to this consideration. In the case of the *Dingle Peninsula 2030* project, aligning with previous discussions on the “messiness” of action research (Ackoff 1999), uncertainty is ubiquitous, with the research looking to investigate a complex multi-dimensional process in-action, rather than retrospectively. This offers an opportunity for the research project to have a positive effect, both in real-time and for future initiatives of a similar nature. By bringing together key community representatives for a mapping exercise, the goals of the different actors become clear. Alongside this, synergies or conflicts surrounding goals, actors, and the wider stakeholder network can be brought to the fore.

The innovative use of what has been deemed here as simply “participatory network mapping”, seeks to combine geographical (Brown and Eckold 2019; Brown and Kyttä 2018) and sociological (Emmel 2008) approaches to mapping. In the geographical literature mapping has been used for issues concerning sustainability (Fahy and Cinnéide 2009), often with relation to communities (Di Gessa, Poole, and Bending 2008). Within sociology, mapping is used for social network analysis sometimes with relation to ego networks (Edwards 2010). Ego networks are networks as they appear to specific individuals, in this case, collaborators in the mapping process. Ego networks have the benefit of simplicity with relation to data collection, but place limitations on tools for analysis (Everett and Borgatti 2005). Ego betweenness refers to the “location of a node along indirect relationships linking other nodes” (Marsden 2002, 410), and can provide insight into actors positions amongst other nodes (Borgatti and Li 2009). The contribution of this paper is therefore to outline the use (and usability) of a participatory network mapping exercise, combining geographical and sociological mapping approaches, as a PAR method for investigating a multi-stakeholder approach to sustainable and just transitions.

3. Methods

The Net-Map process can be used to outline the social network around which several participants are collaborating on. For examples of the Net-Map process administered through a range of interviews (see: Schröter et al. 2018a). In the initial stage of the focus group the facilitator needs to explain to the collaborators the purpose of Net-Map, i.e. it “helps explore those relationships that shape and affect the issue at stake but are not necessarily reflected in formal hierarchies or otherwise easily visible” (Schiffer and Hauck 2010, 236). The approach is aligned with the principles of PAR by working in real-time with a group of actors, coming together to discuss an issue at hand or a project on which they can collaborate to outline potential synergies and/or conflicts around different goals and stakeholder links between goals. The process works as follows:

Net-Map uses figurines to represent different actors involved in a given activity. Lines connecting these actors are then drawn, using different colours to represent the various types of linkage existing between them, such as funding sources or hierarchy. After identifying who is involved and how they are linked, the next step is to determine how the various actors can influence the activity in question. To visualise who holds the greatest or least influence, the figurines are placed on ‘influence towers’ – the stronger the influence, the higher the tower. Finally, users map the goals of each actor, so that all the objectives, complementary or competing, become clear to the group. (Schiffer and Hauck 2010, 104)

A representation of the adapted process is shown in Figure 2. The process has been designed to be engaging and hands-on to gain insights from all the actors involved. For further outlines of the Net-Map method applied to different circumstances see Ilukor et al. (2015, 4–5) and Schröter et al. (2018, 4). An adapted version of the Net-Map process, defined here simply as participatory network mapping, has been used to apply greater suitability to the context in question. The use of influence towers has been withdrawn from the process due to the potential power conflicts which may emerge when discussing the relationship between top-down and bottom-up actors. Although an important issue, this is not related to the purpose of this mapping exercise. The



Figure 2. Picture of participatory network mapping exercise adapted from Net-Map toolkit.

potential to create conflicts through undertaking the approach in a workshop setting must be acknowledged (Schröter et al. 2018a). In addition to the established net-map approach, within the mapping exercise participants were asked to classify different support types needed to achieve their goals. Each support type was colour coded and used in the mapping process (see: Table 3). Open group discussion occurred following the mapping exercise to facilitate potential social learning by drawing out key challenges faced. The net-map approach to participatory network mapping fits within a PAR approach because it aims to interact with an active project to facilitate the visualisation of the network in which key stakeholders interact, with relation to the goals they wish to achieve, which can be revisited for project planning and management.

