

Multilevel networks for climate change adaptation – what works?

Climate
change
adaptation

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Abstract

Purpose – The paper aims to compare and evaluate two Norwegian municipal networks for climate change adaptation, to see how such networks should be initiated and implemented as a means of achieving adaptation measures within municipalities.

Design/methodology/approach – The findings are based on 12 qualitative interviews taken from two case studies, and the results are explained in relation to the multilevel network framework and environmental psychology.

Findings – Multilevel networks can promote learning and identification of specific actions in connection with climate change adaptation. The aim should be to establish interdisciplinarity, with participants from at least two authority levels. Representatives should be in positions that enable them to introduce acquired knowledge to the organization and influence its application. A network requires organizational commitment, during the initial phase and throughout the follow-up process. Municipal leaders (mayors) must be aware of the network, act as signatories to relevant documents, and be familiar with participating representatives. Commitment to knowledge application within the organization also requires that participants understand where and how to work strategically to convert new ideas into action.

Practical implications – This paper presents practical and research-based guidelines for the management of climate change adaptation networks at municipal, county and national authority levels.

Originality/value – This paper combines political science and environmental psychology perspectives as a means of analysing network achievements. A psychological approach may help to promote a greater understanding of why and how network knowledge is transferred.

Keywords Networks, Multilevel, Municipalities, Climate adaptation

Paper type Research paper

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1. Introduction

Future climate change will lead to increased stresses on natural ecosystems, buildings and infrastructure (Almås *et al.*, 2011). The ability of society to deal with the consequences of climate change will depend on the availability of resources and tools, knowledge and collaborative efforts. In many countries, local governments have assumed important responsibilities for preventing damaging consequences and for preparing their communities for the impacts of climate change. For Norway, these responsibilities are set out in the White Paper *Climate adaptation in Norway* (St.33, 2012/2013). As in other Nordic and European countries, Norwegian laws and regulations on climate change adaptation measures are broad in scope and open to interpretation (Junker, 2015; Hanssen *et al.*, 2013; Wejs *et al.*, 2014). Local municipalities have been delegated overall responsibility and the authority to decide how and to what extent climate change adaptation measures should be implemented. Much information on climate change is available, but local authorities often give scant consideration to such information in their planning and decision-making processes (Hovelsrud and Smit, 2012; Dannevig and Aall, 2015; Hanssen and Hofstad, 2017; Orderud and Naustdalslid, 2017; Multiconsult, 2017).

To stimulate activity and the initiation of local measures for adapting to climate change, governance networks are being initiated. Sørensen and Torfing (2005) defined a “governance network” as a relatively stable horizontal articulation of interdependent but operationally autonomous actors who interact by means of negotiation. They operate within a relatively institutionalized framework of contingently articulated rules, norms, knowledge and social imaginaries that are self-regulating within limits set by external agencies, and that contribute to societal development. These networks commonly operate across various sectors and political or administrative levels. In this paper, the term “multilevel network” is used to describe a network that incorporates at least two public sector authority levels within its structure. Multilevel networks have been shown to play central roles ensuring greater awareness and learning (Hanssen *et al.*, 2013; Klaussen *et al.*, 2015; Flyen *et al.*, 2017), but little is known of the mechanisms operating within a network that result in specific actions.

This paper links two strands of theory within the literature on networks. The first is found in the institutionalist multilevel governance literature (Bouckaert *et al.*, 2010), especially that focusing on the capacity for knowledge translation between administrative levels – “boundary work” (Corfee-Morlot *et al.*, 2011; Guston, 2001). The second strand is found in the environmental psychology literature (Stoknes, 2015; Clayton *et al.*, 2016; Gifford, 2011). Stoknes (2015) recommended the use of *social strategies* for communication related to climate change, to harness the power of social networks and norms in driving municipal efforts. Analysis of networks working as “interpretive network arenas” (Orderud and Winsvold, 2012) or “boundary spaces” (Corfee-Morlot *et al.*, 2011) can provide valuable insights into the critical factors needed to achieve knowledge transfer, learning and behavioural change.

This qualitative study examines *how multilevel networks for climate change adaptation should be initiated and implemented as a means of achieving climate change adaptation measures in Norwegian municipalities*. The paper seeks to present practical and research-based guidelines for the management of such networks at the municipal, county and national authority levels. Case studies are presented that test the analytical model of network achievement introduced in the theory section.

1.1 Norwegian context

Many Norwegian municipalities are struggling to adapt to climate change (Orderud and Naustdalslid, 2017; Multiconsult, 2017). Adaptation activities vary greatly, and municipalities

that have adopted climate change adaptation networks have undertaken far more adaptive planning, and implemented more adaptive measures, than those without such networks (Rambøll, 2014). Existing higher-level legislation and guidelines have been found adequate for driving climate change adaptation in Norway, but much implementation is left to the municipalities, which struggle or fail to deliver (Flyen *et al.*, 2014).

The *Cities of the Future* network (2008-2014) was probably the most important climate change network established in Norway to date. It involved 13 cities, and operated at municipal, county and national authority levels, focusing on climate change mitigation, as well as adaptation. Almås *et al.* (2015) found that learning and skills development among participating individuals and organizations in *Cities of the Future* were strong and considerable, generating ripple effects via other networks and promoting collaboration in other settings. Municipal representatives participating in role-model building projects describe such networking as crucial for knowledge acquisition and aspirational development. Participating cities advanced from having almost no focus on climate-related issues, to the incorporation of climate change considerations in their plans and procedures. The massive shift in awareness and policy development was remarkable, revealing considerable potential for similar achievements in other municipalities in Norway. Almost half of the Norwegian county authorities were participating in climate change networks in 2015. However, only one of four counties reported changed behaviour, as expressed in budget strategy changes, policies or targeted measures (Hanssen *et al.*, 2015b). For this reason, it is important to obtain more systematic knowledge about how these networks function, and how they achieve their results.

