

Finding a Place in the Arctic Council for Non-Arctic Actors: A Social Network Analysis of the Arctic Monitoring and Assessment Programme

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In recent years, the Arctic Council has received a growing number of applications from states, intergovernmental organizations (IGOs) and non-governmental organizations (NGOs) to obtain Observer status. This has generated a diverse commentary about the impact of increased involvement from non-Arctic actors, what influence they could have, and the role that they should play. An underlying assumption in all of these debates is that the Arctic Council has been an exclusive club that now must open its doors to non-Arctic interests and ideas. But is this in fact the case? Has the Arctic Council been a closed forum? The Arctic Monitoring and Assessment Programme (AMAP) is one of six Arctic Council Working Groups. Its mandate is to “monitor and assess the status of the Arctic region with respect to pollution and climate change issues” (Arctic Climate Impact Assessment, 2016). Using the AMAP as a case study, this article uses social network analysis (SNA) to visualize the network of experts and officials from Arctic and non-Arctic states that have participated in shaping climate and pollution science prepared for the Arctic Council. This article examines the key features of the AMAP’s networks and uses data available between 1998 and 2015 to consider how these networks have evolved and changed over time. This article finds that actors from non-Arctic states have been present in the work of the AMAP since its inception. Furthermore, there has been a growth in their involvement in the AMAP since 2006; although, non-Arctic actors have remained peripheral in the AMAP networks.

As the Arctic Council celebrates 20 years since the signing of its founding declaration (Arctic Council, 1996), those involved at its inception consistently marvel at how much the Council has evolved and the prominence it has achieved both within the Arctic region and internationally. As scientists, governments and the general public (with help from the media) increasingly link the rapidly changing environment in the Arctic to the environmental, economic and social fates of the world, the Arctic Council has been positioned as “the preeminent forum for international diplomacy on Arctic matters” (Ziff, 2015).

As the Arctic Council gains prominence, it is not surprising that the interest of a variety of state and non-state actors to be involved with the Council has also grown. In 2013, the Council received international media attention for granting Observer status to China, India, Italy, South Korea, Japan, and Singapore; while deferring a decision to grant Observer status to the European Union and remaining silent on applications for Observer status from a number of

intergovernmental organizations (IGOs) and non-governmental organizations (NGOs). Since that time, demand by states and organizations to be involved in the Arctic Council has continued to grow and there has been increasing commentary in both the academic and popular literature on the role Arctic Council Observers can and should play – in particular larger states like China and the European Union. These debates often raise difficult issues about the power, influence and motives of different states seeking to gain access to the Arctic Council and participate in its discussions and activities. There is no question the involvement of new Observers raises important issues that many international institutions must grapple with and the Arctic Council will have decisions to make about how it will evolve to engage a broader community. However, underlying these debates is the assumption that the Arctic Council has been an exclusive club that only recently has faced the need to consider how it will involve new actors, in particular non-Arctic states (Lackenbauer, 2014; Wilson, 2013). But is this in fact the case? Is the idea of involving actors from non-Arctic states new? Has the Arctic Council functioned as a closed forum? This article considers these questions by focusing on the participation of actors from Arctic and non-Arctic states in on one of the Arctic Council's longest established working groups – the Arctic Monitoring and Assessment Programme (AMAP).

Using the AMAP as a case study, this article uses social network analysis (SNA) to visualize the network of experts and officials that have participated in shaping the climate and pollution science prepared for the Arctic Council. SNA is a relational methodology that places attention on the features of a network with a particular focus on highlighting the relationships between actors and the patterns of relationships that exist within a network. This article analyzes the people, organizations and states that have participated in the AMAP's work and examines key features of the AMAP's networks of experts and officials by using data available between 1998 and 2015 to consider how these networks have evolved and changed over time. This analysis finds that actors from non-Arctic states have always played a role in the work of the AMAP and their role has increased in the last decade as the Arctic has gained in prominence. However, this article also finds that Arctic Council Member states have consistently made up the core of the AMAP's networks of experts and officials; while non-Arctic states have held peripheral positions.¹

The History of the AMAP

The AMAP is one of six Arctic Council working groups. It is often directly credited with raising the profile of the Arctic Council with the release of its Arctic Climate Impact Assessment Report (Arctic Monitoring and Assessment Program, 2005),² which helped to place the Arctic at the center of growing public acceptance of global climate change in the mid-2000s (Fenge, 2012; Huebert, 2009; Young & Kankaanpää, 2012). It is also often credited with influencing the international negotiation processes that led to the 2001 Stockholm Convention on Persistent Organic Pollutants and the 2013 Minamata Convention on Mercury (Fenge, 2012; Huebert, 2009; Stone, 2016; Watt-Cloutier, 2015).

What is less well understood in certain circles is that the AMAP is one of four working groups³ that pre-date the establishment of the Arctic Council. The need for the AMAP was recognized early on as a critical component of a Circumpolar negotiation process initiated by Finland in September 1989 – often called the Finnish Initiative or the Rovaniemi Process. These negotiations were focused on developing multilateral cooperation around pollution prevention

and response, which culminated in the creation of the Arctic Environmental Protection Strategy (AEPS) in June, 1991. The initial mandate assigned to the AMAP through the AEPS was a critical aspect of the newly established regional agreement because it provided the mechanisms necessary for multilateral sharing of environmental data and a means for experts and officials to collaborate in the analysis of that data with the express purpose of informing domestic, regional and international policy decision-making. This working group was at the heart of this fledgling effort at multilateral cooperation between the region's governments and its work was positioned to be the foundation for informed action to respond to the multiple pollution issues observed in the region.

From its inception, the AMAP was strongly supported by all of the Arctic states (although some states were more engaged than others). Furthermore, from the beginning the AMAP benefited from the support of a secretariat that was hosted by Norway and from strong, experienced leadership capacity. The other working groups identified in the AEPS have also done important work over the years; however, the founding declaration of the AEPS did not provide the same dedicated support and their ability to deliver on their mandates early in their formation was consequently weakened. The mandate and working groups of the AEPS were integrated into the Arctic Council when it was officially launched in 1996. As a result of its long standing capacity and the significant body of work that it has been able to produce, the AMAP serves as a useful case study to understand how different experts and officials from both Arctic and non-Arctic states have participated in shaping the climate and pollution science prepared by the Arctic Council.

