

PROJECT SUMMARY

Overview:

The current opening of the Northwest Passage through rapid sea ice loss from climate change represents a prime example of a large-scale environmental event. The growing ability of commercial vessels to traverse the Northwest Passage as well as easier access -- for mining, commercial fishing, and tourism -- to these formerly isolated locations can be expected to catalyze substantial changes in the currently established legal and policy regimes. The proposed project seeks to use these current circumstances to investigate the theoretical application of existing ideas about law's ability to dynamically re-structure society, re-organize policy priorities, translate across levels of governance, and alter communal behavior in response to large-scale changes in the underlying environmental circumstances.

Intellectual Merit:

This project examines what happens to the existing rules, laws and policies when stable land (in the form of permanent ice) transforms into open water. Focusing on the effects evidenced in Canada and the United States from sea ice loss in the Northwest Passage, the research team examine the dynamic re-interpretation of existing laws and policies by impacted communities and policymakers over a 20 year period from 1999 through 2019. In examining the power of legal mechanisms within the policy processes, the small inter-disciplinary research team will catalog and then analyze changes in the formal wording and day-to-day understanding of international treaties, national and state / provincial statutes, administrative rules, regulations, court opinions, and policy directives.

The project will use a variety of analytical techniques, including content analysis as well as statistical, game-theoretic and computational approaches, to analyze changes within government administrative data, policy reports, environmental data, shipping trends, fishing and local sea use data, tourism data, trade data, economic indicators, information on changing infrastructure, and population demographic data. This array of data will be supplemented by interviews with 45 relevant stakeholders to intellectually situate how the transition from ice to water is anticipated and then governed at the local, tribal, provincial / state, national, and international level.

Intellectually situating how policy processes are deployed in the face of substantial shifts in the environment offers the unique opportunity for intellectual leverage over two fundamental questions about the role of policymaking in society, especially as enacted through legal activity or introduced through existing policy mechanisms. The questions are: 1) the relationship of scale between ongoing social impacts and the resultant legal and policy response, such that a fundamental remaking of the circumstances in the real world invoke an at-scale change in law and policy? And, 2) the effectiveness of the translation of convergent effects by law in the policy processes, such as whether the characteristics of law facilitate it in allowing policy actors to effectively translate possibly innovative solutions to new circumstances across the levels of governance in a way that applies to the case of extreme events?

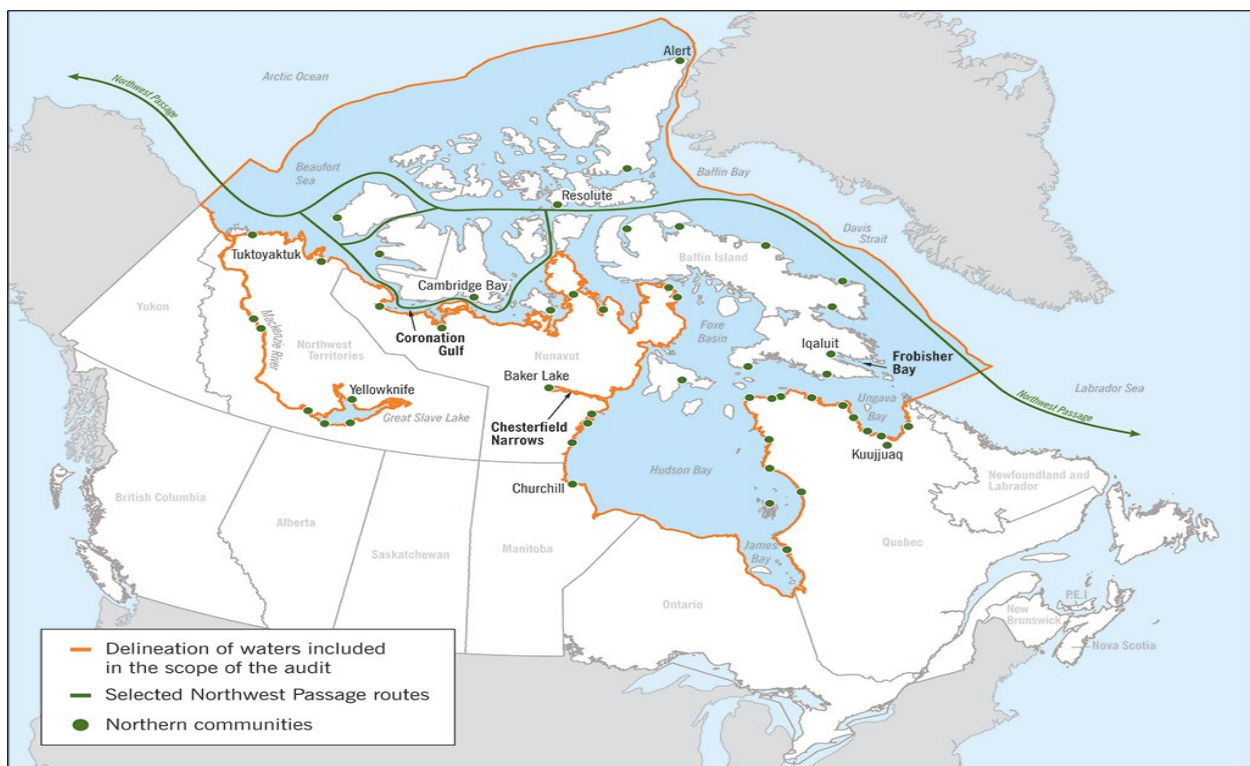
Broader Impacts:

The introduction of new environmental circumstances through climate change is a global phenomenon. Yet, the Arctic is experiencing many of the most substantial changes at this point in time. Although scientists have well-documented many changes in natural systems in the Arctic, there is substantially less documentation of the comprehensive and inter-linked ways that impacted communities deploy law and policy processes to negotiate across levels of governance these fundamental changes in environmental circumstances. Understanding the role and power of law in these policy processes, including its capability to introduce innovative solutions to new circumstances, would greatly enhance the ability of communities and policymakers to generate appropriate legal and policy responses.

