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Communities of practice: One size does not fit all

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ABSTRACT

The need to improve the science-policy/practice divide is recognised for the effective generation and use of climate services to inform adaptation. Intradisciplinary – or within discipline – Communities of Practice (COPs) have long been recognised as a mechanism for furthering the development of information, but the role of transdisciplinary COPs – that span the science-policy/practice divide – is less well studied. In particular it has been claimed that COPs cannot be sustainably created by projects. This paper provides a discussion on what makes each type of COP successful, and a perspective on the extent to which each type of COP can be formed by projects, drawing on experiences from projects in the International Development Research Centre's (IDRC) Climate Change and Water (CCW) programme. We argue that there is need for a more nuanced understanding of COPs. Our findings reinforce the literature that intradisciplinary COPs need to be internally generated, but indicate that it may be possible to create sustainable transdisciplinary COPs through projects. It also highlights some experiences for creating effective transdisciplinary COPs to improve development and use of climate services.

1. Introduction

Communities of Practice (COPs) have long existed in a variety of fields. When successful, they provide effective mechanisms for knowledge sharing that augment the capacities of the individual members as well as the fields in which those individuals operate. As a result, projects and donor-funded interventions often aspire to the formation of COPs as a way of sustaining impact. The form of COPs is typically heterogeneous, and a variety of principles exist for their effective formation. Recent arguments highlight the need for a more nuanced distinction between intradisciplinary and transdisciplinary COPs (Cundill et al., 2015). Intradisciplinary COPs refer to those that bring together people of the same discipline to provide support and lesson sharing. Transdisciplinary COPs bring together people across academia and policy/practice in order to share information and learning across the science-society interface. To date, there have been few attempts to interrogate the difference between these two types of COPs in practice, and thus to investigate the role of each type of COP in the effective generation and use of climate services.

In this perspectives piece, we draw on the examples of projects in the International Development Research Centre's (IDRC) Climate Change and Water (CCW) programme to discuss what makes both intradisciplinary and transdisciplinary COPs successful, and the extent to which it may be possible to successfully form each type through explicit project goals. We argue that transdisciplinary COPs aid in the use and communication of complex scientific information, such as issues around uncertain climate data. We also argue that, whilst sustainable intradisciplinary COPs are difficult to externally impose on communities, it may be possible for discrete projects to generate and catalyse the formation of enduring transdisciplinary COPs.

2. Defining Communities of Practice

A COP brings together a group of people (the community) who share a common interest or passion, and who learn how to do it better through regular interaction (Wenger, 1998). In the traditional sense COPs are informal and self-organising, and set their own agenda with no common goal other than knowledge creation (Cundill et al., 2015). They can vary significantly in their size, membership composition and modality of working. All of these elements are dynamic and can change over time.

Their heterogeneous nature means that it can be difficult to precisely define a COP, but there are a number of circumstances that the literature currently considers outside of the definition. These include

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teams that are created for the purposes of a particular project, or for a fixed time duration. In some cases, over time COPs can morph into formal organisations – for example membership-based professional associations. Hence COPs can be temporary in nature (although to be so classified, they must not originate with the common aim of leading to a formal organisation). However, the literature on COPs shows some variation. Whilst initially self-organisation was deemed essential, there is now more recognition of the variety of COPs, especially given the scope for remote COPs supported by technology. Such support can variously come, for example in the form of webinar services, online community sites, and support to third party social media sites (Wenger et al., 2009).

Given their great scope for added value, it is not surprising that there is often motivation to attempt to create, or support the creation of, COPs, especially when working in developing country contexts where they could play a key role in the pressing need for capacity building (e.g. Johnson and Khalidi, 2005). However, a question remains as to whether effective COPs can be initiated and/or externally supported in their generation, as this appears contrary to the primary understanding in the literature of how COPs can be formed. The principles that exist for creating effective and self-sustaining COPs suggest that they can be externally initiated (Table 1) so this premise has been further investigated in this paper.

Early examples of COPs tended to implicitly focus on people working within the same discipline. However, we support the argument that we should broaden the definition of COPs to recognise two types: intradisciplinary and transdisciplinary (Cundill et al., 2015). Intradisciplinary COPs, or those that consist of people within a discipline, are in-keeping with the traditional definition. Transdisciplinary COPs, on the other hand, which span the science-policy/practice divide, bring together groups of people with different expertise and focus (Srinivasan et al., 2011; Girvetz et al., 2014; Polk, 2015). We argue that these two COPs should be viewed differently in terms of how they can be generated and supported, which has implications for how climate services can be produced.

