



CLIMATE CHANGE AND GEOPOLITICS: A CONFLICT IN THE ARCTIC

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Climate change and Geopolitics: A Conflict in the Arctic

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Abstract

This thesis is focused on the redefinition of the Canadian domestic and foreign Arctic policies based on a model of sustainability and sustainable development customized for the Arctic region. More specifically, since the beginning of the nineteenth century, the Arctic has become a pivotal region in terms of energy resources and economic opportunities due to the influence of the effects of climate change on the region. In fact, climate change is considered the prime trigger of ecological phenomena such as raising of the average seasonal temperatures, thawing of the sea ice and dysfunctional patterns of precipitations. As a result, fundamental ecological mechanisms determining the equilibrium and survival of the ecosystem, such as the albedo effect, are affected, producing alterations in the ecosystem's biodiversity and physical composition.

Therefore, this thesis will focus on the causal relationship that links climate change with both ecological changes and geopolitical and economic opportunities. First, I will analyze this region from an ecological perspective, thus I will define the Arctic as an ecosystem, which means a systemic unit in the planetary environmental system of ecological mechanisms. Through the theory of tipping points, I will demonstrate the crucial role played by the stability of this region in the determination of planetary wind and oceanic currencies.

Then I will focus my attention on the great availability of natural and energy resources in the region. I will consider Canada and the Canadian North as a case study to understand the importance of the Arctic physical composition in the determination of domestic and foreign policies. In fact, the increasing global demand for energy resources and the potential opening of a faster and larger international shipping route compared to the Panama Canal make the Arctic at the centre of global economic policies. For this reason, Canada is trying to obtain a globally recognized leading position in the research about the effects of climate change in the region and internationally recognized sovereign borders in the North.

Finally, after having understood and described the region's ecological vulnerabilities and the main Canadian interests in the North, I will develop a customized model of sustainable policy making for the region. I will ground my model on the theories of sustainability science and geoeconomics. I will achieve a deep understanding of the major Canadian economic objectives, describing them in sustainable terms, which means that I will define the set of parameters, such as public investments, necessary to make an economic policy as much 'environmentally harmless' as possible. My objective is determining a new Canadian model of sustainable policymaking, aimed at the protection and development of the North.

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Introduction

The Arctic is one of the most remote regions of the planet. Its peculiar geographical position, unique environment, and extreme weather conditions make the North a legendary space to be explored and discovered. Generally, the Arctic is imagined as a stable, silent, and white region, in which polar bears and seals live quietly. It is seen as an unchangeable reality where ice and snow lie since time immemorial. The exceptionality of this region is also fostered by the peculiar development of the local societies. The region is inhabited by tribes of Indigenous and Inuit people who sustain communities and ways of life despite the harsh weather conditions. Nevertheless, the human footprint in the Arctic did not change the isolated nature of this region, encouraging the adventurous image of the North for several years.

Geographically the region is located in the area north of the Arctic Circle ($66^{\circ}32'N$). The ice is a fundamental component of the Arctic ecosystem. Not only it affects the geography of the region in terms of surface, but also it conditions the development of life in the ecosystem. For example, the icecap represents a division between the tundra and the taiga vegetation. Seasonally, the thickness of the ice varies, due to changes in temperatures and precipitations.

However, since the beginning of the nineteenth century, the effects of climate change on the region have modified its geography and environment. Furthermore, since the 1980s the average seasonal temperatures have been increasing, impacting the stability of the sea ice and the mechanisms of ice thickness growth. As a result, the region has been subject to unpredictable climate change-induced variations that lead to a reduction of the icecap surface, a modification of the local biodiversity, a dysfunctional alternation of the seasonal climate patterns, and, at the same time, a greater potentiality of human development.

For this reason, the literature analyzes the Arctic mainly from two perspectives. On the one hand, theories of ecology consider the Arctic as a fragile ecosystem, which means a region in which the development of a differentiated biodiversity is endangered by climatic instabilities. On the other hand, theories of neorealist geopolitics consider the Arctic as a pivotal region for the increase of state's power internationally, due to the availability of energy resources and hydrocarbons, and the strategic geographical position.

Accordingly, since the beginning of the nineteenth century, governments and sponsors all over the world have funded and equipped research expeditions in the North, with the aim of establishing their power and influence on the sea ice cover in order to achieve access and potentially property on the resources and hydrocarbons available in the region. In contrast with the romantic vision of a peaceful land, for the entire nineteenth century, the biological and physical composition of the Arctic made it a pivotal region, at the centre of the foreign policies of influential international powers.

I chose to analyze this region after having studied the intersection between environment and human development from an ecological perspective. More specifically, at first, I considered social expansion and economic growth as anthropocentric phenomena that depend on the environment they are settled in.

Then, focusing my attention on the Arctic, I asked myself if this region is such an exceptional ecosystem, then the trends of social expansion, economic development and environmental instabilities were connected. In fact, it is true that the harsh climate and extreme weather conditions of the region represent an obstacle for the economic growth of the few social groups settled there. However, the Arctic is also rich in hydrocarbons and natural resources, which can contribute to a potential fast development of local economic activities.

In this thesis, I focus my preliminary research on the identification of the character of the changes occurring in the region. More specifically, I think that if human development and environment are entangled, and the Arctic is a region characterized by a high degree of environmental variability due to the effects of climate change, then the effects of climate change on the Arctic and on human development should be interconnected.

Furthermore, considering the central role the region plays in the determination of states' power policies, both domestically and internationally, the impacts of the effects of climate change on the degree of environmental instability inevitably affect international geopolitics. Thus, environmental variability can be seen as the determining factor in the definition of international relationships in and for the Arctic.

In this thesis, I analyze the effects of climate change in the North as prime triggers of environmental changes and potential economic development opportunities. For this reason, considering climate change as the major cause of dysfunction, I plan to determine two main groups of harmful effects of climate change.

My categorization of the effects of climate change is grounded on the identification of the aspects that affect the Arctic environment and the aspects that impact directly on the human development of the region. I highlight that in the Arctic region the geopolitical potentialities opened by the effects of climate change and the ecological changes that are influencing the survival of the ecosystem should be seen as two sides of the same coin.

Accordingly, through the application of this distinction, I will convey the idea that the ecological changes and the geopolitical opportunities that we are witnessing in the Arctic are connected. More specifically, in this thesis I consider the Arctic as an ecosystem, which means an ecological unit where environment, biodiversity and human development constitute a balanced system. Then, I analyze the Arctic as a region where environmental changes have effectively opened opportunities for access to natural resources and new

international interests and investments in the region. My main goal is demonstrating that the connection between these two visions can be interpreted as a cause-effect relationship, where the effects of climate change are one of the prime causes for the opening of the new geopolitical opportunities.

In this thesis, I choose to study the role of the effects of climate change in the determination of the connection between environmental variability and international geopolitics. I focus my attention on the case of Canada. Canada is a state bordering the Arctic Circle, where the Arctic covers almost half of the Canadian sovereign territory. Canada considers the North to be a fundamental element of its historical heritage. It is engaged in the protection and safeguard of the Arctic environment and peoples through governmentally funded initiatives and programs. Nevertheless, it recognizes also the geopolitical potential of the region, defining domestic and foreign policies to assure its rights of property and access to the Arctic natural resources.

For this reason, in this thesis, I explore a potential model for Canada to achieve its political and economic interests in the Arctic without contributing to the harmful environmental variability. Thus, I look at the intersection between national policymaking and the effects of climate change in the region, to understand if it is possible to develop economically and socially the Arctic region, without increasing the influence of the effects of climate change on the region's ecological variability.

This thesis is divided into four sections. In the first section, I analyze the Arctic from an ecological perspective to understand the characteristics of the main ecological changes the region is experiencing. Furthermore, I analyze the Canadian Arctic environmental protection policies, to understand if these policies efficiently address the increasing influence of the effects of climate change in the North.

In the second section, I define the geopolitical dynamics occurring in the Arctic. More specifically, I study the Canadian Arctic strategies and the intersection of these policies with the effects of climate change in the region.

In the third section, I propose my model of analysis. I intersect the ecological and geopolitical notions I considered in the previous sections to obtain a definition of development customized for the Arctic region. Thus, I examine how to combine the ecological dysfunctions occurring in the region with the increasing international geopolitical interests to achieve a potential path of development that does not impact the Arctic ecosystem's balance. In this section, I introduce the concepts of sustainability and sustainable development. I demonstrate that the degree of sustainability of an Arctic policy depends on how its implementation tackles the environmental variability of the Arctic region.

Finally, in the fourth and last section, I consider the latest Canadian Arctic domestic and international policies. I assess the degree of sustainability of these policies, identifying their strength and weaknesses based on the model presented in the previous section.

I believe this thesis contributes a small but interesting insight to the field of Arctic and sustainability studies. Nowadays, the effects of climate change on the planet are becoming more and more visible every day. Seasonal changes, climatic patterns, precipitations are altered by the effects of this phenomenon, which is affecting the Arctic region faster and deeper than anywhere else is. For this reason, I propose an analytical method that could inspire a similar large-scale analysis aimed at understanding the importance of sustainability but also the fundamental character of ecological stability. Researching the Arctic today is beneficial for a few people, considering the fragility of this ecosystem. Consequently, I hope this research will inspire a future and profound understanding of this region.

1. THE ARCTIC AND CLIMATE CHANGE

1. Introduction: The Arctic region

The Arctic can be defined as the “that region of the Earth [...] the latitude at which the sun fails to rise for at least one day in the year.”¹ The region is characterized by “a frozen ocean surrounded by continental landmasses and open oceans.”² As a result, oceanographers define the Arctic as the region “where ocean temperature remains near the freezing point of salt water.”

Geographically, the Arctic is the polar region located in the area north of the Arctic Circle (66°32'N).³ It covers the Arctic Ocean, which is about 5.4 million square miles wide,⁴ and the islands northern the continental land areas that border the Circle, such as parts of North America, small parts of Europe, and Asia, including the North Pole.⁵ For this reason, the identification of precise and definite borders is effectively complicated.⁶

The Arctic can be also described as “the land of extremes,” considering its continental climate. In fact, during the year, in the region a short and warm summer alternate with a long and cold winter. As a result, in this region, temperatures in the summer may overcome 20 degrees Celsius and in the winter plunge below minus 50.⁷

¹ R. M. M. Crawford, “Arctic Climate History,” 1 in Crawford, R. M. M. *Tundra-Taiga Biology*. First ed. 2014

² Idem

³ Samuel Knudsen, “The Arctic,” *Greenlandic text*, Kangarsuatssaat (2002): 6

⁴ Tim Marshall, *Prisoners of Geography. Ten maps that explain everything about the world* (New York: Scribner, 2016): 257

Bryson Bates, Zbigniew Kundzewicz, and Shaohong Wu, *Climate Change and Water* (Intergovernmental Panel on Climate Change Secretariat, 2008)

⁵ Oleg Anisimov and Blair Fitzharris, *Polar Regions*, in Bryson Bates, Zbigniew Kundzewicz, and Shaohong Wu, *Climate Change and Water* (Intergovernmental Panel on Climate Change Secretariat, 2008): 807

⁶ Klaus Dodds and Mark Nuttall, *The scramble for the poles* (Cambridge: Polity Press, 2016), 5

⁷ Tim Marshall, *Prisoners of Geography*, 257

In this region, flora and fauna are deeply influenced by the geographical position.⁸ More specifically, two types of climates characterize the Arctic region environment. These two are conventionally divided by the treeline, which is the area in which temperatures and weather conditions allow the growth of coniferous trees.⁹ Above the icecap, which means the space surrounding the North Pole and above the ice cover, there is the Tundra climate.¹⁰ Tundra means “treeless plan,” since it is an environment characterized by high and cold winds, short vegetation and permafrost, “permanently frozen ground that occurs from several inches below the surface to the depths of more than one hundred feet.”¹¹ The Arctic Tundra is geographically located in North America and Asia.¹²

Below the icecap, the region’s climate is defined Taiga, “a zone of scattered ever-green trees.”¹³ It is considered a form of boreal forest, in which bogs diffusion and vegetation growth alternate with the seasons.¹⁴ For example, a more dry and warm weather favor the advancing of vegetation, while bogs may be renewed as soon as the weather becomes cooler.¹⁵ The type of vegetation in the Taiga forest depends on the geographical area considered and, thus, the combination of different combination of climatic factors.¹⁶ In fact, Taiga can be found in North America, Northern Europe and Asia.¹⁷

The word Arctic comes from the Greek *Arktikos*, which means “near the bear,” referring to the Ursa Major constellation, “whose last two stars point toward the North

⁸ National Wildlife Federation, *The Arctic Environment*, 1, available in www.nwf.org/~media/PDFs/Be%20Out%20There/Schoolyard%20Habitats/WhereinArctic.pdf - 34k

⁹ R. M. M. Crawford, “Taiga and bog,” 93 in Crawford, R. M. M. *Tundra-Taiga Biology*. First ed. 2014

¹⁰ National Wildlife Federation, *The Arctic Environment*, 1

¹¹ *Ibidem*, 1-2

¹² *Ibidem*, 2

¹³ *Ibidem*, 2

¹⁴ R. M. M. Crawford, “Taiga and bog,” 93 in Crawford, R. M. M. *Tundra-Taiga Biology*. First ed. 2014

¹⁵ *Idem*

¹⁶ *Idem*

¹⁷ *Idem*

Star.”¹⁸ The word seemed to be documented for the first time in the description of the potentially first recorded expedition in the North. In 330 BC, Pytheas of Massalia declared of having reached a white and cold land inhabited by white bears.¹⁹



Figure 1 - http://www.mapcruzin.com/free-maps-arctic/arctic_region_pol02.jpg

However, the peculiar climatic condition of the Arctic retarded human capabilities of exploration of the region.²⁰ Historically, the most flourishing age of Arctic expeditions is the 19th century. At the time, explorations revealed the presence of Indigenous People tribes and potential of increasing the colonial possession on the region.²¹ Therefore, in since the 1850s treasury chests and sponsors have been

“fund[ing], equip[ping] and dispatch[ing] polar expeditions [...] for the purpose of reaching and extending power and influence over the places, peoples, ecologies, and items of trade,” in the Arctic, making the region a strategic position “for commercial al political benefit.”²²

1.1 Canada and the Arctic

From a Canadian perspective, the Arctic is seen as a “rules-based region with clearly defined boundaries, dynamic economic growth and trade, vibrant northerner

¹⁸ Tim Marshall, *Prisoners of Geography*, 256-257

¹⁹ Marshall, *Prisoners of Geography*, 257

²⁰ John McCannon, *A History of the Arctic Nature, Exploration and Exploitation* (London: Reaktion Books): 130

²¹ Canadian Northern Economic development, “About the North,” accessed February 16, 2018, <http://www.cannor.gc.ca/eng/1368816431440/1368816444319>

²² Klaus Dodds and Mark Nuttall, *The scramble for the poles* (Cambridge: Polity Press, 2016), 5-7

communities, and healthy and productive ecosystems.”²³ The stability of the region and its stewardship have been one of the main objectives of the Canadian governments’ domestic and foreign policy.²⁴

The Canadian North is the region above the Arctic Circle within the Canadian national borders.²⁵ The North makes up the 40 percent of the Canadian national territory. This space is conventionally subdivided between the Canadian North and the Canadian Archipelago. In the former case, the Canadian North is established in the northern part of Canada’s national territory. It is a frozen region, administered as “three territories” called Nunavut, Yukon, and Northwest Territories²⁶. In the latter case, the Canadian Archipelago is made of 94 major islands and more than 30 thousand minor frozen islands, settled in the Northern Arctic Ocean.²⁷ In the North, less than 1 percent of the Canadian population is settled. The greater part of them are Indigenous, Aboriginals, or Inuit communities.²⁸

The North is an integral part of the country territory and of the identity and cultural heritage of the Canadians’ ancestors, due to the presence of various Indigenous and Inuit communities.²⁹ Therefore, the Canadian Arctic culture is a fundamental element of the Canadian identity, being embedded in the Canadian history and culture.³⁰ For this reason, various administrations committed themselves to the economic support and social

²³ Global Affairs Canada, “Statement on Canada’s Arctic Foreign Policy,” accessed February 14, 2018, http://www.international.gc.ca/polar-polaire/canada_arctic_foreign_policy_bookletla_politique_etrangere_du_canada_pour_arctique_livret.aspx?lang=eng&view=d

²⁴ Ibidem

²⁵ Canadian Northern Economic development, “About the North,” accessed February 16, 2018, <http://www.cannor.gc.ca/eng/1368816431440/1368816444319>

²⁶ Ibidem

²⁷ The Canadian Encyclopedia, “The Arctic Archipelago,” accessed February 16, 2018, www.thecanadianencyclopedia.ca/en/article/arctic-archipelago/

²⁸ Canadian Northern Economic development, “About the North,” accessed February 16, 2018, <http://www.cannor.gc.ca/eng/1368816431440/1368816444319>

²⁹ Canada’s Northern Strategy, “Canada’s Northern Strategy,” accessed February 12, 2018, <http://www.northernstrategy.gc.ca/index-eng.asp>

³⁰ Global Affairs Canada, “Statement on Canada’s Arctic Foreign Policy,” accessed February 14, 2018, http://www.international.gc.ca/polar-polaire/canada_arctic_foreign_policy_bookletla_politique_etrangere_du_canada_pour_arctique_livret.aspx?lang=eng&view=d, 2

development of the region, protecting its environmental heritage, and reaching the country's interests both domestically and internationally.³¹

The Canadian Arctic is also a 'nerve center' for the economic development of the entire state. In fact, the presence in the region of world-class diamonds mines and energy resources make the Canadian Arctic a pivotal area for the economic growth of the entire country.³² Furthermore, the presence of abundant natural resources, including living marine resources, represent a strategic potentiality for the social development of the region and its economic diversification.³³

However, since the end of the Cold War, Canadian administrations had to balance national interests in the region with new environmental challenges caused by the effects of global warming temperatures and consequent climatic changes affecting the local flora and fauna.³⁴ More specifically, the



Figure 2 - https://sites.google.com/a/mypolkschools.net/jen/_/rsrc/1468854859302/canada-brochure-project/canada.jpg

Canadian Arctic geography has been reshaped by the influence of ecological phenomena, which impacted on the main characters of the environment of the northerner lands.³⁵

³¹ Ibidem

³² Canadian Northern Economic development, "About the North," accessed February 16, 2018, <http://www.cannor.gc.ca/eng/1368816431440/1368816444319>

³³ Ibidem

³⁴ Shelagh D. Grant, *Polar Imperative. A History of Arctic Sovereignty in North America*. (Vancouver: Douglas and McIntyre, 2011): 463

³⁵ Tim Marshall, *Prisoners of Geography*, 256

This section deals with the definition of the main ecological changes the Arctic region is experiencing. More specifically, in the first part, I will propose the definition of climate change both from a planetary perspective and from a regional perspective. Furthermore, in the second part I will delineate the concept of tipping point, identifying the deep entanglement between this concept and the changing Arctic region. Finally, I will analyze the Canadian environmental policies in the Arctic since the late 1980s, when the effects of climate change have visibly affected the region. In the end, I will determine if these environmental policies are an efficient tool to address the increasing influence of the ecological changes in the region.