Using 3 on-site public workshops in Iqaluit, Ottawa and Washington DC., the research team will work with members of local communities, stakeholders and policymakers to ensure that local communities, policymakers and interested scholars have full access to all data, research findings, and the interpretation of team members. The project also involves graduate students and postdoctoral scholars in a manner that enhances their training in the conduct of science.

NNA Track 1 & Collaborative Research: Analyzing Changes over Time in Legal and Policy Regimes to Large-Scale, Transformative Events

The current opening of the Northwest Passage through rapid sea ice loss from climate change represents the prime, current example of a large-scale environmental event. The increasingly accessible sea routes (Barnhart *et. al* 2015; Pizzolato *et al.* 2016) traverse Canada and the United States from the Atlantic Ocean to the Pacific Ocean using the Arctic Ocean and the waters of the Canadian Arctic Archipelago (see image below, Office of the Auditor General of Canada 2014, Exhibit 3.1). The growing ability of commercial vessels to traverse the Northwest Passage as well as easier access – for mining, commercial fishing, and tourism – to these formerly isolated locations can be expected to catalyze substantial changes in the currently established legal and policy regimes (e.g., Bruun & Medby 2014; Heininen & Nicol 2007; May *et al.* 2005a & 2005b).



This 5 year project examines what happens to the existing rules, laws and policies when stable land (in the form of permanent ice) transforms into open water. Focusing on the effects evidenced in Canada and the United States from sea ice loss in the Northwest Passage, the research team will catalog and then examine the dynamic re-interpretation of treaties, statutes, administrative rules, regulations and policies by impacted communities and policymakers from 1999 -- 4 years prior to the date when Canada first ratified the Convention on the Law of the Sea – until 2024.

Examined changes will include:

- a) international treaty implementation issues, such as
 - a. the legal application of the Convention on the Law of the Sea (UNCLOS);
 - b. new rules by the International Maritime Organization, for fuel use and misuse by ships traversing or operating in the Arctic;

- c. new policy directives and agreements from the Arctic Council;
- d. new policies enacted and the introduction of new infrastructure for enhanced surveillance of shipping for security and emergency response in this previously un-travelled region;
- e. new policies enacted and the introduction of new infrastructure for new meteorological instruments by both Canada and the United States required per World Meteorological organization obligations;
- b) regional, national, and the international issues, such as
 - a. legal contestation over newly-acquired access to environmentally pristine areas;
 - b. legal challenges over previously recognized indigenous lands;
 - c. alteration of expected trade routes with related economic impacts on ports;
- c) local, state / provincial / territorial issues, such as
 - a. the requirement of new regulatory oversight on land and sea usage;
 - b. the introduction of new infrastructure and new population into previously largely homogenous, low population areas to accompany the opening of new mining, commercial fishing, and tourism in the region;
- d) tribal issues, such as
 - a. changes in local tribal lifestyle through sea ice loss and;
 - b. changes in established transportation patterns and housing locations through decline of permafrost.

The proposed project deploys a small, inter-disciplinary research team, supported by a postdoctoral scholar and graduate students, to collect and integrate data over a 25 year period (1999 through 2024) in order to analyze the initial institutional and administrative response to the unfolding of a large-scale environmental event. The team will investigate the theoretical application of existing ideas about law's ability, within policy processes, to dynamically re-structure society, re-organize policy priorities, translate across levels of governance, and alter communal behavior.

The resultant research will facilitate enhanced understanding of the role of law, as deployed within policy processes, to react to a large-scale change in environmental circumstances. It will allow expanded consideration of the manner in which policymakers and stakeholders bring legal order, and relatedly political acceptance, to large-scale environmental events. And, the project's granular-level focus on the incremental responses of institutions over an extended period of time will also allow the research team to gain new insights into the role of law and policy in making sense of everyday social practices within a variety of Arctic community settings. Most importantly, it will better situate the function of routine institutional interactions within and across levels of governance in enabling the development of responsive policies and fostering new social practices among impacted populations. As such, it directly addresses the idea of better understanding the mechanisms by which much of the political engagement of communities, including local indigenous communities, is translated into policy solutions and codified in ways that will act to guide future undertakings around climate change.

Deliverables from the project will include a comprehensive database – ranging systematically over the 25 year period and involving an expansive array of governmental, organizational, and communal data -- of the legal and policy changes wrought by the response to this environmental event. As such,

it is designed to capture, with attention to the timing and involved actors, the discussions that lead to policy enactment. For ease of accessibility, this material will be data visualized and made publicly available in multiple formats, including with the research team's insights from statistical and computational techniques, to policymakers, local communities, and other stakeholders.