2. Theoretical framework – analysing multilevel governance networks

Despite the many international and Norwegian climate change studies, local municipalities lack relevant information in readily comprehensible formats, and many lack local-level capacity to translate such information into practical initiatives (Corfee-Morlot *et al.*, 2011; Guston, 2001; Dannevig and Aall, 2015; Hauge *et al.*, 2017). Due to the inherent uncertainty of climate change models, many find it hard to translate scientific knowledge into practical policies (Orderud and Winsvold, 2012; Hinkel, 2011). To understand how networks can promote this translation process, and achieve greater certainty in the field of climate change adaptation, there is a need to establish approaches involving analysis of the multilevel governance dimension involved in the networks themselves (Jessop, 2002; Bouckaert *et al.*, 2010; Sørensen and Torfing, 2005; Torfing *et al.*, 2012; Sørensen and Torfing, 2017; Fawcett *et al.*, 2017). These approaches may shed light on *the meaning* of networks in governance. There is a need for approaches that analyse *what* happens within networks, in relation to boundary work (Corfee-Morlot *et al.*, 2011; Guston, 2001). Environmental psychology “examines transactions between individuals and their built and natural environments” (Gifford, 2014), and such an approach may explain *how and why* learning, attitudinal change and pro-environmental behaviour may be triggered by network participation. The environmental psychology literature chosen as source material for this paper includes studies that apply social psychology theories to explain motivation for pro-environmental behaviours (Clayton *et al.*, 2016; Gifford, 2014; Stoknes, 2015; Goldstein *et al.*, 2008), and behaviours related to climate change adaptation (Hauge *et al.*, 2017; Gifford, 2011). The added value inherent in this research is the combination of the governance and environmental psychology perspectives: a holistic interdisciplinary approach to the analysis of governance networks.

2.1 Multilevel governance and boundary work

In Norway, overall responsibility for adaptation to climate change is delegated to the local government authorities (St.33, 2012/2013; Junker, 2015). However, the national and regional authorities also have important responsibilities here, making effective interplay among these bodies crucial to the implementation of effective and adequate adaptation policies. Recent decades have seen the establishment of a more egalitarian relationship between governmental levels, in recognition of the need for both universal scientific knowledge and local knowledge derived from the municipalities (Marks and Hooghe, 2004). It is thus important to highlight the multilevel governance dimension in complex and intricate policy fields, such as climate change adaptation (Bouckaert *et al.*, 2010; Christensen and Læg Reid, 2011; Dannevig and Aall, 2015; Sørensen and Torfing, 2005; Hanssen *et al.*, 2013; Kern and Bulkeley, 2009). There is growing awareness of the importance of interpreting universal scientific knowledge within local contexts, and of downscaling the climate change scenarios at local levels, as a means to identify robust adaptation strategies (Orderud and Naustdalslid, 2017).

Furthermore, it is essential to help municipalities to navigate within the broad landscape of climate-relevant knowledge, providing opportunities for “boundary work” (Dannevig and Aall, 2015; Guston, 2001; Corfee-Morlot *et al.*, 2011). Boundary work, or boundary organization, enables “negotiations between science assessments and decision-making and in the context of regional and local adaptation” (Corfee-Morlot *et al.*, 2011, p. 182). The term “boundary” is understood here to refer to the boundaries between science and non-science (policy), and is associated with the deliberate mediation, translation and communication between the two worlds of science and policy, to produce legitimate, salient and credible knowledge to solve policy problems (Dannevig and Aall, 2015). Partnerships and networks between public, private and civil community agencies are identified as success factors in bridging the gaps linked to challenges associated with scientific research, national requirements and local contexts (Guston, 2001). It is in such arenas that encounters between the knowledge producers, knowledge users, knowledge managers and politicians take place. Advanced scientific and specialist knowledge derived from research material and official sources is mediated, translated, contested and considered by the relevant agencies. Frequent users of contextual, climate-relevant, knowledge can play important roles as “co-translators”. There is a growing interest in network approaches, representing a combination of self-organization and government regulation. Networks cannot replace the accountability of existing hierarchical bureaucracies, but can complement them by operating within, or in parallel with, existing structures.

2.2 Environmental psychology perspectives

Within environmental psychology, social psychology theories are often applied to explain challenges encountered by individuals and groups in terms of human behaviours, perceptions and motivations in the face of climate change (Clayton *et al.*, 2016; Goldstein *et al.*, 2008). An environmental psychology perspective may therefore contribute towards explaining why networks achieve, or fail to achieve, behavioural changes. Stoknes (2015) recommended a focus on *social strategies* for communication in climate-related contexts, harnessing the power of social networks and norms. *Learning within climate-change adaptation networks takes advantage of the social mechanisms that influence our attitudes and actions.*

First, people imitate others – they look to others to find out how they themselves should behave. *Social norms* represent the sum of knowledge (imagined or real) of what others would say or do in one’s own situation. Even if people may state that the actions of their

peers have little effect on their own habits in relation to the environment, research indicates the opposite (Stoknes, 2015; Sussman and Gifford, 2013). Reductions in household energy consumption were greater in situations where households were told that “your neighbours do it” (reference to social norms), than when induced by more idealistic or financial motivations (Allcott, 2011; Nolan *et al.*, 2008; Schultz *et al.*, 2007).