Methodology and Data

During a series of interviews with Arctic Council officials and staff between 2014 and 2015, the role of Arctic Council Observers was specifically discussed. Representatives from Arctic Council Member states, Permanent Participants, and state and non-state Observers consistently acknowledged that Senior Arctic Official (SAO) meetings no longer provide a forum for "real" participation by Observers. As one official noted: "They are Observers. They are there to observe the meeting" (personal communication, January 16, 2015). However, these discussions also indicated that most interviewees were aware that, despite the title of "Observer," many states and organizations that had acquired this title were interested in a more substantive role. In several cases, the solution proposed by interviewees was that "Observers need to get involved where the work is really getting done. Their best opportunity to participate in the work of the Arctic Council is through the working groups" (personal communication, September 16, 2014). Given the structure of the Arctic Council, this advice seems intuitively sound. However, to date, there has been no research done to confirm that Observers should expect to play a more meaningful role at this level. As a result, this article seeks to empirically assess the role that actors from Arctic and non-Arctic states have played at the working group-level.

This article will use social network analysis (SNA) as a methodological tool. SNA is a methodology initially applied by sociologists to study the relationships between people and the structures of social networks (Scott, 2013). Overtime, other social sciences have adopted SNA as a tool to map the relationships between different actors, organizations, states and issues to study the features of different types of networks. It provides a useful analytical tool to organize and

present relational data. SNA enhances our ability to empirically analyze the relationships between actors and the structures of networks by visually presenting relationships in network maps. SNA places the focus on the dynamics that exist in a network. These maps use nodes to represent the person or item of interest and ties (or edges) to link or show a relationship between nodes.

For the purposes of this article, SNA is used to present data related to the individual-, organization- and state-level of involvement in the work of the AMAP with the goal of analyzing the structures of the networks that has supported the work of this working group and how it has evolved over time. To support this analysis, data was collected on the authors⁴ that contributed to the AMAP's 19 scientific assessments published between 1998 and 2015.⁵ Data was also collected about participants at the AMAP meetings from the minutes of the 18 AMAP working group meetings that took place between 1999 and 2015.⁶ This data is complemented with material from interviews with Arctic Council officials and staff that are, or have been, involved with the Arctic Council that were conducted by the author between May 2014 and June 2016.

As part of this analysis, two key tools of SNA are applied to further enhance our understanding of the AMAP's networks of experts and officials. First, the centrality measure of "betweenness" is used to highlight those actors that are important for linking together other actors in an AMAP network. The measure of "betweenness" is used to highlight those actors that have the potential for "controlling flows through the network" emphasizing their importance to the network and their ability to filter or translate information passing through the network (Borgatti, Everett & Johnson, 2013: 175). The second SNA tool applied in this article is a core-periphery analysis. In a network that has a core-periphery structure, those nodes at the core of the network have strong ties to each other and also have connections to the peripheral nodes; whereas peripheral nodes are mainly connected to the network through the core with little or no connection to other peripheral nodes (Borgatti et al., 2013: 223). Again, this tool provides us with useful insights about the flows of information within a network.

Analysis

Although the existing literature about the Arctic Council will often differentiate between the types of work undertaken at the SAO-level versus the work done in the working groups, for the purposes of this analysis it is important to recognize that the working groups perform multiple tasks. The work of the AMAP can be differentiated into two distinct functions. The first component of its mandate is to "monitor and assess the status of the Arctic region with respect to pollution and climate change issues" (Arctic Climate Impact Assessment, 2016). This function draws on the data, experience and expertise of a network of specialists in areas such as acidification, persistent organic pollutants, human health and radioactivity. The main products of this work are a collection of peer reviewed scientific assessment reports. The second component of the AMAP's work is to summarize and translate the findings in these scientific assessments into advice for policymakers. This second function is the responsibility of the working group members and results in a variety of products, including summary reports, presentations, and policy advice to other Arctic Council working groups, the Arctic Council SAOs and Ministers, and other regional and international institutions.

With these distinctive functions in mind, it is useful to separate the analysis in this article into two parts. The first section will focus on an analysis of the network of experts that participate in

the AMAP scientific assessments. The second section will focus on those actors involved in translating expert analysis into policy advice.

AMAP Network of Experts

The data collected from the AMAP's scientific assessment reports indicates that 896 unique authors have contributed to its 19 reports. These authors represent 273 different organizations, including national government departments and agencies, sub-national government departments and agencies, universities, public and private research institutes, Indigenous organizations, IGOs, NGOs, private consulting firms, and industry representatives. These authors also represent the participation of 22 different states.⁷

This confirms that the AMAP has drawn on a large network of experts to produce its scientific assessment reports, but it tells us very little about the nature of the relationships that exist between these experts or the structure of the network that shapes how these experts work together. To enhance our understanding of these networks, SNA is used to present the data collected at the author-, state- and organization-levels.

The Authors Network

Of the 896 authors that have participated in AMAP reports, 86.7% of the authors contributed to only 1 AMAP report; while 11% contributed to 2-3 reports, 1.6% contributed to 4-5 reports and only 0.5% contributed to between 6-8 reports. Figure 1 maps this network of authors with each node representing an individual author and the complex collection of ties between the nodes representing authors that have worked together on individual reports. Blue nodes represent authors from Arctic states and yellow nodes represent authors from non-Arctic states. Certain nodes in Figure 1 are larger. These nodes represent those authors that are central to the network of authors using the measure of betweenness. These authors are identified as critical nodes that link authors in the network together. Those authors represented by larger, square nodes at the centre of the network map are identified as central to the production of AMAP reports because of the number of reports they have been involved in. Whereas authors represented by larger, diamond-shaped nodes that rest more at the periphery of the network are recognized as important to the network of authors because they are identified as the link between the central core of the author network and a collection of authors that are only connected to the larger network of authors through them.