The data gathered was loaded into a visualisation software, Visualyzer, to create a computer-generated map such as the one shown in Figure 4. The benefits for participants within the research process have been outlined, in keeping with the principles of PAR outlined previously, as follows:

- Understanding complex policy networks
- Determining who can serve as a broker
- Capitalising on the diversity of viewpoints
- Integrating network thinking into project planning and implementation
- Using networks strategically to achieve personal success

(Schiffer and Peakes 2009, 104)

While the positives are clear, the limitations must also be acknowledged. The participants are unlikely to be representative of the overall stakeholder community (Glaser et al. 2018). To combat this limitation further research may be required to get a deeper understanding of the stakeholder community. In the initial stage of this research project, all potential stakeholders on the peninsula with the capability of partaking in *Dingle Peninsula 2030* were outlined. Following this, preliminary interviews with ten stakeholder representatives occurred to assess who would serve as potential participants. Regular attendance of events in the area for 12 months served to guide the selection of key stakeholders. This process was critical, preliminary work; “you need to be confident that the informants you speak with are ones who have a good understanding of the network in question and can offer an accurate picture of the members of this network” (Prell 2012, 66). As noted, all relevant stakeholders should be outlined and analysed from the initial stages of a project and clear objectives for the process need to be agreed upon at an early stage (Reed 2008). From the preliminary work,

four organisations (and representatives within) emerged as key actors to date and invited to take part in the process. A limitation of this investigation must be recognised within this. From the perspective of planning, the involvement of community organisations in participatory processes has been sought. However, due to the emergent nature of the Dingle Peninsula 2030 project, whereby there were not many organisations actively involved at the time of investigation, the number of community organisations suitable for participation was limited despite the wide range of associated (or potentially associated) organisations at the early stage. Alongside this, awareness must be given to levels of involvement, with some being more active than others. The groups selected are shown in [Table 1](#):

Another limitation is that goals or stakeholders may sometimes be grouped. Participants should be encouraged to diversify between different goals and stakeholders to the greatest extent possible to get a holistic representation of the network. As an elaborate data collection tool, the process requires a lot of time for completion, this again should not be taken lightly when setting out to use a participatory network mapping approach. The need for ethical issues to be taken into serious consideration, particularly surrounding sharing the identity of participants in the process with the wider stakeholder network, is a self-evident issue. Within a PAR approach it is not possible to outline all potential ethical considerations, due to the unfolding and emergent nature it entails. There are however some ethical principles that can be followed surrounding the quality of relationships (Coghlan and Shani 2005), confidentiality and anonymity (Williamson and Prosser 2002), and balancing conflict (Walker and Haslett 2002).

Lievrouw et al. (1987) outlined how social networks are always combined, never existing in isolation, going on to suggest that to complement this the methods used to investigate them should too be mixed (Edwards 2010, 25). The use of ten preliminary interviews, participatory network mapping, and focus group style discussion following the mapping achieved this mix. For validity, all participants received a copy of the completed visual map after the workshop to feedback any errors or oversights which may have occurred. An outline of the adopted participatory network mapping process used in this study is included ([Figure 3](#)).

4. Results

Following the workshop, the data gathered was collated into a visualisation using the VisualLyzer software. Here the qualitative insights taken from the participatory workshop setting are structured for quantitative analysis. However, no claims are made of objectivity, with the workshop representing an ego network approach. Despite this, insights can be gathered through the analysis of data gathered through the process as it relates to individual participant goals as part of the *Dingle Peninsula 2030* initiative. Initial findings include:

- A total of 156 Linkages outlined through the mapping exercise, 46 of which were potential linkages, or capacity to be developed.
- 118 links were from organisations to goals, 43 of which were potential linkages
- 38 linkages were between organisations, 3 of which were potential linkages
- 15 of the organisations represented were local to the peninsula
- 31 were organisations external (or working within and beyond) to the peninsula

Table 1. Linkages of participant groups to goals outlined.