2.1. Intradisciplinary Communities of Practice

The definition of intradisciplinary COPs has long been open to discussion. At their broadest, it has been claimed that the process of learning is not so much for the individual acquiring of knowledge, but to enable participation in a community of practice which, in turn, promotes further learning (Lave, 1991; Snyder et al., 1999). In this way academics have earned the right to participate in the COP of their discipline through attainment of a graduate degree. Taking a narrower perspective, COPs are a group of people (a community) who share a common interest or passion, and who learn how to do it better through regular interaction (Wenger, 1998; Millen et al., 2002). When successful, they provide effective mechanisms for knowledge sharing that augment the capacities of the individual members as well as the fields in which those individuals operate. A COP of climatological and hydrological modellers, for example, has the potential to augment knowledge and capacity to generate climate information to inform water resources management.

2.2. Transdisciplinary Communities of Practice

There is increasing recognition that enabling adaptation to climate change is contingent on improved dialogue between scientists and users (policy-makers/practitioners) to reduce the current “usability gap” of climate services (Lemos et al., 2012). New networks are required for facilitating dialogue and information exchange that recognise cultural, institutional and personal/worldview differences between the different communities, and can address issues such as uncertainty and terminology differences (Dessai et al., 2005; Bidwell et al., 2013; Kiem et al., 2014; Cvitanovic et al., 2015).

Transdisciplinary COPs are one way in which such post-normal science can be practised. The focus is on linking knowledge, policy and practice (Hearn and White, 2009). In contrast to intradisciplinary COPs, transdisciplinary COPs are discipline transcending, and bring together producers and users of information for a process of co-production of knowledge (Austin et al., 2008). The shift towards transdisciplinary work represents a major shift in traditional academic functioning but is seen as necessary for understanding the complexities of societal decision-making and for enabling effective dialogue around science (Austin et al., 2008; Moser, 2016).

In transdisciplinary work, the societal questions frame the research thinking (Thompson Klein, 2013). The emerging climate services agenda is a typical example of stakeholder-informed science that is best addressed by transdisciplinarity (GFCS, 2014). This stems from the academic consensus that a user-producer co-production process of guiding decision-making is critical for informing user-relevant science (Dutton, 2002; Miles et al., 2006; Weeks et al., 2011; Hewitt et al., 2012; Vaughan et al., 2014; Vaughan and Dessai, 2014; GFCS, 2014; Polk, 2015). The involvement of actors external to academia engenders a sense of ownership for problems and solution options generated through the science (Lang et al., 2012). Hence this co-production dialogue and process typically takes place within the context of a transdisciplinary COP.

A major defining feature of transdisciplinary work is that the knowledge production is measured by the criteria of appropriateness and acceptability of the output and solutions. This is in contrast to the objectivity and validity of the methods used, which are the traditional measures of academic research (Wickson et al., 2006; Ravenek and Rudman, 2013). The literature describes this transdisciplinary co-production process as a process of *negotiated understanding* or a *pull-push* process (Gawith et al., 2009; Mastrandrea et al., 2010; Lemos and Rood, 2010; Dilling and Lemos, 2011; Lemos et al., 2012). As with intradisciplinary COPs, it involves a group of people who have a vested interest in the output of the research and work together to achieve that output – but the difference is that the members have varying expertise across disciplines (Polk, 2015). The importance of enabling such co-exploratory relationships has been recognised by a number of donors, who are showing interest in supporting them[1].

In informing the factors that allow for the creation of sustainable COPs, we draw on illustrations from the IDRC Climate Change and Water (CCW) programme. Involvement in this programme allowed for insights into the nuances between intra-and transdisciplinary COPs and an opportunity to explore the successfulness of initiating each of these kinds of COPs within discrete projects.

3. Illustrations from the IDRC Climate Change and Water programme

The CCW programme incorporated 22 projects in Latin America, Africa and Asia for a 24 month period. One of IDRC’s explicit aims was to facilitate the formation of an intradisciplinary COP. A five day science workshop was held, attended by the majority of the projects, to catalyse this process. The author team was contracted to run this workshop and support subsequent engagement by the science projects, and thus it is possible to investigate the success of this intradisciplinary COP and the extent to which it was successfully formed by a project.