Second, within a network, or between networks, people compete to perform better than their peers. People try not only to imitate or achieve the same as their peers but also to outdo them (Griskevicius *et al.*, 2010). These status- and competition-related mechanisms may also be of importance in climate change adaptation networks, where members may attempt to impress one another. Third, human beings need to be seen and praised for the good they do. People try to avoid social exclusion and social sanctions. Praise from other members in their group strengthens their attitudes and values (Cialdini and Goldstein, 2004).

Fourth, seeing what others accomplish can inspire imitation. A major reason why residents requested for total energy renovation of their blocks of flats was the inspiration from renovations of neighbouring buildings (Hauge *et al.*, 2013). Graziano and Gillingham (2014) showed that the popularity of installing solar photovoltaic systems is influenced by the number of installations observed by residents in their own neighbourhoods. Personal anecdotes and tangible examples often act to influence attitudes towards climate change and the environment to a much greater degree than the provision of impersonal information (Stoknes, 2015).

Fifth, social learning occurs when people engage with others and share perspectives and experiences. Learning loops are stronger and more deeply entrenched in social settings, in comparison with reading and reflection alone (Orderud and Winsvold, 2012). The effects of social learning involving feedback loops are not restricted to self-regulation: they may also have the potential to influence higher-order goals, values and identities (Shove, 2010; Clayton *et al.*, 2016).

Sixth, face-to-face communication and messages from the “in-group” are known to be more effective than mass media communication or messages from strangers (Sussman and Gifford, 2013; Stoknes, 2015). Networks take advantage of this when a person trained within a network carries new approaches derived from the group into his or her own organization.

Finally, belonging to a group of climate change adaptation experts strengthens individual members’ identities as persons who care about the problem of climate change. Our attitudes are profoundly influenced by the groups we want to belong to – the groups we recognize as high-status groups (Klößner, 2015; Tajfel, 2010).

2.3 An analytical tool for studying multilevel networks

To analyse the achievements of multilevel networks, the authors use a model with specified categories for the various levels of achievement – from awareness and learning to action. The model draws on research on multilevel networks, and was first published by Hanssen *et al.* (2013) and Hanssen *et al.* (2015b). The model consists of a ladder, with successive rungs representing advances in achievement and with behavioural change/action defined as the ultimate goal. The initial levels, or rungs, of the ladder, are inspired by the “ladder of citizen participation” introduced by Arnstein (1969). The ladder itself exhibits some similarities with the transtheoretical model of behaviour change (Prochaska and DiClemente, 1983; Prochaska *et al.*, 2002) widely used to explain health behaviour in particular. Recently, this model has been applied in connection with pro-environmental behaviour (Klößner, 2015). The transtheoretical model describes how behavioural modification involves movement through five stages – from pre-contemplation, to contemplation, preparation, action and finally maintenance of the new behaviour. The time spent at each stage varies. The

transition between stages is not necessarily linear, and people often oscillate between stages. Our model for *network achievement* for behaviour change is built on the same foundation. Networks may move back and forth between the rungs. The “network achievement model” has been developed mainly to illustrate the gap between achievements obtained *within* network settings, and those obtained in the participants’ own municipalities/organizations. The ladder concept used for analysing network achievements is illustrated in Figure 1, and the different levels of network achievements are explained in the following text.

The rungs of the ladder indicate various levels of achievement. The lowest rung represents mediation and awareness-raising spurred by mutual exchange of knowledge. The second rung is defined as discussions that lead to the development of shared worldviews and knowledge translation. Here, “boundary work”, involving the bridging of various specialist discourses (Guston, 2001; Corfee-Morlot *et al.*, 2011), is of special interest. This bridging process, or changes in worldviews, may result from the gradual emergence of a shared language, as is emphasized in network governance theories (Sørensen and Torfing, 2005). Many social psychology perspectives may help in explaining the mechanisms that trigger awareness-raising (Rung 1) or knowledge translation and the development of shared

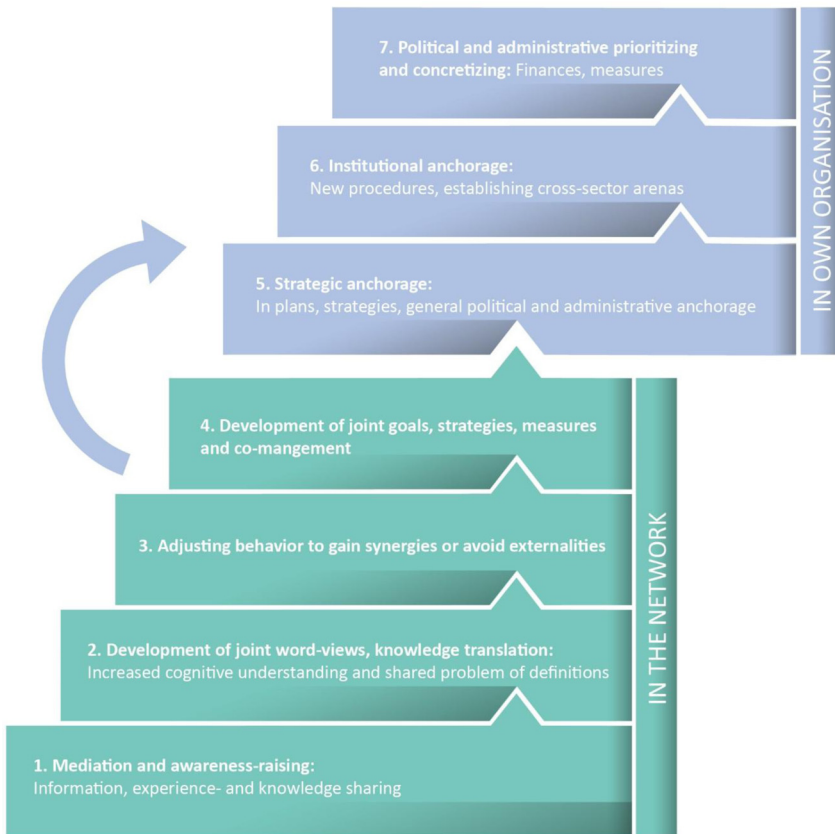


Figure 1.
The ladder of
network achievement

Source: Hanssen *et al.* (2013)