Name	Number of links	Of which potential
Mol Teic	16	0
NEWKD	13	3
Transition Kerry	10	0
Údarás Na Gaeltacht	5	0

Activity	Objective
1. Preliminary interviews with key stakeholders	Using interviews to build relationships with actors in the area to determine who could provide a useful contribution to the workshop
2. Phone call/ email contact with selected participants	An initial phone call with selected participants to gauge interest in attending a workshop, followed by an in-depth email outlining the process
3. Preparatory planning for workshop	Working with participants to find a date and time which suits everyone. All necessary supplies should be gathered and a venue should be booked.
4. Workshop running order developed	The running order should cover necessary steps in the participatory network mapping exercise, whilst still being flexible to emergent issues.
5.1 Participatory network mapping stage 1	All participants are asked to read an ethics form, to be sent at end of the process, form also sent before the workshop for people to read. Dictaphone can be used to record the conversation. Everyone introduces themselves and a little about their relationship to the project in question. The group of participants sit around a table, with a whiteboard placed face-up atop the table.
5.2 Participatory network mapping stage 2	Participants are asked to collaboratively list all the different stakeholders currently involved in the range of initiatives being discussed. Colour coding is used to define those within the region and those outside the region
5.3 Participatory network mapping stage 3	Participants are asked to outline their individual goals from the perspective of the community organisation which they represent. Colour coding is used for short (<1 year), medium (1-5 years), and long (>5 years) term goals.
5.4 Participatory network mapping stage 4	A discussion is facilitated to outline what are the key supports provided (or which could be provided) to achieve the different goals. Here 5-8 support types should be drawn up, and colour coded using different felt markers.
5.5 Participatory network mapping stage 5	Now the stakeholders from 5.2 are connected to the individual goals from 5.3 using the supports outlined in 5.4. Where supports are currently in place solid lines and used. Where potential support could be provided a dotted line is used.
5.6 Participatory network mapping stage 6	Finally, a discussion takes place on what has been outlined on the map. Sample questions include: (1) What stakeholder supports are in place to achieve certain goals? (2) How to deal with competing goals and how to strengthen complementary goals? (3) How to achieve the range of goals in light of the diversity of the stakeholder network. (4) Stakeholders to outline key issues they have with relation to their goals/ overall project to increase awareness of different issues for different groups.
6. Post workshop activities	Following the workshop (within a few days) contact should be made with participants in thanks to their contribution to the exercise. Once the mapping has been digitalized (fig. 4) this should be sent through for fact-checking with participants. In this instance, a large A2 printed version of the map was posted to participants. At this stage, an evaluation of the process can be undertaken with participants if deemed relevant.

Figure 3. Outline of process for network mapping workshop. Initiation (yellow), planning (green), execution (blue), and reflection (red).

Following this the information gathered was organised into 5 key tables, looking specifically at the 118 linkages to goals.

From Table 2 (above) the centrality of Mol Teic becomes apparent, which supports its role as the facilitator of projects related to *Dingle Peninsula 2030*. Both NEWKD and Transition Kerry are also strongly linked to initiatives, through the provision of numerous supports. Údarás Na Gaeltacht, at this early stage of the project, are not as linked to suggested goals, providing support to 4 of the 6 goals outlined from their organisational perspective. While having some interest in energy projects, the remit of Údarás Na Gaeltacht extends far beyond, into rural regeneration. They do, however, provide support across all five of the support typologies (Table 3) outlined by the participants, highlighting the internal capacity of the organisation.

During the workshop, the different support types necessary in support of goals were decided upon by the group (see 5.4 in Figure 3). A key feature of this process, when looking from a bottom-up perspective, is the centrality which the development of mutually beneficial networks plays for the participants. As a research intervention at the early stage of a multi-stakeholder approach to transitions, we can see the early establishment of the wider network needed. Further supports such as financial and volunteer are more heavily weighted towards potential supports illustrating a next stage of project development building upon the mutually beneficial networks which have been established. (Figures 4 and 5; Tables 4 and 5).