2. Climate change in the Arctic

Planet Earth can be considered a self-regulating biosphere, which means “a system comprising all ecosystems and living organisms in the atmosphere, on land (terrestrial biosphere), or in the oceans (marine biosphere), including derived dead organic matter, such as litter, soil organic matter, and oceanic detritus.”³⁶ Therefore, the biosphere can be defined as a balanced system of mechanisms of equilibrium among different ecosystems based on processes of feedback regulation of energy conservation, temperature regulation, and life development.³⁷

More specifically, an ecosystem is “a distinct system of interacting living organisms, together with their physical environment.”³⁸ Therefore, it is an ecological unit in which specific organisms, similar topography, and stable climate determine the condition for the development of life and its conservation.³⁹ As Blew argues, “organisms

³⁶ Intergovernmental Panel on Climate Change, “Reports – Assessment Reports,” accessed February 13, 2018, www.ipcc.ch/ipccreports/tar/wg2/index.php?idp=689

³⁷ Tim Lenton, *Earth System Science. A Very Short Introduction* (Oxford: Oxford University Press): 6

³⁸ Intergovernmental Panel on Climate Change, “Reports – Assessment Reports,” accessed February 13, 2018, www.ipcc.ch/ipccreports/tar/wg2/index.php?idp=689

³⁹ Roger D. Blew, “On the Definition of Ecosystem,” *Bulletin of the Ecological Society of America* 77, no. 3 (1996): 171

are at the center of the definition of an ecosystem.” The inanimate components and climatic conditions of the ecosystem are to be considered the main resources for the organisms to develop and reproduce.⁴⁰ Consequently, a perturbation in the components or conditions of an ecosystem produces a change in the entire ecosystem life cycle.⁴¹

Furthermore, a feedback system is a closed loop formed by a chain of “cause-and-effect” ecological mechanisms, which produce and influence a present (and potentially future) state of a specific ecosystem.⁴² There are two types of feedback system. Positive feedback system is “an amplifying loop of causal connections,” which means that the consequences of a perturbation of the conditions or components of an ecosystem are going to exponentially amplify the effects of the perturbation. On the contrary, negative feedback system is “a damping loop of casual connections,” which means that an initial perturbation in the ecosystem is going to downscale the effects of the change.⁴³

Consequently, given that the biosphere a system of balanced ecosystems, the feedback system of regulation plays a fundamental role in the determination of the equilibrium of the biosphere. However, being the biosphere a complex system, to determine a change in its planetary balance “a multitude of closed feedback loops” is necessary.⁴⁴

In this perspective, climate change represents the system of closed feedback loops that influence the equilibrium of the planet. It is an ecological process that influences the mechanisms of climate regulation of the planet through modifications of the feedback systems of each ecosystem in the planet, provoking a rupture in the mechanisms of stabilization of the climatic conditions.⁴⁵

⁴⁰ Idem

⁴¹ Blew, “On the Definition of Ecosystem,” 173

⁴² Tim Lenton, *Earth System Science*, 6

⁴³ Ibidem, 7

⁴⁴ Ibidem, 6

⁴⁵ Ibidem, 6-8

According to the United Nation Framework on the Convention of Climate Change, climate change can be defined as “a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.”⁴⁶

More specifically, since the beginning of the industrial revolution and the utilization of fossil fuels in the industry field the concentration of carbon dioxide (CO₂) and greenhouse gases in the atmosphere has increased due to economic growth and energy production.⁴⁷ Consequently, greater concentration of CO₂ and greenhouse gases in the air has been pushing, especially since the 1980s, the atmosphere to a general increase in the average temperatures of the planet.⁴⁸

However, from a planetary perspective, human activity and natural variability are deeply entangled. Accordingly, increasing temperatures and different atmospheric biological and physical composition are effectively ecological changes that inevitably influence the feedback system of regulation both of each single ecosystem and of the biosphere as a whole.⁴⁹

As a result, a more precise definition of climate change is provided by the Intergovernmental Panel on Climate Change (1988), which defines climate change as “any change in climate over time, whether due to natural variability or as a result of human activity.”⁵⁰ Accordingly, “an assessment of the sensitivity of global temperatures to outside

⁴⁶ UN General Assembly, *United Nations Framework Convention on Climate Change: resolution / adopted by the General Assembly*, 20 January 1994, A/RES/48/189, available at: <http://www.refworld.org/docid/3b00f2770.html> [accessed 7 February 2018]

⁴⁷ Mark Maslin, *Climate Change. A Very Short Introduction* (Cambridge: Cambridge University Press): 6

⁴⁸ Fred Pearce, *With Speed and Violence. Why Scientists Fear Tipping Points in Climate Change* (Boston: Beacon Press): 15

⁴⁹ Tim Lenton, *Earth System Science*, 7

⁵⁰ Intergovernmental Panel on Climate Change, “Reports – Assessment Reports,” accessed February 13, 2018, www.ipcc.ch/ipccreports/tar/wg2/index.php?idp=689

forcing” inevitably influence the climatic condition triggering a feedback loop.⁵¹ Whether the feedback loop activated is negative or positive is still an open debate among scientists.⁵²

Climate change should not be confused with the phenomenon of global warming. Global warming is a process of exponential rising of the average temperatures due to the warming of the atmosphere provoked by the greater diffusion in the air of greenhouse gases and CO₂ because of high industrialization.⁵³ Climate change is the whole system of feedback loop mechanisms that the increasing density of greenhouse gases in the atmosphere provokes in each ecosystem and in the whole biosphere.⁵⁴ Therefore, global warming is a single perturbation that triggers a system of feedback loops, while climate change is the entire system of changes in the conditions and components of each ecosystem due to the activation of many different feedback loop mechanisms.⁵⁵

Furthermore, a second connection between human activity and climate change is represented by the main global impacts of climate change on the planetary balance that affect human activities. Changing the climatic patterns of different ecosystems will lead to the escalation of exceptional climatic phenomena and the alteration of climatic patterns that in the long run will become exponential.⁵⁶ As a result, the interaction of climatic changes with other mechanisms of closed feedback loop influences the survival of the ecosystem.⁵⁷ Phenomena such as land degradation, water acidification, or biodiversity loss will produce a systemic change that may lead to a new state of the ecosystem quickly.⁵⁸

⁵¹ Pearce, *With Speed and Violence*, 15

⁵² Ibidem, 16

⁵³ Peter, Rogers, "Climate Change and Global Warming," *Environmental Science and Technology* 24, no. 4 (1990): 429

⁵⁴ Idem

⁵⁵ Idem

⁵⁶ Maslin, *Climate Change*, 68

⁵⁷ Idem

⁵⁸ Maslin, *Climate Change*, 98

3. Climate change tipping points

The climate response to a “climate forcing,” such as a surplus of greenhouse gases in the atmosphere, is difficult to foresee.⁵⁹ Thus, even though it is scientifically proved that changing the climatic conditions of an ecosystem means activating a feedback loop, it is not clear which kind of feedback and what are the loop’s characteristics.⁶⁰

Consequently, as Maslin argues, scientists are trying to develop models based on historically precedent cases to understand how each ecosystem’s climate has responded to the “climates forcing.”⁶¹ The main objective of the development of these models is understanding climate thresholds in each ecosystem, the main consequences of passing them, in order to understand at a planetary level what the limits not to overcome to prevent the biosphere to collapse.⁶²

From a planetary perspective, critical climate thresholds are defined as ‘tipping points.’⁶³ Tipping points are the thresholds at which “the future state of the system can be qualitatively altered by a small change in forcing” that act in the physical, chemical, and biological components of the planet.⁶⁴ Therefore, a tipping point can occur in any ecosystem with strong non-linearity in its internal dynamics.⁶⁵

Lenton and Maslin distinguish two types of tipping points. On the one hand, they define ecologic tipping points the large-scale shifts in the climate system of the planet,⁶⁶ which “come in the form of planetary processes, of ecosystem adjustment.”⁶⁷ On the other hand, they define societal tipping points the regional threshold that, once overcome, is

⁵⁹ Idem

⁶⁰ Idem

⁶¹ Maslin, *Climate Change*, 100

⁶² Ibidem, 102

⁶³ Idem

⁶⁴ Tim, Lenton, and Tim, O’Riordan, *Addressing Tipping Points for a Precarious Future* (Oxford: Oxford University Press, 2013):24

⁶⁵ Idem

⁶⁶ Maslin, *Climate Change*, 102

⁶⁷ Lenton and O’Riordan, *Addressing Tipping Points*, 3

going to influence the human and social dynamics of the region.⁶⁸ In this case, tipping points “come in the form [...] of military, terrorist, or convulsive political action, or profound shifts in the economic performance, cultural outlooks and social behavior.”⁶⁹

Tipping points are defined also as “large-scale discontinuities,” considering the unpredictable nature of the consequences and changes that passing them will lead to. Furthermore, another element of uncertainty about tipping point’s consequences is the pace at which climate change both regionally and planetarily is driving the mechanism of feedback loop towards reaching them.⁷⁰

In fact, the nature of tipping points is still based on “deterministic components,” such as nature of the change and level of influence of the change in the ecosystem.⁷¹ Nevertheless, the main vulnerabilities and fluctuations of each ecosystem are different and represent an element of oscillation of the mechanisms of feedback loops that are triggered regionally.⁷² As Lenton affirms, the biosphere has a system of early warning of a tipping point proximity, but the “irreducible uncertainty” of the ecological feedback loops mechanisms as a response of the “climate forcing” represent a flaw in the social action capabilities.

Accordingly, the main scientific open debate about tipping points is their reversibility. In fact, the forcing in the climate of each ecosystem does not necessarily escalate exponentially in the long term. On the contrary, as in the case of greenhouse gases and CO₂, if the forcing returns below the tipping point system, the behaviour of the ecosystem may be different. In some cases, the ecosystem might return to its original state, recovering the changes provoked by the feedback loop reaction.⁷³ Nevertheless,

⁶⁸ Maslin, *Climate Change*, 102

⁶⁹ Lenton and O’Riordan, *Addressing Tipping Points*, 3-4

⁷⁰ Idem

⁷¹ Ibidem, 38

⁷² Idem

⁷³ Ibidem, 24

reversibility has never been completely tested in practice, and as Lenton highlights, “reversibility in principle does not mean that changes will be reversible in practice.”⁷⁴

Lenton identifies in ice melting, biome loss, circulation change, biodiversity loss, and land deterioration the main and most dangerous tipping points not to overcome the survival of the planet.⁷⁵ Accordingly, if the planetary effects of climate change lead to overcome them, then a “structural change” in the system of balance of the biosphere will be the main consequence.⁷⁶

Furthermore, as the author highlights, these planetary tipping points are deeply interrelated, which means that “tipping one element of the [...] system, significantly increases the probability of tipping another.”⁷⁷ Consequently, the effects of a single phenomenon such as global warming on a single ecosystem are going to influence not only the single ecosystem, but it can be perceived as a potential early indicator of a tipping point.⁷⁸

3.1 The Arctic ecosystem as a tipping point

Lenton defines with the terms ‘tipping element’ a part in the biosphere “that has a tipping point” at a regional level.⁷⁹ Thus, a tipping element is either a regional change or a component in a region that has changed due to a natural or human-induced change in the ecosystem.⁸⁰ The Arctic ecosystem represents one of the most important tipping elements caused by the effects of climate change on the biosphere.⁸¹

⁷⁴ Lenton and O’Riordan, *Addressing Tipping Points*, 25

⁷⁵ *Ibidem*, 25-30

⁷⁶ *Ibidem*, 35

⁷⁷ *Idem*

⁷⁸ *Ibidem*, 37

⁷⁹ *Ibidem*, 24

⁸⁰ *Idem*

⁸¹ Paul, Wassmann, and Timothy M. Lenton, "Arctic Tipping Points in an Earth System Perspective," *Ambio* 41, no. 1 (2012): 3, <http://www.jstor.org/stable/41418334>

The Arctic is one of the most important ecosystems in the definition of the feedback balance of the biosphere.⁸² The peculiar environmental and climatic characteristics of the region make it “the cooling system” of the planet, being the extreme weather conditions and temperatures range the main drivers of wind currents from the poles to the tropics and vice versa; being the reserve of dangerous gases frozen in the soil, such as methane in the permafrost; and being a reserve of freshwater.⁸³

The polar ice represents the determinant constituent of the entire ecosystem.⁸⁴ There are two different types of ice. The sea ice is the layer of ice that forms on the water surface. It forms after a layer of young ice stabilize on the sea surface. It is thin and almost transparent.⁸⁵ The multi-year ice is several years old ice. It is stratified, very thick and white.⁸⁶

The process of growth of the ice is not linear. Ice in the Arctic forms from a long-term process. First, water on the sea surface freezes, forming a very thin and transparent layer of ice, called ‘nilas’.⁸⁷ After the first winter, nilas becomes thicker and whiter, and after the following year, it reaches a thickness of one meter and a half.⁸⁸ After the first year of consolidation, the ice growth becomes a seasonal process. During the summer, the top cover melts in small superficial lakes, thus, reducing the thickness of the ice. During the winter, the surface is covered in snow that helps the surface to freeze again faster and consolidate the surface, while, at the same time, more water freezes at the bottom of the thick pack of ice, contributing to thicken the ice sheet.⁸⁹

⁸² Peter, Wadhams, *A Farewell to Ice. A Report from the Arctic* (New York: Oxford University Press, 2017): 4

⁸³ Pearce, *With Speed and Violence*, 38

⁸⁴ Wadhams, *A Farewell to Ice*, 6

⁸⁵ Ibidem, 12

⁸⁶ Ibidem, 3

⁸⁷ Ibidem, 13

⁸⁸ Idem

⁸⁹ Idem

The ice is also the main tipping element in the Arctic ecosystem. Being the growth and definition of the ice sheet a dynamic and season-dependent process, it is also the component of the ecosystem, which is influenced the most by climatic changes.⁹⁰ For example, considering the phenomena of global warming, an increase in the average summer temperature causes an increase in the process of surface melting, inevitably affecting also the process of winter superficial stratification.⁹¹

3.2 Albedo effect: reflectivity and positive climatic feedback

Scientists define ice-melting and ice-freezing as solar energy-based “threshold processes.”⁹² In fact, the seasonal alternation of winter ice pack formation and summer warming temperatures is based on the capability of the planet of absorbing and/or reflecting solar energy.⁹³

The albedo is defined as “the measure of the reflectivity of the planet’s surface.”⁹⁴ It represents the “fraction of solar radiation reflected by a surface object.”⁹⁵ On the planet surface, albedo is generally measured in percentage, because it varies based on the kind of ecosystem considered. For example, snow-covered surfaces, being mainly white, have a high albedo, meaning that they reflect the greater part of the solar energy that shines upon them. On the contrary, vegetation covered surfaces and open ocean waters have a low albedo, since their darker colour implies also a greater capability of absorbing solar energy.⁹⁶

⁹⁰ Pearce, *With Speed and Violence*, 36

⁹¹ Wassmann and Lenton, "Arctic Tipping Points in an Earth System Perspective," 4

⁹² Pearce, *With Speed and Violence*, 36

⁹³ Idem

⁹⁴ Ibidem, 103

⁹⁵ Intergovernmental Panel on Climate Change, “Reports – Assessment Reports,” accessed February 13, 2018, www.ipcc.ch/ipccreports/tar/wg2/index.php?idp=689

⁹⁶ Ibidem

In the case of the Arctic ecosystem, its albedo is a fundamental “controlling factor in the seasonal and climatological evolution of the sea ice cover.”⁹⁷ Seasonal changes of temperatures and the surface of ice cover make the reflectivity of the ice an important component of the climate balance of the ecosystem.⁹⁸ For example, the open ocean reflectivity stays around 1 percent the whole year, while the level of reflectivity of the sea ice can vary from 5 to 9 percent between fall and winter, dropping below 5 only during the summer.⁹⁹

The sea ice albedo effect is a positive feedback mechanism that it is activated by a perturbation in the seasonal alternation of temperatures due to the effects of climate change on the albedo of the sea ice.¹⁰⁰ It is a mechanism based on the variation of the sea ice and/or multi-year ice surface.¹⁰¹ Therefore, the albedo feedback mechanism influences the processes of winter freezing and summer melting, impacting on the sea surface covered in ice of the region.¹⁰²

The albedo feedback mechanism and the effects of climate change in the Arctic region are deeply entangled.¹⁰³ The effects of climate change in the region displayed at first as a rise in the average temperatures in all seasons.¹⁰⁴ Being average temperatures warmer, the ice started to melt earlier in the year.¹⁰⁵ As a result, approaching summer, which means the warmest time of the year, with multi-year ice already partially melted, the ecosystem

⁹⁷ S., Agarwal, and W. Moon, and J. S. Wettlaufer. "Decadal to Seasonal Variability of Arctic Sea Ice Albedo," *Geophysical Research Letters* 38, no. 20 (2011): 1

⁹⁸ Stephen R., Hudson, "Estimating the Global Radiative Impact of the Sea Ice–albedo Feedback in the Arctic," *Journal of Geophysical Research: Atmospheres* 116, no. D16 (2011): 1

⁹⁹ Wadhams, *A Farewell to Ice*, 105

¹⁰⁰ Kashiwase, Haruhiko, Kay I. Ohshima, Sohey Nihashi, and Hajo Eicken, “Evidence for Ice–Ocean Albedo Feedback in the Arctic Ocean Shifting to a Seasonal Ice Zone,” *Scientific Reports* 7, no. 1 (August 15, 2017): 8170 <https://doi.org/10.1038/s41598-017-08467-z>

¹⁰¹ Idem

¹⁰² Idem

¹⁰³ Wadhams, *A Farewell to Ice*, 106

¹⁰⁴ Haruhiko, Ohshima, Nihashi, and Eicken, “Evidence for Ice–Ocean Albedo Feedback in the Arctic Ocean,” 1

¹⁰⁵ Wadhams, *A Farewell to Ice*, 106

was changing its internal composition, being the sea ice radiation reflectivity capacity different, and its climatic conditions, being average temperatures higher due to the increasing impact of the effects of climate change on the biosphere.¹⁰⁶

Nevertheless, as Wadhams highlights, in the Arctic ecosystem, “an albedo loss is a radiation gain, [which means] again in the heating of the planet.”¹⁰⁷ In fact, having such a high albedo, the ice used to represent a “shield” for the planet, allowing the biosphere to balance a warmer temperature at the tropics with a cooler climate at the poles.¹⁰⁸ Changing the ice capacity of reflectivity implies also changing the capacity of absorption of solar energy of the entire ecosystem, thus, producing a “growing energy imbalance” both in the ecosystem and, consequently, in the biosphere.¹⁰⁹

As a result, a warmer Arctic climate has caused an imbalance in the seasonal process of ice growth. Consequently, ice starts melting earlier in the spring, but it starts freezing again only later in winter.¹¹⁰ For this reason, more open water is exposed to solar radiations for longer in the year, which means lower albedo capacity for longer.¹¹¹ Thus, more solar radiations are absorbed triggering a positive feedback mechanism that has rapidly escalated non-linearly.¹¹² For example, as Wadhams affirms, in September 2005 the multi-year ice in North America was about 20 percent thinner than in 1980. Two years later, in 2007, temperatures in the Arctic rose and, in the summer, the Northwest Passage was for the first time in history completely ice free.¹¹³

¹⁰⁶ Haruhiko, Ohshima, Nihashi, and Eicken, “Evidence for Ice-Ocean Albedo Feedback in the Arctic Ocean,” 1

¹⁰⁷ Wadhams, *A Farewell to Ice*, 107

¹⁰⁸ Pearce, *With Speed and Violence*, 38

¹⁰⁹ *Ibidem*, 102

¹¹⁰ Wadhams, *A Farewell to Ice*, 106

¹¹¹ *Idem*

¹¹² *Ibidem*, 107

¹¹³ *Ibidem*, 71

Therefore, the albedo feedback mechanism and climate change are interrelated, since they trigger a ‘vicious cycle’ in which both the phenomena are responses and drivers of a deep change in the Arctic ecosystem and the planetary balance.¹¹⁴ At the same time, the two mechanisms are reciprocally buttressing the change in the ecosystem climatic conditions and ice composition, amplifying the respective effects exponentially.¹¹⁵ As a result, the effects of climate change in the Arctic ecosystem are “twice as fast as the global average,” making the region one of the most endangered systems on the planet.¹¹⁶ For example, in July 2012, the 97 percent of the entire Greenland ice sheet surface was reported experiencing ice surface melting.¹¹⁷

3.3 Did we pass the tipping point in the Arctic?

The deep entanglement of climate change and ice albedo feedback mechanisms have developed a systematic amplification of the phenomena of warming temperatures in the Arctic ecosystem.¹¹⁸ As a result, in the past years, the ice pack surface trend has been “relentlessly downward,” and seems to be accelerating.¹¹⁹ However, predictions on the future of the ecosystem are still difficult to make. In fact, scientists are still debating on which are the weather factors that influence the process of ice melting and how.¹²⁰

Nevertheless, it is certain that the Arctic ecosystem has been stressed very deeply by continuous changes in its conformation and composition, which inevitably affected also the development of life in the region.¹²¹ Therefore, scientists seem to agree in recognizing

¹¹⁴ Ibidem, 120

¹¹⁵ Klaus, Dodds, and Mark, Nuttall, *The Scramble for the Poles* (Cambridge: Polity Press, 2016): 54

¹¹⁶ Idem

¹¹⁷ Idem

¹¹⁸ Henry P., Huntington, Eban Goodstein, and Eugénie Euskirchen, "Towards a Tipping Point in Responding to Change: Rising Costs, Fewer Options for Arctic and Global Societies," *Ambio* 41, no. 1 (2012): 66, <http://www.jstor.org/stable/41418340>

¹¹⁹ Wadhams, *A Farewell to Ice*, 76

¹²⁰ Idem

¹²¹ Ibidem, 85

that the ecosystem has passed a threshold and cannot recover its state before the increasing influence of climate change.¹²²

More specifically, the sensitivity of the Arctic ecosystem to climatic changes depends on “the thickness of the sea ice.”¹²³ Therefore, considering the high level of variability of the ice surface and its increasing instability, scientist have been asking if we already passed a planetary tipping point.¹²⁴ As Serreze points out, ice is generally thinning, and multi-year ice has become more and more vulnerable to rapid loss events.¹²⁵

The author argues that, at the moment, the Arctic ecosystem is going through a process of irreversible change that is comparable to a regional tipping point. However, from a planetary perspective changes are prone to lead to a tipping point but are still potentially controllable.¹²⁶ More specifically, even recognizing that there is “no chance” for the multi-year ice cover to reconstitute as much strong and thick as before the changes caused by the warming temperatures, the author affirms that for some years there will still be a winter ice cover.¹²⁷

The main problem is in the identification of the main seasonal patterns that influence the formation and melting of the ice seasonally. As Wadhams highlights, the main climatic dysfunction of the ecosystem is in the winter season, when the ice used to freeze its surface and to increase its thickness. Accordingly, since the late 1980s, during the summer time, because of the lower albedo and, thus, greater absorption of sun radiations, the ice cover is warmed both on the surface and at the bottom.¹²⁸ Therefore,

¹²² Ibidem, 86

¹²³ Yongyang Cai, Timothy M. Lenton & Thomas S. Lontzek, “Risk of multiple interacting tipping points should encourage rapid CO2 emission reduction,” *Nature* vol 6 (2016): 61 doi:10.1038/nclimate2964

¹²⁴ Idem

¹²⁵ Mark C. Serreze, “Climate change: Rethinking the sea-ice tipping point,” *Nature* 471 (03 March 2011): 48 doi:10.1038/471047a

¹²⁶ Idem

¹²⁷ Wadhams, *A Farewell to Ice*, 86

¹²⁸ Ibidem, 87

while approaching the winter season, the ice has been thinned by a double action, one on the superficial surface and one at the delimitation between ice and water. As a result, the capacity of winter self-restoration of the ice cover is deeply influenced, inevitably impacting on the reformation of the ice, which may become a seasonal ice cover according to scientists.¹²⁹

However, as Lenton argues, the warming of the temperatures and waters of the Arctic region and the retreat of permanent sea ice represent a very likely structural change for the biosphere, whose impacts will be seen especially at a regional level. The whole summer without the ice cover in the region will inevitably affect the development of the life cycle of the ecosystem, especially in terms of biodiversity.