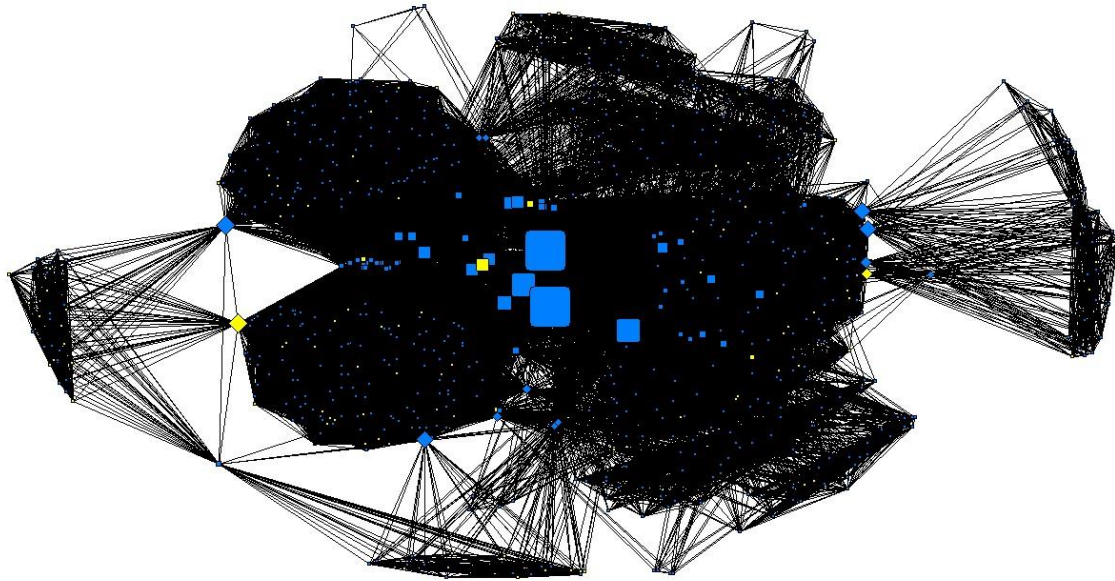


Figure 1: The network of authors that contributed to AMAP reports from 1998 to 2015. Blue nodes represent authors from Arctic states and yellow nodes represent authors from non-Arctic states. The size of each node represents an author's centrality in the network using the measure of "betweenness." Larger square nodes represent authors that have been involved in a larger number of reports and diamond-shaped nodes represent nodes that are important to join peripheral authors to the network. The ties between the nodes represent authors that have worked together on specific AMAP reports.

This figure provides an interesting presentation of the network of authors that have participated in writing the AMAP scientific reports. It confirms that these reports draw on the expertise of a large network of people and also highlights that there are a relatively small group of authors who are central to the network because of the role that they play in linking together the broader community of experts (diamond-shaped nodes). Not surprisingly, most of the authors that are recognized as central to the network of experts are from Arctic states (blue nodes); however, there is a good distribution of authors from non-Arctic states (yellow nodes) throughout the network and there are authors from non-Arctic states with high betweenness measures because of the number of reports they have contributed to (larger square nodes) and because they join peripheral authors to the network (diamond shaped nodes).

Figure 1 confirms that non-Arctic actors have been and can be meaningfully involved at the individual-level. This SNA map also highlights that there are a relatively small number of authors that are well positioned to influence the flow of information across the network and between AMAP reports and, by extension, these few authors may be well positioned to engage and connect new actors to the existing AMAP network of experts. Figure 1 is less helpful in explaining how and where non-Arctic states and organizations have been involved in the AMAP's work to date.

The State Network

To more directly consider the question of the role that non-Arctic states have played in the AMAP's network of experts, the data collected on authors was organized and rolled up to the state-level. This does not mean that an expert is a state representative; it only captures the state where the expert was located at the time that they contributed to a particular AMAP report. To

further refine the analysis, the author data has also been segmented into two distinct time periods. The first time period presented in Figure 2 is from 1998 to 2005 that includes 7 published reports, including the acclaimed 2005 Arctic Climate Impact Assessment (ACIA). It is commonly accepted that this was a period when global interest in the Arctic and the Arctic Council was relatively limited. The second time period presented in Figure 3 is 2006 to 2015. This is the period when the Arctic and the Arctic Council grew in prominence globally. During this period, the AMAP published 12 reports.

Figure 2 shows us that authors from all of the Arctic Council Member states (represented by green circles) were involved in the two largest reports prepared by the AMAP during this period – the first AMAP assessment published in 1998 and the 2005 ACIA. However, 3 Member states, Canada, Norway and the United States, rest at the center of the network. They are the only states with authors that contributed to all the AMAP reports published during this period and the thickness of the ties between these three states and several of the reports indicate that they, in many cases, were also the largest contributors to individual AMAP reports.