worldviews (Rung 2). Perspectives showing how people become inspired to imitation by the accomplishments of others help to explain the importance of sharing experiences (Rung 1) (Hauge *et al.*, 2013). Perspectives that focus on the effect of face-to-face communication, and messages supplied by one's "in-group" (Sussman and Gifford, 2013; Stoknes, 2015), are relevant for explaining how networks represent arenas where shared worldviews evolve.

Rungs 1 and 2 are prerequisites for advancing to the higher rungs, but rung advancement may also occur in parallel, in the opposite direction, or progress back and forth. Furthermore, Rungs 1 and 2 alone are insufficient to ensure the development of climate change adaptive communities at local levels. Local authorities need to adjust their behaviour, and this occurs on Rung 3. As regard climate change adaptation, this means that network participants start to internalize new worldviews and begin adjusting their behaviour within the network. The fourth rung represents the highest achievement level within networks: when network participants are able to formulate shared goals, strategies and measures, or develop co-management models. This is described in the literature addressing adaptive co-management (Keast *et al.*, 2007).

Public authorities initiate climate networks as a means of influencing behaviour in response to climate change within the participants' home municipalities or organizations. Participants must then convince their own organization to change course (Keast *et al.*, 2007). This often requires high levels of strategic commitment (Rung 5), or institutional commitment (Rung 6), to reach agreement. An example would be the establishment of internal cross-sectoral arenas for climate change adaptation. However, political and/or administrative commitment is also necessary (Rung 7). Multilevel governance perspectives focus on ensuring action and the democratic legitimacy of networks through obtaining the commitment of political leaders (Sørensen and Torfing, 2005). On each of these rungs, social psychological perspectives can help to explain the social mechanisms operating within networks. They may also assist in convincing participants to adjust their behaviours, and in explaining how participants can develop commitment to new insights within their own organizations. Four major factors exert a primary influence on the achievements of networks:

- (1) *Scope*: The mandate of the network. Does the network operate with a single goal, or multiple ones? Is the mandate restricted to discussions of climate change adaptation, or is this subject only one of many? This will influence the time and attention dedicated to the subject.
- (2) *Participants*: Are relevant resource-controlling participants included in the network, so as to ensure that the results are legitimate and implemented (Sørensen and Torfing, 2005)? Are the relevant public authorities and/or private sector participants represented, to enable implementation of adaptation measures (Keast *et al.*, 2007)?
- (3) *Characteristics of the network organization*: The factors contributing towards network achievement may include:
 - the existence of an egalitarian atmosphere (relative formality/informality);
 - the extent to which the network is mandatory or established voluntarily by its members;
 - available resources;
 - the existence of formal leadership structures such as hands-off/hands-on steering mechanisms (Sørensen and Torfing, 2005; Hovik and Hanssen, 2015); and
 - how responsibility is delegated (Ansell and Gash, 2012).

- (4) *Commitment*: The literature on network governance (Jessop, 2002; Kooiman and Jentoft, 2009; Sørensen and Torfing, 2005) holds that the meta-governance of networks is crucial to the production of results from network cooperation. Especially important is the guarantee of adequate commitment among the institutions of representative democracy (Torfing *et al.*, 2012; Sørensen and Torfing, 2017; Fawcett *et al.*, 2017). Such guarantees may be secured through the participation of political or administrative leaders, and by ensuring that essential strategic decision-making is conducted directly by the city or municipal council, or more indirectly as a result of the network. Commitment is basic to achieving the higher levels of network achievements.

3. Methods and data: case studies of two multilevel networks

3.1 Methodological approach

The findings in this study draw on qualitative interviews conducted as part of two case studies. The results from these case studies can be generalized by means of analytical generalization: that the findings from one study can be used as a predictive guide to what may occur in other, similar situations. Emphasis is thus placed on contextual information and transparency in argumentation (Brinkman and Kvale, 2014).

A total of 12 interviews were conducted, each lasting about 1 h. All the interviews were recorded and transcribed, and themes and meanings subsequently sorted into groups, analysed and discussed.

3.2 Network 1

The purpose of Network 1 was to achieve mutual learning among three levels of government and between knowledge producers and users. Two Norwegian public sector agencies acted as intermediaries. Participants included the Norwegian Directorate for Civil Protection, the Norwegian Water Resources and Energy Directorate, the National Meteorological Institute, the local County Governor, county council representatives and two municipalities. Three municipalities were asked to join, but the third did not have sufficient resources to enable participation. The network was in operation for two years. Its chief aims were to identify information needs among the municipalities, and to enable the knowledge producers to develop tailor-made knowledge products. Interviewing was conducted in 2014 and 2015 (face-to-face and by telephone) (Table I).

3.3 Network 2

The purpose of Network 2 was to enable small municipalities to learn about climate change adaptation from one of the largest cities in Norway. The chief aims were to contribute towards increasing the number of municipalities developing vulnerability analyses for climate change and increasing the number of municipalities developing plans for climate change adaptation. All municipalities in the county were asked to join. Only four took part. The network was in operation for one year. Four meetings were arranged, each chaired by the largest municipality, which was responsible for the organization and agenda of the meetings. The county planning authority was also represented in the network, which was a multilevel network. Interviewing was conducted in March 2017, via Skype. Meeting notes, funding applications and a brief evaluation were used as additional sources of information (Table II).