Accordingly, it is directly responsive to three NNA Solicitation Research Focus areas: Focus Area 2 - "Studies to understand and forecast interdependent changes in the . . . , institutional, and social processes occurring in the new Arctic." Focus Area 4 - "Convergence research approaches to help researchers to understand the complex relationship between Arctic residents and their natural and cultural landscape. Studies are needed to better understand how social, economic, and governance systems interact with infrastructure and how environmental and biophysical changes in the Arctic impact these interactions." And, by focusing on international treaties, Focus Area 5 - "Understanding and forecasting global influences, consequences, and opportunities arising from a changing Arctic." Under with the goals of NSF's 10 Big Ideas, the database created by the current research would constitute a capacity building project, while the conduct of the research would facilitate current and future educational activities.

Intellectual Merit

Intellectually situating how the transition from ice to water is anticipated and then governed at the local, provincial / state, national, and international level offers the unique opportunity for intellectual leverage over some fundamental questions about the role of policymaking in society, especially as enacted through legal activity (as in, statutes, court opinions, administrative rules and regulations) or introduced through policy mechanisms (new policy directives, new guidelines on existing rules).

The historical record shows that fundamental change in the environment has been an important force in triggering major political and social upheaval in established legal and policy regimes, including the accompanying population displacement usually more associated with the effects of war or conflict over scarce resources (e.g., Egan 2006, Diamond 2004). But, these large-scale environmental events are only occasionally analyzed in a holistic manner from a law and policy perspective (e.g., Malloy 2009; May et al. 2009; Birkland 2006), primarily because such environmental change is rarely both comprehensive in scope and contemporaneous in nature.

However, the present opening of the Northwest Passage through rapid sea ice loss offers the opportunity to observe first-hand and at granular-level the legal, bureaucratic and social response that occurs in such circumstances (see also Jensen & Honneland 2015; Knecht & Keil 2013; Wilson 2013; Stokke 2007).

The projects seeks to intellectually leverage the current opportunity to focus on two fundamental questions (noted below) about the role of law in powering these policy processes as they navigate large-scale environmental events. A review of the existing literature is largely ambiguous as to the expectations about the power inherent in existing legal mechanisms within the policymaking processes as they might apply *at this scale* and *to these complex, often newly emergent, set of circumstances*. This project plans to rectify that absence in the existing law and policy literature as well as document the interplay of policy forces on these issues.

- 1) The first question involves **the relationship of scale between ongoing social impacts and the resultant legal and policy response**: Are large-scale events – for example, ones that are

truly transformative to the existing environment at a regional or global level —reflexively mirrored by catalyzing a similar scale in their transformative effect upon existing legal and policy regimes? In essence, does a fundamental remaking of the circumstances in the real world, such as is likely to occur through the increasing sea ice-loss in this Arctic region, invoke an *at-scale* change in law and policy?

The present expectation, based on current literature, is that the conservative bias of law – its inbuilt desire to reinforce and preserve existing rules (e.g., Cover 1983) -- and its inherent institutional characteristics – the inability of law to effectively engage complex issues in holistic fashion (e.g., Horowitz 1977) -- will make law poorly able to reflexively engage in a contemporaneous manner the true scale of the changes being wrought by this large-scale environmental event. Clearly, if true, it is a foreboding prospect for the future of policy making around many of the largest of the large-scale effects associated with climate change, such as ending hypoxia in the oceans and waterways, or constraining CO2 levels.

And, the historical record confirms that law has, at best, under-performed in powering policy-making when pressed to effectively respond to widespread cultural shifts involving complex social issues, such as the rights of women. Rather than facilitating a comprehensive shift in rules consistent with the shifting cultural positioning, courts have appeared to gravitate to those aspects that lend themselves most immediately to translation into simple and existing legal frames. Thus, the expectation within the literature is that, in the application of law and policy, policy actors and legal approaches will firstly address those areas of the environmental event that most easily fit within the existing legal and policy regime. This logical approach could have important implications, including leading policymakers to incrementalize responses as well as deal piecemeal with a set of related issues (Horowitz 1977), which would have potentially detrimental effects on policy making around large-scale environmental events, such as is occurring with sea ice loss in the Northwest Passage.

Conversely, the ability of law to quickly engage with newly emerging social practices (Ewick & Silbey 1998) may mitigate much of this inherent conservative bias. And, there is some reason to believe that some policy actors, including legal actors, are better equipped, given their institutional positioning, to engage with incorporating new knowledge (Horowitz 1977). This latter characteristics would lead an expectation that law could have a primary, and relatively unique role (Barnes & Burke 2015), in dealing with the effects of climate change, even if that engagement leads subsequently to a fundamental transformation in existing governance practices.

Extant law and policy research has largely eschewed this important question, by presuming that law, operating within the policy processes, is either inherently designed to radically transform upon demand or its personnel are socialized to strategically avoid the truly transgressive predilections within society (e.g., Sarat 2012). Yet, dealing with the effects of the present sea ice loss is an event that cannot be easily sidestepped by either policy actors or the legal system – as to its magnitude nor in its need for recognizing the wide and divergent array of expected societal impacts from it. How do such actors, operating within the multiple levels of governance, use the characteristics of law and policy to more effectively engage this issue? For example, is there evidence that ratcheting up to the international law scale purposely to mitigate the most complex aspects of the changes in the regulatory regime? Or conversely, do they individually and collectively eschew purposefully some aspects of the issue? And, which aspects do they avoid addressing?