At the same time, a seasonal ice loss needs to be considered a “large forcing perturbation” for the planet in the medium- and long-term. Consequently, the qualitative alteration of the system of complex closed feedback loops that regulates the equilibrium among the different ecosystems in the biosphere will trigger a sort of planetary reorganization, in which each tipping point are interrelated in a sort of “domino dynamics, in which tipping one element [...] significantly increases the probability of tipping another.”¹³⁰

3.4 Addressing climate change: Mitigation and Adaptation policies

Climate change represents an ecological challenge that influences the planetary life support system acting directly on the environmental conditions of life development.¹³¹ Therefore, addressing climate change means identifying the main drivers and causes of this

¹²⁹ Idem

¹³⁰ Lenton and O’Riordan, *Addressing Tipping Points*, 35

¹³¹ Pearce, *With Speed and Violence*, 240

phenomenon, in order to affect significantly the mechanisms of complex feedback loop that influence the development of life in the biosphere.¹³²

Scientists agree that one of the most important drivers to be considered in the analysis of climate change is the development of human industrial activity planetary.¹³³ They affirm that after the early industrial revolution, the increasing intensive utilization of fossil fuels as a principal source of energy has altered the atmospheric carbon concentration in the entire globe, triggering a series of closed feedback loops that inevitably affected “other biogeochemical cycles, [such as] the modification of the hydrogeological cycle.”¹³⁴

For this reason, it can be said that the increasing influence of human activity is perturbing the planetary mechanisms of balance among different ecosystems.¹³⁵ In fact, the alteration of the atmospheric composition has become pivotal in the determination of the planet’s life-support system, making humans the species capable of jeopardizing the survival of the other species through the control of the carbon cycle.¹³⁶

As a result, some scientists affirm that the planet has entered a new geological era, and have defined it Anthropocene due to the fundamental role humans play in the definition of the life-support climatic mechanisms of the biosphere.¹³⁷ Consequently, human interactions and social development have a fundamental function in the definition of the capacity of the planet to respond to climatic and environmental disturbances.¹³⁸

Consequently, there are two main strategies to cope with climate change in order to address the vulnerability of the planet to the harm of climatic forcing. On the one hand,

¹³² Idem

¹³³ Carl, Folke, Reinette Biggs, Albert V. Norström, Belinda Reyers, and Johan Rockström, "Social-ecological Resilience and Biosphere-based Sustainability Science," *Ecology and Society* 21, no. 3 (2016): 30, <http://www.jstor.org.px.units.it/stable/26269981>

¹³⁴ Idem

¹³⁵ Idem

¹³⁶ Pearce, *With Speed and Violence*, 23

¹³⁷ Folke, Biggs, Norström, Reyers, and Rockström, "Social-ecological Resilience," 30

¹³⁸ Ibidem, 31

from a human perspective, climate change could be mitigated. On the other hand, from a planetary perspective, climate change can be addressed by adapting to the planet needs.¹³⁹

Mitigation is a human intervention “to reduce the sources or enhance the sinks of greenhouse gases.”¹⁴⁰ It originates on the crucial role of human society in the determination of a climate forcing in the atmosphere through the control of the carbon cycle.¹⁴¹ It is considered a necessary measure to address climate change because scientists’ previsions about the future of the planet cannot determine precisely the planetary response to continuous rising emissions of greenhouse gases in the atmosphere.¹⁴²

Furthermore, mitigation can be seen as an “anthropocentric policy” aimed at the reduction of carbon emissions in the atmosphere and a potential conversion from a fossil fuel energy dependent society to a more natural form of energy supply in order to improve production efficiency.¹⁴³ Therefore, it should represent the response of the human species to the potentially dangerous effects of climate change on the human society survival and security into a changing planet.¹⁴⁴

¹³⁹ Idem

¹⁴⁰ O.Edenhofer, R. Pichs-Madruga, Y. Sokona, S. Kadner, J. C. Minx, S. Brunner, S. Agrawala, G. Baiocchi, I. A. Bashmakov, G. Blanco, J. Broome, T. Bruckner, M. Bustamante, L. Clarke, M. Conte Grand, F. Creutzig, X. Cruz-Núñez, S. Dhakal, N. K. Dubash, P. Eickemeier, E. Farahani, M. Fischedick, M. Fleurbaey, R. Gerlagh, L. Gómez-Echeverri, S. Gupta, J. Harnisch, K. Jiang, F. Jotzo, S. Kartha, S. Klasen, C. Kolstad, V. Krey, H. Kunreuther, O. Lucon, O. Masera, Y. Mulugetta, R. B. Norgaard, A. Patt, N. H. Ravindranath, K. Riahi, J. Roy, A. Sagar, R. Schaeffer, S. Schlömer, K. C. Seto, K. Seyboth, R. Sims, P. Smith, E. Somanathan, R. Stavins, C. von Stechow, T. Sterner, T. Sugiyama, S. Suh, D. Ürgen-Vorsatz, K. Urama, A. Venables, D. G. Victor, E. Weber, D. Zhou, J. Zou, and T. Zwickel, Technical Summary, in *Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J. C. Minx (eds.)] (Cambridge: Cambridge University Press, 2014): 37

¹⁴¹ Pearce, *With Speed and Violence*, 110

¹⁴² O.Edenhofer et al., Technical Summary, 37

¹⁴³ United Nations Environment Program, “Mitigation,” Accessed February 15, 2018 <https://www.unenvironment.org/explore-topics/climate-change/what-we-do/mitigation>

¹⁴⁴ NASA Global Climate Change, “Responding to Climate Change,” accessed February 15, 2018 <https://climate.nasa.gov/solutions/adaptation-mitigation/>

Consequently, through a process of climate change mitigation, humans try to significantly reduce their interference in the climate system both regionally and planetary.¹⁴⁵ The main objective is to reduce the emission of carbon and greenhouse gases in the atmosphere in order to recover the atmosphere composition, allowing the planet to adapt to climatic changes without any human direct intervention.¹⁴⁶

Adaptation is an “adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.”¹⁴⁷ It is a planetary response mechanism to the changes in the climatic system of each ecosystem aimed at the preservation and continuation of life.¹⁴⁸ Accordingly, the unpredictability of climate change effects and the pace at which climate change impacts will increase represent a threat to the life system.¹⁴⁹

Climate change cannot be avoided or radically modified, thus, from a human perspective, adaptation is the principal option for them to protect the human population.¹⁵⁰ Processes of adaptation are necessary “to reduce exposure to [a] known or possible hazard; to develop a capacity cope with unavoidable damage [...], and to take advantage of new forms of living and governing so as to seek to redesign hazard or threat out of the system.”¹⁵¹

Adaptation and adaptive capacity represent the main indicator for the definition of the vulnerability of an ecosystem.¹⁵² In fact, being adaptation a process based on the

¹⁴⁵ Ibidem

¹⁴⁶ Ibidem

¹⁴⁷ Intergovernmental Panel on Climate Change, “Reports – Assessment Reports,” accessed February 13, 2018, www.ipcc.ch/ipccreports/tar/wg2/index.php?idp=689

¹⁴⁸ Zmarak Shalizi, and Franck Lecocq, “To Mitigate or to Adapt: Is that the Question? Observations on an Appropriate Response to the Climate Change Challenge to Development Strategies,” *The World Bank Research Observer* Vol. 25, No. 2 (August 2010): 298

¹⁴⁹ Maslin, *Climate Change*, 137

¹⁵⁰ Idem

¹⁵¹ Lenton and O’Riordan, *Addressing Tipping Points*, 15

¹⁵² Dagmar Schröter, Colin Polsky And Anthony G. Patt, “Assessing Vulnerabilities to The Effects of Global

development and maintenance of life, the capacity of living organisms in the ecosystem to cope with the escalating effects of climate change is a form of slowdown of tipping points early warning.¹⁵³

Adaptation and mitigation are not “perfect substitutes for each other.”¹⁵⁴ The impacts of climate change in the developmental process of an ecosystem affect specifically the mechanisms of growth of the living organisms, which means that they influence the capacity of the ecosystem to create the condition to preserve life.¹⁵⁵ However, the distinction between adaptation and mitigation is based on a human perspective, which means that even though it depends on the visible impacts of the effects of climate change, it is based and centred on the human needs.¹⁵⁶

Accordingly, in the Anthropocene, preserving life means granting the human species the condition to survive and cope with in a changing environment. In this sense, prioritizing mitigation or adaptation is a choice that needs to be made from a social perspective.¹⁵⁷ Mitigation represents the human choice to address the causes of climate change, re-organizing the socio-economic models that characterize the human society. As a result, even though carbon emissions might be reduced, it does not consider the ecosystem consequences, as for example in the case of irreversible biodiversity loss.¹⁵⁸ Adaptation represents human choices to adapt to the consequences of the impacts of climate change. Therefore, even though it cannot prevent irreversible changes, it may lead to a reorganization of social and economic activities based on the rhythms and needs of the

Change: An Eight Step Approach” *Mitigation and Adaptation Strategies for Global Change* No. 10 (2005): 576

¹⁵³ Lenton and O’Riordan, *Addressing Tipping Points*, 39

¹⁵⁴ Shalizi and Lecoq, “To Mitigate or to Adapt,” 304

¹⁵⁵ *Ibidem*, 298

¹⁵⁶ *Idem*

¹⁵⁷ *Ibidem*, 303

¹⁵⁸ *Ibidem*, 304

ecosystem, aimed at slowing down the effects of climate change in the long term and preserving the survival of life.^{159b}

4. Canada's environmental policy in the Arctic

Addressing climate change in the Arctic is a fundamental form of governance in the region.¹⁶⁰ The Canadian government recognizes the importance of the effects of this phenomenon on the region, highlighting that “the climate impacts [...] are expecting to persist and worsen as a result of past and present-day emissions.”¹⁶¹

For this reason, Canada's administrations are engaged in the development of the Arctic region both socially and economically, while, at the same time, funding policies of environmental protection and climate change research. Accordingly, Canada is promoting “an ecosystem-based management approach” with other nation accessing the region and addressing climate change strengthening scientific research.¹⁶² Canada's action for the Arctic region conservation is twofold. On the one hand, Canada operates through domestic policies aimed at the development of the region and the adaptation to the effects of climate change. On the other hand, it acts internationally, establishing plans of cooperation with other nations and actively participating to international organizations and forums.

Domestically, Canada recognizes the Arctic as an “ecologically sensitive” area, “essential for the conservation of Arctic species.”¹⁶³ For this reason, it is establishing strong boundaries for the protection of flora and fauna in the region, in order to prevent

¹⁵⁹ *Idem*

¹⁶⁰ Lenton and O'Riordan, *Addressing Tipping Points*, 230

¹⁶¹ Government of Canada, “Adapting to the Effects of Climate Change,” accessed February 17, 2018, <https://www.canada.ca/en/services/environment/weather/climatechange/climate-action/adapting-to-effects.html>

¹⁶² Global Affairs Canada, “Statement on Canada's Arctic Foreign Policy,” accessed February 14, 2018, http://www.international.gc.ca/polar-polaire/canada_arctic_foreign_policy_bookletla_politique_etrangere_du_canada_pour_arctique_livret.aspx?lang=eng&view=d

¹⁶³ *Ibidem*

irreversible ecological losses in the biodiversity of the ecosystem.¹⁶⁴ Therefore, Canada is planning to establish protected areas and to expand the national park system in the North.¹⁶⁵

Moreover, recognizing the influence of the impacts of climate change in the region, Canada is fostering the development of mitigation and adaptation policies.¹⁶⁶ Canada defines adaptation as a necessary strategy to reduce environmental harm and take advantage of new opportunities that the effects of climate change open in the region.¹⁶⁷ To this end, Canada recognizes the necessity to “mak[e] adjustments in [the] decisions, activities, and thinking,” of the central administrations.¹⁶⁸

Accordingly, Canada is committed to the reduction of emissions of greenhouse gasses in the atmosphere, aiming at developing a system of low-carbon economy.¹⁶⁹ In addition, the government is engaged in the identification of the climatic risks for the North, defining the future challenges for the Arctic ecosystem in order to build “the know-how and expertise necessary” to pursue adaptation policies.¹⁷⁰ The main actions of the Canadian government to face the increasing impacts of climate change in the North are the Pan-Canadian Framework on Clean Growth and Climate Change in order to fund research to reduce emissions of greenhouse gases. Secondly, the Expert Panel on Climate Change Adaptation and Resilience Results that will foster federal, provincial, and territorial

¹⁶⁴ Ibidem

¹⁶⁵ Ibidem

¹⁶⁶ Government of Canada, “Adapting to the Effects of Climate Change,” accessed February 17, 2018, <https://www.canada.ca/en/services/environment/weather/climatechange/climate-action/adapting-to-effects.html>

¹⁶⁷ Ibidem

¹⁶⁸ Ibidem

¹⁶⁹ Global Affairs Canada, “Statement on Canada’s Arctic Foreign Policy,” accessed February 14, 2018, http://www.international.gc.ca/polar-polaire/canada_arctic_foreign_policy_bookletla_politique_etrangere_du_canada_pour_arctique_livret.aspx?lang=eng&view=d

¹⁷⁰ Government of Canada, “Adapting to the Effects of Climate Change,” accessed February 17, 2018, <https://www.canada.ca/en/services/environment/weather/climatechange/climate-action/adapting-to-effects.html>

policies of adaptation including also educational programs. Finally, the Federal Adaptation Policy Framework enhance governmental investments in the institutionalization of federal programs of health care based on the individualization of future climate risks.¹⁷¹

Internationally, Canada's action is very proactive. Canada is one of the participants in the Intergovernmental Panel on Climate Change (IPCC), funding research on the current status of the planetary effects of climate change and their potential consequences in the future.¹⁷² Furthermore, Environment and Climate Change Canada represent a great contributor to the research about climatic phenomena, providing data and knowledge assessed by the IPCC in its reports.¹⁷³ In this sense, Environment and Climate Change Canada are considered one of the main hubs for the research for the conflict assessment programs and research activities.¹⁷⁴ For example, "the analysis of historical climate and future scenarios was a significant Canadian contribution to globally-coordinated science for the IPCC Assessment Report."¹⁷⁵

Canada is also one of the principal funders of the Conservation of Arctic flora and fauna (CAFF), whose objective is the development of a system of international cooperation for the conservation of Arctic biodiversity.¹⁷⁶ The presence of Canada allowed the development of programs of environmental and biodiversity protection, management of prevention strategies, and proposals of intergovernmental negotiations and recommendations in accessing the region.¹⁷⁷

¹⁷¹ Ibidem

¹⁷² Government of Canada, "Contribution to Intergovernmental Panel on Climate Change," accessed February 17, 2018 <https://www.canada.ca/en/environment-climate-change/services/climate-change/contribution-intergovernmental-panel.html>

¹⁷³ Ibidem

¹⁷⁴ Ibidem

¹⁷⁵ Ibidem

¹⁷⁶ Government of Canada, "Conservation of Arctic Flora and Fauna," accessed February 18, 2018 <https://www.canada.ca/en/environment-climate-change/corporate/international-affairs/partnerships-organizations/conservation-arctic-flora-fauna.html>

¹⁷⁷ Ibidem

4.1 Climate change and Canada's policy compatibility

According to the United Nations Environment report of December 2017, Canada's climate action has been effective. Canada is making great progress towards its climate targets and greenhouse gases reduction goals, investing in programs for the biodiversity conservation and funding plans for the implementation of new projects of environmental protection.¹⁷⁸

However, between 2016 and 2018 domestic policies and initiatives towards sustainability had to be balanced with the main economic and political interests of the Canadian administration.¹⁷⁹ Although targeted governmental investments have been made for the development of infrastructural projects aimed at the definition low carbon plans of transportations, Canada is still having difficulties in addressing environmental friendly procedures of national energy supply, still grounded on fossil fuels supply.¹⁸⁰

In the Arctic, the great influence of the accelerating effects of climate change on the ecosystem is inevitably producing new challenges for the Canadian administration.¹⁸¹ The greater warming of the region compared to the rest of the planet is influencing the local resource development, the economic diversification, and the improving territorial capacity to face changes.¹⁸² The Canadian Arctic climatic vulnerability is creating a great barrier for the development of the region, which can be defined as "a significant infrastructure deficit."¹⁸³

¹⁷⁸ Government of Canada, "Canada's Climate Action is Working, Report to United Nations Conforms," accessed February 18, 2018, https://www.canada.ca/en/environment-climate-change/news/2017/12/canada_s_climateactionisworkingreporttounitednationsconfirms.html

¹⁷⁹ Sustainable Canada Dialogues and McGill University, *Rating Canada's Climate Policy. Sustainable Canada Dialogues Reports on 2016 Progress* (Montreal: McGill University, 2016): 3

¹⁸⁰ Idem

¹⁸¹ Indigenous and Northern Affairs Canada, "Canada's Arctic Policy Framework," Accessed February 17, 2018, <https://www.aadnc-aandc.gc.ca/eng/1503687877293/1503687975269>

¹⁸² Ibidem

¹⁸³ Ibidem

Furthermore, the fragility of the environmental balance of the ecosystem is fostering the implementation of adaptive policies in the region.¹⁸⁴ Conservation and restoration initiatives in the ecosystem should be balanced to policies of economic development of the Canadian North. However, resource management and territorial stewardship are often prioritized on the environmental protection.¹⁸⁵ Even though Canada is committed to a program of “Clean Growth” and a plan of “Ocean Protection” in the Arctic, reducing the Canadian dependence on fossil fuels and funding projects of infrastructure upgrade and economic progress are a major obstacle towards an efficient ecological domestic policy.

Consequently, it can be said that the international active role Canada is playing in the definition of an intergovernmental regime for the protection of the Arctic ecosystem is effective. Being a bordering state to the Arctic region, Canada’s role internationally is very influential, especially in the identification of the major drivers of change and the most affected areas in the Northern region.

Nevertheless, domestically, Canadian administrations must balance national interests with the region’s ecological needs. In fact, the importance of fossil fuels in the energy supply of the central state and plans of infrastructural development represent a major obstacle for the implementation of efficient ecological policies. Therefore, even though the government publicly recognizes the deep influence of climate change in the environment and biodiversity of Arctic region and the necessity for adaptive policies, the efforts made are all aimed at the mitigation of the effects of climate change in the region.

Consequently, Canada’s efforts for a more environmental-friendly economic development is still centred on the human control and organization of the action for the

¹⁸⁴ Ibidem

¹⁸⁵ Ibidem

identification of the drivers of the climate forcing in the region. Although the government aims at the adaptation to the major impacts of climate change, national interests are still at the centre of the government acts. Nevertheless, internationally, Canada's role in the creation of an international environmental regime is fundamental.

2. ARCTIC AND GEOPOLITICS

1. Introduction: the Arctic potentialities

Since the beginning of the century, the Arctic has been considered a key region in the development of the main geopolitical strategies of global powers, due to its geographical position and to its biological and physical composition.¹⁸⁶ More specifically, the presence of hydrocarbons and potentially oil has made many states internationally to redress their national and international interests in the region, influencing the definition of military, economic and foreign policies.¹⁸⁷

The environmental challenges produced by the effects of climate change are balanced by the geopolitical opportunities arising from the opening ice.¹⁸⁸ In fact, in this region, climate change has been influencing the physical geography, making northerner lands more accessible by the much warmer temperature for longer periods throughout the year.¹⁸⁹

As a result, since the late 1970s, access to the scientific seabed explorations, which implies access to the energy and natural resources deposits located there, has been more possible.¹⁹⁰ For this reason, it can be said that the environmental changes provoked by climate change in the region are influencing the states interests.¹⁹¹

The alteration of climate patterns is affecting the states' action capabilities, having inevitably an impact on the development of geopolitical and economic strategies.¹⁹²

¹⁸⁶ Klaus Dodds and Mark Nuttall, *The scramble for the poles* (Cambridge: Polity Press, 2016), 5-7

¹⁸⁷ Charles Emmerson, *The future history of the Arctic. How climate, resources, and geopolitics are reshaping the north, and why it matters to the world* (London: Vintage, 2011), 74

¹⁸⁸ Shelagh D. Grant, *Polar Imperative. A History of Arctic Sovereignty in North America*. (Vancouver: Douglas and McIntyre, 2011): 463

¹⁸⁹ Tim Marshall, *Prisoners of Geography. Ten maps that explain everything about the world* (New York: Scribner, 2016): 256

¹⁹⁰ Grant, *Polar Imperative*, 463

¹⁹¹ Marshall, *Prisoners of Geography*, 269

¹⁹² Idem

Consequently, energy policies, internal economic strategies, and military approaches are being shaped based on these new climate patterns.¹⁹³ For example, phenomena such as the melting of the ice can be seen as an occasion for the redefinition of the energy policies, considering the great potentialities of resource extractions in this region.¹⁹⁴

For this reason, among the interests of the states bordering the Arctic Circle, the establishment of their national sovereignty is seen “no longer simply [as] a right, but [as] a responsibility.”¹⁹⁵ In fact, sovereignty represents for each state the capability of having an exclusive access to the ice pack, but at the same time the responsibility of protecting and preserving the Arctic environment.

This section deals with the definition of the main geopolitical dynamics developing in the region and the peculiar interrelation between geopolitics and climate change in the determination of Canadian sovereignty and security policies. More specifically, in the first part, I will propose the definition of Polar geopolitics. Furthermore, I will define the notions of Canadian Arctic sovereignty and Canadian Arctic security, as foundational concepts for the identification of the main geopolitical mechanisms Canada is applying in its approach to the Arctic region.