Through looking at goals as they relate specifically to the participants/organisations who outlined them we can highlight the organisational make-up. Transition Kerry, as a volunteer organisation, requires the development of further capacity with relation to the goals which have been outlined. The need to build greater financial and volunteer supports is a common issue within volunteer

Table 2. Support types ranked by appearance with relation to goals.

Support type	Number of links	Of which potential
Mutually beneficial networks	37	16
Financial support	28	14
Volunteer support	23	12
Management, administration, communication	17	4
Access to groups/organisations	13	0

Table 3. Goal links grouped by organisation.

Goals of organisation	Number of links	Of which potential
Transition Kerry (G1–5)	35	21
Údarás Na Gaeltacht (G6–12)	29	5
Mol Teic (13–18)	30	10
NEWKD (19–23)	23	7

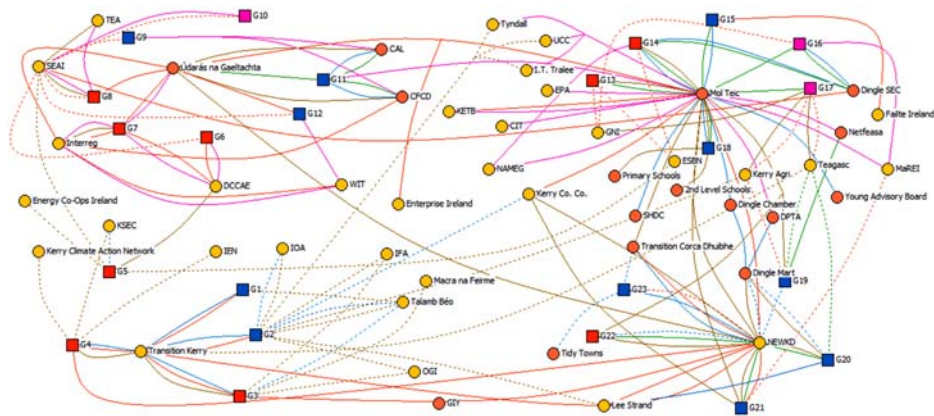


Figure 4. Visualised participatory network map.

organisations (Watson et al. 2020). Údarás Na Gaeltacht, as a fully funded state body with a mandate with regards to the development of Gaeltacht regions, has many of the links highlighted already established.

Short and medium-term goals were the predominant features of the network outlined. The three long term goals outlined, of which there were 13 established and potential links, were aspirational with relation to energy and agriculture. Goal 10 and Goal 16 focused on the peninsula being a net exporter and energy independence while G17 focused on sustainable agriculture. While the long term goals were not heavily linked to supports or clearly defined the short and medium term were, highlighting the focus on actionable solutions, guided by a wider awareness of the framing vision which is being work towards (represented through the long term goals).

Finally, the ten most networked groups excluding the participants have been represented in Table 6. This has been done to illustrate the role of key organisations in supporting different

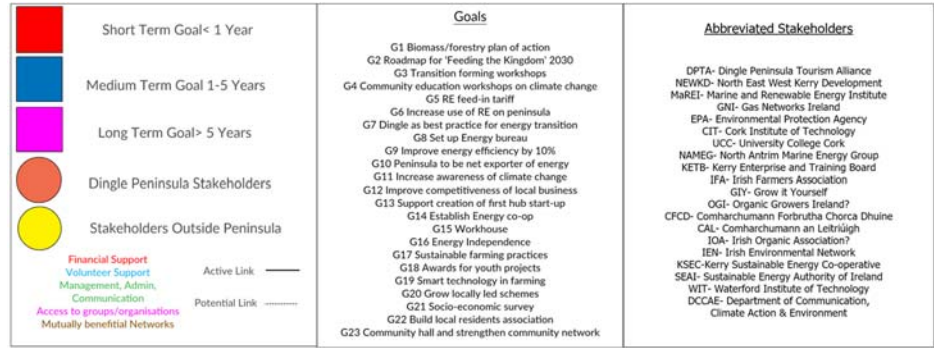


Figure 5. Legend for visualised participatory network map.

Table 4. Number of links to goals grouped by goal timeframe.