- 2) The second question involves the **translation of convergent effects by law in policy processes**: How does law translate the effects of extreme events within and across the various levels of governance in ways that simultaneously acknowledge the input of numerous constituencies while still allowing the space for the dynamic introduction of new and emerging understanding of the event? Do the characteristics of law permit it to allow policy actors to effectively “talk” across the levels of governance in a way that facilitates policy solutions in response to extreme events? And, when and how does new knowledge on this emergent event become introduced into the policy discussion?

Law is often attributed the ability to standardize and neutralize the language of major policy reform in ways that make it bureaucratically palatable (e.g., Barnes & Burke 2015), but often with the result of rendering many aspects of that transition as largely hidden as they are incorporated into existing bureaucratic and administrative activities (e.g., Barnes & Burke 2006). And, by inherently incorporating the ability to reference as well as distinguish previous analogous activities, law introduces the ability in policymaking to more effectively foresee the implications of legal and policy decisions as they encounter relatively new circumstances. Finally, the characteristics of law, which is common across the multiple levels of governance as well as utilized by social movements and interest groups in pursuing policy change, offers the important ability to place disparate ideas on a shared frame while utilizing a shared language. Accordingly, law appears well constructed to act as a means to bring together, in a truly convergent manner, a range of distinct actors and ideas.

Yet, it is easy to imagine that this apparent ability within law could be overwhelmed by the sheer cacophony of input and volume of new knowledge from a multitude of constituent actors operating across multiple policy levels, especially as legal and policy actors face large-scale, transformation of the underlying environmental circumstances. For example, the loss of sea ice is heralding into being a complex new set of inter-related circumstances for many existing parts of the population around the Northwest Passage (Office of the Auditor General of Canada 2018).

Answering these two questions also offers the opportunity to better document at a comprehensive level the changes being brought as part of navigating the new arctic. The data collected will act to situate the use in transforming governance of the array of scientific data collected by natural scientists on the environmental impacts currently being experienced in the region. Given the high quality and expanse of data available from current and prior research on the environment in this region, it is a logical progression to now ask – in a scientific manner, based on existing theories in the social sciences and economics – how effectively is this new knowledge being incorporated into the policy processes. Answering that latter question allows researchers to better understand the translation of their recent insights on the processes at work in the Arctic

Like the natural science research, the current project will work forward from baseline effects to fully situate the resultant changes and it will do so at a level that effectively maps the legal and policy terrain against which the environmental circumstances are unfolding. And, as communities, policymakers, and stakeholders engage the necessary task of navigating the new arctic, it continues the process of allowing the social, political, and legal components involved as to be categorized and analyzed at a scientific scale similar to many of the existing natural science counterparts.

Why now and why this event?

There are four distinct advantages to pursuing the proposed project at this time.

The first advantage is in the amplification of effects. As noted above, fundamental transitions in law and policy often occur in ways that act to subsume or hide the primary effects (e.g., Barnes & Burke 2006). Usually, these effects must therefore be teased out from amongst competing social narratives and resultant changes in complex social practices (Ewick & Silbey 1998). Yet, much of the expected response to be documented by the proposed project will occur in locations where the effects of the environmental event are both dramatic and unusually overt, from the overwhelming scale and rapidity of the expected sea ice loss (Barnhart et. al 2015) to its effect on existing institutions and local populations (e.g., Office of the Auditor General of Canada 2018; Koivurova, T. & Heinämäki, L. 2006).

For example, as part of the project, the team will consider changes that directly impact the Territory of Nunavut, Canada, which has a population of only 36,000, of which 84% are Inuit (Census of Canada 2016). The 2018 report of the Office of the Auditor General of Canada, *Climate Change in Nunavut* (2018) notes that “The shortened and less reliable ice season has affected those who travel on sea ice. It affects cultural connections with the local environment as well as hunting and fishing, which can affect income and food security.”

In addition, the increase in sea ice loss means that, for the first time, a portion of the territory’s land and waterways will be made more easily accessible to mining, commercial fishing, general shipping and tourism. This is land that included previously pristine areas and/or sacred spaces claimed under indigenous rights. The combination -- small population, highly homogenous and previously stable communities, and the presence of formerly pristine land – is likely to foreground the effects of any change in infrastructure, population, economics, land usage, pollution, and policy choices brought into being by the current environmental event.

The second advantage is that the initial responses, by institutions at all levels, have been primarily juridical and bureaucratic; in effect, confirming that the event is catalyzing changes in established legal and policy regimes. This aspect simplifies the project because law and policy changes appears to be identified explicitly as one of the primary ways that the policymakers and actors at all levels of governance will negotiate this event. And, it is easier to identify even minor changes when the contestation involves bureaucratic documentation. Accordingly, the project will focus on these changes. But, by incorporating interviews with key stakeholders, the project retains the ability to capture any resultant norm changes or subsequent de-centering of law through the consequential social practices.

The third advantage relates to the noted absence of regulation in some key areas on this issue. The relatively rapid transition from ice to water has meant that, in this region, some areas of possible application are currently absent of regulation. For example, how states and local communities might address some obvious environmental risks, such as invasive species on ships (hullfouling) and vessel strikes on marine mammals, is not covered by the existing Polar Code. The existence of these policy gaps allows the project to investigate directly the development and efficacy of incentives designed by policymakers to address environmental, fiduciary and physical risks related to the newly enhanced shipping access.