2. Geopolitics of the Arctic: Polar Geopolitics and the importance of sovereignty and security in the Arctic

Since the end of the Cold War, the Arctic has been considered a “geopolitical masterstroke,” which means a region characterized by both a regional and a global character.¹⁹⁶ Accordingly, it is a region in which geographical position and composition

¹⁹³ Idem

¹⁹⁴ Dodds and Nuttall, *The Scramble for the Poles*, 118

¹⁹⁵ Grant, *Polar Imperative*, 402

¹⁹⁶ Emerson, *The Future of the Arctic*, 74

make it is an “exceptional space” in terms of “size, location, remoteness” at the center of nations’ political and economic interests.¹⁹⁷

As Klaus Dodds and Mark Nuttall argue, from a geopolitical perspective, attention on the Arctic region is focused on its national positions.¹⁹⁸ In fact, in the North the identification and structuration of political mechanisms of the bordering states are generally aimed at the acquisition of “sovereign authority” on the territory.¹⁹⁹ Sovereignty powers on the Arctic land represent the main condition of accessibility and potential national property of both natural and energy resources located in the region.²⁰⁰

More specifically, the impacts of climate change in this region have been influencing the geography of the Arctic generating new ice-free passages for longer time during the year. Moreover, the increased development in technology and military means affected the region making it a strategic location to be secured.²⁰¹ Consequently, bordering states could have an easier access to the Arctic land and waters even northerner than before. Therefore, energy resources and natural resources deposits below the ice have been discovered, incrementing the interests of each state in establishing its sovereign authority and power on the territory.²⁰²

For this reason, the region can be described as a contended land, in which legal capacity and military capabilities are used as means to establish national sovereignty.²⁰³ As Dodds and Nuttall continue, “there are plenty of actors eager to imagine the Arctic [...] ripe for future resource extraction and colonization, political appropriation, and security,” especially in a time of great environmental changes and technological development.²⁰⁴

¹⁹⁷ Dodds and Nuttall, *The Scramble for the Poles*, 24

¹⁹⁸ Ibidem, 25-28

¹⁹⁹ Ibidem, 11

²⁰⁰ Marshall, *Prisoners of Geography*, 256

²⁰¹ Ibidem, 258

²⁰² Idem

²⁰³ Ibidem, 265-266

²⁰⁴ Dodds and Nuttall, *The Scramble for the Poles*, 23

In this perspective, ‘Polar geopolitics’ is defined as the series of inter-nations dynamics and geopolitical processes “involved in trying to pin down and make sense of claims to sovereignty and security.”²⁰⁵ This concept is grounded on the traditional notion of neorealist geopolitics.²⁰⁶ In light of the traditional neorealist theory of Kenneth Waltz, it can be said that each ‘state’ is included in a system of states, in which decisions are made to develop integration and governmental control of economic interests and market forces.²⁰⁷ Thus, considering the great capabilities of each state to develop relationships with the other members of the system, economics and foreign policies are interrelated as drivers of the actions of the state. However, the sovereign power of the state enables each state to determine these policies. Therefore, economics and foreign policy are subjected to the state sovereignty power.²⁰⁸

In this paradigm, the Arctic can be seen as a regional context in which the effects of climate change and the new technologies are influencing the accessibility of Arctic territory. Richard C. Powell and Klaus Dodds define the Arctic as a “vast reserve of natural resources [...] and a military space for the performance of sovereignty, national security and economic interests of Arctic states.”²⁰⁹ Therefore, Polar geopolitics defines the North as a “reserve of natural resources,” to which access is determined by the expression and definition of national sovereignty and international security on the Arctic territory.²¹⁰ Consequently, ‘Polar geopolitics’ is the result of a process as “environmental and political

²⁰⁵ Ibidem, 15

²⁰⁶ Richard C. Powell, "Lines of Possession? The Anxious Constitution of a Polar Geopolitics," *Political Geography* 29, no. 2 (2010): 74

²⁰⁷ Kenneth N., Waltz, “America as a Model for the World? A Foreign Policy Perspective,” *Political Sciences and Politics* 24 (1991): 669-670, accessed November 19, 2016, stable URL: <http://dx.doi.org/10.2307/419401>

²⁰⁸ Kenneth N., Waltz, *Man, the State, and War a Theoretical Analysis*, (New York: Columbia University Press): 208

²⁰⁹ Powell, Richard C., and Klaus, Dodds, and Edward Elgar Publishing, *Polar Geopolitics? : Knowledges, Resources and Legal Regimes* (Cheltenham: Edward Elgar Pub): 242

²¹⁰ Ibidem, 244

awakening,”²¹¹ based on “a pattern of confrontation and cooperation [that led to] new approaches to [understand and define] regional problems” and regional opportunities created by the changing environmental and political conditions.²¹²

Since the Arctic is a region rich in energy and natural resources, its physical and political control will influence power politics and national security of each bordering state, shaping economic strategies and foreign policies.²¹³ Accordingly, as Tim Marshall points out, “the hunger for energy [resources] suggests the race is inevitable in what some specialist have called the New Great Game.”²¹⁴ This ‘Game’ is characterized by the global attraction towards Arctic resources that led nations “outside the Arctic states themselves,” which means the coastal states bound by the Arctic Circle,²¹⁵ to re-address their stakes in the Northern region, potentially threatening the circumpolar states internal security.²¹⁶ In this perspective, as Shelagh D. Grant affirms, sovereignty and climate change are to be seen as “two sides of the same coin.”²¹⁷ In fact, as the author argues, the effects of climate change on the ice pack represent the occasion to claim sovereignty rights on the Arctic for the bordering states, which means enforcing their sovereignty powers.

Nevertheless, the discovery of economic potentialities in the region has increased the interest in accessing the ice pack globally.²¹⁸ Consequently, the development of systems of multilateral cooperation among the “circumpolar countries” has represented a tool to establish a regional enclave, in which bordering states could have benefited from the

²¹¹ Ibidem, 246

²¹² Ibidem, 247

²¹³ Ibidem, 244

²¹⁴ Marshall, *Prisoners of Geography*, 269

²¹⁵ Ian G., Brosnan, and Thomas M. Leschine, and Edward L. Miles, "Cooperation or Conflict in a Changing Arctic?," *Ocean Development & International Law* 42, no. 1-2 (2011): 175

²¹⁶ Adam Lajeunesse, *Lock, Stock and Icebergs. A History of Canada's Arctic Maritime Sovereignty*, 290

²¹⁷ Grant, *Polar Imperative*, 400

²¹⁸ Idem

resources available and at the same time could have addressed the main environmental concerns raised since the late 70s, preventing ‘non-Arctic states’ from accessing the ice.²¹⁹

Canada is the second most influential actor in the region in terms of geopolitical dynamics. In fact, “the Canadian North[’s]” surface covers about the 40 percent of Canada’s national territory (Russia is the first).²²⁰ For Canada, establishing a powerful sovereignty on the Arctic region means addressing issues of access to resources, national security, and internal environmental protection.²²¹ In fact, Canada considers itself “a responsible steward of its Arctic region,” which means responsible for the “leadership, stewardship and ownership in the region.”²²²

2.1 Canada’s Arctic sovereignty

The definition of Arctic sovereignty is considered necessary from a geopolitical perspective, for the securitization and the accessibility to the region, in order to seize on the available resources and the future potential economic opportunities in this region.²²³ Consequently, it can be said that the main potential geopolitical challenge the country has had to face since the end of the Cold War is considered the institutionalization of an international legal regime, in which the Canadian sovereignty is not questioned.²²⁴

Canadian Arctic sovereignty is, generally, defined based on a historical notion. Canadian sovereignty is grounded on the pre-colonization history of the Canadian land. As Donald Pharand affirms, the notion of Canadian Arctic, even if referred to a “year-to-year variability” of the condition of the sea-ice can be supported historically because Canada

²¹⁹ Ibidem, 390-391

²²⁰ Arctic Council, “Canada,” accessed January 15, 2018, <https://www.arctic-council.org/index.php/en/about-us>

²²¹ Michael, Byers, and Canadian Electronic Library, *Who Owns the Arctic? Understanding Sovereignty Disputes in the North* (Vancouver: Douglas & McIntyre): 8-18

²²² Grant, *Polar Imperative*, 441

²²³ Klaus, Dodds, "Graduated and Paternal Sovereignty: Stephen Harper, Operation Nanook 10, and the Canadian Arctic," *Environment and Planning D: Society and Space* 30, no. 6 (2012): 992-995

²²⁴ Grant, *Polar Imperative*, 441

“inherited the Arctic Islands from Great Britain in 1880.”²²⁵ In fact, human activity has developed in the “Circumpolar North” since before the arrival of the European colonization.²²⁶ Then, in the past two hundred years, human activity has been increasing thanks to a greater technological development.²²⁷ Consequently, Canada claims that historically, they can consider themselves as sovereign on the Arctic waters, based on the importance of the Arctic region in shaping the Canadian national identity, in terms of the heritage of past traditions, and national economic interests, in terms of military and energy policies.²²⁸

Furthermore, Canada’s control of the “mainland Arctic” is “historical” because it was established at the formation of the Northwest and Yukon Territories.²²⁹ Michael Byers highlights that differently from other contexts, in the Arctic the presence of communities of Indigenous people and Inuit communities recognizing the Canadian sovereignty on the Passage is foundational to the notion of Canada’s historical sovereignty.²³⁰ In fact, as the author argues, the Inuit traditional occupancy and practices in the Passage represent the originality of the Canadian claim, because the Inuit communities used to be settled on the frozen Passage. Since this one was frozen, there was no actual distinction between land and ice.²³¹

However, after the end of the international bipolar alignment and the increasing influence of the effects of climate change on the geography and environment of the region,

²²⁵ Donat Pharand, “The Arctic Waters and the Northwest Passage: A Final Revisit,” *Ocean Development & International Law* 38, no. 1–2 (July 2007): 9, <https://doi.org/10.1080/00908320601071314>

²²⁶ Government of Canada, “Canada’s Northern Strategy. Our North, our Heritage, our Future,” accessed January 20, 2018, <http://www.northernstrategy.gc.ca/cns/cns-eng.asp>

²²⁷ *Ibidem*

²²⁸ *Ibidem*

²²⁹ Mike, Perry, “Rights of Passage: Canadian Sovereignty and International Law in the Arctic,” *U. Det. Mercy L. Rev.* 74 (1996): 666

²³⁰ Byers, *Who Owns the Arctic?*, 53

²³¹ *Idem*

the definition of Canadian Arctic sovereignty changed nature.²³² Since the 1980s Canada re-oriented its economic and foreign policies towards the strengthening of the definition of Arctic sovereignty based on the environmental changes and the state's legal capacity to take advantage of these changes.²³³

Scholars like Robert Huebert started to define Canada as an "Arctic nation," based on the legal capacity of Canada to institute a series of political and economic mechanisms on the region based on its geographical position. Huebert affirms that the Canadian government has changed attitude towards its Northern Territories profiting of its position on the Arctic Circle.²³⁴ He says that "until very recently, the Arctic climate has allowed Canadian leaders the luxury of spending very little to secure the region [since] the North was [almost] inaccessible."²³⁵ However, the potential opportunity for resource development and discovery caused by the impacts of the effects of climate change have increased the international geopolitical interests at stake in the region.²³⁶ As a result, sovereignty, national borders' defence, and circumpolar cooperation became the main points of the political agenda in the region.²³⁷

Moreover, Grant defines sovereignty based on the Canadian legal capacity of assuming the responsibility of environmental protection, which implies a stable establishment of its sovereign powers on the region. She states that the legal notion of Canadian sovereignty is supported by the historical role Canada has played in term of

²³² Grant, *Polar Imperative*, 402

²³³ Robert, Huebert, "Canada and the Changing International Arctic. At the Crossroads of Cooperation and Conflict," 2. In Franklyn, Griffiths, and Robert Huebert, and P. Whitney, Lackenbauer, *Canada and the Changing Arctic: Sovereignty, Security, and Stewardship*. Waterloo, Ont.: Wilfrid Laurier University Press

²³⁴ Robert, Huebert, "Polar Vision or Tunnel Vision the Making of Canadian Arctic Waters Policy: The Making of Canadian Arctic Waters Policy," *Marine Policy* 19, no. 4 (1995): 360

²³⁵ Huebert, "Canada and the Changing International Arctic," 2

²³⁶ *Idem*

²³⁷ Huebert, "Polar Vision or Tunnel Vision," 361

protection of the Arctic environment and preservation of the Arctic biodiversity.²³⁸ She says that, in a context where the impacts of climate change are so entangled with the definition of the state geopolitical strategy, sovereignty and access to the region must be seen by the States bordering the Arctic Circle “no longer simply [as] a right, but [as] a responsibility.”²³⁹ In this sense, according to the author, “Canada is faced with the question of whether the interests of the country [...] should take precedence” over the environmental protection and sustainable development.²⁴⁰

2.2.1 Sovereignty and environmental protection

Therefore, it can be said that since the end of the Cold War the definition of Canadian sovereignty has considered the capability of the Canadian administrations to interpret the changes induced by climate change from a Polar geopolitics perspective.²⁴¹ More specifically, when the first positive outcomes of the Arctic seabed explorations started to be published, Canadian reacted raising the concern for the preservation of the Arctic environment in the 1970s.²⁴²

While recognizing the importance of the discoveries of energy and natural resources for the definition and development of economic activities in the region, Canada highlighted also the peculiarity of the Canadian ecosystem.²⁴³ Consequently, Canadian’s administrations found in the environmental protection of the Arctic from the threat of globalization the means to establish its sovereignty internationally.²⁴⁴

Two main agreements exemplify the process the establishment of Canadian sovereignty in the second half of the twentieth century: the Arctic Water Pollution

²³⁸ Grant, *Polar Imperative*, 380-381

²³⁹ Ibidem, 402

²⁴⁰ Idem

²⁴¹ Idem

²⁴² Ibidem, 175-176

²⁴³ Adam, Lajeunesse, *Lock, Stocks and Icebergs. A History of Canada’s Arctic Maritime Sovereignty* (Vancouver: UBC Press, 2016): 244

²⁴⁴ Ibidem, 244

Prevention Act (AWPPA) in 1970 and the Arctic Cooperation Agreement (ACA) in 1988. The AWPPA was the treaty created to regulate international shipping in the Northwest Passage after the first travel of the tanker SS Manhattan transporting oil from Alaska to the East Coast in 1969. According to Adam Lajeunesse, the discovery of oil in the Arctic was a “mixed blessing” for Canada, because, on the one hand, it granted Canada the possibility to enhance programs of Arctic economic and research development reducing the costs of oil importation. It also represented a potential complication on its weak sovereignty policies, giving the Northwest Passage “a potentially vital role in America’s energy supply.”²⁴⁵ In fact, the SS Manhattan travel was planned as an experiment to evaluate costs and benefits of the means of transportation.²⁴⁶ The positive outcome of the experiment represented for Canada the threat of a potential establishment of a “major petroleum shipping route through the Arctic sensitive waters” of the Northwest Passage.²⁴⁷

The AWPPA represented a legislation with the purpose of pollution prevention; therefore, it allowed the Canadian administration to exclude ships entirely in the “Arctic waters” at determined environmental conditions.²⁴⁸ The treaty is considered a sovereignty claim since it permits Canada to regulate shipping traffic in the waters of the whole Archipelago, which means that Canada could have controlled waters beyond the territorial sea settled conventionally 100 miles from the mainland established by international law.²⁴⁹

Therefore, the SS Manhattan travel “rearranged the traditional order of Canada’s maritime priorities,” highlighting that the Arctic region required greater attention and new legal approaches.²⁵⁰ Nevertheless, the implementation of this treaty and of new measures

²⁴⁵ Ibidem, 137-138

²⁴⁶ Ibidem, 140

²⁴⁷ Ibidem, 147

²⁴⁸ Ibidem, 167

²⁴⁹ Donat Pharand, “The Arctic Waters and the Northwest Passage: A Final Revisit,” *Ocean Development & International Law* 38, no. 1–2 (July 2007): 11, <https://doi.org/10.1080/00908320601071314>

²⁵⁰ Lajeunesse, *Lock, Stock and Icebergs*, 177

of environmental protection strengthened the image of Canada and its international legal capacity, making its sovereignty claims on the Northern region a new prerogative.²⁵¹

The ACA was a treaty resolving a dispute between Canada and the United States between 1985 and 1988. This conflict was a legal dispute on the “Canada’s title on the [Northwest Passage] waterway.”²⁵² Although for years the issue of owning and/or accessing the Passage did not raise due to the harsh weather and environmental conditions, the technological development and the impacts of the effects of climate change in the region have opened for the bordering states greater capabilities for accessing the natural and energy resources in the Northwest Archipelago.²⁵³ In particular, in 1985, the United States icebreaker Polar Sea crossed the Northwest Passage without a formal Canadian authorization.²⁵⁴ This action, perceived by Ottawa as a sovereignty challenge, led to “a significant diplomatic dispute” between the parties.²⁵⁵ Nevertheless, both Ottawa and Washington recognized the importance of “maintaining good American-Canadian relations.”²⁵⁶

Consequently, the two countries decided to solve the question through a series of bilateral talks and treaties aimed at keeping the peace in North America in a moment still influenced by the Cold War dynamics.²⁵⁷ As a result, in 1988, the parties signed the Canada – United States Agreement on Arctic co-operation.²⁵⁸ This agreement is “a bilateral attempt

²⁵¹ Pharand, 12

²⁵² Byers, *Who Owns the Arctic?*, 42

²⁵³ Lajeunesse, *Lock, Stocks and Icebergs*, 258

²⁵⁴ Grant, *Polar Imperative*, 376

²⁵⁵ Rob, Huebert. “Climate Change and Canadian Sovereignty in the Northwest Passage,” 389. In Ferris, John Robert, P. Whitney Lackenbauer, University of Calgary, and Centre for Military and Strategic Studies. *Canadian Arctic Sovereignty and Security: Historical Perspectives*, (Calgary: Centre for Military and Strategic Studies, University of Calgary, 2008)

²⁵⁶ Idem

²⁵⁷ Elizabeth B., Elliot-Meisel, “Still Unresolved after Fifty Years: The Northwest Passage in Canadian-American Relations, 1946–1998,” *American Review of Canadian Studies* 29, no. 3 (1999): 418

²⁵⁸ Robert, Huebert, “Climate Change and Canadian Sovereignty in the Northwest Passage,” *Isuma* 2, no. 4 (2001): 1

to affirm the political will of Canada and the United States to cooperate in advancing their shared interests in Arctic navigation, development, and security.”²⁵⁹

2.2.2 Sovereignty and the military

Recently the correlation between Arctic sovereignty and environmental protection has been rephrased. During his administration in 2008, the former Canadian Prime Minister Stephen Harper made the definition of a strong Arctic sovereignty part of both his internal and foreign policies. Differently from before, he declared the introduction of the Canadian military in the region as both political symbol of strength and capabilities of the central state of acting in the North, and symbol of the interest of the administration to protect the fragile ecosystem assuming the international responsibility of it.²⁶⁰

In 2009, the publication of the document “Canada’s Northern Strategy: Our North, Our Heritage, Our Future” highlighted the “absolute priority” the former Canadian Prime Minister Harper government was giving to the identification and definition of the Canadian Arctic sovereignty in order to provide the region with development investments and tools, environmental protection and governance.²⁶¹ Former Prime Minister Harper’s administration aim was highlighting the dangers Canada could have faced as a consequence of the influence of the effects of climate change.²⁶²

Therefore, former Canadian Prime Minister Harper’s administration established a new “vision for the North,” based on the respect and protection of the Circumpolar Canadian land, the people inhabiting it, and their traditions, and on the implementation of governmental and economic structures to generate development and investments in the

²⁵⁹ Kirkey, Christopher. "Smoothing Troubled Waters: The 1988 Canada-United States Arctic Co-operation Agreement." *International Journal* 50, no. 2 (1995): 401-426

²⁶⁰ Byers, *Who Owns the Arctic?*, 22-27

²⁶¹ Grant, *Polar Imperative*, 442

²⁶² Klaus, Dodds, "Graduated and Paternal Sovereignty: Stephen Harper, Operation Nanook 10, and the Canadian Arctic," *Environment and Planning D: Society and Space* 30, no. 6 (2012): 1002

region.²⁶³ This vision was aimed at “strengthening [the governmental] presence” and stewardship of the Northern resources, through a series of military structures and economic investments, and by assuming the international responsibility for the protection of the fragile Arctic environment.²⁶⁴

1.2.3 Canada’s Arctic Security

According to Polar geopolitics, national security is one of the main interests and the main driver of states’ intervention in the Arctic region.²⁶⁵ In fact, the circumpolar states, imagining the Arctic as a “zone of transition,” have seen a potential external threat to their internal stability and safety, which has “provoked [a] greater interest in encouraging investments [...] in polar infrastructure including military capabilities” to defend their national borders.²⁶⁶

Canada Arctic sovereignty is in a situation of “crisis,”²⁶⁷ considering that the idea that “previous governments have failed to protect Canadian [domestic] interests”²⁶⁸ has acquired importance under Prime Minister Harper’s government.²⁶⁹ As a result, the opening of the New Great Game, thus of a ‘globalized interest’ in the region resource and economic potentialities, had led the Circumpolar states to change their notion of security in the region, making sovereignty the most important tool to enclose the “strategic importance of the region” in a system of national military stewardship and international cooperation.²⁷⁰

²⁶³ Government of Canada, “Canada’s Northern Strategy. Our North, our Heritage, our Future,” accessed January 20, 2018, <http://www.northernstrategy.gc.ca/cns/cns-eng.asp>