The structure of the programme also allowed for investigation into the generation and sustainability of transdisciplinary COPs. A key feature of all these projects was that they included researchers and users (for example policy-makers, or partners from government parastatals,

[1] As well as the IDRC Climate Change and Water programme, other examples include Future Climate for Africa (DFID), Weather and Climate Information Services for Africa (DFID), Climate Information for Resilient Development in Africa (UNDP).

Table 1
Principles for creating effective and self-sustaining COPs (Wenger, 2000; Wenger et al., 2002).

Principle	Example
Design for evolution	Ensure scope for evolution to meet interests of participants within the area of interest
Open dialogues	Encourage discussion to enable sharing of perspectives from outside the COP
Encourage different levels of participation	Ensure a combination of core members (full and regular contribution), regular (active contribution) and peripheral (often largely observers with occasional contribution)
Develop both public and private community spaces	The core COP may have its regular "private" spaces for interaction, but also contribute to public spaces, e.g. through blogs, sessions at conferences
Focus on value	Identify what the COP most values, and then focus discussion and activities around these
Combine familiarity and excitement	Introduce radical or challenging discussion ideas as well as the more common concerns
Create a rhythm for community	Regular schedule of activities and/or focal points that regularly bring participants together

regional agencies or the private sector, as well as grassroots communities and community organisations). They thus allowed the scope for investigating experiences of transdisciplinary COPs across a variety of geographical contexts for enabling adaptation in the water sector. A science-policy/practice workshop was held towards the end of the programme, and was attended by invited representatives of 10 CCW projects, bringing together the project Principal Investigators (PIs), associated user, and a project-selected technical researcher. The invited projects were selected based on a representative geographical spread and those projects that had demonstrated user engagement. The aim was to investigate insights into the characteristics of successful science-policy/practice communication pathways. The process thus contributed to developing understanding of the modalities of an effective transdisciplinary COP based on the common experiences arising from the projects. A limited number of follow-up interviews were held with a self-selecting subsample of project researchers/PIs and users to gain further project-specific insights into the process of development of the transdisciplinary COP, and how various challenges were navigated in order to bridge the science-policy/practice interface.

3.1. Lessons learned about building intradisciplinary Communities of Practice

The CCW programme reinforces existing theory and experiences of forming intradisciplinary COPs. The science workshop within the programme brought together technical researchers and PIs with the intention of generating of an effective intradisciplinary COP, by convening like-minded scientists from across the projects in Africa and Asia to share experiences and receive technical training on working with climate data.

An explicit aim of the science workshop, as mandated by IDRC, was to develop a formal intradisciplinary community of practice with the aim of continuing learning from shared challenges post-workshop. As well as technical training, several of the workshop sessions focused on the development of an intradisciplinary COP in an attempt to enhance the learning and sharing on using complex information. As a start, the participants were asked to define a COP and mechanisms for continuing the group beyond the formal workshop activities. Other sessions during the workshop were also designed to foster a COP, such as participant speed dating and a session dedicated to developing joint research proposals. In addition, regional COP coordinators (identified from within the projects) were appointed by the funders and paid a modest annual honorarium (approximately US$1000/year) to undertake a regional coordination effort for the lifetime of the CCW programme. An interactive project website was established as a medium for hosting the activities of the community, with dedicated regional forum pages for the African, Asian and Latin American regional sub-groups to undertake regional discussions.

Whilst commitment was expressed during the workshop for such an intradisciplinary COP, enthusiasm waned subsequently. It was clear, from the exercises during the workshop, that the participants required clear incentives for being part of a community and explicit activities laid out within the community in order for it to be sustained. While it was intended that the regional coordinators would take on a "champion" role, this did not transpire. This was most likely because the regional coordinators were appointed by the funders as opposed to proposing themselves due to their passion for the role. There was also no formal reporting requirement attached to the payment of the honorarium.

This experience reinforces evidence in the literature that intradisciplinary COPs need to develop organically in order to be sustainable. An intradisciplinary COP is not a mechanism that can be imposed on a group of people, because it requires commitment from each and every member and particularly from a "champion" member who can act as the core and provide leadership (Wenger, 1998, 2000). This is essential to ensure that the COP provides added value to its members, which likely encourages their ongoing participation in a virtuous circle of growth and consolidation. However, the sustainability of a COP is dependent on the members recognising the value and actively contributing in order to maintain it.