Such incentives matter to anyone interested in marine living resources that support food security for Inuit as well as general biodiversity. Lancaster Sound along the Northwest Passage is one of two bottlenecks identified in a July 2018 National Academy of Sciences report (Donna *et al.*, 2018) for

threats to marine mammals (narwhals, bowheads) from increased vessel traffic that affects traditional resources of coastal communities.

The fourth advantage is scope. The project is purposely designed to create a comprehensive understanding of actions developed through current institutions across levels of governance as they respond dynamically to a set of shared circumstances. The temporal and spatial scale of the response is relevant to assess the potential for long term pan Arctic governance addressing the Northwest Passage. As such, the project is directly responsive to the general criticism of much of the current literature in law and policy that it fails to effectively incorporate effects over time and inherent institutional constraints into a single, coherent approach (Burke & Barnes 2017).

Data Collection:

The research team – two political scientists, two economists, and a shipping expert – plan to gather and analyze data from legal, regulatory, administrative and other policy sources across levels of governance during the 25-year period between 1999 and 2024. The goal of the data collection and analysis will be to establish a database of the role of law and policy discussions in shaping and facilitating the underlying policy interactions as governments, NGOs, and communities negotiate these new circumstances.

First, the team determined an appropriate baseline – the institutional and organizational position prior to (or, at least, minimally impacted by) any response to the current environmental event. Preliminary work identifies the most appropriate baseline as 1999, 4 years prior to the date when Canada ratified the Convention on the Law of the Sea in 2003, which it had first signed in December 1982.

Second, the team will document from 1999 through 2024 any notable changes – both large and small -- in response to the current environmental event, specifically including the:

- i) application,
- ii) interpretation, and
- iii) creation of:
 - 1) laws
 - 2) administrative rules
 - 3) institutional policies
 - 4) constitutional reasoning
 - 5) statutory approaches
 - 6) social or political practices
 - 7) communal norms, and
 - 7) incentive systems.

This research will consider the:

- a. domestic level including
 - i. litigation
 - ii. legislation
 - iii. executive action
 - iv. sub-national policy responses to national law
 - v. national legal responses to foreign law
- b. international level including

- i. arbitration and dispute settlement laws
- ii. litigation
- iii. treaties
- iv. international private law responses

In relation to legal and policy change, the team will document the timing of the initiation of changes and any resultant policy change, the level of governances involved, the full configuration of political and legal actors involved in the initiating the change, and other relevant factors consistent with existing literature; all effort will be made to document the dynamic nature of these interactions as well as any inconsistencies in their application or implementation.

Documents will be gathered from official sources – primarily via internet access to publicly released documents and supplemented by on-site access, when required. Preliminary work confirms the value of this approach.

The team will compile on a monthly basis:

- a. International law and international organizational data, related to:
 - i. Convention on the Law of the Sea
 - ii. Arctic Council
 - iii. Polar Code
 - iv. International Maritime Organization
 - v. World Meteorological Organization
 - vi. International Seabed Authority
 - vii. Commission on the Limits of the Continental Shelf (CLCS)
 - viii. International Tribunal for the Law of the Sea
- b. Government administrative data on the region, including
 - i. National (Canada, US) and sub-national government budgets
 - ii. National (Canada, US) and sub-national economic indicators
- c. Government policy reports, including:
 - i. Defense and Security reports on Arctic activities
 - ii. Auditor General of Canada reports
 - iii. National Weather Service reports
 - iv. Fisheries and Oceans Canada reports
 - v. Environment Canada reports
- d. National and sub-national legal authorities' briefs
- e. Infrastructure projects including updates on the region related to:
 - i. port facilities
 - ii. fuel provision
 - iii. search and rescue
 - iv. weather facilities
 - v. land and air transportation
- f. Extractive and commercial enterprises, including related to:
 - i. mining leases,
 - ii. tourism ventures
- g. Shipping,

- i. timing, volume, size, origin, and destination of vessels
- h. Environmental data, specifically including related to
 - i. heavy fuel oil usage
 - ii. pollution levels
- i. Fishing and local sea use data, including:
 - i. fishery resources
- j. Tourism data
- k. Trade data
- l. NGO reports, including from:
 - i. Clean Arctic Alliance
 - ii. Arctic Waterways
 - iii. Wildlife Conservation Society, Arctic Beringia Program
 - iv. Inuit Circumpolar Council
- m. and, Population demographic data, including
 - i. population change
 - ii. housing changes
 - iii. health changes
 - iv. community re-siting (related to permafrost melting)

This array of data will be supplemented by interviews (primarily via Skype or similar format, but with some opportunity built in to the project for face-to-face interviews) with approximately 45 key international policymakers, government and elected officials, appropriate NGO officials, and local community leaders. Interviews will be transcribed for analysis.

The project will primarily rely on the individual research team members to collect data in their area of expertise in order to ensure reliability in coding and consistency in interpretation. This aspect forms a large part of the current budget request. The requested graduate student will facilitate data collection across the team as well as data compilation over the first four years of the project. The requested postdoctoral scholar will act to facilitate integration of the resultant data as well as aid in the development of Web-accessible access to the data. The postdoctoral scholar will also work with the team in development of enhanced data visualization of this material in ways that increase expected use subsequently by policymakers and stakeholders. Where permitted, links to the original documents will be incorporated into the database for verification and source provenance.