²⁶⁴ Ibidem

²⁶⁵ Powell and Dodds, *Polar Geopolitics*, 7

²⁶⁶ Idem

²⁶⁷ P. W. Lackenbauer, “Polar Race or Polar Saga?,” 219. In James, Kraska, *Arctic Security in an Age of Climate Change* (Cambridge: Cambridge University Press)

²⁶⁸ Idem

²⁶⁹ Idem

²⁷⁰ Michal, Luszczuk “Military cooperation and enhanced arctic security in the context of climate change and growing global interest in the Arctic,” 35-38. In Lassi, Heininen, *Future Security of*

More specifically, even though “every Arctic country has national interests at stake in the region,”²⁷¹ in the Canadian case defending the North means “accepting an integrated concept of security – one in which military requirements are combined with an awareness of the need to act for ecological, economic, cultural and social security.”²⁷² Accordingly, Canadian Arctic security can be defined as a system of environmental stewardship policies, aimed at the protection of the ecosystem and the prevention of pollution, and social development interventions. As a result, the sustainable economic development of the region is a foundational security policy “to ensure the well-being of the people and their surround,” through military means and “transboundary [...] processes,” enhancing international cooperation with the other ‘Arctic states’.²⁷³

Moreover, the definition of Canadian Arctic security is to be considered both as the series of military policies for “the protection of the states from the threats,” that in this specific case are both from other states and from the environmental and climatic changes influencing the region.²⁷⁴ As a result, Huebert identifies two types of security. On the one hand, he calls “traditional security” the mechanisms of military defence against other states, such as in the case of the disputes with the United States about the legal status of the Northwest Passage, and the consequent threat to the Canadian sovereignty on the Passage waters. On the other hand, the author calls “non-traditional security” the system of “environmental, scientific and economic branches” to be activated in order to defend Canada’s interests in the region with the other circumpolar states.²⁷⁵

the Global Arctic: State Policy, Economic Security and Climate (New York: Palgrave Pivot, 2016)

²⁷¹ Lackenbauer, “Polar Race or Polar Saga?” 231

²⁷² *Ibidem*, 218

²⁷³ Franklyn, Griffiths, “Arctic Security. The Indirect Approach,” 7-8. In James, Kraska, *Arctic Security in an Age of Climate Change*, (Cambridge: Cambridge University Press)

²⁷⁴ Rob Huebert, “Canada and the Newly Emerging International Arctic Security Regime,” 196. In James, Kraska, *Arctic Security in an Age of Climate Change* (Cambridge: Cambridge University Press)

²⁷⁵ Rob Huebert, “Canada and the Newly Emerging International Arctic Security Regime,” 197

In the former case, Huebert refers to the system of governmental “authoritative decisions [...] within the[ir] established borders.”²⁷⁶ For example, the Northwest Passage is one of the straits located in the Arctic Ocean connecting the Atlantic and the Pacific Oceans. It lies “within the centre of the Canadian Arctic Archipelago, and [it] is part of a collection of possible routes through the Canadian Arctic.”²⁷⁷ In the Northwest Passage, there are potentially four shipping routes opened by the process of ice thaw caused by climate change; “In the west there are three feasible paths: The M’Clure Strait, the Prince of Wales Strait and the Peel Sound. In the East, the passage is traditionally limited to the Lancaster Sound.”²⁷⁸

In this case, the main issue at stake in the “diplomatic dispute” between Canada and the United States is related to the different capabilities of accessing the Passage. On the one hand, the United States “has long considered that the Passage [...] fulfils the legal criteria for an international strait by [...] being used for international navigation.”²⁷⁹ Therefore, from the United States point of view, Canada can administer the Archipelago, but it cannot prevent the access to other countries’ vessels, which are said having the “right to transit passage.”²⁸⁰ On the other hand, Canada considers the Passage as “internal waters,”²⁸¹ which means having full sovereignty on the Archipelago.²⁸² Therefore, foreign vessels need an official Canadian authorization to cross the Passage and are submitted to the Canadian internal law while crossing.²⁸³

²⁷⁶ Rob Huebert, “Canada and the Newly Emerging International Arctic Security Regime,” 195

²⁷⁷ Lu, Park, Choi, and Oh, “An Economic Analysis of Container Shipping Through Canadian Northwest Passage,” *International Journal of E-Navigation and Maritime Economy* 1 (2014) :63

²⁷⁸ *Idem*

²⁷⁹ Byers, *Who Owns the Arctic?*, 42

²⁸⁰ UN General Assembly, *Convention on the Law of the Sea*, 10 December 1982. Accessed January 27, 2017. <http://www.refworld.org/docid/3dd8fd1b4.html>

²⁸¹ *Ibidem*

²⁸² Byers, *Who Owns the Arctic?*, 42

²⁸³ *Idem*

In the latter case, “non-traditional security” originates from “a paradigm shift in how we look at the [Arctic] region.”²⁸⁴ They affirm that since the Arctic has been considered a “focal point of global economic and political interest and activity,” three different trends have changed the nature of Arctic geopolitics and, thus, security.²⁸⁵ These trends are global warming, which is affecting the geography of the region, technological advance, which is influencing nations’ capabilities of extraction, industrial development and communications, and, finally, the “increasing global scarcity of vital natural resources,” which are shaping international investments and research policies in the region.²⁸⁶

In this perspective, Canada’s plans of Arctic security are entangled with the affirmation and protection of its sovereignty on the North and are based on the notion of international cooperation.²⁸⁷ In fact, as Lassi Heinen points out, Arctic security is a common issue among the circumpolar states. For this reason, fostering a system of cooperation allows the states to emphasize sovereignty as both individual and regional claims,²⁸⁸ maintaining the “control” on global power politics in the region.²⁸⁹ As Franklin Griffiths underlines, acting on a regional basis, ‘Arctic states’ can develop “collective measures,” avoiding the military means and addressing common problems and interests, such as climate change mitigation and sustainable civil cooperation development.²⁹⁰

²⁸⁴ Pauli Järvenpää and Tomas Ries, “The Rise of the Arctic on the Global Stage,” 129. In James, Kraska, *Arctic Security in an Age of Climate Change*, (Cambridge: Cambridge University Press)

²⁸⁵ *Idem*

²⁸⁶ *Ibidem*, 130

²⁸⁷ Lassi, Heinen, “Security of the Global Arctic in Transformation,” 24. In Lassi, Heinen, *Future Security of the Global Arctic: State Policy, Economic Security and Climate* (New York: Palgrave Pivot, 2016)

²⁸⁸ *Idem*

²⁸⁹ Järvenpää and Ries, “The Rise of the Arctic on the Global Stage,” 134

²⁹⁰ Griffith, Griffiths, “Arctic Security. The Indirect Approach,” 6

1.2.4 Security and international cooperation: the Arctic Council and the Ilulissat Declaration

Arctic geopolitical questions of sovereignty and security and the impacts of the effects of climate change in the North are interrelated. Consequently, since the beginning of the 21st century, the notion of Arctic security has been changing its meaning.²⁹¹ Before, the geopolitical dynamics in the Arctic region were analyzed through a resource-focused methodology. However, the phenomenon of globalization and the increasing need for better long-term sustainable plans is fostering a process of “reconceptualization of sovereignty, with the argument that the Arctic agenda is no longer only about the interstate relationship and economic activities, but also about realizing the knowledge-based potential to implement sustainable use of resources.”²⁹²

As Lajeunesse says, “resource development [has] attracted global attention to the North.”²⁹³ Consequently, climate change has “transform[ed] and open[ed]” the Arctic to new plans of regional development.²⁹⁴ As a result, Arctic sovereignty is becoming “an ongoing challenge,” that requires “a concerted national effort to monitor, control, and develop the region.”²⁹⁵

Matthias Finger defines “Arctic paradox” the potential of the region of becoming “the next frontier of development.” Although the strategic geographic position and the great economic potentialities of the North, the overexploitation of the resources is causing a simultaneous acceleration of the impacts of climate change on its fragile ecosystem.²⁹⁶ For this reason, the definition of security involves also the identification of developmental

²⁹¹ Lassi Heinen, “Security of the Global Arctic in Transformation,” 20-21

²⁹² Ibidem, 23

²⁹³ Lajeunesse, *Lock, Stock and Icebergs*, 290

²⁹⁴ Ibidem, 309

²⁹⁵ Ibidem, 310

²⁹⁶ Matthias Finger, “The Arctic Laboratory of the Anthropocene,” 128-129. In Lassi, Heinen, *Future Security of the Global Arctic: State Policy, Economic Security and Climate* (New York: Palgrave Pivot, 2016)

trends to be prevented or adapted to the increasing influence of the effects of climate change.²⁹⁷

Therefore, the Arctic region security situation cannot be considered separately from the political, economic, and environmental spheres.²⁹⁸ Nevertheless, the national and military aspects of the Arctic territorial sovereignty of each state, except for a few still disputed borders, are already clearly established in terms of sovereignty powers.²⁹⁹ Thus, security policies and actions should be implemented in terms of regional development, due to the fragility of the ecosystem considered and the unpredictability of the effects of climate change.³⁰⁰

Accordingly, “to sustain the developmental trajectories constitutes a security threat,” since “industrial civilization [...] will do whatever it takes to access and exploit the Arctic’s resources,” which means that even though environmental concerns could be raised, this one “will be sidelined” given the interests at stake.³⁰¹ Consequently, Arctic security becomes not only a regional concept, referring security to the identification and adaptation of the less sustainable developmental trends to a more ecologically sustainable system of developmental mechanisms, but a global threat, considering the strong entanglement among the system of ecosystems that characterizes the planet.³⁰²

Accordingly, “there is an Arctic imperative, and the issue of sovereignty and security cannot be ignored.”³⁰³ In this perspective, the creation of the Arctic Council in 1996 and the signature of the Ilulissat Declaration in 2008 are two of the of the most

²⁹⁷ Ibidem, 130

²⁹⁸ Lassi Heinen, “Security of the Global Arctic in Transformation,” 27

²⁹⁹ Matthias Finger, “The Arctic Laboratory of the Anthropocene,” 130

³⁰⁰ Idem

³⁰¹ Idem

³⁰² Ibidem, 132-133

³⁰³ Elizabeth B. Elliot-Meisel, “Still Unresolved after Fifty Years: The Northwest Passage in Canadian-American Relations, 1946–1998,” *American Review of Canadian Studies* 29, no. 3 (1999): 422

effective agreements in the system of regional cooperation and interrelation among the countries bordering the Arctic Circle.³⁰⁴ More specifically, the Arctic Council is “an intergovernmental forum whose members consist of the eight ‘Arctic states’: Canada, Denmark, Finland, Iceland, Norway, the Russian Federation, Sweden and the United States.”³⁰⁵ The official *Declaration on the Establishment of the Arctic Council* (or Ottawa Declaration) was signed in 1996 in Ottawa³⁰⁶.

The Arctic Council represents the identification of the Arctic region as an exceptional space in which the geopolitical relations among the states are regulated through a series of interventions involving either the state as a single actor in order to pursue international interests or a system of states in order to reach a common interest.³⁰⁷ Accordingly, internationally the Council is recognized as the “leading intergovernmental forum promoting cooperation, coordination and interaction among the Arctic States [...]”.³⁰⁸ Among its main accomplishments, the Council reached pivotal agreements aiming at the protection of the fragile regional ecosystem and agreements aiming at the sustainable development of the region.

However, the Council has many limitations to its actions. Among these, the lack of military capabilities is the most important.³⁰⁹ For this reason, while recognizing the importance of the Council’s actions promoting research and environmental protection, thus

³⁰⁴ Arctic Council, “Canada,” accessed January 15, 2018, <https://www.arctic-council.org/index.php/en/about-us>

³⁰⁵ Andrew, Jenks, “Canada-Denmark-Finland-Iceland-Norway-Russian Federation-Sweden-United States: Joint Communiqué and Declaration on the Establishment of the Arctic Council,” *International Legal Materials* 35, no. 6 (1996): 1382

³⁰⁶ *Ibidem*, 1383

³⁰⁷ Moisio, Ingram, Dittmer, and Klaus, Dodds, “Have You Heard the One about the Disappearing Ice? Recasting Arctic Geopolitics,” *Political Geography* 30, no. 4 (2011): 203

³⁰⁸ Arctic Council, “Canada,” accessed January 15, 2018, <https://www.arctic-council.org/index.php/en/about-us>

³⁰⁹ *Ibidem*

fostering sustainable development programs in the region, this forum cannot prevent states to prioritize economic considerations over the environment.³¹⁰

In this sense, Canada's position seems to be twofold. Although Ottawa was one of the main supporters of the creation of the Council and the development of common Arctic policies,³¹¹ the election of the former conservative administration of Prime Minister Harper in 2008 "made strong political statements about protecting the Arctic sovereignty with lists of future plans to achieve that goal."³¹²

More specifically, former Prime Minister Harper campaign for the re-establishment of a strong Canadian protection on the Northern territories was seen as imperative in order not to lose the Canadian legal and sovereign capacity on the region and it was based on the utilization of military means for its implementation.³¹³ In Harper's vision, "the most serious threat to Arctic sovereignty is not external, but the enemy within,"³¹⁴ which means that in his administration's vision the strengthening of the national borders had priority on the ecological preservation and protection of the region.³¹⁵ Although former Prime Minister Harper does not deny the importance of the effects of climate change in the region, he sees in the region a great economic potentiality to be maximized.³¹⁶ Therefore, investments in the military field were necessary because the military presence in the North was considered as the best means to defend the Canadian borders and to "confirm the political legitimacy of Canada's sovereign claim."³¹⁷

³¹⁰ Grant, *Polar Imperative*, 392

³¹¹ Ibidem, 432

³¹² Grant, *Polar Imperative*, 433

³¹³ Byers, *Who Owns the Arctic?*, 62-63

³¹⁴ Grant, *Polar Imperative*, 433

³¹⁵ Lee-Anne, Broadhead, "Canadian Sovereignty versus Northern Security," *International Journal* 65, no. 4 (2010): 919

³¹⁶ Idem

³¹⁷ Broadhead, "Canadian Sovereignty versus Northern Security," 920

Moreover, Canada's engagement in the Arctic Council represents potentially a tool to monitor and consolidate its policies and strategies in order to establish its sovereignty on the region also internationally.³¹⁸ In this sense, as Oran Young argues, although the Arctic Council has enhanced since its creation processes of international cooperation, the increasing influence of the effects of climate change and the greater capabilities of access to the Arctic resources "may give rise to a securitization narrative" that will potentially influence the Polar geopolitics dynamics among the nations.³¹⁹

In fact, as the author continues, climate change is the main "biophysical driver of transformation," of the Arctic ecosystem,³²⁰ but it is also the driver of "geopolitical changes [in the region]," as in the case of sovereignty claims based on economic interests.³²¹ For this reason, the Arctic Council plays a pivotal role of regional body of control and regulation in the Arctic Circle, dealing with regional and global paradigms in a more efficient way.³²² Therefore, Canada's participation to the Council is a strategical priority to prevent other nations to access the Arctic region, which results under the control of the Canadian administration, and protected by the regional system of the Council.³²³

The Ilulissat Declaration, ratified in 2008, was signed by Canada, Denmark, Norway, Russia and the United States in order to affirm their "commitment to working together within an existing framework of international law."³²⁴ This agreement represents one of the most important examples of regional cooperation after the establishment of the Council because, signing it, five of the circumpolar states committed themselves to the

³¹⁸ Lajeunesse, *Lock, Stock and Icebergs*, 310

³¹⁹ Oran, Young, "The Arctic Council at Twenty: How to Remain Effective in a Rapidly Changing Environment," *UC Irvine Law Review* 6, no. 1 (2016): 101

³²⁰ *Ibidem*, 102

³²¹ *Ibidem*, 103-105

³²² *Ibidem*, 106

³²³ Grant, *Polar Imperative*, 463

³²⁴ Byers, *Who owns the Arctic?*, 89

definition of a regional framework in which their claims would be resolved through peaceful means of soft power.³²⁵

Canada's role in the agreement is grounded on the necessity of the country to secure its sovereignty claims in an international regime, which at the same time provides the country the legal and operational tools to address the other drivers that threaten Canada's Arctic security, such as climate change and technological development.³²⁶ In fact, through this treaty, Canada saw recognized the capacity of action established in the 1970 AWPPA against the United States in the Northwest Passage.³²⁷

Furthermore, by being part of the Declaration, Canada has the possibility to enter a system of diplomatic mechanisms to adopt in case of conflict, which prevent the re-discussion of previous legal decisions. Consequently, the Declaration in the future may represent an efficient system of juridical enforcement to secure Canadian northern borders.³²⁸

2.3 Is Polar Geopolitics efficacious?

Drawing on Huebert's thoughts, the notion of Canadian Arctic polar geopolitics "look[s] to the past to determine the response to the future."³²⁹ In fact, even though the increasing influential impacts of the effects of climate change are changing the geography of the region, and the increasingly global interests in the region are conditioning the international geopolitical dynamics, Canada is still grounding its notion of security on the establishment of territorial sovereignty and the securitization of the land.³³⁰

³²⁵ Huebert, "Canada and the Newly Emerging International Arctic Security Regime," 204

³²⁶ Donald, Rothwell, "The Arctic in International Affairs: Time for a New Regime?," *The Brown Journal of World Affairs* 15, no. 1 (2008): 253, <http://www.jstor.org/stable/24590963>

³²⁷ Rothwell, "The Arctic in International Affairs," 242

³²⁸ Geneviève King, Ruel, "The (Arctic) Show Must Go On: Natural Resource Craze and National Identity in Arctic Politics," *International Journal* 66, no. 4 (2011): 830, <http://www.jstor.org/stable/23104395>

³²⁹ Robert, Huebert, "Submarines, Oil Tankers, and Icebreakers: Trying to Understand Canadian Arctic Sovereignty and Security," *International Journal* 66, no. 4 (2011): 809

³³⁰ *Ibidem*, 811

Therefore, the main question to be raised is whether the notion of Arctic security is effective to address the economic development and the geographical change of the region.³³¹ In fact, the definition of the Arctic Great Game and the identification of the technological potentialities to reach and exploit resources in the Arctic seem not to consider the “impact on the natural environment.”³³²

The NATO report of the Political Committee about the security in the Arctic published in October 2017 defines the institutionalization and strengthening of national sovereignty as one of the highest priorities of the Arctic circumpolar states. Although in the report environmental risks are identified, states are still “increasing human activity in the region.”³³³ The Arctic region is at the centre of national and global commercial and geopolitical interests enhanced by a system of projections describing the increasing rate of ice melting and the consequent increasing potential economic capabilities.³³⁴ Therefore, territorial claims, regional governance, and governmental collaboration are foundational for the development of a system of international cooperation.³³⁵

Accordingly, climate change is seen as a challenge not to be underestimated considering the importance of its effects on the Arctic ecosystem. Nevertheless, it is also seen as a significant opportunity for the development of economic policies based on the rational stewardship of the natural resources that the effects of climate change are making potentially more reachable.³³⁶ In fact, it is proved that in the Arctic region there is the availability of oil, gas, and mineral resources. For this reason, considering the global

³³¹ Broadhead, "Canadian Sovereignty versus Northern Security," 928

³³² *Idem*

³³³ Gerald E., Connolly, *Political Committee Report. NATO and Security in the Arctic 2017*, 2, available in <https://www.nato-pa.int/document/2017-nato-and-security-arctic-connolly-report-172-pctr-17-e-rev1-fin>

³³⁴ *Ibidem*

³³⁵ *Ibidem*

³³⁶ Johanne M., Bruun, and Ingrid A., Medby, "Theorising the Thaw: Geopolitics in a Changing Arctic," *Geography Compass* 8, no. 12 (2014): 921

geopolitical interests in these resources and the spread technological capabilities to access them are fostering the demand for mining and trade regulations, making the development of ecological and sustainable policies a second-order debate.³³⁷

Moreover, even though the creation of the Arctic Council has established a forum of regional intergovernmental talks openly declaring its intention of investing on the implementation of programs of scientific research and sustainable development in the North,³³⁸ the Council has no juridical mandate, thus no legal capacity.³³⁹ Consequently, the forum cannot foster the institutionalization of a system of regional governance. On the contrary, the increasing influence of a ‘globalized interest’ in the region has made the scientific knowledge a tool of sovereignty and, thus, resource-property and stewardship capabilities.³⁴⁰

Therefore, from a geopolitical perspective, climate change is the “the driving force behind renewed interest in the Arctic,”³⁴¹ subject to economic, political and societal processes and decisions.³⁴² Even if it is known that “Arctic development will surely create environmental consequences,”³⁴³ the region is still considered of “strategic significance because the resources in the area are becoming commercially available.”³⁴⁴ Consequently, a different kind of analytical tools and paradigm is required for the identification of the new geopolitical trends and mechanisms to be changed to address the notion of sustainability in such a fragile ecosystem.