Goal type	Number of links	Of which potential
Short Term (<1 year)	50	19
Medium Term (1–5 years)	54	18
Long Term (5 + years)	13	6

Table 5. Most represented organisations through links to goals, excluding participant organisation.

Organisation	Number of links	Of which potential
SEAI (External)	9	6
DDCAE (External)	5	0
Dingle SEC (Local)	4	4
Talamb B (External)	4	4
Teagasc (External)	4	3
CAL (Local)	3	0
CPCD (Local)	3	0
ESBN (External)	3	2
GNI (External)	3	2
Interreg (External)	3	0
Kerry Agri (External)	3	2

Table 6. Most represented organisations through links to goals, excluding participant organisation.

Organisation	Number of links	Of which potential
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Teagasc (External)	4	3
CAL (Local)	3	0
CPCD (Local)	3	0
ESBN (External)	3	2
GNI (External)	3	2
Interreg (External)	3	0
Kerry Agri (External)	3	2

sustainability issues, and whether such organisations are local to the peninsula or external, and established or potential links. By outlining organisations in this way we can establish where linkages can be further developed to achieve goals. External stakeholders to the peninsula account for seven of the ten organisations. Despite this, many of the linkages are potential, illustrating the need to establish external connections to support goals. Overall, across the 118 links to goals, 81% of local links were established while only 52% of the external links had been established. This highlights both the importance of the local network as a mechanism through which to build upon projects at an initial stage and also the need to find mechanisms through which to tap into external stakeholder supports in the scaling up of projects.

5. Discussion

While the previous section sought to outline some results from the social network analysis post-workshop, within this section some of the discussion points from the workshop will be outlined focusing predominantly on the process rather than the analysis. This will be supported by data from the post-map discussion and reflections from both participants and researchers following the workshop. A self-reflective approach, influenced by the PAR literature, has been taking for researchers and participants to “improve upon the practises in which they participate and the situations in which they find themselves” (Baum, MacDougall, and Smith 2006, 854). Social learning, who

participates, and visualising complexity are selected here as the topics of discussion due to the insights they provide around the potential benefits and limitations of this study. Based on the experience of this research intervention for both participants and researchers the discussion is orientated towards offering relevant findings for the deployment of this method in other PAR contexts.

5.1. Social learning

In a multi-stakeholder process, the potential for social learning increases greatly by having a range of different actors with different expertise and objectives working together on a shared goal (perhaps with different specific aims). Social learning has been shown previously to help facilitate innovation (Tukker and Butter 2007), which in turn can be a positive force with regards to the socio-technical transition to a low-carbon society. This idea of social learning was represented by participants in reflection on the process.

It was useful to do it because people had different ideas and say “you do that with that group there?” and all of a sudden you are putting a line and a link ... it was good doing it with those people

The process is useful in fostering a greater level of understanding towards governance structures with the ability to identify stakeholders, their inter-relations, their goals and their influence. Community stakeholders have previously been referenced as the most logical starting point for public participation in issues related to sustainability and justice (Wyness 2015; Morgan 2009). Participatory network mapping enables stakeholders to visualise the social networks in which they are entwined and from this a means to plan and navigate this web becomes clear (Hauck et al. 2015, 401). Social learning is facilitated through the mapping process as both stakeholders and researchers work together. The diversity of stakeholder perspective, combined with the researchers own perspectives, can lead to a rich depth of social learning, “the co-production of network maps plays a major role in this learning process, as it allows participants to reflect on their understanding of the network in the context of how others see it” (Hauck et al. 2015, 409). The mapping of goals in a co-produced manner, and the exclusions and partialities which they may entail, could offer a more reflexive and responsible starting point for future planning within socio-technical transitions (Longhurst and Chilvers 2019), with particular relevance here to responding to climate justice.

there were a lot of interconnections and I suppose my expectation would be that in mapping them out that we would gain an amount of clarity as to where all those interconnections are going and which ones were overlapping and which ones could support each other. So it would be to bring clarity to the interconnections ... this coupled with other work we have done over the summer months is bringing about that level of clarity which is important.