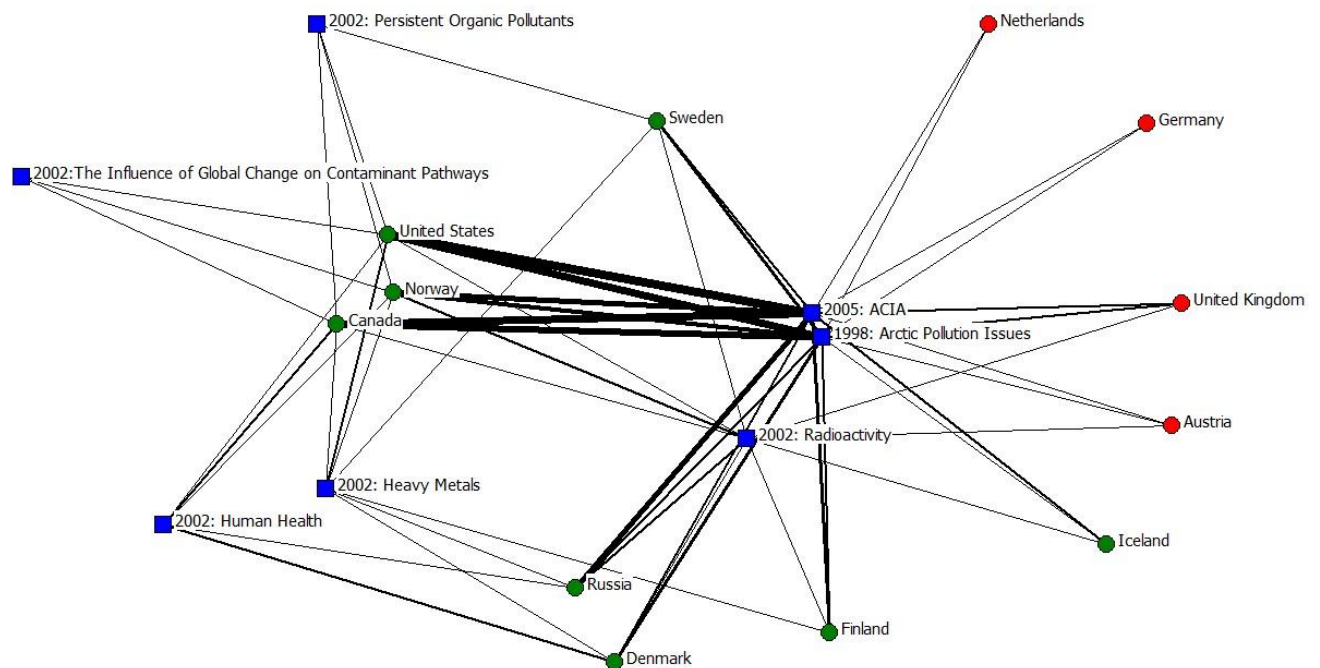


Figure 2: State-level participation in the authorship of AMAP reports from 1998 to 2005. Blue square nodes represent AMAP scientific assessment reports published during this period, green circle nodes represent Arctic Council Member states and red circle nodes represent non-Arctic states. The thickness of the ties between nodes indicates the strength of the relationship of a state to a report measured by the number of contributing authors.

A core-periphery analysis of the network confirms that the United States, Canada and Norway are the core of the network that produced the AMAP reports during this period with Russia and Denmark also holding notably strong positions in the network. Surprisingly, Finland, who is credited with launching negotiations towards the AEPS and the creation of the AMAP, is not identified as central in the network based on the number of authors from this state.

This figure also shows that authors from four non-Arctic states contributed to AMAP reports during this period (represented by red circle nodes). This map indicates that in the early years of the AMAP, the involvement of authors from non-Arctic states was limited to a collection of European states with long histories of interest and involvement in the Arctic region.⁸ The Netherlands, Germany and the United Kingdom all requested and received Observer status in the Arctic Council at its inception. Interestingly, Austria did not have Observer status during this period and still does not have this status. This confirms that Observer status in the Arctic Council was not a requirement to contribute to AMAP scientific reports. During interviews with staff and officials involved with the AMAP, interviewees confirmed that the criteria for selecting authors is based on engaging the best experts in the world on a particular topic with no consideration to the location of this expertise. However, these officials also confirmed that the leads of the scientific assessment look to Member states and the existing network of experts to identify potential authors for any given AMAP report. This serves to maintain the central position of authors from Arctic Council Member states in the network of experts and reinforces the existing structure of the network by relying heavily on previously established relationships between experts. Based on the process for identifying authors for AMAP scientific reports, the opportunities for an expert with no connection to the existing network of experts to engage in the work of the AMAP is limited.

Furthermore, one official explained that efforts to engage experts from non-Arctic states are at times limited by the funds available. Funding provided by Arctic Council Member states to the work of the AMAP often is specifically linked to ensuring the participation of the funding states' expertise. The AMAP secretariat must often scramble to secure funds to support the involvement of experts from non-Arctic states (personal communication, June 13, 2016).

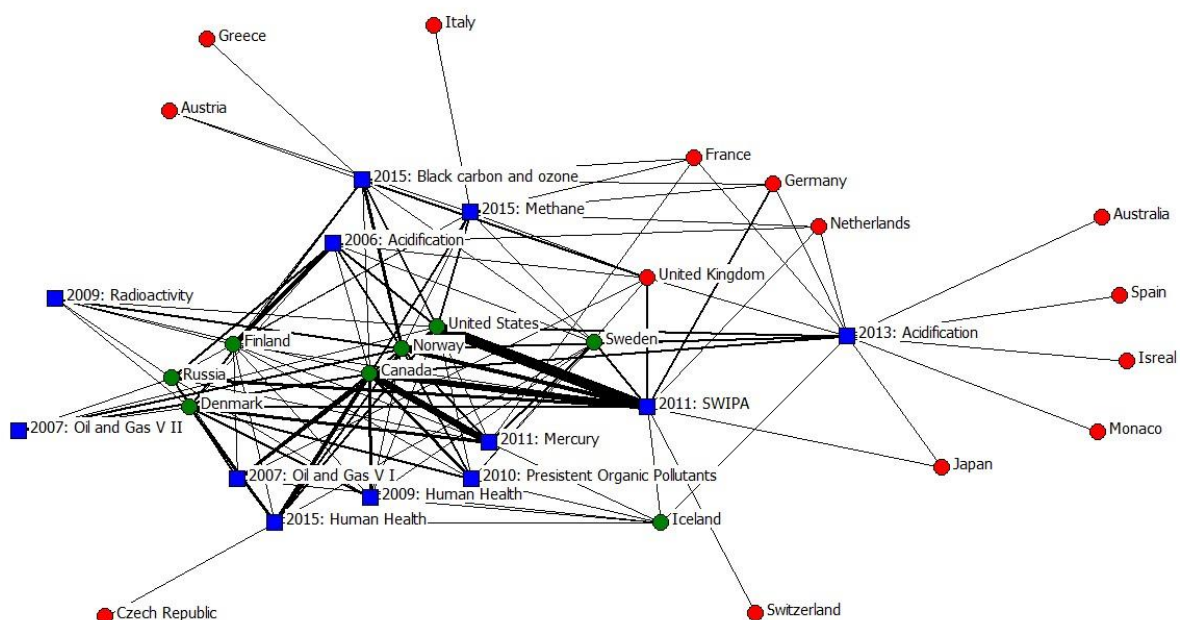


Figure 3: State-level participation in the authorship of AMAP reports from 2006 to 2015. Blue square nodes represent AMAP scientific assessment reports published during this period, green circle nodes represent Arctic Council Member states and red circle nodes represent non-Arctic states. The thickness of the ties between nodes indicates the strength of the relationship of a state to a report measured by the number of contributing authors.