Informant	National, regional or municipal authority – characteristics
Observer at the two-day long final meeting of the two-year network cooperation (minutes from the meeting)	All participants, representing national authorities (Two national Agencies; The Norwegian Directorate for Civil Protection and the Norwegian Water Resources and Energy Directorate), National Research institute (Met), County Governor, County authority, two municipalities
1. Male, water/waste water department	Large city in Norway, coast, about 70 000 inhabitants
2. Male, climate/environmental coordinator	Large city in Norway, coast, about 70,000 inhabitants
3. Male, planning executive	Large city in Norway, coast, about 70,000 inhabitants
4. Female, planner	Small coast municipality, ca 3,000 inhabitants
5. Male, planner	Small coast municipality, ca 3,000 inhabitants
6. Woman, special advisor, energy and environment	County authority
7. Woman, coordinator of the network	County Governor (state), Department of planning, reindeer and civil protection

Table I.
Informants Network 1

Informant	Municipality characteristics
1. Woman, climate coordinator	One of the largest cities in Norway, coast, ca 200,000 inhabitants
2. Woman, climate coordinator	County planning authority
3. Woman, environmental consultant	Small coast municipality, ca 6,400 inhabitants
4. Woman, building application handler	Small mountain municipality, ca 6,800 inhabitants
5. Woman, planner	Small mountain municipality, ca 6,000 inhabitants

Table II.
Informants
Network 2

3.4 Selection and comparison of case studies

The selection of case studies was based, first, on governance networks, focusing on municipalities that were then involved in learning about climate change adaptation. The second criterion concerned existing multilevel networks in which at least two levels of authority were represented. The selection of networks was based primarily on accessibility. Norway places heavy emphasis on governance networks (Hanssen *et al.*, 2013), and is thus a highly suitable arena for collecting experiences in relation to network achievements.

Network 1 had more participants than Network 2. Network 1 had more representatives from county and governmental authority levels, and also included knowledge producers, whereas Network 2 had more municipal representatives: indeed, it had representatives from the municipal and county level only. Furthermore, the aim of Network 1 was to produce a user's guide, whereas Network 2 focused on municipal planning. Nevertheless, aspects shared by both networks made them suitable for examining how multilevel networks can be initiated in municipalities as a means of achieving measures for climate change adaptation.

4. Analysis: identifying key factors that ensure network achievements

4.1 Network achievements

How do the network achievements reported by the participants compare with the rungs in the ladder presented above? First, for informants from national, regional and local levels in both networks, the sharing of information and experience, combined with raising of awareness, was extensive and important. Many also reported that knowledge of climate change adaptation had increased in their municipalities due to activity in the network in

question, and because they had also participated in other similar networks. The municipalities in Network 1 reported that they now knew more about climate change because of participating in a network that involved knowledge-producers (governmental agencies and research centres). They had also become more skilled in identifying their needs in terms of new knowledge:

Based on our newly acquired knowledge, we now see that we need more mapping, for example, more detailed mapping of altitudes (Network 1).

Participants reported that both networks acted as learning arenas that promoted both knowledge transfer and the development of shared understanding. All Network 2 participants mentioned the development of a mutual understanding of each other's roles and tasks, in turn fostering smoother interaction between governmental levels. Participants also noted that they had become mutually dependent, leading to better understanding. Many reported the development of a "common language" that has promoted better communication (Hanssen *et al.*, 2015a):

Don't forget where we were when we started. Now we all use the same language and trust each other. We needed time to talk to each other, to get to trust each other, to move on in our work. We come from different [professional] cultures. Our aim was to transform knowledge into action. It took two years before we agreed on how to do this. Now it will be easier. (Network 1)

Many municipal and regional representatives reported that obtaining flood-zone maps was not enough. They needed expert help to interpret such maps and translate the results into regional and local contexts (Hanssen *et al.*, 2015a).

Network 2 participants also reported achieving shared worldviews and a shared understanding of main concepts and methods. The network served as an important wake-up call for the municipalities, which came to recognize the value of sharing knowledge related to climate change adaptation:

We shared what we knew about methodology, and, as I see it, all the municipalities agreed on the understanding of risk and vulnerability analysis, probability, and consequences. I felt the network was a learning hub with a focus on sharing professional knowledge. (Network 2, small municipality)

Thus, both networks seem to have functioned as arenas for boundary work. Social norms regarding attitudes to and values concerning climate change, combined with aspects appreciated and praised within the group (Cialdini and Goldstein, 2004), contributed towards achieving the first two rungs on the ladder.

Adaptation to a changing climate often requires local authorities to adjust their business-as-usual mindsets. An example is the change in land-use planning policies to prohibit the construction of houses in flood-prone areas. Individuals and organizations within the networks "internalize" these new worldviews and start adjusting their behaviour. The fourth and highest level of achievement within a network is the ability to formulate shared goals, strategies, products and measures, or develop co-management models. Network 1 co-produced a handbook to provide guidelines to assist the municipalities in their local adaptation work. This network also produced and facilitated tailored regional climate profiles and consolidated the role of municipalities as purchasers of relevant knowledge on climate change. Municipalities within the network reported improved cooperation with regional and national authorities. Network 2 did not have a specific shared product for development, but the city municipality was active in sharing its climate change adaptation goals and strategies. However, these goals and strategies were not co-produced by all network participants, so the fourth rung was only partly achieved for this network.