External organisations can play a role in catalysing the formation of a COP, and then supporting its evolution, if these factors are in place (Cundill et al., 2015). Creating the impetus for generation of a COP may include hosting a workshop of like-minded individuals. This provides the space for rich discussions and recognition of the opportunities of collaboration for knowledge creation. If common aims emerge, and the community recognises the potential gains of active participation, under the leadership of key individuals, the COP has the potential to survive past the initial burst of post-workshop enthusiasm (Cundill et al., 2015; Wenger et al., 2009). Once the decision has arisen from participants to create a COP, external organisations can continue to play a supporting role. This may include hosting a virtual platform, or providing funding for face-to-face interactions in the early days to consolidate momentum. The identification, need for, and aims of, such opportunities should arise from the COP itself. However, to attempt to drive the process, even based on the principles in Table 1, does not guarantee the necessary ownership for sustainability.

3.2. Lessons learned about building transdisciplinary Communities of Practice

The CCW programme was contingent on the formation of teams, comprising the researchers and users. Using Wenger's (1998) definition, a project team is not the same as a transdisciplinary COP. However, the experiences of this programme support Cundill et al's (2015) elaboration of the COP definition such that transdisciplinary COPs are recognised. They also highlight enabling circumstances that underpin successful transdisciplinary COPs.

Broadening the timeframe to look before and after the CCW programme, the experiences of the project teams suggest that projects can

play an effective role in catalysing sustainable transdisciplinary COPs. Firstly, a number of the projects comprised researchers and users who had collaborated in previous projects and built trust relationships. Indeed these previous relationships were cited as key reasons for the formation of teams to apply for funding within the CCW programme. In projects in Argentina, Chile and India, scientists and users remarked that their transdisciplinary COPs essentially already existed from previous projects, and were cemented during the CCW programme projects. In other cases the formation of the transdisciplinary COP took place during the CCW projects and, even in the relatively short time between the end of the programme and the interviews, there were indications of ongoing linkages. The PI of a project investigating how the interaction between human activity and ecosystem services will affect water availability under climate change in Small Island Developing States (SIDS) noted that, as a result of trust built between him and the project policy-maker during the CCW project, he had subsequently been invited to sit-in on government-led working groups and provide briefings on environmental health topics. Since there is ongoing interaction that arises out of the value perceived by both parties, this suggests that a transdisciplinary COP has been generated and continues to exist, although this is happening outside of a project-funded intervention. This has implications in that it highlights that there may be a role for projects to play in catalysing the formation of transdisciplinary COPs, and experience from the CCW programme highlights both the existence of established transdisciplinary COPs, and the creation of new ones as a result of discrete projects.

3.2.1. *Characteristics that underpin successful transdisciplinary COPs*

Given that there may be a role for projects to play in supporting the formation of transdisciplinary COPs, it is important to investigate the particular characteristics that enable project teams to effectively engage in co-production of climate services for adaptation. In the science-policy/practice workshop and subsequent interviews a number of common characteristics emerged based on project experience.

3.2.1.1. Bringing together researchers and users from the start of the project. The earlier in the decision-making process the user-producer relationship is established, the more effective it is likely to be (Hanger et al., 2013). Widespread consensus was that bringing scientists and users together from the start of the project is an effective way of ensuring that a project team continues as a transdisciplinary COP.

3.2.1.2. Ensuring openness and empathy for each other's contexts. Ensuring that all parties are open and willing to show empathy for one another's position is also key to building effective working relationships. The most effective teams were built where all parties were open to the notion of collaboration, and willing to put themselves in the shoes of other disciplinary backgrounds/job roles in order to understand the contexts in which decisions are made, whether they are research designs or policy/practical decisions. Typically, for example, scientists are much more conservative, given their understanding of the inherent uncertainties and limitations of their field. Many users seek immediate solutions – which is particularly problematic in the case of modelling water supply and demand in the context of a changing climate, because of the differences in preferred timeframes of analysis of users and scientists (although some attempts have been made to generate shorter range hydroclimatic scenarios, see for example Kiem and Verdon-Kidd, 2011).