Figure 3 illustrates that the network of states involved in AMAP scientific reports grew and changed in the period after 2006. A core-periphery analysis indicates that the United States, Canada and Norway remain at the core of the network with Russia, Denmark and Sweden holding notably strong positions. Finland's centrality has also increased with a particularly strong involvement in the 2006 AMAP report on acidification in the Arctic, which it led. Iceland's involvement in the authorship of AMAP reports remains the lowest of the Arctic Council Member states, which could be attributed to its relatively small size. Experts from the Netherlands, Germany, the United Kingdom and Austria continue to be involved. Authors from these states have been joined by experts from 10 other non-Arctic states, although authors from 8 of these states only contributed to one AMAP report.

These findings serve to reaffirm that the network of experts that the AMAP engages to prepare its assessments continues to be open to authors from non-Arctic states. It also confirms that the network of experts involved in the AMAP's work is growing and changing, although Arctic Council Member states continue to remain at the core of the network. These findings validate the advice of Arctic Council officials that suggest that those states or organizations looking to be involved in the work of the Arctic Council will find opportunities to inform and influence the Council by engaging with working groups and taskforces.

The Organization Network

An alternative approach to visualizing the network of experts involved in the AMAP scientific assessment reports is to focus on the network of organizations that have participated in their preparation. Again separating the network of experts into two time segments, Figure 4 shows that in the earlier years (1998-2005) the most central organizations in the network were organizations from Arctic Council Member states (green nodes) with only one organization from a non-Arctic state (red node) present in the core of the network. However, it is also important to observe that the network remains quite decentralized with many organizations contributing to a small number of AMAP scientific reports. The map suggests that during this period, at the organization-level, this network did not exhibit the signs of having a core-periphery structure. Rather there are two larger clusters in the network that are joined by a collection of central organizations that link the two main clusters together.

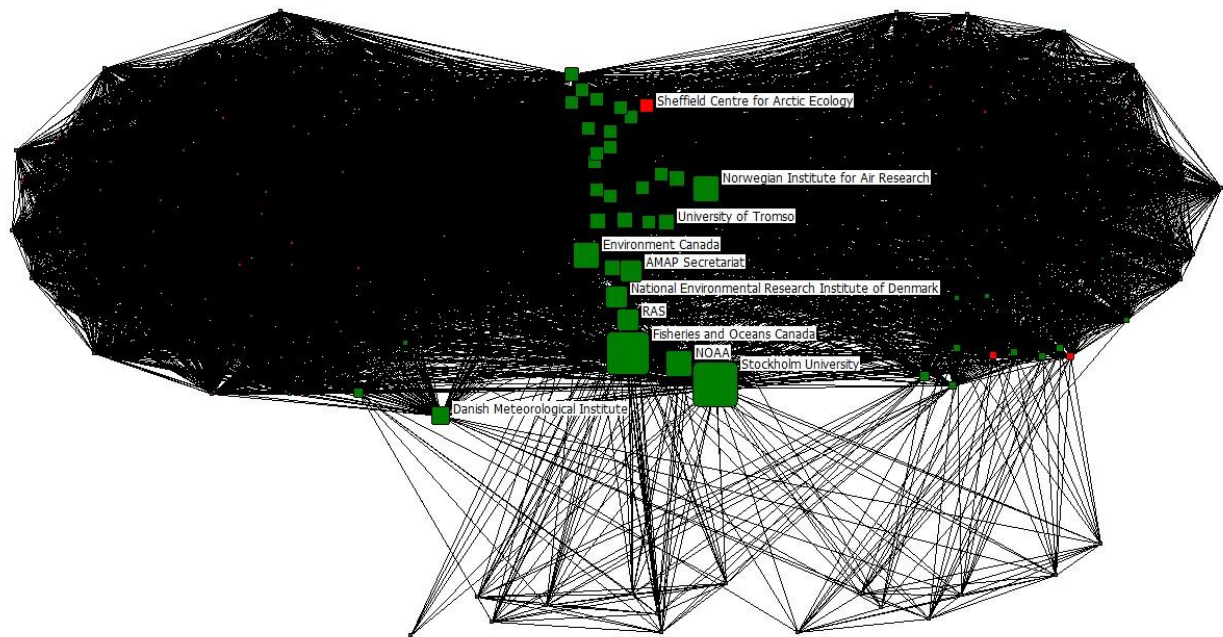


Figure 4: The network of organizations that contributed to AMAP reports from 1998 to 2005. The size of each node represents an organization's centrality in the network using the measure of "betweenness." The ties between the nodes represent organizations that have worked together on specific AMAP reports.

Figure 5 visualizes the network of organizations that contributed to the AMAP scientific reports between 2006 and 2015. This figure illustrates that the network is now developing to have more of a core-periphery structure, which is consistent with the state-level network map for this same period (Figure 3). This indicates that certain experts are only connected to the network through an organization at the core of the network. This figure is also interesting because we see several changes in the organizations that are central to the network of experts. This map shows us that no organizations from non-Arctic states (red nodes) are central to the network. This would suggest that, although non-Arctic state participation increased during this period, each individual organization's participation was minimal. Focusing on organizations from Arctic states (green nodes), we observe that six of the central organizations identified in Figure 3 (the AMAP Secretariat, National Oceanic and Atmospheric Association (NOAA), University of Tromsø, Environment Canada, Fisheries and Oceans Canada, and the Norwegian Institute of Air Research) maintain a central position in the network; however, four organizations (Russian Academy of Sciences (RAS), National Environmental Research Institute of Denmark, Stockholm University and the Danish Meteorological Institute) are no longer present. Interestingly, three more Canadian organizations (Health Canada, Laval University, and Trent University) assume central positions in the network during this period. This indicates that five of the top 14 organizations that contributed to AMAP reports were Canadian with three of those being federal government departments. It is also worth noting that, despite Iceland's low centrality in the state-level network map, the University of Iceland appears as a central organization in this organization-level analysis. This emphasizes that examining the network of experts at different levels can expose unique features of the network that might not be evident if the network is only analyzed at one level.