³³⁷ Bruun and Medby, "Theorising the Thaw," 922

³³⁸ Arctic Council, "Canada," accessed January 15, 2018, <https://www.arctic-council.org/index.php/en/our-work/environment-and-climate>

³³⁹ Bruun and Medby, "Theorising the Thaw," 918

³⁴⁰ Ibidem, 919

³⁴¹ Elina, Brutschin, and Samuel R. Schubert. "Icy Waters, Hot Tempers, and High Stakes: Geopolitics and Geoeconomics of the Arctic." *Energy Research & Social Science* 16 (2016): 147

³⁴² Lassi, Heininen, and Matthias, Finger, "The “Global Arctic” as a New Geopolitical Context and Method," *Journal of Borderlands Studies*, 2017, 1

³⁴³ Tessa, Mendez, "Thin Ice, Shifting Geopolitics: The Legal Implications of Arctic Ice Melt," *Denver Journal of International Law and Policy* 38, no. 3 (2010): 533

³⁴⁴ Mendez, "Thin Ice, Shifting Geopolitics," 528

3. THE ANTHROPOCENTRIC ARCTIC: SUSTAINABILITY AND GEOECONOMICS

1. Introduction: Sustainability

Sustainability is a concept used to acknowledge that “humankind has created an imbalance”³⁴⁵ in the ecosystem where they live.”³⁴⁶ According to some scientists, entering the Anthropocene has meant that human species has reached the capacity of controlling the future of the planet, because they are the ones whose development has led to the principal dysfunctions in the ecosystem balance mechanisms.³⁴⁷

The concept of sustainability was institutionalized by the United Nation Conference on Human Environment in 1972.³⁴⁸ During the conference, the United Nations (UN) systematized the protection of the environment through the creation of the UN Environmental Program (UNEP) and the promulgation of the Stockholm Declaration for the definition of human environment.³⁴⁹ As a result, internationally, the term sustainability evoked the identification of a series of principles related to the definition of some common environmental concerns that represented a “barrier to [domestic social and economic] development” to be addressed with methods respectful of the environment.³⁵⁰

This concept lacks a precise and universal definition.³⁵¹ The complex and multidimensional application of this term makes the identification of a conventional concise explanation of the term very complicated.³⁵² Accordingly, many scientists agree

³⁴⁵ Jeremy L., Caradonna, *Sustainability. A History* (Oxford: Oxford University Press, 2014): 3

³⁴⁶ Ibidem, 5

³⁴⁷ Idem

³⁴⁸ Elena Giovannoni, Giacomo Fabietti, “What is Sustainability? A review of the Concept and Its Applications,” 24 available in C. Busco et al. (eds.), *Integrated Reporting 2013*, DOI 10.1007/978-3-319-02168-3_2

³⁴⁹ Caradonna, *Sustainability*, 140

³⁵⁰ Giovannoni, Fabietti, “What is Sustainability?,” 24

³⁵¹ Simon, Bell, and Stephen, Morse, *Sustainability Indicators. Measuring the Immeasurable?* (New York: Earthscan, 2008): 10

³⁵² Ibidem, 11

that in this case a single summarizing definition for such a complex and broad meaning would be unhelpful and constrictive seen the many fields of application of this term.³⁵³

Sustainability addresses directly the intersection between human development and ecosystem ecological needs.³⁵⁴ The concept is an efficacious analytical tool to study the interrelation between social and economic dynamics, necessary for an efficient human development, and ecological mechanisms, necessary for the functioning of an ecosystem.³⁵⁵

For this reason, many scientists agree that sustainability can be defined as a multidisciplinary concept, applicable to three main dimensions: “environment, economy, and social equity.”³⁵⁶ The environmental dimension of sustainability is grounded on the safeguard of biodiversity and preservation of feedback mechanisms. Thus, it requires human activity and economic development not to impact these two components. The economic dimension is grounded on the efficacy of the productive system and the capacity to respond constantly to the increasing demands of the human population. Thus, the production system requires not to be interrupted by the lack of raw materials and constant investments from the society. Finally, the social justice/equity dimension is grounded on the definition of political decisions in order to guarantee the physical security of the human species and justice within the social groups. Thus, it requires efficient social structures grounded on just economic policies able to respond to the pace of social development and a safe environment where to live.³⁵⁷

According to Jeremy L. Caradonna, in the Anthropocene era, environment, economics, and social justice represent also three components of an ecosystem’s internal

³⁵³ Idem

³⁵⁴ Caradonna, *Sustainability*, 8

³⁵⁵ Bell and Morse, *Sustainability Indicators*, 12

³⁵⁶ Caradonna, *Sustainability*, 8

³⁵⁷ Ibidem, 13

organization that cannot be considered separately.³⁵⁸ Therefore, he argues, there is a connection between ecosystem's internal mechanisms and sustainability.³⁵⁹ Thus, sustainability represents the ecological consequence of the efficient interaction between the three components of an ecosystem in the Anthropocene era. It is characterized by the capacity of the ecosystem to make the three components interface producing a situation where the system fundamental characters, the ones determining the survival of the ecosystem and its nature, remain unaltered.³⁶⁰

The concept of sustainability should not be confused with the notion of sustainable development. Sustainable development is an analytical approach created by the most important international and intergovernmental organizations, such as the UNEP, based on a series of indicators aiming at the definition of social and economic policies aiming at achieving sustainability in a given ecosystem. The notion of sustainable development became prominent in the early 1980s, after scientific researches about the increasing instability of the environment were published.³⁶¹ Recognizing the difficulty in tackling the main environmental changes, the UN World Commission on Environment and Development fostered the creation of the concept of sustainable development in order to institutionalize new social and economic goals to be achieved through a new configuration of social, and economic policies based on new rising environmental challenges.³⁶²

Sustainable development was used officially for the first time in the report *Our Common Future* published by the Brundtland Commission (named after Gro Harlem Brundtland, the chairperson appointed by the UN Secretary General) in 1987.³⁶³ The

³⁵⁸ Idem

³⁵⁹ Idem

³⁶⁰ Bell and Morse, *Sustainability Indicators*, 12

³⁶¹ Bert J. M. de Vries, *Sustainability Science* (New York: Cambridge University Press, 2013): 124

³⁶² Ibidem, 125

³⁶³ Ibidem, 126

increasing global environmental response to the endemic industrial development and resource overexploitation fostered the need for the creation of an internationally recognized system of human-environment conjunctions to “ensure that the [planet] system would have last.”³⁶⁴ Today, the Intergovernmental Panel on Climate Change defines sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”³⁶⁵

In fact, sustainable development can be considered the anthropocentric response to the environmental changes. More specifically, the identification of “development pathways”³⁶⁶ that should respect the ecosystem biodiversity, its resource reconstitution capacity and its carbon absorption capacity represents the definition of a ‘social commitment’ in response to external changes.³⁶⁷

Therefore, sustainability is a sort of property of an ecosystem that allows it to keep intact its fundamental characters and, thus, ecological equilibrium, addressing the intersection among environmental, economic and social dimensions of human development. Sustainable development represents an analytical approach, aimed at achieving social and environmental objectives of human development, without affecting the environmental components of the system and its fundamental characters.

1.1 How is sustainability measured? Are there precise indicators?

The lack of a scientific and precise definition of sustainability has not to be considered a limitation for its applicability. On the contrary, the lack of a specific delimitation in the potential actions and applications conveyed by this term is one of the main strengths of this concept, making it greatly flexible and, thus, applicable to different

³⁶⁴ Editorial, *Nature Sustainability*

³⁶⁵ Intergovernmental Panel on Climate Change, “Reports – Assessment Reports,” accessed February 13, 2018, www.ipcc.ch/ipccreports/tar/wg2/index.php?idp=689

³⁶⁶ Idem

³⁶⁷ Idem

contexts.³⁶⁸ Therefore, sustainability can be seen as “a nodal discourse around which other discourses clusters.”³⁶⁹ More specifically, sustainability represents the approach through which the maintenance of the life support system and its threats are addressed.³⁷⁰

However, the absence of a delimitation to the concept affects its measurability. In fact, the shortage of a spatial or temporal delimitation makes the identification of parameters for the determination of sustainable environmental, economic, or social mechanisms. A recognized variable in the definition of sustainability is system quality. System quality is the measure of the quality of life in the ecosystem based on the natural resource base, the environment that characterizes the ecosystem, and the complexity of organisms living in the ecosystem.³⁷¹ It is useful to measure sustainability since it is considered the way to measure the evolution of the development of life in the ecosystem. In fact, the more complex the organisms and the longer they live, the higher the quality of the system. Thus, the higher the level of sustainability of the system.³⁷²

In this perspective, sustainability science is an analytical approach that connects the notions of sustainability, sustainable development, and ecological science in order to provide an efficient measurable tool for sustainability in an ecosystem.³⁷³ It is aimed at “understanding the causal [social and economic] mechanisms and the [ecological] behavioural responses” of an ecosystem to modifications of the conditions of the ecosystem considering system quality as the foundation of the measurement.³⁷⁴

³⁶⁸ Bell and Morse, *Sustainability Indicators*, 12

³⁶⁹ John S., Dryzek, *The Politics of the Earth* (Oxford: Oxford University Press, 2013): 16

³⁷⁰ Turner, B. (2010). Vulnerability and resilience: Coalescing or paralleling approaches for sustainability science? *Global Environmental Change*, 20(4), 572

³⁷¹ Bell and Morse, *Sustainability Indicators*, 17

³⁷² Idem

³⁷³ De Vries, *Sustainability Science*, 4

³⁷⁴ Per Becker, *Sustainability Science. Managing Risks and Resilience for Sustainable Development* (Waltham: Elsevier, 2014): 3

Sustainability science is a transdisciplinary approach in which biophysical processes and socio-economic mechanisms are integrated to understand the ecological, social, and economic rules that affect the ecosystem producing a transition, either through the activation of mechanisms of adaptation or through the activation of mechanisms of transformation (evolution).³⁷⁵

Therefore, the ecosystem is seen as a fundamental unity defined as “social-ecological system,” which means that an ecosystem is a complex system of intersections between human development and environmental mechanisms, integrated through reciprocal feedbacks and interdependences.³⁷⁶ The main objective of using the sustainability science approach is understanding the dynamic character of an ecosystem, which means that processes as single complex unities to be analyzed from an ecological, economic, and social perspective.

Consequently, human development is understood as a fundamental component of the ecosystem. Thus, human development is a complex phenomenon involving not only social and economic mechanisms, such as productivity, stability, and justice, but also ecological mechanisms, such as stable seasonal weather patterns, soil fertility, and water availability.³⁷⁷

In this sense, sustainable development is the “the [form of human] development that meets the needs of the present generation without compromising the ability of future generation to meet their own needs.”³⁷⁸ Accordingly, sustainable development is a complex system of human and ecological process aimed at obtaining the optimal interrelation of the two in order to keep the level of system quality in the long term as much stable as

³⁷⁵ De Vries, *Sustainability Science*, 5

³⁷⁶ Idem

³⁷⁷ Ibidem, 2-3

³⁷⁸ Ibidem, 7

possible.³⁷⁹ Hence, sustainable development is a phenomenon, not a unit of measurement of sustainability.

According to sustainability science, climate change represents the major social-ecological stressor of an ecosystem³⁸⁰ Climate change is a complex phenomenon impacting the climate patterns of an ecosystem, which originated from the alteration of the carbon cycle of the ecosystem.³⁸¹ Considering it a social-ecological phenomenon means addressing both its causes and consequence on the systemic development of the quality of life in the system. Although effectively the main cause of the alteration of the climate patterns must be considered anthropogenic, more precisely the intensive emissions of carbon dioxide into the atmosphere, climate change has been affecting the main systemic feedback mechanisms and life development processes since the early 1980s.³⁸²

Therefore, analyzing climate change through the sustainability science approach means addressing climate change as a triggering mechanism of internal complex social, economic, and ecological phenomena that impact directly the structure of the ecosystem, producing a transformation. The transformation produced is based on the quality of the system. According to sustainability science, the structure of an ecosystem can be vulnerable or resilient.

An ecosystem is vulnerable when it is “susceptible to harm.”³⁸³ Thus, vulnerability is the degree of susceptibility of an ecosystem to the consequences of a phenomenon, in this case, climate change, and to the unpredictability of the triggered systemic social, economic, and ecological feedback mechanisms.³⁸⁴ The higher the degree of vulnerability,

³⁷⁹ Idem

³⁸⁰ Ibidem, 28

³⁸¹ Idem

³⁸² Ibidem, 223

³⁸³ Becker, *Sustainability Science*, 140

³⁸⁴ Idem

the lower the capacity of the ecosystem to absorb the transition through adaptive mechanisms, the more probable the transformation of the ecosystem.³⁸⁵

An ecosystem is resilient when it can “react to disturbances.”³⁸⁶ Thus, resilience is the degree of reactive capacities of an ecosystem to the influence of a phenomenon and to the consequent triggered system social, economic, and ecological feedback mechanisms.³⁸⁷ The higher the degree of resilience, the higher the capacity of the ecosystem to absorb the transition through adaptive mechanisms, the less probable the transformation of the ecosystem.³⁸⁸

This section deals with the definition of sustainability and the application of this concept in the Arctic region. More specifically, I will propose the analysis of the level of sustainability of the Arctic ecosystem through the sustainability science approach. In the first part, I will determine the degree of vulnerability and resilience of the ecosystem. Then, in the second part, I will delineate the concept of sustainable development, identifying its specific contextual meaning in the Arctic. I will use the geoeconomics analytical tools to understand the main challenges sustainable development will face in the region. Finally, I will determine a customized definition of sustainability and sustainable development for the Arctic. I will use notions of environmental security and geopolitics to demonstrate that geoeconomics is the best approach to define Arctic sustainability.

Even though I recognize the importance of the social component of sustainability, I will not address this specific topic in this chapter. In fact, addressing the main social issues in the Arctic would imply dealing with Indigenous people and Inuit identity and social organization that is not coherent with the type of analysis I would like to propose.³⁸⁹

³⁸⁵ Ibidem, 142

³⁸⁶ Ibidem, 143

³⁸⁷ Idem

³⁸⁸ Becker, *Sustainability Science*, 146

³⁸⁹ In the following chapter, I will deal with the social dimension of sustainable development more deeply, highlighting the importance of this dimension in the Canadian context.

2. Ecological Considerations on Sustainability in the Arctic Region

2.1 Vulnerability

Vulnerability is an analytical approach that refers to the elements of a system that can be considered sustainable based on the ‘human’ need to recognize the main environmental challenges for development.³⁹⁰ It is considered a “combination of exposures, sensitiveness and adaptive capacities in a social-ecological system,” which are determined by “specific representative patterns” that influence the intersection between human and ecological development.³⁹¹ Thus, vulnerability represents “the degree to which a system, subsystem, or system component is likely to experience harm due to exposure to a hazard,”³⁹² which is a factor causing damage, either as a perturbation or as a stress/stressor.³⁹³

In the field of sustainability studies, vulnerability is the approach used to identify the adaptive capacity of an ecosystem.³⁹⁴ It originates from a multidisciplinary approach aimed at integrating the social and economic mechanisms of human development with the degree of sensitivity and adaptive capacity of an ecosystem to environmental and natural changes.³⁹⁵ The analysis of an ecosystem vulnerability is aimed at the identification of “the susceptibility to harm [of the ecosystem] from exposure to stresses associated with environmental and social change and the absence of capacity to adapt.”³⁹⁶ For this reason,

³⁹⁰ De Vries, *Sustainability Science*, 111

³⁹¹ *Idem*

³⁹² Jon, Barnett, Simon Lambert, and Ian Fry, "The Hazards of Indicators: Insights from the Environmental Vulnerability Index," *Annals of the Association of American Geographers* 98, no. 1 (2008): 103, available in <http://www.jstor.org/stable/25515101>

³⁹³ C.R. Pratt, U.L. Kaly, and J. Mitchell, *Manual: How to Use the Environmental Vulnerability Index (EVI)*. SOPAC Technical Report 383, 60 pp; 1 appendix, 2 figures, United Nations Environment Programme (UNEP). South Pacific Applied Geoscience Commission (SOPAC) 2004, 1, available in <http://islands.unep.ch/EVI%20Manual.pdf>

³⁹⁴ Andrey N., Petrov, Shauna, BurnSilver, F. Stuart Chain III, Gail, Fondahl, Jessica K., Graybill, Kathrin, Keil, Annika E., Nilsson, Rudolf, Riedlsperger, and Peter, Schweitzer, *Arctic Sustainability Research: Past, Present and Future* (New York: Routledge Research in Polar Regions, 2017): 32

³⁹⁵ *Ibidem*, 36

³⁹⁶ *Idem*

the vulnerability approach affects the identification of the degree of an ecosystem adaptive capacity either as an asset or as an assessment.³⁹⁷

In the first place, considering vulnerability an asset, thus “the starting point from which underlying patterns of drivers, sensitivity and adaptive capacity could be disaggregated,”³⁹⁸ means measuring vulnerability prioritizing social mechanisms of human development, to identify the main social and economic processes that are open or constrained by the lack of flexibility to environmental changes of the ecosystem.³⁹⁹ In this sense, vulnerability can be interpreted as a parameter influencing socio-economic mechanisms at different levels, based on the complexity of the system of analysis.⁴⁰⁰ In fact, vulnerability applies both to physical processes and to individuals, based on the “level of risk,” which means likelihood of occurrence, of an hazard.⁴⁰¹ Therefore, being an ecosystem a very complex system of intersection mechanisms between humans and the environment, measuring vulnerability as an ecosystem asset means addressing patterns of adaptive capacities considering the interaction of environmental factors, biophysical factors, and human factors (economic and social) to determine their influence in the perpetration of social phenomena.⁴⁰²

In this perspective, climate change has to be considered one of the processes that potentially “open or constrain options for people.”⁴⁰³ Therefore, climate change is analyzed considering its effects on the social development of the human species, who is also the one identifying potential adaptive mechanisms, to be pursued in order to prevent social dysfunctions.⁴⁰⁴ Consequently, it is a human-centred analysis of climate change, in which

³⁹⁷ Ibidem, 35

³⁹⁸ Ibidem, 37

³⁹⁹ Ibidem, 37

⁴⁰⁰ Pratt, Kaly, Mitchell, *Manual: How to Use the Environmental Vulnerability Index*, 1

⁴⁰¹ Idem

⁴⁰² Ibidem, 3

⁴⁰³ Petrov et al., *Arctic Sustainability Research*, 37

⁴⁰⁴ Idem

it is described as one of the potentially dangerous drivers of change in the ecosystem that will have cumulative effects on people and environment.⁴⁰⁵ Thus, vulnerabilities are described as systemic weaknesses to be controlled through a system of policies and infrastructural investments to achieve human stewarded sustainability.⁴⁰⁶

In the second place, considering vulnerability as an assessment means analyzing the deep entanglement between the ecosystem capacities of adaptation to changes and the human development of the ecosystem.⁴⁰⁷ In this sense, vulnerability is measured prioritizing ecological indicators and biophysical drivers of the ecosystem on the human development of the ecosystem, in order to identify potential adaptation options to achieve sustainability in the definition of investment policies.⁴⁰⁸ Therefore, given the complexity of a single ecosystem, vulnerabilities represent the local specificities that interfere in the process of adaptation of the ecosystem to the natural and environmental changes.⁴⁰⁹ Thus, vulnerability is a variable dependent on the ecosystem “exposure, susceptibility, coping capacities and adaptive capacities” to internal changes provoked by environmental interferences to its mechanisms of ecological balance.⁴¹⁰

In this perspective, climate change has to be considered what triggers the main hazards that affect the perpetuation of systemic life mechanisms in an ecosystem at each level of complexity in different ways.⁴¹¹ Climate change impacts the ecosystem as a whole, thus, it affects the internal feedback mechanisms from complex physical and biological processes to human social and economic development.⁴¹² Accordingly, the multi-layer

⁴⁰⁵ Ibidem, 38

⁴⁰⁶ Idem

⁴⁰⁷ Ibidem, 36

⁴⁰⁸ Idem

⁴⁰⁹ Walter, Leal Filho, Haruna, Musa, Gina, Cavan, Paul, O'Hare, Julia, Seixas, *Climate Change Adaptation, Resilience and Hazards* (Springer International Publishing): 7

⁴¹⁰ Ibidem, 14

⁴¹¹ De Vries, *Sustainability Science*, 111

⁴¹² Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [C.B., Field, V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea,

character of the effects of climate change on an ecosystem should be considered “clustering of more vulnerable cohorts and the biophysical qualities of the location of the clusters.”⁴¹³

Therefore, vulnerability to climate change can be defined as the incapacity of the ecosystem at all levels to respond to climatic and weather phenomena triggered by a change in the climate regulation system of mechanisms of the ecosystem. For example, the intensive emission of greenhouse gases in the atmosphere and the consequent modification of the carbon cycle inevitably influence the water system, affecting the lives of all the species living in that space.⁴¹⁴ In this sense, social and economic vulnerability represents the human activities directly influenced by the phenomena triggered by the alteration of the systemic feedback mechanisms provoked by the increased influence of climate change in the ecosystem’s ecological balance.⁴¹⁵ Therefore, the relation between sustainability and the research on vulnerabilities is aimed at “emphasiz[ing] the threats to and sensitivity and adaptive capacity” of an ecosystem when the effects of climate change impacts on both the environmental and socio-economic factors that characterize it.⁴¹⁶

The IPCC defines vulnerability as “the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity.”⁴¹⁷

T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.), *IPCC, 2014: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects* (New York: Cambridge University Press, 2014):1050

⁴¹³ De Vries, *Sustainability Science*, 111

⁴¹⁴ Idem

⁴¹⁵ Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, *IPCC, 2014*, 1050

⁴¹⁶ B.L. Turner, “Vulnerability and resilience: Coalescing or paralleling approaches for sustainability science?,” *Global Environmental Changes* 20 (2010): 572

⁴¹⁷ Intergovernmental Panel on Climate Change, “Reports – Assessment Reports,” accessed February 13, 2018, www.ipcc.ch/ipccreports/tar/wg2/index.php?idp=689

2.1.1 Is the Arctic a vulnerable ecosystem?

In the Arctic region, climate change is deeply impacting the environmental transformation, landscape fragmentation, and species loss due to its increasing impact on the albedo effect that characterizes the region.⁴¹⁸ The main systemic change produced by the influence of climate change is the increase in the average temperatures of the region, whose impact on the ecological balance is affecting greatly the adaptive capacity of the whole ecosystem.⁴¹⁹ More specifically, climate models predict that greater changes are forthcoming, based on the climatic patterns that alternate irregularly, challenging the stability and security of the whole region.⁴²⁰

Therefore, the Arctic is a vulnerable ecosystem, and the influence of the effects of climate change on the region represent the main threat to its stability and survival.⁴²¹ For this reason, identifying and addressing the main vulnerabilities of Arctic is aimed at defining the most sustainable way to address the increasing impact of the effects of climate change.