A few informants in both networks have now started to implement knowledge acquired during their participation, now as part of municipal planning. Networks tend to work in parallel in their attempts to persuade various levels of hierarchical municipal structures to cooperate outside their line of command line. The networks themselves are seldom mandated to implement measures: participants must bring their new understandings and agreements “back to home base” and attempt to convince their organizations about behavioural change. This process may prove difficult (Hovik and Hanssen, 2015; Hanssen and Hofstad, 2017), and many networks will never reach the higher achievement rungs (5-7). It appears that the implementation of new knowledge, incorporating Rungs 5-7, depends on the scope of the network, its participants, organizational structure and levels of commitment.

4.2 Scope

Scope is a crucial factor in determining network achievements. While some networks have a broader thematic emphasis, such as “sustainable development”, the two case study networks had a relatively narrow focus on adaptation to climate change (Hanssen *et al.*, 2015a). This may explain why participants found most of the information presented to be relevant.

In Network 1, the information needs of the participating municipalities were discussed. The need for more tailored “knowledge-products”, such as avalanche and flood-zone maps, was emphasized. Another topic concerned empowering the municipalities to become better purchasers of detailed mapping information. The handbook developed by Network 1 was also an important discussion topic. By contrast, in Network 2, the focus was primarily on planning for climate change adaptation. Network meetings discussed geographic information system issues, historical climate change-related incidents, vulnerability analysis, municipal planning and interdisciplinary cooperation.

In interdisciplinary networks, identification of the appropriate scope always presents a challenge. Most municipal participants interviewed for this study considered the range of subjects to be relevant. Since the smaller municipalities had little prior knowledge of climate change adaptation, the topic had to be addressed at a fairly basic level. One county council representative felt there was an over-emphasis vulnerability that was too strong, whereas municipal representatives said they appreciated the opportunity to compare vulnerability analyses conducted by various municipalities. However, many participants in Network 2 wanted more focus on practical measures and technical solutions. As one participant put it: “I’ve learned that this is a problem, but we haven’t learned how to solve it!” It was suggested that Network 2 should be conducted in two steps: an initial year on overall planning, followed by a second year on possible technical measures. Participants also highlighted the importance of being included in preparation of the detailed network programme.

The case study of Network 2 indicates that a one-year network focused on climate change adaptation, involving at least four whole-day meetings and delegated assignments in-between meetings, may be sufficient to induce behavioural change – at the higher levels of network achievement.

4.3 Participants

A pivotal factor in climate change adaptation networks appears to be representation from various governmental levels (Hanssen *et al.*, 2013; Hanssen *et al.*, 2015a). Network 1, in which all three tiers of government were represented, produced information transfer in all three directions. All Network 1 participants reported having acquired new information from the other tiers, helping them to do their job better. This aspect was emphasized despite the

theoretical possibility that distances within the hierarchical system might have hindered egalitarian, two-way dialogue. Representatives from national agencies reported having learned more about how local decision-making takes place, which in turn had helped to improve their work as knowledge producers:

We have all learned a lot about how municipalities work, and how municipal planning takes place. Bringing together many governance levels in the same network arena brought new insights. Being able to meet the municipalities in this role has been very helpful, because the gap between what researchers present, and what the municipalities actually need, is huge. (Network 1)

This coincides with the findings of [Corfee-Morlot *et al.* \(2011\)](#), [Mahoney and Thelen \(2010\)](#) and [Hauge *et al.* \(2017\)](#), all reporting the need to present scientific knowledge in more comprehensible formats as a basis for work linked to climate change adaptation.

In Network 2, only regional and local government levels were represented, and municipal representatives were the main participants. The network organizer pointed out how challenging it was to get small municipalities included in the network: “they have so few professionals. The same person may be responsible for environment, agriculture and planning.” The major differences in the background knowledge of the various participants represented a problem. In Network 1, most participants were already well-informed, so the initial general level of awareness and knowledge was quite high. In Network 2, by contrast, representatives of the smaller municipalities acknowledged that they had “zero knowledge of climate change adaptation” and were “starting from scratch”. They added that there existed little knowledge of climate change adaptation in the municipal administration where they worked. They were eager to learn and reported that the network had functioned as an arena for fruitful exchange of knowledge and experience.

Interviewees in Network 2 felt that their professional backgrounds had a bearing on what they gained from participating in the network, and that there were advantages in having participants from different municipal departments. This illustrates the need for interdisciplinary (cross-sector) work on climate change adaptation. Participants in Network 2 were not chosen on the basis of their professional background or role within the municipality, but because they were available and had time to involve themselves in the network. The interdisciplinarity that emerged was emphasized as valuable, although it had not been planned.

The effect of network achievements depends on the opportunities for network participants to apply acquired knowledge in their home municipalities. One municipal building official, who normally had little time to work with assignments other than building matters, reported that she found it difficult to apply the knowledge she had obtained in her own municipality. Another participant from Network 2 says:

Yes, a lot depends on what position you have. If you are only a municipal building official, it might be more difficult to get into a position of influence. However, my position enables me to participate in many different forums. That makes everything so much easier. (Network 2)

Members of Network 2 also noted the advantage of there being at least two people from each municipality in the network who can share the responsibility for bringing the network achievements “back to home base”:

I think it is crucial to have more than one person from each municipality participating in the network. It is not easy if you're the only one who's trying to get the whole municipality to think in the same direction. (Network 2, small municipality)

Several recent studies have highlighted the role of network participants as bridge builders who can promote commitment to newly acquired knowledge in their home organizations