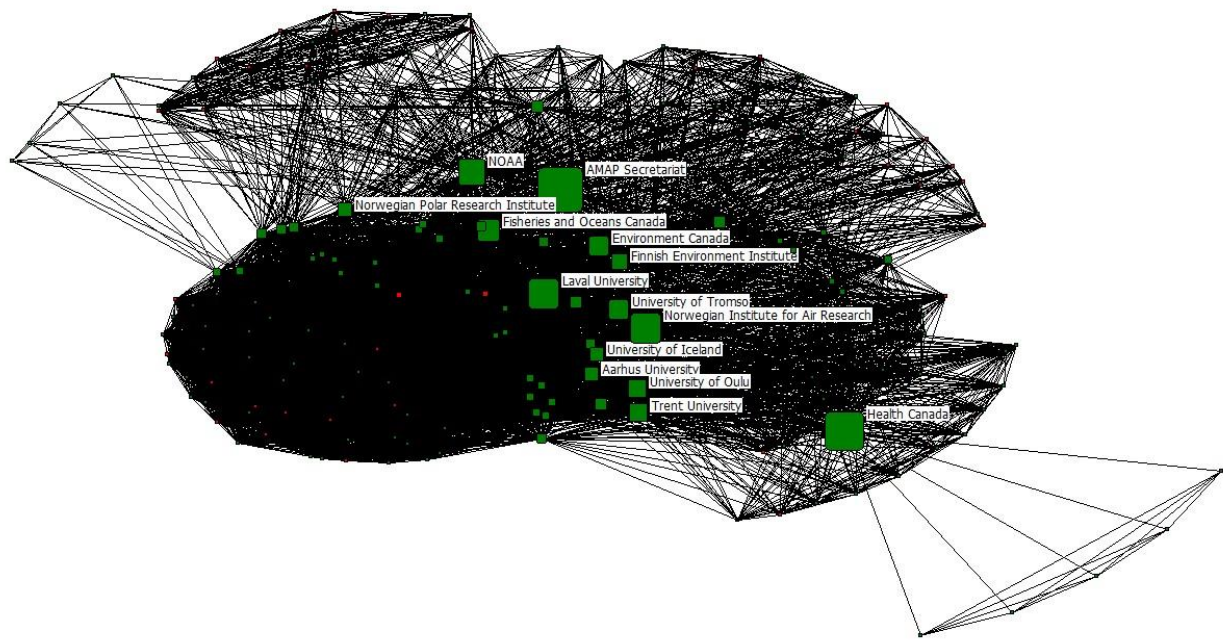


Figure 5: The network of organizations that contributed to AMAP reports from 2006-2015. The size of each node represents an organization's centrality in the network using the measure of "betweenness." The ties between the nodes represent organizations that have worked together on specific AMAP reports.

Overall, these three levels of analysis confirm that the AMAP's work has drawn on a large network of experts that have authors and organizations from Arctic Council Member states at its core; however, this network has been open to the contributions of experts and organizations of non-Arctic states. Furthermore, as more actors become involved in the AMAP, we see that the network appears to be adopting more of a core-periphery structure with authors and organizations from Arctic Council Member states at its core. It is worth noting that there is evidence that this type of network structure is more robust and facilitates the flow of information better than a network that is made up of multiple clusters (Borgatti et al., 2013: 223).

AMAP Policy Advice Network

The translation of the AMAP scientific reports into policy advice and recommendations is a function that requires different skills and is primarily the responsibility of a separate network of people. To support this function of translating expert analysis into policy advice, each Arctic Council Member state identifies a Head of Delegation (HoD) that is given the authority to represent their state for the AMAP and these HoDs hold the responsibility of securing any internal approvals required for the Member state to support the policy advice of the AMAP working group. HoDs are usually technical experts and most commonly associated with a state's ministry of environment; however, there is limited crossover between the network of experts that contribute to the scientific assessments and the HoDs (although there are examples of working group members and AMAP secretariat staff contributing their expertise to the AMAP scientific reports). With the support of the AMAP secretariat, HoDs and Permanent Participant representatives hold the responsibility for preparing the AMAP's policy recommendations

(personal communications, January 15, 2016); however, this policy advice is also reviewed by the lead authors of AMAP assessment reports and discussed at the AMAP working group meetings prior to being finalized.

In addition to Arctic Council Members states and Permanent Participants, the AMAP working group meetings are open to Arctic Council Observers and invited experts. This is the main forum where Arctic Council Observers have an opportunity to engage in discussions about what the AMAP scientific reports mean from a policy perspective and to comment on the proposed policy advice of the AMAP. To support the SNA mapping of the network that participates in translating the AMAP scientific assessments into policy advice, data was collected from the AMAP working group meeting minutes available for 18 meetings held between 1999 and 2015. This data indicates that 351 people from 138 different organizations and 19 different states attended meetings during this period. Consistent with the data collected about the AMAP network of experts, data about meeting participation was collected at the individual-, organization- and state-level; however, Figures 6 and 7 focus on presenting state-level participation in these meetings. Furthermore, the data collected has once again been segmented into two distinct time periods – 1999 to 2005 and 2006 to 2015 – to highlight changes in the network of participants as the Arctic and the Arctic Council grew in prominence.

Figure 6 illustrates that in the early years of the AMAP, working group meetings were attended by all the Arctic Council Member states. Making all the Member states equally central to the network (represented by the size of the node). The thickness of the ties between each Member state indicates that some states had larger delegations attend meetings. This figure also highlights that there was very limited participation by representatives from non-Member states with the Netherlands being the only regular attendee at meetings and the United Kingdom and France each attending one meeting during this period.

Figure 7 illustrates that most Member states (with the exception of Iceland) maintained regular attendance in the AMAP meetings between 2006 and 2015 making them equally central to the network using the measure of betweenness. This figure also highlights that during this period the Netherlands continued to participate regularly and Japan also became a regular participant.