More specifically, measuring the level of vulnerability of the Arctic ecosystem and the main risks that will potentially increase its future instability means developing a model to identify the potential challenges to ecological and geopolitical security of the region analyzing the intersection between environment and human development including all the stressors drivers of hazards impacting the biophysical and socio-economic processes of the system.⁴²² Consequently, a vulnerability in the Arctic is twofold. It is defined an assessment from an ecological perspective, and as a feature from an anthropocentric perspective.

⁴¹⁸ UNESCO, *Climate Change and Arctic Sustainable Development: Scientific, social, cultural and educational challenges* (Paris: UNESCO): 84

⁴¹⁹ Leal Filho et al., *Climate Change Adaptation, Resilience and Hazards*, 36

⁴²⁰ James D., Ford, and Barry, Smith, "A Framework for Assessing the Vulnerability of Communities in the Canadian Arctic to Risks Associated with Climate Change," *Arctic* No. 4 (December 2004): 389

⁴²¹ *Ibidem*, 391

⁴²² *Ibidem*, 392

As an assessment, the North's vulnerability is the degree of the ecosystem's susceptibility to the effects of climate change. Thus, climate change represents the main driver of major ecological hazards, such as rising temperatures and increase albedo feedback mechanism effects on the Arctic ice, that are impacting the biodiversity, the water system (including sea ice loss), and human development.⁴²³ For example, phenomena such as thawing permafrost and ice sheet decrease affect the adaptive capacity of the ecosystem impacting at the same time on biodiversity, such as migratory species whose seasonal path is altered;⁴²⁴ on the geographical conformation of the region modifying the seasonal ice reconstitution cycle;⁴²⁵ and on the human development capacities affecting people's health conditions and daily life.⁴²⁶

As a feature, Arctic vulnerability is the degree of the ecosystem's susceptibility to the effects of climate change on the socio-economic processes that constrain the adaptive capacity of the ecosystem while potentially opening occasions of greater human development.⁴²⁷ In this sense, climate change represents the main driver of ecological changes from which human social and economic development might benefit, such as in the case of resource extraction, while at the same time affecting regionally the ecosystem. Thus, "vulnerability [...] is an outcome of processes that open or constrain options for people,"⁴²⁸ since it can also be considered the degree at which the governance and institutional capacity of adaptation are influenced by the effects of climate change on the social and economic organization in the region.⁴²⁹

⁴²³ Petrov et al., *Arctic Sustainability Research*, 38

⁴²⁴ UNESCO, *Climate Change and Arctic Sustainable Development*, 81

⁴²⁵ *Ibidem*, 27

⁴²⁶ *Ibidem*, 174

⁴²⁷ Ford and Smith, "A Framework for Assessing the Vulnerability," 393

⁴²⁸ Petrov et al., *Arctic Sustainability Research*, 37

⁴²⁹ *Ibidem*, 38

Therefore, it can be said that climate change represents the main stressor of the region influencing its adaptive capacity and, thus, its future conditions. Thus, to address efficiently future hazards provoked by the effects of climate change in the ecosystem, the degree of vulnerability of the Arctic region can be measured from both an ecological and an anthropocentric perspective.

However, the achievement of sustainability is dependent on the identification of future challenges to the intersection between environment and human development in the region. In fact, only identifying the degree of vulnerability of the ecosystem as a unit then all the environmental, social and economic dynamics will be efficiently tackled.

2.2 Resilience

Being an ecosystem a ‘living unity,’ which means a complex system of interactions between physical and biological processes fostering the development of life, its composition and condition do not remain unaltered in time and space. On the contrary, an ecosystem is subject to “fluctuating external conditions and interacting intrinsic cycle in the ecosystem.”⁴³⁰ In this perspective, resilience is “the ability of a system to absorb disturbance and reorganize while undergoing change, and without losing its identity, function, structure, and feedback.”⁴³¹ It represents the magnitude of disturbance that can be absorbed by the system before it undergoes a “structural change.”⁴³²

In the field of sustainability studies, resilience is the approach used to identify the adaptive capacity of an ecosystem, which means to maintain to its essential identity, structures and dynamics despite an external change. In this perspective, an ecosystem changes its nature when the disturbances provoke an irreversible modification of either an element or a process. Thus, resilience can be defined as the set of systemic processes of

⁴³⁰ De Vries, *Sustainability Science*, 276

⁴³¹ Lenton, O’Riordan, *Addressing Tipping Points*, 260

⁴³² De Vries, *Sustainability Science*, 276

learning and mechanisms of transformation that prevent the ecosystem to overcome a threshold, which means a series of irreversible changes that will lead the ecosystem to lose its nature.⁴³³ For this reason, there are different types of systemic resilience. The most important are ecological and social resilience.

Ecological resilience focuses on the persistence, unpredictability, and variability of the change.⁴³⁴ More specifically, resilience theory “posits four interrelated system functions” that belong to a resilient system. these are release, reorganization, growth, and conservation.⁴³⁵ These functions are fundamental for the identification of the spectrum of the ecosystem thresholds, which means that the system will change to a different state that implies a new set of structures and feedbacks mechanisms.⁴³⁶ In fact, these functions are the dynamics that keep the ecosystem stable. However, as soon as one of them cannot efficiently contribute to the adaptive capacity of the ecosystem, this will approach a threshold.⁴³⁷

Social resilience is defined as the ecosystem’s adaptability capacity in response to socio-economic modifications.⁴³⁸ In this case, resilience is measured “based on the outcomes,” which means the capacity of the ecosystem of adapting to human stewardship-oriented policies, thus, governance structures and institutions.⁴³⁹ Therefore, in this perspective, resilience is represented as the capacity of the ecosystem to maintain efficient its complex biophysical mechanisms and interacting intrinsic cycles even though elements of the ecosystem change their patterns of behaviour.⁴⁴⁰ Thus, resilience is interpreted as the capacity of an ecosystem to adapt based on social and economic needs, since at a social

⁴³³ Petrov et al., *Arctic Sustainability Research*, 38

⁴³⁴ De Vries, *Sustainability Science*, 276

⁴³⁵ Petrov et al., *Arctic Sustainability Research*, 39

⁴³⁶ Idem

⁴³⁷ Idem

⁴³⁸ Idem

⁴³⁹ Idem

⁴⁴⁰ De Vries, *Sustainability Science*, 276

level, there is limited knowledge about the “runaway set of events” that can be triggered once a systemic threshold is overstepped.⁴⁴¹

In this perspective, climate change is considered a ‘basal problem’, which means a climatic phenomenon triggering a series of dangerous and unpredictable stressors in the ecological balance of the ecosystem. Consequently, resilience represents the capacity of the ecosystem of absorbing and adapting to the risks associated with the increasing influence of climate change in the ecosystem.⁴⁴² In fact, the impacts of climate variability and unpredictability in the ecosystem ecological balance lead the system to blend its adaptive capacity mechanisms with natural hazards, impacting directly its internal equilibrium.⁴⁴³ Therefore, resilience mechanisms are fundamental to respond to increasingly intense weather-related events and the preservation of the identity of the ecosystem in the long term.⁴⁴⁴

In this sense, ecological tipping points represent critical climate thresholds at which the planetary system will be qualitatively altered. Thus, ecological resilience can be also defined as the mechanisms of an ecosystem to avoid maladaptation to a climatic shock in order to keep the ecosystem “within the desired state,” preventing a planetary chain reaction consequent to the systemic change of nature.⁴⁴⁵

Consequently, sustainability and resilience are deeply entangled, both in terms of ecological resilience and social resilience. In the former case, considering that to be sustainable a policy need to act directly on the resilience mechanisms of an ecosystem,

⁴⁴¹ Emily Boid, “Exploring adaptive governance for managing tipping points,” 259, available in Tim, Lenton, and Tim, O’Riordan, *Addressing Tipping Points for a Precarious Future* (Oxford: Oxford University Press, 2013)

⁴⁴² Stephen Knight-Lenihan, “Benefit cost analysis, resilience and climate change,” *Climate Policy* 16:7 (2016): 909 DOI: 10.1080/14693062.2015.1052957

⁴⁴³ Darryn McEvoy, Hartmut Fünfgeld, and Karyn Bosomworth, “Resilience and Climate Change Adaptation: The Importance of Framing,” *Planning Practice & Research* 28:3 (2013): 282, DOI: 10.1080/02697459.2013.787710

⁴⁴⁴ McEvoy, Fünfgeld, and Bosomworth, “Resilience and Climate Change Adaptation,” 285

⁴⁴⁵ Emily Boid, “Exploring adaptive governance for managing tipping points,” 258

enhancing its adaptive and transformative mechanisms, ecological resilience and sustainability affect directly the adaptive capacity of the ecosystem, with the aim of “maintaining existence of function.”⁴⁴⁶ In fact, the closer the ecosystem to a threshold, the lower the degree of its adaptive capacity.⁴⁴⁷ Thus, if sustainability means identifying the forces and movements that in a stable ecosystem “restore [its] original condition,” then resilience represent the ecological tool to redefine an internal equilibrium transforming the disturbance and absorbing it into the structure of the ecosystem.⁴⁴⁸

In the latter case, a policy is considered sustainable as soon as its effects keep the system in function. In this case, since the disturbance can be both ecological or human-induced, then resilience and sustainability both affect the intersection between human development’s needs and ecological ecosystem’s needs and the way the two systems of mechanisms interact in order to “maintain the efficiency of function.”⁴⁴⁹ Thus, sustainability is the pivotal tool of human development to make human-induced disturbances as much congruent as possible to the ecosystem’s degree of resilience.⁴⁵⁰

2.2.1 Is the Arctic a resilient ecosystem?

The Arctic is an ecosystem whose internal ecological balance is deeply affected by the effects of climate change. In this ecosystem, ice represents the dominant constituent of the entire region, and, thus, the determinant factor for the definition of the ecological equilibrium of the ecosystem. For this reason, ice-melting and ice-freezing represent the ecological mechanisms that are responsible for the perpetration of the nature of the

⁴⁴⁶ De Vries, *Sustainability Science*, 276

⁴⁴⁷ Emily Boid, “Exploring adaptive governance for managing tipping points,” 261

⁴⁴⁸ De Vries, *Sustainability Science*, 276-277

⁴⁴⁹ Ibidem, 276

⁴⁵⁰ Arctic Council, *Arctic Resilience Interim Report 2013* (Stockholm: Stockholm Environment Institute and Stockholm Resilience Centre, 2013): i

ecosystem. These mechanisms determine the growth and stabilization of the ice and the solar-energy absorption capacity of the region.⁴⁵¹

The Arctic is not a very resilient ecosystem. The influence of climate change on the ice seasonal growth and stabilization processes and the consequent alteration of the ecosystem composition and conformation represent the main obstacles to the efficacy of the adaptive capacity of the ecosystem. Furthermore, the increasing international geopolitical interests in the region are fostering policies of human intervention in the region caused by the need for resources or of goods transportation.⁴⁵²

More specifically, the rate at which climate change is changing the Arctic is developing so rapidly that it is going to become uncontrollable through the traditional ecosystem adaptation and transformation mechanisms.⁴⁵³ In fact, the Arctic ice is gradually thinning due to the constantly increasing average temperatures in the region and it is becoming more vulnerable to “rapid loss events.”⁴⁵⁴ For this reason, many scientists agree that there might be “no chance” for the reconstitution of a strong ice cap as it was before the exponential impact of the effect of climate change with inevitable impacts on biodiversity, geography, and social development of the region.⁴⁵⁵

Furthermore, the policies aimed at securing the strategic geographical position and accessing hydrocarbons and natural resources present in the region did not efficiently address sustainability and social resilience. Questions of sovereignty and access to the

⁴⁵¹ Peter, Wadhams, *A Farewell to Ice. A Report from the Arctic* (New York: Oxford University Press, 2017): 6-8

⁴⁵² Arctic Council, *Arctic Resilience Interim Report 2013*, i

⁴⁵³ Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [C.B., Field, V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)], IPCC, *Climate Change 2014 – Impacts, Adaptation and Vulnerability: Part B: Regional Aspects* (New York: Cambridge University Press, 2014): 1570

⁴⁵⁴ Mark C. Serreze, “Climate change: Rethinking the sea-ice tipping point,” *Nature* 471 (03 March 2011): 48 doi:10.1038/471047a

⁴⁵⁵ Wadhams, *A Farewell to Ice*, 86

resources deposits in the Arctic and consequent political and economic regulations did not consider efficaciously their environmental consequences, affecting the adaptive capacity of the region.⁴⁵⁶

As a result, in the Arctic, both ecological and social resilience is compromised by environmental hazards produced by the increasing influence of climate change, and by the regional the unsustainable policies aimed at reaching the geopolitical interests in this region. However, even though the adaptive capacity of the ecosystem is reduced, there is still room to implement sustainable adaptive policies in order to mitigate the effects of the change in the region. Therefore, new Arctic-based methodologies of research and mechanism of governance are required in order to effectively achieve sustainability in the region.

3. Geopolitical Considerations on Sustainability in the Arctic Region

3.1 Sustainable Development

As previously said, the notion of sustainable development represents the most important human acknowledgement of the increasing instability of the environment in the whole planet.⁴⁵⁷ It was described for the first time in 1987 as a reflection of “a shift in environmental consciousness from strict conservatism [...] to a more constructive philosophy of social transformation and a more dynamic appreciation of the interplay between the environment, the economy, and human well-being.”⁴⁵⁸

The notion of sustainable development implies both the definition of sustainability, in terms of stable intersection between systemic ecological needs and human development, and the definition of development in terms of anthropogenic policies aiming at resource stewardship and economic productivity. According to sustainability science, development

⁴⁵⁶ Arctic Council, *Arctic Resilience Interim Report 2013*, xi

⁴⁵⁷ De Vries, *Sustainability Science*, 124

⁴⁵⁸ Caradonna, *Sustainability*, 141

is an anthropocentric concept that describes “the application of the human, financial, living, and non-living resources to satisfy human needs and improve the quality of human life.”⁴⁵⁹ Thus, in this perspective, sustainable development is a system of “ethical guiding principle[s]”⁴⁶⁰ that should guide human development policies in prioritizing the ecosystem ecological needs to the immediate achievement of human needs.⁴⁶¹

Sustainable development can be seen as a ‘human assumption of responsibility’ towards the ecosystem where humans live. More specifically, this concept originated in the human recognition that being an ecosystem a complex system, societies and their environment are deeply interrelated.⁴⁶² Thus, human development, systemic feedback mechanisms, and ecological balance are integrated and interdependent. Consequently, efforts to invest in a more sustainability-oriented economic growth are motivated by the identification of social, scientific, and technological means for a better economic efficiency and a better quality of social life.

Accordingly, human sustainable development is the redefinition of a “resource-efficient economic growth”⁴⁶³ based on the improvement of the production methods through investments in new technologically advanced means.⁴⁶⁴ Thus, a ‘sustainably developed’ society is characterized by its members’ capacity to define policies organizing social needs in the long term, in a flexible way, keeping open as many options for the future as possible, providing an equitable distribution of resources, while maintaining the productive system efficient but respectful of the ecological rhythms of the ecosystem.⁴⁶⁵

⁴⁵⁹ Idem

⁴⁶⁰ De Vries, *Sustainability Science*, 133

⁴⁶¹ Idem

⁴⁶² Ibidem, 129

⁴⁶³ Ibidem, 134

⁴⁶⁴ Ibidem, 133

⁴⁶⁵ Ibidem, 134

In this perspective, the interpretation of climate change is twofold. On the one hand, it is considered the main consequence of intensive air pollution, thus, addressing it requires a series of controlling mechanism built through “science-driven targeted approach[es].”⁴⁶⁶ More specifically, climate change is seen as a threat to the human development because it is seen as the major trigger of extreme and unpredictable weather phenomena, that make the definition of economic policies almost impossible.⁴⁶⁷ According to this vision, sustainable development is a sort of ‘human adaptive mechanism,’ which means that the application of sustainable development principles to economic and resource stewardship policies makes possible to identify when pollution levels should be considered potentially dangerous, and how to reduce them, in order to prevent dysfunctions in the social system in the long term.⁴⁶⁸ In this sense, human economic and social development are seen as regional phenomena, thus, climate change is considered as a set of environmental dysfunctions specific to a certain area too. Therefore, addressing climate change is a social imperative.⁴⁶⁹

On the other hand, climate change and sustainable development are seen as interdependent phenomena. Thus, the achievement of sustainable policies depends on the efficient analysis of their intersection.⁴⁷⁰ More specifically, climate change is seen as the environmental response to the global economic development and the consequent improvement of human life quality, and sustainable development is the approach to apply to keep the social system productive while preventing further environmental degradation.⁴⁷¹ In this sense, human economic development is emphasized as a global

⁴⁶⁶ Johanna, Depledge, and, Farhana Yamin, “The Global Climate Change Regime: a Defence,” 435, available in Dieter, Helm, and Cameron, Hepburn, *The Economics and Politics of Climate Change* (Oxford: Oxford University Press, 2013)

⁴⁶⁷ Idem

⁴⁶⁸ Idem

⁴⁶⁹ Idem

⁴⁷⁰ Ibidem, 436

⁴⁷¹ Idem

process, thus, climate change is considered as a set of environmental dysfunctions that, affecting the whole planet, need to be addressed through the creation of a system of international cooperation. For this reason, one of the major achievement of sustainable development policy-making is considered the creation of the “climate-change regime,” whose objective is the definition of universally recognized sustainability targets to be reached for the security of the planet.⁴⁷²

As a result, sustainability can be defined as the reduction of the impacts of economic development through the redefinition of parameters of economic efficiency. Economic efficiency is the result of policies of investments aimed at reducing carbon emission through the improvement of “environment[ally] benign” technologies and replacement of scarce resources as means of production in the productive cycle.⁴⁷³ Consequently, sustainability can be defined as the responsible and efficient use of resources for the improvement of human quality of life and human economic production capacity, maintaining under control the degree of environmental degradation and possibly reducing it.⁴⁷⁴

3.1.1 Is the Arctic ecosystem sustainably developed?

The Arctic is an ‘exceptional region,’ whose geographical position and environmental composition make it a pivotal territory in the field of geopolitics. As a result, polar geopolitics is defined as the series of political, economic, and military processes activated by states in order to pin down claims of sovereignty that will grant the state accessibility, property, and authority rights on the region. In fact, the impact of the effects of climate change on the geography of the North has opened great opportunities of

⁴⁷² Idem

⁴⁷³ De Vries, *Sustainability Science*, 135

⁴⁷⁴ Idem

economic and social development, since the melting of the ice pack has allowed humans to reach natural resources present in the region.

At the moment, the Arctic is not sustainably developed. After the end of the Cold War, the increasing importance of Polar geopolitics in the definition of Arctic sovereignty has led security and access to be the main mechanisms for the definition of both economic and environmental policies in the region. Therefore, the Arctic is an ecosystem where it can be said that human development, which implies economic efficient productivity, is considered a necessary condition to establish a stable and secure environment. Therefore, environmental changes are seen as a threat to human development, thus, environmental protection is seen as a “non-traditional [means of] security,”⁴⁷⁵ necessary to guarantee the perpetuation of economic efficiency.

Consequently, polar geopolitics main objective is the establishment of strong sovereignty power on the region to implement its development through economic policies based on the great resource availability, using environmental protection as a means to achieve productivity. On the contrary, the main objective of sustainable development should be the improvement of the ecosystem quality of life, integrating human development and ecological needs.

According to Polar geopolitics, even though the effects of climate change are dangerous for the survival of the ecosystem and the planetary balance as a whole, they are also potential occasions to improve the regional productivity, being hydrocarbons and oil deposits more reachable and so fostering the “scramble for access to the resources that [...] become available.”⁴⁷⁶ Consequently, from a sovereign state perspective, climate change in

⁴⁷⁵ Robert, Huebert, “Canada and the Changing International Arctic. At the Crossroads of Cooperation and Conflict,” 195, available in Franklyn, Griffiths, and Robert Huebert, and P. Whitney, Lackenbauer, *Canada and the Changing Arctic: Sovereignty, Security, and Stewardship*. Waterloo, Ont.: Wilfrid Laurier University Press

⁴⁷⁶ Simon, Dalby, “Rethinking Geopolitics: Climate Security in the Anthropocene,” *Global Policy Volume 5* (2014): 2

the region is seen as the main triggered of negative implications in the nations' investments portfolios, that aiming at the improvement the economic efficiency of the region fails to tackle the larger ecological implications.⁴⁷⁷

Therefore, even though the Arctic ice pack is melting much more rapidly than projections, Polar geopolitics seems to be playing a “great game,” in which the notion of national security is invoked as a necessary response to potentially dangerous political threats to the national sovereign power.⁴⁷⁸ However, according to Dalby, “ecology has a politics,” which means that a global scale, being the Arctic such a pivotal ecosystem for the maintenance of the planetary ecological balance, human activity needs stricter regulations.⁴⁷⁹

Entering in the Anthropocene era involves the necessity of a deep understanding of ecological dynamics and the impacts that these changes have on the “changing social context of humanity.”⁴⁸⁰ However, it is also true that the main geopolitical trends cannot be nullified. They should be redirected in order to address properly climate change as a “conflict multiplier,” which means a phenomenon triggering ecological feedback mechanisms and dysfunctions and instabilities in the socio-economic policy making. For this reason, sustainable development and sustainability science approaches should be integrated in order to reshape the definition of security including both geopolitical and ecological notions.