Social learning has been noted previously as playing a key role in building capacity to help enable collaborative work on complex environmental issues (Kilvington 2007). Within this capacity building can be supported through group participation and interaction.

5.2. Who participates?

One critique with regards to a multi-stakeholder approach to transition management, and participatory mapping as a PAR intervention within this, is the potential for any power-sharing to involve the usual suspects (Stringer et al. 2006), failing to include specific forms of local knowledge which may prove essential to the successful operation and outcome of a project. The same critique has been aimed at the Aarhus Convention concerning participatory justice in environmental decision making (Lee and Abbot 2003). A failure to move beyond the traditional networks is an issue that needs to be carefully considered to achieve a deep form of social learning, whilst also keeping the focus of the overall project concentrated. There is a need for “better critical contextual analysis to elucidate power inequalities inside and outside the participatory space, and making these

inequalities open to questioning, dialogue and negotiation between stakeholders" (Kapoor 2001, 274). This was represented by a participant during the post-mapping discussion;

I think even looking at this (the completed map) there is a huge gap in information. People, community members, don't have an idea about the stuff that is going on.

A sensitivity to informational exclusion is essential to achieve a reflexive multi-stakeholder network but must be balanced. The ultimate goal should not be to fully include every potential stakeholder within the process irrespective of the aims of a project. "Who participates?" is not insignificant in relation to governance for sustainability (Wittmayer et al. 2016). There is a need here for further research to address issues around how or who is involved and what is achieved (Tritter and McCallum 2006), alongside how information is disseminated. By posing the question of who participates and for what reason or end (Cohen and Uphoff 1980), we can move beyond Arnsteins' ladder (1969) of participation to look at "optimum participation" which is context-specific and does not work in a vertical scaled manner. For practitioners seeking to implement the method developed here, optimum participation should be sought, particularly due to the limitations of the method (small focus groups are the optimum means of developing such maps). The key to participation is the use of appropriate mechanisms borne out of an understanding of clear objectives. As noted, "different levels of engagement are likely to be appropriate in different contexts, depending on the objectives of the work and the capacity of stakeholders to influence outcomes" (Reed 2008, 2419), and within this, the importance of participatory justice for sustainability must be given precedent to move beyond the usual suspects (Carter and Howe 2006). In post-workshop reflections, one participant suggestively noted the potential issue around the usefulness of the exercise for another participant (named here as "X").

It is always useful to sit down and try to take stock of where you are ... I needed to do that, did X need to do that?

When looking at who participates in processes one must also reflect on the role of the researcher, moving beyond the "expert role" to a role as facilitator/collaborator. Reflecting on this, the researcher was aware of the limitations of the research process and the need for further actions to add value for the other participants, despite meeting preconceived research objectives. Reflecting as a researcher on your place in the process enables mobilisation towards more useful contributions. In this case, following the de-brief post-workshop, further reflections from the participants on potentially useful outputs were gathered.

Here, we encounter an important aspect of the social change agenda in which researchers move from an antiquated "expert role" to being collaborators. An undertheorized aspect of this role change, borrowing from legal terminology, is *quid pro quo*. Therefore, of central importance to the relationship between the research and wider participants is reciprocity. In most cases, despite moving to a collaborative role, researchers have predefined research/institutional objectives. While this will be influenced through collaboration it is also important to ensure the needs of participants are considered. The importance of impact orientated collaborations is acknowledged as warranted with relation to sustainability transformations, moving beyond previously defined research roles. Through active involvement in the group/project in question, on a personal level, a greater level of responsibility has been felt with regards to making a positive contribution when compared with previous less-collaborative research projects.

Through regular interaction with the community in question over 12 months prior to this workshop, and continued engagement following it as part of a wider research project, some reflections can be referenced from a researcher perspective. Despite continued involvement in the project, this will not continue out until the 2030 deadline. Within this the mapping exercise assists with legacy planning whereby the capacity potential is outlined, drawing out linkages that can be built upon between bottom-up and top-down organisations and also across the community. Funding to enable interaction between stakeholders and researchers and time to build trust and solidarity (Lemos et al. 2018) over a longer period than more traditional funded research structures may

offer a way forward with relation to collaborative research practises with relation to sustainable transition projects.