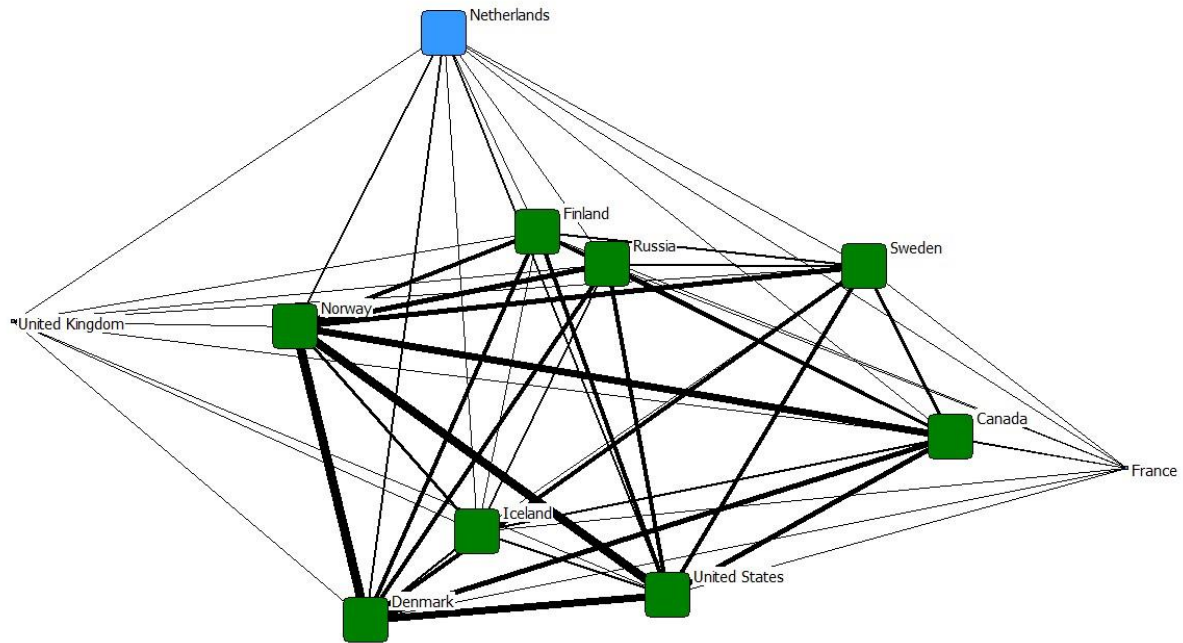


Figure 6: The network of states that participated in the AMAP working group meetings between 1999 and 2005. The size of each node represents a state's centrality in the network of authors using the measure of "betweenness." The thickness of the ties indicates the strength of the relationship between different states by the number of representatives participating in the AMAP working group meetings.

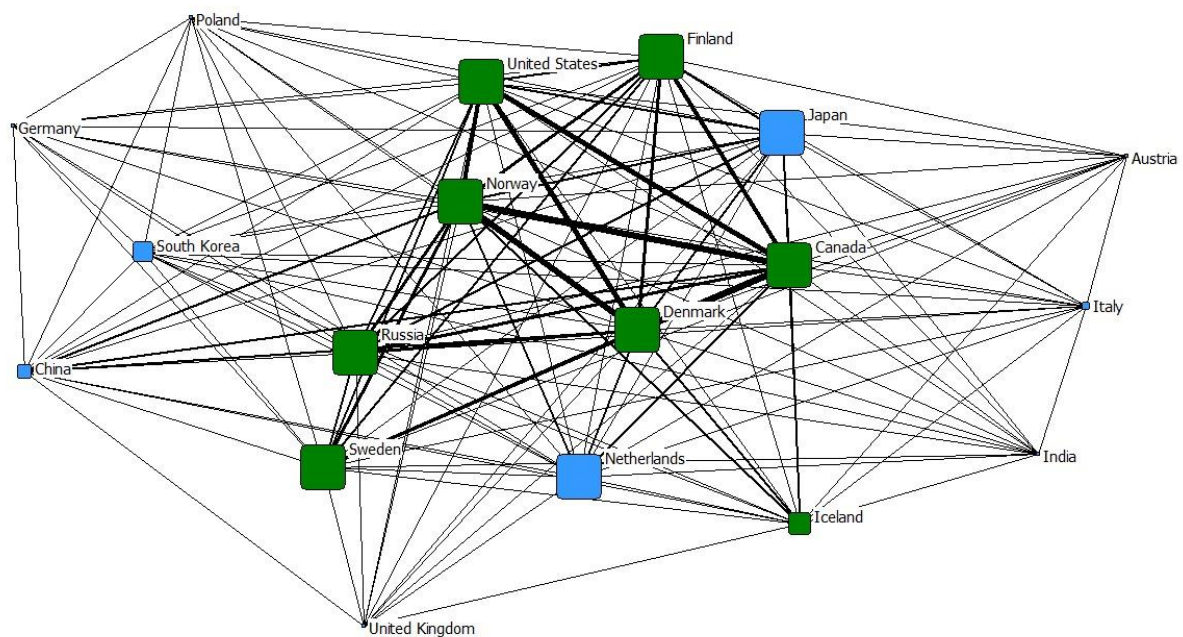


Figure 7: The network of states that participated in the AMAP working group meetings between 2006 and 2015. The size of each node represents a state's centrality in the network of authors using the measure of "betweenness." The thickness of the ties indicates the strength of the relationship between different states by the number of representatives participating in the AMAP working group meetings.

It is interesting to see a growth in participation by other states at specific meetings. This figure serves to confirm that interest in the work of the AMAP increased during this period; although,

very few of these states participated regularly. This raises question about how the intermittent participation of certain representatives might impact the dynamics at working group meetings. Irregular attendance by certain states make it difficult for representatives to build relationships with other participants at the working group meetings or meaningfully engage in discussions about the policy advice being proposed as a result of the AMAP assessment reports.