Unique Place of the Inuit People:

The current project recognizes the unique place of the Inuit in many of the policy making processes that the project will consider. As such, the project will incorporate consideration of informal and formal policy activities pursued by the Inuit in this setting.

This includes consideration of the Inuit Circumpolar Council that encompasses the Inuit in Nunavut, the Inuit in Inuvialuit along the Canadian Northwest Passage as well as Inuit in the U.S. also along the Northwest Passage, along with Inuit in Greenland and Russia and the Arctic Council for which the Inuit Circumpolar Council has permanent membership. Given the leading role to be played by the United States over the next four years in the Inuit Circumpolar Council, the timing and resonance of the current project seems accentuated; a project which seeks to understand and document the ways

that tribal and communal voices, among others, are incorporated and then translated into policy responses at multiple levels of engagement.

To-date, the Inuit Circumpolar Council is consistent in its support for advancing Arctic governance and enforcement of international policy such as the IMO Polar Code and additional strong regulations on shipping primarily to minimize disruptions to wildlife and safety for food security and subsistence (ICC General Assembly, July, 2018).

At the sub-national level, the Legislative Government of the Territory of Nunavut has strong representation of the Inuit people who live within and around its territorial borders (Office of the Auditor General of Canada 2018). For example, The Nunavut Territorial Government established the Nunavut Climate Change Centre (2018), which offers an expansive summary of effects from sea ice loss and other climate change effects, many of which specifically impact practices by the Inuit population.

The role of the Inuit peoples plays an important dimension at the nexus of international and domestic law in Canada. Canadian law requires the Prime Minister to consult with First Nations people before ratifying any international treaty that may directly affect them. While this additional step can delay ratification of international treaties generally supported in Canada, it allows First Nations leaders to have direct input on international laws expected to have local ramifications.

To ensure that the team is fully cognizant of the issues related to unique positioning and perspective of the Inuit communities, all of the team members will undertake a site visit to Iqaluit, Nunavut and Anchorage, Alaska as part of the prelude to data collection. And, we will work diligently throughout the project to incorporate with respect for culture and context, the ideas and input of tribal communities in this region.

Analysis of Data:

The accumulated data will be analyzed using a variety of methods. All documents will be subject to content analysis. Collected data, occasionally in aggregated forms, will be subjected to cross-sectional time series and multi-levels statistical analysis related to the timing and impact of policy inputs as well the apparent effect of policy changes on observed behaviors. This statistical approach will be supplemented by game theoretic models to consider the role of incentives in policymaking in this environment, especially in areas of policy that were not previously addressed in this region. Once all data is finally collected and near the end of the project, the data will also be subject to meta-analysis using present computational approaches.

In these analyses, particular attention will be paid to the dynamic effects of policy input over time as way to account for new knowledge incorporation into the policy process. Using statistical models to situate the timing and impact of policy input and their subsequent effect on behavior of institutional actors and communities is a skillset in which the team has high specialization. For example, PI Fernandez has recently statistically evaluated, using econometrics, various policy effects on transportation and air pollution for three countries sharing international borders in North America (Canada, U.S. and Mexico) with variation of policies over time and space (e.g., Fernandez 2017). Co-PI Sheriff uses econometric methods to evaluate the impact over time of environmental regulations on workers and economically disadvantaged communities. PI Barclay has worked extensively on cross-sectional time series analysis of policy choices, including in different policy

venues and across levels of governance (e.g., Barclay and Flores 2017; Flores and Barclay 2016). Co-PI Comstock uses duration models, multi-level models, and instrumental variable models on cross-sectional time series data on domestic state behavior around international law (e.g., Comstock 2019).

These statistical approaches will be complemented by interpretative methods that directly reference the accumulated administrative documents. Collectively, all four PIs have strong prior experience interpreting policy decision making in international, cross-national, national and sub-national forums. PIs will use the latest approaches, including ATI, to document decision processes related to their interpretive approaches.

Computational approaches, utilized toward the end of the project, will be used to investigate previously hidden or undiscovered connections across the array of gathered data. This will add to the level of nuance of insights offered by the researchers.

Examples of Other Questions Able to be Addressed by the Collected Data:

Beyond the larger question of mapping the complex ways that law is invoked in the policy processes and then deployed across levels of governance to facilitate the transition of legal and policy regimes as governments, and their constituent populations, confront new circumstances, the data collected by the project should allow it to also engage with a range of other important questions. Below is two examples.

International Law and Security: Article 76 of the UN Convention on the Law of the Sea allows state parties the opportunity to submit territorial claims on the continental shelf extending from the 200 nautical miles granted to states. Parties have 10 years to make territorial claims to an extended continental shelf. Norway, Denmark, Canada, and Russia all have made territorial claims to the Arctic.

While the claims primarily note natural resource access and exploitation, these states have increasingly militarized their Arctic presence. According to the *New York Times* on February 9, 2016, Russia increased military activities in the Arctic “including by rebuilding Cold War-era naval bases and airstrips on the New Siberian Islands, across the Chukchi and East Siberian seas from Alaska.”