(Ansell and Gash 2012; Hanssen *et al.* 2014) . This requires that network participants understand the complex, multilevel governance systems involved. Furthermore, they must be equipped with individual courage, personal charisma and network-building capabilities, and must have the ability to accomplish demanding “boundary work”. One participant in Network 2 pointed out the importance of personality factors:

What kind of person should be invited to the network? That will depend on the positions and impact they have in their municipalities, on personality characteristics and their relationship with their managers. Are they stimulated to take what they learn in the network further, or will it stop with them? (Network 2)

4.4 Organization

What are the best ways of organizing networks to promote effective cooperation on climate-related issues? How to ensure an “egalitarian atmosphere” in a network where participants may be formally ranked as superior or subordinate? Informants emphasized the importance of establishing mutual trust and respect. Here the network coordinator often plays a key role. Many Network 1 participants highlighted the way in which network leadership was exercised as a factor crucial for developing shared understanding. Participants from all levels agreed that Network 1 was characterized by a very egalitarian atmosphere. The original invitation to join had come from the national authorities. Knowledge producers were asked to contribute their scientific knowledge and assumed responsibility for producing a handbook. This necessitated understanding and meeting the needs of target groups that included knowledge mediators and knowledge users. The latter were in the best position to advise on the day-to-day functioning of local municipalities. These factors, not least the recognition that all participants are “knowledge-holders”, generated an egalitarian atmosphere, mutual trust and learning opportunities in this network.

In Network 2, a representative from the largest municipality chaired the network and made the decisions. Representatives from the smaller municipalities generally acquiesced, although a member of the county council expressed some scepticism to this imbalance of power. Representatives from the small municipalities were in practice regarded as students, invited to learn from the largest municipality, which held all the answers. These representatives appear to have accepted and appreciated this role, feeling that they did not have sufficient knowledge to contribute. Only one participant identified the imbalance of power involved. But, in this type of network, can learning be transmitted in two directions? Interviewees from Network 2 indicated that the representative from the large municipality may have acquired some new ideas, but no new “knowledge” as such.

Many municipalities in that county had been asked to join, but only four of them sent representatives. The invitation had been issued jointly by the county authority and the county’s largest municipality. The low attendance may indicate reluctance among the smaller municipalities towards the perceived dominance of the largest one. Such factors can influence how social norms are imitated and learned. The positive effect of communication from an “in-group” member (Sussman *et al.*, 2013; Stoknes, 2015) may be weakened in the presence of a power imbalance and in situations where not all members’ contributions seem to be taken as equally valuable. One informant from Network 2 expressed greater faith in workshops operating among small municipalities, rather than networks dominated by one large municipality. If municipal representatives can join the network as equal partners, they

have a greater obligation to contribute, and this may engender a deeper commitment to success.

A further crucial factor is whether the municipalities have sufficient *resources* to enable them join network arenas, and if the networks themselves have the resources to back up their participants. In Network 2, travel costs were covered, but participants stated that more municipalities might have joined the network if there were monetary compensation (like a *per diem* allowance) for attendance. It would have been easier for the municipality to prioritize participation if additional funding had been made available. [Multiconsult \(2017\)](#) found that the threshold for network participation ultimately depends on the resources available – and that can make it difficult for small municipalities.

4.5 Commitment within the home organization

It is easier to achieve results *within* a given network than to obtain commitment to achievements, such as new knowledge, ideas, agreements, strategies and measures “back home”. Commitment to new knowledge depends on how the network is organized, who is invited and the organizational characteristics of the municipality in question. Commitment to networks among municipalities may be influenced by, *inter alia*, the network’s initial contact phase. As noted, the final three rungs on the ladder describe strategic commitment, institutional commitment and political prioritization.

Some difficulties were experienced in bringing knowledge obtained within the network “back to home base”. In both Networks 1 and 2, participants learned that it was essential to adopt interdisciplinary (cross-sector) approaches to climate change adaptation; however, participants from the municipal and county authorities in Network 1 had already been working intensively to implement policies for climate change adaptation as part of their planning strategies:

Participation in the network has led to profound knowledge development. It has contributed to ensuring knowledge advancement by means of participation in all discussions. I’m very aware that I’m challenging established knowledge. (Network 1)

Achieving commitment is a challenging task. Participants from the municipalities in Network 1 pointed out that without acceptance and understanding among their administrative managers, they could neither promote awareness of, or commitment to, new knowledge among political leaders, nor could they ensure that awareness would “trickle down” to the various civil servants in relevant departments. In both networks, participants from the municipalities mentioned challenges in this aspect of their work. One participant in Network 2 struggled hard to find forums in which to present her new knowledge, as she was never asked to present the results from her network participation. This person was a building development administrator, working in a hierarchical municipal organization with little interest in climate change adaptation. In fact, the municipality adopted a new risk and vulnerability analysis without consulting her. The mayor of this municipality knew nothing of the network or who had been assigned to participate in it. This participant went on to say:

Yes, it [implementing new knowledge] is hard. You have it in your head, but you just continue where you left off [. . .] I’m trying to be aware when I work, but it’s hard to spread it to everybody, to get them to be focused. It just gets put aside. (Case 2, small municipality)

Another participant in Network 2 had a different role in a more team-based activity within the municipality. She had more success in influencing her co-workers:

Interviewer: Your colleagues and leaders, are they interested in what you have learned in the network?

Informant: Yes, some are. We're pretty good at working in teams within different topics here. So, if you are a part of a team, for example in Planning, it is easy to take up new knowledge. Yes, I think so.

Interviewer: Do you get to use the new knowledge?