Furthermore, what Figures 6 and 7 do not capture is the position or skill sets of the representatives of each state. Whereas Arctic Council Member states consistently send officials with the appropriate expertise and authority to engage in discussions about the policy advice that can be drawn from AMAP scientific reports, several officials interviewed indicated that the Observer state representatives often lacked either the expertise or the authority necessary to contribute to this type of discussion. This highlights that it is important for participating states and organizations to understand the functions of the working group and ensure that the appropriate representatives participate in meetings in order to meaningful engage in the translation of scientific assessments into AMAP policy advice.

Of course, as with any analysis, there are limits to what is presented and it is worth highlighting some of the more prominent issues that deserve further exploration in future research projects. First, this SNA analysis does not attempt to weight the nodes or the ties of authorship in AMAP assessment reports or participation in the AMAP working group meetings by quality or extent of involvement. A lead author in an assessment is given the same weight in a network as a minor contributing author and a representative that attends one AMAP working group meeting is given the same weight as the AMAP working group chair. Secondly, the article focuses on authorship in AMAP assessment reports and participation in AMAP working group meetings; however, it is important to acknowledge that there are other means of participating in the AMAP work that complement this analysis and provide different insights. For example, sources of core and project funding of the AMAP and sources of data used to support AMAP analyses. Finally, the analysis does not compensate for the variations in the size of participating organizations or states. The network maps illustrate the actual levels of involvement and not the level of involvement relative to a state or organization's capacity. If we were to take these variations into account, it might seem less surprising that Iceland's contribution has been smaller than the United States and the prominence of Sweden or Finland's roles might become more notable.

Conclusion

The analyses presented in this article provide different lenses to understand both the structures of the networks involved in the AMAP work and the prominent actors at the individual-, state, and organization-level. What these analyses demonstrate is that, despite recent debates, engaging non-Arctic actors in the work of the AMAP is not a new issue. Non-Arctic actors have been involved in the network of experts that support the scientific assessments of the AMAP since the working group's inception. This analysis confirms that valuable opportunities exist for Observers to get involved in the Arctic Council at the working group-level. This article also confirms that there has been increasing participation by non-Arctic actors in both the AMAP network of experts and the policy advice network as the Arctic and the Arctic Council gain international attention; however, the growth of participation by non-Arctic actors has been gradual and Figures 6 and 7 demonstrate that their participation in the network of AMAP policy advice has

remained weaker and more intermittent. This would suggest that, despite growing interest in the Arctic Council by non-Arctic actors, Observer states are currently not taking full advantage of the access that they already have to inform the policy advice prepared by the AMAP.

And perhaps most importantly, these analyses offer strong evidence that Arctic Council Member states make up the core of both networks that support the AMAP's work and the core-periphery structure of these networks suggest that the United States, Canada, and Norway have maintained a strong presence at the centre of these networks throughout the life of the AMAP. These analyses suggest that the AMAP networks have evolved to accommodate increasing participation by non-Arctic states and, in fact, there are areas where Observer states are not taking full advantage of the access they have. However, the AMAP case study also suggests that non-Arctic states will always hold peripheral positions in the networks and concern that new actors might dominate the policy agenda of Arctic Council work is likely overstated. For those Observers looking for opportunities to more meaningfully engage in the work of the AMAP, these network maps provide guidance on the organizations and states best positioned to connect them to the existing networks and provides options for how they might position themselves to support the AMAP mandate and priorities.

Finally, this article demonstrates that SNA offers interesting opportunities to better understand both the Arctic Council and the collection of people and institutions that support governance in the region. Future SNA research could assess the networks within states that support policy decision-making in the region, compare and contrast the features of the different Arctic Council working groups, and identify the linkages between the Arctic Council and other institutions.

Notes

1. This article does not consider or discuss the unique position of Permanent Participants in the AMAP. This is an important issue that requires focused attention. Data about the participation of Permanent Participants is included at the individual-, state-, and organization-levels; however, authors and officials from Permanent Participant organizations do not stand out in the AMAP network maps.
2. Although the ACIA published in 2005 is often credited to the AMAP, it is important to acknowledge that this report was a collaboration of the AMAP, the Conservation of Flora and Fauna (CAFF) working group and the International Arctic Science Committee (IASC) that was coordinated by the AMAP.
3. The AMAP, CAFF, Emergency Prevention, Preparedness and Response (EPPR) and Protection of the Marine Environment (PAME) were established as part of the Arctic Environmental Protection Strategy (AEPS). The Sustainable Development Working Group was conceived of by the AEPS Member states, but the working group was launched as an Arctic Council working group in 1998. The final Arctic Council working group, the Arctic Contaminants Action Programme (ACAP), was established by the Arctic Council in 2006. It took on responsibilities of managing activities that were initiated in 1998 to address pollution sources identified by the AMAP.

4. The terminology used to classify authors varies in the AMAP scientific reports. For the purposes of this article, the term “author” includes lead authors, authors, co-authors, contributing authors, and assessment leads. Many reports also acknowledge contributors, data contributors, editors, the AMAP secretariat and the AMAP working group members. This data was also collected but not included in the analysis presented in this article because it was not possible to assess the relative weight that should be placed on the different types of contributions. In some reports, staff from the AMAP secretariat participated as authors. This data is included in the analysis at individual-, organization- and state-level.
5. The full collection of AMAP scientific assessment reports are available at: <http://www.amap.no/documents/18/scientific/21>.
6. AMAP working group meeting minutes are available at: <http://www.amap.no/documents/18/working-group-documentation/18>

It should be noted that data on Arctic Council Member states, Permanent Participants and Observers are included in the data set used in this article. Data regarding the participation of AMAP secretariat staff is not included because it assumed that secretariat staff are required to attend and including data about their participation would dominate the network maps.

7. For 87 authors the state was identified, but the author was unable to confirm additional information about the organization the person represented at the time of their involvement in the work of AMAP. In addition, there are 18 authors where no data about the state or organization could be found by the author.
8. In fact, several non-Arctic states have a long history of interest and expertise in Arctic-related science. See *LASC After 25 Years* (Rogne, Rachold, Hacquebord, & Corell, 2015) and *The Changing Arctic Environment* (Stone, 2016) for more information.

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