Climate change is heightening the prospect of conflict over Arctic resources and strategic positioning (Brosnan *et al.* 2011). The Arctic is experiencing more adverse effects of climate change than any other location. This matters for territorial claims (Steinberg 2014) because as the land ice disappears or sea ice becomes more mobile in shipping lanes that widen over space and time (longer season to transit) and/or will be created in locations previously inaccessible to ships creates more potential for ship interaction with living marine resources. Increased access means there will be 1) increased state interest in mapping and claiming previously inaccessible parts of the continental shelf as well as navigable waters 2) natural resource-driven competition and 3) increased militarization of the Arctic.

Additionally, the documentation and analysis of legal changes at the international and domestic level over time related to climate change in the Arctic addresses a question of growing interest in International Security: do complications of climate change -- such as increasing temperatures, rainfall shortages, etc. -- increase the rates of intergroup conflict? Our project data collection enables another aspect of this research area to be examined: does the increasing complication of climate change as

seen through increasing ice melt/decreasing ice coverage in the Arctic lead to increased cooperation to address the climate complexity or materialize in increased legally contentious actions?

Economic Incentives: Another related issue is how Arctic institutions, states and local communities might address environmental risks not covered by the Polar Code (e.g., invasive species on ships (hullfouling), vessel strikes, noise, water, and air pollution (black carbon, etc.)? As warming temperatures increase the feasibility of exploitation of Arctic resources, the existence of these policy gaps makes it increasingly important to investigate incentives to address environmental, fiduciary and physical risks related to shipping and economic activity. What are the incentives to behave prudently to avoid the various (commercial, extractive, or recreational) navigation risks of the new Arctic and enable low-impact shipping corridors with preventative measures prior to transit in the Northwest Passage? So far, inspection for compliance with the Polar Code has yet to be completely articulated with some speculation that the initial ports on either side of the Northwest Passage would assume the most responsibility for carrying out inspection.

Additionally, these ports may also be strapped with addressing the additional risks not covered by the Polar Code with improved management foresight. While the *Crystal Serenity* conducted advanced planning for its two Northwest Passage transits in 2016 and 2017, it required two rescues during 2017 due to ice conditions. The International Maritime Organization (IMO)'s Ballast Water Management Convention entered into force in 2017 worldwide but is not extensive in its coverage of all potential vectors of invasive species on ships in the Arctic and elsewhere.

Collective Expertise of the Research Team:

The research team brings together four scholars, and a shipping expert, with the range of intellectual backgrounds and prior experience required to effectively engage the breadth of current project.

PI Scott Barclay's ongoing research project explores the interplay of political, demographic, and social movement factors that influence the deployment of law as they relate to policy choices. He previously considered how these factors shaped the timing and nature of legal policies on lesbian and gay rights at the state and national level in the United States, including leading a big data project hosted by UCLA Law School that gathered 45 years of proprietary public opinion data from lesbian and gay rights groups. He was a co-founder of the Law and Society Association's Collaborative Research Network on Law and Social Movements.

PI Linda Fernandez recently co-edited a book on Arctic marine resource governance (Vestergaard et al, 2018). She is completing an NSF project titled "Bioeconomic Analysis for Arctic Marine Resource Governance and Policy." Dr. Fernandez previously evaluated empirical dynamic game theory strategies for the U.S. and Canada to prevent marine invasive species from shipping (2006, 2007, 2008).

Co-PI Audrey Comstock is known for her statistical findings on the effects of international law on the application of human rights' treaties at the national level, including consideration the role of institutional constraints, such as national legislative barriers to ratification, on treaty implementation. She has also compiled comparative case studies on the legal and policy activities of nation-states as well as recently data mined *Travaux préparatoires* created during treaty development. Dr. Comstock was previously a visiting pre-doctoral scholar at the Browne Center for International Politics at the University of Pennsylvania.

Co-PI Glenn Sheriff's research focuses on the distribution of benefits and costs of environmental, natural resource, and climate policy. His recent work includes quantifying the distribution of environmental outcomes for regulatory environmental justice analysis. He was previously the Deputy Associate Director for Energy and Climate Change at the White House Council on Environmental Quality, an economist at the National Center for Environmental Economics of the US Environmental Protection Agency, and a senior economist at the US Department of State. In addition to his academic work, this public sector work experience had given him practical expertise in the design, promulgation, and analysis of regulations for addressing environmental problems.

Consultant Erik Bogaard previously worked as an educator for the *ProSea Foundation*: a maritime training organization in Europe focused on improving the environmental awareness of those in the shipping industry. He is currently involved with the organization, *ResponSEAble*, which "is mapping European marine research and knowledge to further our understanding of complex human-ocean relationships and the economic benefits that we derive from our seas and the ecosystems they support."

Results from Prior NSF Support:

PI Scott Barclay is Director of the School of Social and Behavioral Sciences at Arizona State University. He is an expert in law, social movements and institutional signaling.

(a) NSF Award: SES 1649513 Amount: \$208,934 Period of Support: 07/11/16-07/10/2017

(b) Title of Project: "Intergovernmental Personnel Act (IPA)"

(c) NSF support resulted in the following:

Intellectual Merit: As a Program Director at NSF, Barclay encouraged the development of research teams and supported research projects after expansive review by appropriate experts in the field, consistent with NSF standards

Broader Impact: As a Program Director at NSF, Barclay assisted in cross-disciplinary initiatives, including serving on the NSF's CAREER Coordinating Committee, in ways that facilitated the support of junior scholars across a range of disciplines.