5.3. Visualising complexity and participant-research communication

While participatory network mapping of this nature is not sufficient to all contexts, starting from the basis of PAR it is an apt approach. Lievrouw et al. (1987) talk about the reality of social networks, whereby they can be defined by a general “messiness”. A range of different actors with different objectives and interests is an untidy start point when undertaking social research. When the relations between these actors are added to the investigation, things become even more complicated. Approaching social network analysis to arrive at a well-defined and absolute depiction of the network under investigation will ultimately be futile. Heath, Fuller, and Johnston (2009) have investigated the difficulty of bordering social networks. A simple question of where something starts and ends becomes a difficult task within SNA. Concerning the Dingle Peninsula, while the regional border can be defined geographically it is more uncertain when trying to border the social network. “Supporting members” (Michaud and Audebrand 2018) outside of the region may prove to have central roles in the social network. The idea of messiness quickly becomes evident. This parallels the earlier notion of “messes” (Ackoff 1999) and the complex, multi-dimensional nature of PAR. The complication of visually representing the complexity of the network was noted by several participants:

Now the thing is I have stopped and reflected but I am looking at it here now months later and I am going ‘Oh My God’, I can’t even read it after creating it and how it all works together

It is a very crowded map ... I am just wondering how we might some way do it differently because you lose track of the lines.

Participants contributed ideas towards how the visual aid may become more useful, with one suggesting the need to isolate individuals goals (see appendix.1), another suggesting a focus on key organisations, looking at types of links that exist within organisations and different levels of relationships, and finally, a third proposing doing the task around pre-set goals rather than organisational perspectives. Alongside these ideas, further work is needed towards the optimal way to represent outputs from participatory network mapping exercise for them to be useful on the ground. When undertaking this process, following a PAR approach, the researcher must remain cognisant of the need to ensure findings are useful to participants to prove effective. Further research interventions (such as the one represented in Appendix 1) may be warranted for this reason.

6. Conclusion

In using a participatory network mapping approach to the creation of ego networks for social network analysis, one must first be clear on one’s intentions. While aggregated, interview-based approaches using the Net-map toolkit have been undertaken (Schröter et al. 2018b), within this research intervention the approach taken was guided by the principles of participatory action research, building upon previous discussions concerning participatory (Brown and Eckold 2019). This is beneficial as a process for inclusive participation to achieving just transitions. However, the number of actors/ organisations linked to participants, the types of linkages, and the goals of stakeholders represented through this process is only evident on individual interpretations of networks in a given context, at a certain time, despite the collaborative mechanism deployed. The use of this approach, therefore, must not be undertaken to arrive at a holistic interpretation of the network, instead favouring a qualitative understanding (Schiffer and Hauck 2010; Emmel 2008). While a quantitative social network analysis (See: Carrington, Scott, and Wasserman 2005) approach would yield greater data validity, the methodology used here offers insights into the interpretation of a social network around a low-carbon transition project as it appears to bottom-up actors. Through the emergence of the need for a multi-stakeholder intervention to bring together key organisations

and groups to discuss their goals in relation to the shared vision, this method was established. The primary contribution of this paper is the development of an innovative participatory mapping approach to social network analysis in the context of just transitions to a low carbon society. With regards to policy interventions, the method outlined has the potential to offer a mechanism through which to involve a diverse range of stakeholders around deliberative decision-making processes. Aligning with the Aarhus Convention, it is suggested as a tool that can be drawn upon by active change agents working in community contexts to increase their capacity to engage a wider public in planning. While further research is needed on effective outputs for the visualisation of complex maps, the process has highlighted the potential of this participatory network mapping exercise as PAR approach to social network analysis which seeks to develop upon mapping approaches within both the sociological and geographical literature.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This work was supported by Science Foundation Ireland [grant number 12/RC/2302_P2].

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