Informant: Yes, absolutely. (Case 2, small municipality)

This municipality is uniquely focused on teamwork. The hierarchical vs team-based way in which a municipal organization works, and the role of participants, is of utmost significance for disseminating new social norms.

One suggestion for increasing commitment to new knowledge was to hold network meetings on the premises of the participating municipalities, on a rotational basis. That would give the host municipality the opportunity to invite more of its employees to its own meeting, thereby promoting knowledge dissemination.

As regard political commitment, the literature on boundary work (Guston, 2001) argues that it is essential to apply to the “principals” when implementing agreements established in the networks. Other scholars hold that commitment among local political leaders is essential if networks are to result in action (Sørensen and Torfing, 2005; Corfee-Morlot *et al.*, 2011; Dannevig and Aall, 2015; Torfing *et al.*, 2012). This argument was also expressed by our municipal informants:

We're working to ensure political commitment, because they [the political leaders] have final decision-making authority for the plan. The municipality in general has responsibility for many other things, like business development, childcare [...] That means there is competition to get organizational awareness of new policy areas such as adaptation. Other things are also important, like care of the elderly, or where to locate schools. (Network 1)

The need to obtain commitment towards network participation and output among political leaders, and the task of convincing them that the network approach does help to address policy challenges, have also been highlighted by other studies (Sørensen and Torfing, 2017; Torfing *et al.*, 2012). An evaluation of a large network consisting of the 13 biggest cities in Norway (Cities of the Future), showed that endorsement by the mayor of a municipality was pivotal to the ultimate impact of the network (Flyen *et al.*, 2017). This is an argument for addressing the network invitation directly to the mayor. The mayor did not sign up for participation in Network 2 – a lost chance of obtaining high-level political commitment. Interviewees suggested that the mayors and selected leaders from each municipality should participate in the first seminar, as political commitment at the launch of a new network is of great significance. Furthermore, there are greater chances of implementing new knowledge if the participants hold middle-level management positions or have coordinating responsibilities. Tajfel (2010) presented theories on the central meaning of social identity, and on how people strive to be part of status groups and imitate the most “significant others” – indicating that the status of network members is important.

4.6 Validity and generalization: some considerations

Validity and generalization in qualitative research require detailed information about the case study context, and transparency in argumentation (Brinkman and Kvale, 2014). All studies based on self-reported data are subject to limitations. Our interviews with network initiators were probably influenced by their roles – initiators want their networks to succeed and may thus downplay any deficiencies. However, the interview method contributes

towards an in-depth exploration of the *reasons* why network achievements have been obtained, and it is difficult to uncover these reasons by other approaches.

This research study is limited in its use of only two case studies, and further studies are needed to validate the findings. The aspects of time and scope should be studied more thoroughly. In addition, leadership and the personalities of the participants are topics that should be examined in greater depth.

The network achievement ladder (Hanssen *et al.*, 2013; Hanssen *et al.*, 2015a) is considered to be an analytical tool suitable for the categorization of network achievements. However, its “rung” structure may be too detailed for application to all types of governance networks, especially if used in other cultures or for other topics. That being said, the model clearly brings out the gap between achievements within the network as such, and achievements obtained later in the participants’ home municipalities. The four main factors influencing the various rungs in the model should be subject to further tests. Although this research project has focused on municipalities and public sector authorities, most of the findings should be equally applicable to networks involving private sector organizations.

5. Conclusions

This paper has investigated how multilevel networks for climate change adaptation can best be initiated and implemented to establish adaptation measures within municipalities. The main conclusion is that multilevel networks can promote learning about climate change adaptation and even lead to behavioural change in the form of policy implementation. The following factors emerge as especially important:

Scope: Having a specific focus on climate change adaptation increases the chances of developing a network dealing with points of interest to all participants. Participants should be involved in the work of preparing the details of the network programme. Furthermore, networks may profitably be implemented with parallel sessions, or in two steps: one might address high-level planning; the other, technical measures.

Participants: The aim should be to establish interdisciplinary and multilevel networks. Network representatives should hold positions that allow them to introduce and implement the insights and knowledge they acquire in the network in their own organizations. Ideally, network invitations should be addressed to at least *two* persons, with different roles, within each municipality in the county in question. These should preferably be municipal employees in middle management or coordinator positions.

Organization: Organizational qualities should be developed to ensure that the network arena is a good “boundary space” as regard generating trust and understanding. An egalitarian atmosphere where relevant inputs and experiences of all participants are valued is important, helping to create a close in-group, which in turn promotes more robust learning.

Commitment: The higher levels of network achievement involving behavioural change in the participants’ own organizations require commitment before, during and after the actual network period. Finding ways of securing commitment and implementing network knowledge are central to bridging the gap between what is discussed in the networks and ensuing outcomes in participants’ own organizations. Securing commitment is not a separate process outside network activities: it forms the basis for network achievements and can be achieved through planning and wise network implementation. Invitations to join networks should be addressed to mayors and/or organizational leaders, who need to be aware of the network, and the identity of the municipality’s representative(s). If the

municipal administration is committed to participation in the network, municipal leaders will be more likely to encourage the development of internal arenas for implementing the knowledge acquired. Commitment within the organization also presupposes that participants have a good understanding of the system – where and how to work strategically with managers to ensure that new ideas get implemented. Through dialogue with invited municipalities and organizations, network initiators may be able to ensure that municipalities select the “right” representatives to participate in the network.

Perspectives from environmental psychology may help us to understand more about how and why learning and behavioural change occur in networks. Further research should incorporate more detailed studies on the learning processes related to climate change adaptation in networks. Such studies should focus on how and why networks function, and on ways to promote and boost positive mechanisms.

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