(d) No publications were produced under this award

Co-PI Audrey Comstock is a Postdoctoral Scholar for AY 2018-2019 at Arizona State University. Beginning AY 2019-2020, she will be an Assistant Professor of Political Science and Human Rights in the School of Social and Behavioral Sciences at Arizona State University. Dr. Comstock is an early career scholar, who is a beginning investigator with the NSF.

(a) No prior NSF awards.

Co-PI Glenn Sheriff is an Assistant Professor in the School of Politics and Global Studies at Arizona State University. His expertise is in designing economic incentives to protect environmental resources and measuring the distribution of environmental impacts across affected populations. Dr. Sheriff is an early career scholar, who is a beginning investigator with the NSF.

(a) No prior NSF awards.

PI Linda Fernandez is an Associate Professor of Environmental and Natural Resource Economics in the Department of Economics and Center for Environmental Studies at Virginia Commonwealth University. Her expertise is in international transboundary environmental and natural resource protection in water, land and air-sheds through economic incentives and policy.

(a) NSF Award/Belmont Forum: PLR 1534055 Amount: \$402,256/\$864,000, Period of Support: 06/01/15-05/31/20

(b) Title of Project: “Bioeconomic Analysis for Arctic Marine Resource Governance and Policy”

(c) NSF support resulted in the following:

Intellectual Merit: The project has resulted in not only interdisciplinary research products for publications listed below and oral presentations at various conferences involving economists, policymakers and other academic disciplines. As PI, Fernandez heads the international research team across three countries (U.S., Norway, Denmark).

Broader Impact: Fernandez has been requested as an expert for Harvard University’s Arctic Initiative to advise Iceland in its upcoming chairmanship of the AC (takes over from Finland in 2019) and has recruited 4 minority undergraduates from VCU to participate in a 2018 Northwest Passage expedition through an NSF award to University of Rhode Island conducting interdisciplinary research of Arctic environmental change and environmental education ship to shore outreach to science centers (Exploratorium, Smithsonian, and Alaska Science Center) as well as preparation of research presentations at science conferences.

(d) List publications:

Journal articles

B. Kaiser, M. Kourantidou, L. Fernandez (2018) “A Case for the Commons: The Snow Crab in the Barents” *Journal of Environmental Management*, in press.

B. Kaiser, L. Fernandez, N. Vestergaard (2016) “The Future of the Marine Arctic: Environmental and Resource Economic Development,” *The Polar Journal* 6(1):152-168.

M. Kourantidou, B. Kaiser, L. Fernandez, “Towards Arctic Resource Governance of Marine Invasive Species”, *Arctic Yearbook* 2015.

Book, Edited Volume

Arctic Marine Resource Governance and Development (2018) N. Vestergaard, B. Kaiser, L. Fernandez, J. Nyman Larsen, eds, Springer Polar Sciences, Dordrecht, ISBN:2510-0475.

Broader Impacts:

The introduction of new environmental circumstances through climate change is a global phenomenon. Yet, the Arctic and Antarctic are presently experiencing many of the most substantial

changes. This is apparent in NSF's own call around developing comprehensive research to better document the ways of navigating the new arctic.

Consistent with the current solicitation, the project will document the ways that impacted communities within the Arctic negotiate in real-time across levels of governance these fundamental changes in environmental circumstances. Understanding these processes would greatly enhance the ability of communities and policymakers, including those within the United States and Canada, to generate appropriate legal and policy responses in the near future. It will allow them to better understand the ability of these extreme events to disrupt existing governments even as it dislocates existing communities. And, it may offer these communities the knowledge that familiar legal ideas and existing policy processes may be able to adapt in unexpected ways to naturalize these circumstances in ways that facilitate effective policy solutions.

All the accumulated and aggregated data collected will be deposited to the NSF Arctic Data Center on an annual basis during the project, with all data, including coding decisions, fully deposited by the end date of any NSF award. (See the data management plan for further detail.) The research team members will engage in general dissemination in academic forums.

The research team will work with members of local communities, NGOs, social movements, and policymakers to ensure that impacted communities have full access to all data, research findings, and the interpretation of team members, the team will hold 3 one-day, on-site, free public workshops in Iqaluit, Ottawa and Washington DC, respectively.

These Workshops, where we hope to engage directly as a team with up to 50 local policy actors and local community members at each location, will allow the team to better facilitate effective use of the collected data as well as more appropriately situate the scientific findings for general consideration by the public. The Washington DC Workshop will be held at the new ASU Washington Center and each of the other two Workshops will rent local facilities for use for the event. Attendance at the 4 hour events will be free and lunch will be provided for attendees. The team will advertise the event to relevant stakeholders and communities in advance as well as to policymakers in each location – the team will use networks and contacts garnered throughout the project to ensure broad attendance at these events.

The research team involves scholars from two academic disciplines – economics and political science – in an inter-disciplinary collaboration, which also foreground divergent disciplinary training in theory and methods as a strength of the conduct of the research and its analysis (see accompanying Management Integration Plan).

In addition, two of the five team members are junior scholars who are early in their academic careers – they are teamed directly with more senior colleagues in ways that facilitate mentorship of these scholars. And, the research team is evenly gender-balanced, including by senior and junior rank.

Finally, the team will include a postdoctoral scholar and a graduate student whose training in the methods of scientific research can be expected to be enhanced by their direct engagement with the project. This is consistent with the underlying goals of NSF's Big 10 Ideas to increase educational training, especially as it might relate to research insights on this vulnerable region.

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