3.2.1.3. Regular face-to-face communication, where possible. As well as the principles necessary to create effective transdisciplinary COPs at the start, a number of elements arose as key for sustaining the science-policy/practice communication pathways to produce effective climate services. Most reported the need for continuous and patient communication, particularly at the beginning of a project, in order to share differing viewpoints. The importance of face-to-face communication, whether through full project meetings or one-on-one interactions was highlighted as a key mechanism to develop effective transdisciplinary communities. This was deemed particularly important in the case of government/parastatal/private sector users, who are subject to competing demands on their attention and typically have to prioritise the most immediate concerns that arise. An Indian PI highlighted that he held monthly meetings with the project users, which built trust and also ensured that climate and hydrological information was effectively tailored and interpreted to inform policy decisions.

The importance of communication is also essential to sustain transdisciplinary COPs. Communication should be meaningful and efficient to ensure that all liaisons have a purpose i.e. only when there is a real need for engagement in terms of seeking inputs or disseminating outputs. A key achievement of these communication processes was awareness raising of the specificities of the contexts of scientists and users, for example the uncertainties in model outputs and how they can be used effectively, as well as the decision-making process and how inputs can be tailored to better inform this. This reiterates existing findings that the participatory communication process needs to be purposeful, iterative and sustained, in order that scientists and decision-makers can come to a common understanding of the climate information required for decision-making, and scientific products can be tailored accordingly (Dilling and Lemos, 2011; Kiem and Austin, 2013).

3.2.1.4. Willingness to adapt the methodology – and workplans – to reflect emerging user needs. Both scientists and users from various projects highlighted the evolution in their understanding of each other's perspectives as the project progressed – and how they used this knowledge to continue effective communication. A representative from a development organisation in Nepal who acted as a PI, for example, explained her realisation that "we're all talking about the same thing in different languages". Others elaborated on how similar improved understandings of the communication channels enabled them to more effectively package and target their outputs. In the words of the project PI, "You have to be calculative to understand the decision context", meaning that it requires a concerted effort to understand the landscape in which decisions are made in order to find appropriate entry points for scientific inputs.

Improved understanding of each other's perspectives and ways of working, and the empathy that resulted, facilitated readiness to be flexible in the process of undertaking the project. A number of projects noted that willingness to adapt their methodology – and workplans – to reflect emerging user needs was essential. This can be complex and time-consuming, depending on the variety of participants within the transdisciplinary COP, and the, often, unpredictable competing needs on their time. It was noted as a particular adjustment for the technical researchers in the project, most of whom were modellers. For them the process of engagement in co-production is typically very different from their usual circumstances, where they are able to control progress without reliance on external actors.

4. Towards effective and sustainable COPs for climate services

Using the examples from the IDRC CCW programme, we argue that there is a need for more nuanced understanding of COPs, which distinguishes intradisciplinary and transdisciplinary variants. Much of the existing literature focuses on intradisciplinary COPs, and highlights the need for these to be self-generating. The CCW programme explicitly intended to create an intradisciplinary COP of climate and water researchers but was unsuccessful in creating something sustainable, hence reinforcing the existing hegemony.

However, whilst it seems intradisciplinary COPs cannot be successfully generated by projects, the experience of the CCW programme

suggests that there may be a role for projects in generating sustainable transdisciplinary COPs that comprise researchers and users of various categories (for example policy-makers, or partners from government parastatals, regional agencies or the private sector, as well as grassroots communities and community organisations). Transdisciplinary COPs share many of the characteristics of their intradisciplinary counterparts in terms of being effective fora to share information for more efficient group learning and use, but, unlike intradisciplinary COPs, they might be able to be successfully and sustainably formed through projects. However, their success will be dependent on the project context, the process followed, and the development of trust established across the disciplines.

Experiences of the CCW programme also illustrate a range of criteria that are necessary to support sustainable transdisciplinary COPs that support science-policy/practice communication. Effectiveness was based on willingness of both scientists and users to work with others, develop new modes of communication, and engage in flexible processes to identify appropriate entry points. When this occurs, trust relationships are built. In some cases the project cemented existing transdisciplinary COPs that had been built between researchers and users in previous projects. In others they were created but, even in the short time since the end of the programme, there are indications from project participants that many have been sustained.

Recognising that there is a distinction between intradisciplinary and transdisciplinary COPs has implications for the effective implementation of climate services and also for donors in identifying how COPs may be supported or created. By bringing together researchers and users, transdisciplinary COPs create a forum in which climate services can be co-produced. Whilst donors should be cautious about the ability to create sustainable intradisciplinary COPs, their support for transdisciplinary COPs may create a mechanism to improve science-policy/practice communication for development of effective climate services to inform adaptation.

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Appendix A. Supplementary data

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