4. Environmental Security and Geoeconomics: A New Definition of Sustainability in the Anthropocentric Arctic?

Security is an anthropogenic concept used to delineate the conditions that affect human development. It represents the “stable and relatively predictable environment in

⁴⁷⁷ Ibidem, 1

⁴⁷⁸ Ibidem, 3

⁴⁷⁹ Idem

⁴⁸⁰ Idem

which a [social] group may pursue its ends without disruption.”⁴⁸¹ Thus, it can also be described as the setting resulting from the efficient interdependence between environmental conditions and human development. Therefore, security represents the system of ecological mechanisms that favour the development of a human social and economic dimension and its future improvement.

Nevertheless, in the Anthropocene era, security is deeply changing.⁴⁸² In fact, this new geologic era has determined a deep modification of the interpretation of the concept. “Humans have impacted on [the environment] everywhere,” which means that humans have already shaped the environment where they live in order to obtain economic and social efficiency. Consequently, now “mankind has emerged as a globally significant [...] force capable of reshaping the face of the planet.”⁴⁸³

Therefore, the concept of security can be rephrased both in ecological and economic terms. In the former case, environmental security refers to potential threats to human economic and social development produced by changes in the traditional systemic cyclical patterns and the consequent environmental instability.⁴⁸⁴ Thus, environmental security refers to the potentially dangerous consequences of the changes that are produced in the ecosystem by ecological transformations and transitions.⁴⁸⁵

In this perspective, human development and climate change are seen as the main triggers of potential systemic disruptive changes. On the one hand, humankind is considered a “geological force,” because of its capacity to influence the planetary carbon

⁴⁸¹ David J Brooks, "What Is Security: Definition through Knowledge Categorization," *Security Journal* 23, no. 3 (2009): 226

⁴⁸² Simon, Dalby, “Geopolitical Identities: Arctic Ecology and Global Consumption,” *Geopolitics* No. 1 (2003): 198

⁴⁸³ Madeleine Fagan, “Security in the Anthropocene: Environment, Ecology, Escape,” *European Journal of International Relations* Vol. 23 No. 2 (2017): 293

⁴⁸⁴ Simon, Dalby, “Climate Change: New Dimensions of Environmental Security,” *The RUSI Journal* No. 3 (2013): 34

⁴⁸⁵ Dalby, “Geopolitical Identities,” 237

cycle that is determinant for the definition of the environmental characters of the ecosystem where they live.⁴⁸⁶ On the other hand, climate change is considered a major dysfunction in the climatic mechanisms of an ecosystem, generating unpredictable weather and environmental instabilities due to its direct impact on the feedback mechanisms that regulate the climate of the ecosystem.

In the latter case, economic security refers to the political and economic policies developed to improve productivity and efficiency of a social group's economic capacity controlling and managing the environment where they live.⁴⁸⁷ It is represented by the series of strategic investments in energy resources extractions aimed at fostering the improvement of the productive capacity of a social system.

Therefore, economic security refers to the potential dysfunctions that changes in the environment may create in the productive process and the consequent social repercussions.⁴⁸⁸ More specifically, human development is based on the constant increasing of the efficiency of the productive cycle in order to respond to societal demands. In fact, entering the Anthropocene era has meant for humans being able to provide "commodities for metropolitan consumption."⁴⁸⁹ According to Dalby, this means being able to prevent dangers for the human species and facilitate its flourishing, even if this means putting the environment in the state of danger.⁴⁹⁰

In this perspective climate change is considered the prime cause of disequilibrium in the human-environment dynamics. In fact, even though economic security is not completely dependent on the environmental condition of an ecosystem, being grounded mainly in the investment capacity of a social group and on the efficiency capacity of an

⁴⁸⁶ Fagan, "Security in the Anthropocene," 295

⁴⁸⁷ Dalby, "Geopolitical Identities," 234

⁴⁸⁸ Ibidem, 239

⁴⁸⁹ Idem

⁴⁹⁰ Idem

economic cycle, environmental unpredictable changes will deeply impact on the organization of the social group, thus, on its productive capacity.⁴⁹¹

Consequently, from a security perspective, environmental thresholds and tipping points represent the most important threats to the future of the human species. Accordingly, even though humans are influencing and modifying the carbon cycle in many different ecosystems, they cannot manage the consequences of this change planetarily.⁴⁹² In this sense, sustainability addresses the intersection between human development and ecological needs identifying a circumscribed set of parameters that determine the systemic equilibrium among the social, economic, and environmental dimensions.

Accordingly, sustainable development can be redefined based on the security approach. Even though sustainable development can be considered an integrative set of “ethical guiding principles,”⁴⁹³ aiming at a responsible use of available resources, this interpretation lacks the notion of security. More specifically, including in the mechanisms of sustainable development notions of economic and environmental security implies selecting a set of social needs and consequent economic trends of development.

In fact, as previously seen, sustainable development addresses for each ecosystem its ecological vulnerabilities in order to identify the most efficient combination of investments and productive methods to obtain a long-term responsible economic growth. However, to this extent, human development seems to be considered an infallible process that requires being redirected through “ethical guiding principles,” because of its harmful ecological consequences.⁴⁹⁴

⁴⁹¹ Idem

⁴⁹² Dalby, “Geopolitical Identities,” 243

⁴⁹³ De Vries, *Sustainability Science*, 133

⁴⁹⁴ Stockholm Environment Institute [Jakob, Granit, Henrik, Carlsen, Marcus, Carson, Karl, Hallding, Oliver, Johnson, Kevin, Rosner and Nina, Weitz], and Swedish Defence Research Agency (FOI) [Mikael, Eriksson, Christer, Andersson, Birgitta, Liljedahl, Malin, Mobjörk, Michael, Tulldahl, and Annica, Waleij], *Stockholm Environment Institute, Working Paper 2015-14. Integrating sustainable development and security: An analytical approach with examples*

For this reason, the intersection of anthropocentric security with sustainability and sustainable development will be the identification of a collection of parameters of human development re-interpreted through an ecological lens.⁴⁹⁵ In this perspective, climate change represents the major element of contact between the two approaches.

The Arctic represents an ecosystem where the intersection between security and sustainability is deeply entangled with the increasing instability of the region, both ecologically and geopolitically. In fact, the deep effects of climate change in the region have influenced both the ecological balance of the ecosystem and of the planet, for example increasing the influence of the albedo feedback effect on the reproductive cycle of the ice, and the geopolitical and economic interests at stake in the region, such as the availability of energy resources deposits.⁴⁹⁶

However, the traditional geopolitical approach applied for the development of Arctic economic strategies has been shaped aiming at sovereignty as a primary objective. Accordingly, Polar geopolitics has been oriented to reach economic and political interests based on the main human development needs, both economic and ecological, in order to achieve sovereignty on this territory.⁴⁹⁷ Thus, security is seen as a geopolitical tool for the identification of the main threats and challenges for the social and economic development of the region.

Consequently, to this extent, the impacts of the effects of climate change on the geographical and environmental composition of the Arctic are seen from a geopolitical perspective, which means that the instability of the climatic conditions represents a threat

from the Middle East and North Africa, the Arctic and Central Asia (Stockholm: Stockholm Environment Institute and Swedish Defence Research Agency (FOI), 2015): 7

⁴⁹⁵ Ibidem, 8

⁴⁹⁶ Idem

⁴⁹⁷ Tessa, Mendez, "Thin Ice, Shifting Geopolitics: The Legal Implications of Arctic Ice Melt," *Denver Journal of International Law and Policy* 38, no. 3 (2010): 528

to be managed for the establishment of sovereignty, and at the same time, an economic opportunity for a greater resource availability.⁴⁹⁸

However, Polar geopolitics analytical tools do not address the deep ecological transition the Arctic is going through. In fact, as previously seen, the deep modifications of the Arctic geography and systemic composition are opening economic opportunities while, at the same time, they are threatening the planetary ecological equilibrium. For this reason, identifying parameters for ‘strategical Arctic sustainable development’ that includes the identification of trends of sustainable development and geopolitical needs, while considering specific systemic vulnerabilities and security issues could be, in my opinion, the most efficient way to achieve sustainability in the region.

Accordingly, Arctic security studies and Arctic sustainable development both address international cooperation, sovereignty claims, and unpredictable future environmental conditions as the main institutional consequences of climate change.⁴⁹⁹ More specifically, in the first case, international cooperation is shaped based on the creation of the Arctic Council as an intergovernmental forum for the institutionalization of agreed mechanisms of efficient and responsible use of Northern resources see the degree of environmental degradation of the region. Then, sovereignty claims resulted from the opening of the pivotal straits of the regions because of the thawing ice, such as the Northwest Passage. Finally, the unpredictability of future environmental conditions due to the impacts of the climatic instability stands for potential threats to biodiversity and local human development.⁵⁰⁰

⁴⁹⁸ Lee-Anne, Broadhead, "Canadian Sovereignty versus Northern Security," *International Journal* 65, no. 4 (2010): 916

⁴⁹⁹ Idem

⁵⁰⁰ Stockholm Environment Institute and Swedish Defence Research Agency (FOI), *Stockholm Environment Institute, Working Paper 2015-14*, 12-13

Therefore, in this case, sustainability must be seen not only as the acknowledgement of the dysfunction in the systemic interdependence among the social, economic, and ecological dimensions of the Arctic ecosystem. Sustainability, in this case, must be related also to the global importance of the Arctic region both ecologically and geopolitically.

For this reason, I think the best analytical tool to determine the degree of sustainability of Arctic policies is represented by geoeconomics. Geoeconomics is defined as “the use of economic instruments to promote and defend national interests, and to produce beneficial geopolitical results; and the effects of other nations’ economic actions on a country’s geopolitical goals.”⁵⁰¹ As Blackwill and Harris affirm, “geoeconomics [...] is about providing a parallel account of how a state builds and exercises power by reference to economic factors rather than geographic ones.”⁵⁰²

Geoeconomics started to be a successful analytical tool during the shortage of natural resources in the 1970s when an effective control on the natural resources affected the global balance of power.⁵⁰³ Today, it represents the tool that states use in order to identify new trends of foreign policy in which economic goals are prioritized compared to the military-oriented ones.⁵⁰⁴ In this perspective, both security and sovereignty would change of meaning becoming choices of foreign policy to be re-shaped based on economic interests.⁵⁰⁵

I think geoeconomics is an analytical tool that allows obtaining a deeper understanding of the main global economic interests in the Arctic resources through the implementation of sustainable development policies.⁵⁰⁶ In fact, theories of geoeconomics

⁵⁰¹ Robert D. Blackwill and Jennifer M. Harris, *War by other means, geoeconomics and statecraft* (Cambridge: The Belknap Press of Harvard University Press, 2016), 20

⁵⁰² *Ibidem*, 24

⁵⁰³ Timothy W., Luke, "The (Un)Wise (Ab)Use of Nature: Environmentalism as Globalized Consumerism," *Alternatives: Global, Local, Political* 23, no. 2 (1998): 178

⁵⁰⁴ Blackwill and Harris, *War by Other Means*, 26

⁵⁰⁵ *Ibidem*, 39

⁵⁰⁶ Heinen and Finger, "The Global Arctic," 2

are based on the deep “interconnection between territory and economy, including the commercial value of an action in a specific region.”⁵⁰⁷ Thus, according to the geoeconomics approach, economic policies aimed at human development are efficient if they are planned on a long-term resource availability.⁵⁰⁸ Thus, environmental and economic security are both fundamental parameters for the identification of developmental mechanisms.⁵⁰⁹

According to Juha, Käpylä, and Harri Mikkola, the “geoeconomics potential” of the Arctic region is grounded on the potential social and economic development of the region due to its strategic geographic position and the great resource availability. Nevertheless, the authors argue that an accurate estimate of the geoeconomics potential can be done only integrating the deep environmental instability of the region.⁵¹⁰

Accordingly, the planetary consequences of the melting of the ice, which means surpassing irreversibly a tipping point, will have major consequences also in the definition of the international economic and strategic policies. In fact, the needs for a greater availability of energy resources or new faster shipping routes need to be balanced with the need for a more sustainable set of policies to guarantee the survival of the ecological balance of the biosphere.

As a result, the geoeconomic approach in the Arctic represents the analysis of a series of parameters that describe the great geopolitical potentialities of the region, while at the same time counterbalancing them with a set of realistic ecological parameters that measure the effective economic potentialities of such an environmentally unstable and ecologically fundamental region. In the geoeconomic approach, Arctic vulnerabilities are

⁵⁰⁷ Juha, Käpylä, and Harri Mikkola, "The Promise of the Geoeconomic Arctic: A Critical Analysis," *Asia Europe Journal* 14, no. 2 (2016): 203

⁵⁰⁸ Blackwill and Harris, *War by Other Means*, 24

⁵⁰⁹ *Idem*

⁵¹⁰ Käpylä and Mikkola, "The Promise of the Geoeconomic Arctic," 205

not considered as economic opportunities, but as environmental constrictions that need to be considered in the definition of the economic gain of an agreement.⁵¹¹

Therefore, in this perspective, climate change has to be considered a global concern, triggering environment instabilities planetarily, and, thus, affecting the framing of economic policies everywhere.⁵¹² Therefore, climate change is an environmental and economic variable, because it determines the degree of unpredictability of the future environmental condition of an area, impacting on the definition of economic and social targets of human development. In the Arctic case, being its effects on the region accelerated by its influence on the albedo feedback mechanisms, which is both a response and a driver of the deep change, it must be seen as an economic variable to be considered in the definition of the geoeconomic potential.⁵¹³

For this reason, in this perspective, Arctic sustainability can be described as the set of economic and environmental parameters that determine the geoeconomic potentiality of the region. Consequently, sustainable development can be considered the system of economic and environmental conditions that support an efficient but responsible human development.

⁵¹¹ Blackwill and Harris, *War by Other Means*, 218

⁵¹² *Ibidem*, 237

⁵¹³ *Idem*

4. THE ARCTIC DURING PRIME MINISTER TRUDEAU'S ADMINISTRATION

1. Introduction: A change in the Canadian Administration

Since November 4, 2015, a new Liberal government was appointed. The leader of the Liberal Party, Justin Trudeau was elected Prime Minister with a striking majority. The new liberal administration represented a great change for the Canadian society after nine years of Conservative government under the guide of Prime Minister Stephen Harper.⁵¹⁴

Since the early campaign, the remarkable difference between the two leaders and their political programs influenced profoundly the Canadians' decision. On the one hand, the liberal candidate was represented as young and charismatic, available to listen to the needs of his multicultural electorate.⁵¹⁵ On the other, the conservative leader Stephen Harper "had acquired an image of hard-heartedness, suspicion and cynicism,"⁵¹⁶ due to his campaign aimed at highlighting the potential inexperience of his adversary and the importance of the stabilization and maintenance of the status quo in the country.⁵¹⁷

More precisely, the new Prime Minister supported a 'different future' for Canada both domestically and internationally. In the former case, Prime Minister Trudeau prioritized social policies addressing major social dysfunctions and economic policies aiming at the country economic growth, diversification, and development. In this sense, among the main social objectives of the new liberal government, there is the achievement of the gender equality in the work field and the reconciliation with the Indigenous communities.⁵¹⁸ In terms of economic achievements, the most important is the creation of new jobs based on the great diversity that characterize the Canadian working class and the implementation of

⁵¹⁴ Barbara J. Messamore, "Justin Trudeau and Canada's 2015 Election," *The Round Table* 105:1 (2016): 82, DOI:10.1080/00358533.2015.1126958

⁵¹⁵ Idem

⁵¹⁶ Idem

⁵¹⁷ Idem

⁵¹⁸ Justin Trudeau, Prime Minister of Canada, "Prime Minister Justin Trudeau," accessed April 4, 2018, <https://pm.gc.ca/eng/prime-minister-justin-trudeau>

policies of sustainable and green growth aimed at addressing at a national level the phenomenon of climate change.⁵¹⁹

In the latter case, the new liberal government's foreign policy is centred in the re-definition of the international role of Canada.⁵²⁰ More specifically, Prime Minister Trudeau promised during the electoral campaign, he would have reshaped the relationship with the United States from both a military and a geopolitical perspective, for example, changing the patterns of energy resource exchange between the countries in order to achieve a more sustainable energy foreign policy.⁵²¹ Furthermore, he said that internationally he would have given Canada a leading role in the action against climate change, fostering research, setting targets on carbon emissions, and committing Canada to the attendance of the United Nation climate summit in Paris in 2015.⁵²²

In this section, I will analyze the consequences of the results of the 2015 Canadian elections on the Canadian Arctic domestic and foreign policies. I will begin by identifying the main differences in the policies and political objectives between Prime Minister Trudeau and Prime Minister Harper. Then, I will describe the main measures of Arctic domestic and foreign policies promoted by the new liberal Prime Minister. Finally, based on what discussed in the previous chapters, I will determine the degree of sustainability of these policies.

It must be highlighted that due to the recent election of Prime Minister Trudeau, the analysis of his administration's domestic and foreign policies might result limited, because it is grounded on the study of the first two years of his government (2015-2017). I chose to limit my analysis both in terms of timeframe considered and in the number of actors

⁵¹⁹ Ibidem

⁵²⁰ Rajini Vaidyanathan, "Canada election: Seven things Justin Trudeau believes in," *BBC News Toronto* (2015), available in <http://www.bbc.com/news/world-us-canada-34580420>

⁵²¹ Ibidem

⁵²² Ibidem

considered in order to tackle the determination of the degree of sustainability of the policies clearly and efficaciously. In particular, I centered the analysis of the liberal administration's foreign policies on the Canadian relationship with the United States during the last years of presidency of former President Obama (whose charge was taken by the conservative President Trump in January 2017) and the last years of the former presidency of President Putin (whose charge was reconfirmed last March 2018). I did not consider the international bilateral and multilateral connections of Canada with China, even though I recognize it is an actor whose importance in the Arctic context is increasing. Although China has been outlining policies "to develop shipping routes, expand its research programs, pursue environmental protection and develop resources across the Arctic,"⁵²³ the major objective of this country's Arctic policies remains ambiguous for the other 'Arctic States.'⁵²⁴

2. From Prime Minister Harper to Prime Minister Trudeau: similarities and differences of the 21st century Arctic policies

The election of Prime Minister Trudeau in 2015 changed Canada both domestically and internationally. In particular, the attention the new Prime Minister Trudeau has given to the protection of the planet and to the importance of the research about the phenomenon of climate change has represented a deep political and societal change of perspective.⁵²⁵ In fact, since his election, Prime Minister Trudeau said he has planned to commit Canada to carbon emissions targets and international multilateral conferences and agreements on the topic of climate change mitigation and potential adaptation.

⁵²³ CBC News, "What does China's new Arctic policy mean for Canada?," accessed April 18, 2018, <http://www.cbc.ca/news/canada/north/what-does-china-s-new-arctic-policy-mean-for-canada-1.4506754>

⁵²⁴ Ibidem

⁵²⁵ Justin Worland, "Why Justin Trudeau's Election is Good News for the Fight Against Climate Change," *Time* (2015), available in <http://time.com/4080073/canada-climate-change-justin-trudeau/>

His predecessor, Prime Minister Harper had a different vision on this topic. He believed that even though climate change was an ecological issue, it was not possible to address it without damaging the country economic growth and development.⁵²⁶ Accordingly, during his mandate, Prime Minister Harper prioritized the development of bilateral relationships and agreements for the definition and implementation of innovative economic measures, on the participation of multilateral agreements.⁵²⁷

For example, in 2011 Prime Minister Harper pulled out Canada from the Kyoto Protocol agreement, which implied a limitation in the greenhouse gases emissions and yearly targets of emissions reductions. He motivated this choice affirming that emissions reductions targets and limitations represented a threat to the industrial development of the country.⁵²⁸

Conversely, as soon as he was elected, Prime Minister Trudeau engaged Canada in the definition of responsible environmental policies addressing climate change as a prime cause of dysfunction. In fact, among the very first acts of his government, he disclosed at the swearing-in ceremony of Canada's new cabinet Ministry of Environment and Climate Change, which was Ministry of Environment during the government of the previous administration.⁵²⁹ Furthermore, he re-committed Canada to the international multilateral regime of environmental protection. Thus, at the end of 2015, Canada participated in the United Nation climate change-themed conference organized in Paris. According to Prime Minister Trudeau's declaration at the conference, "Canada [would have taken] on a new

⁵²⁶ Ibidem

⁵²⁷ Christopher, Dunn, and Canadian Electronic Library Distributor, *Harper without Jeers, Trudeau without Cheers: Assessing 10 Years of Intergovernmental Relations* (DesLibris, IRPP Insight 8 Documents Collection, 2016): 8

⁵²⁸ CBC News, "Canada pulls out of Kyoto Protocol," accessed April 5, 2018, www.cbc.ca/news/politics/canada-pulls-out-of-kyoto-protocol-1.999072

⁵²⁹ Joshua Ostroff, "Canada Now Has A Minister Of Climate Change," *The Huffington Post Canada* (2015), accessed April 18, 2018, https://www.huffingtonpost.ca/2015/11/04/canada-minister-of-climate-change-catherine-mckenna_n_8473828.html

leadership role internationally”⁵³⁰ on investments and research about climate change, both as a form of responsibility towards the planet and potentially as a new opportunity of economic development.⁵³¹

This deep difference of perspectives on the potential ecological impact of the effects of climate change on the Canadian environment and the importance of the participation of Canada in the international system is clearly visible in the field of the Canadian Arctic region regulation proposed by the two Prime Ministers. The North covers approximately the 40 percent of the national surface of Canada. As previously seen, it is a very vulnerable ecosystem, where the effects of climate change are opening both ecological challenges and economic opportunities at an increasing rate.

The main difference of vision between the two political leaders is made clear by interpretation of their Arctic policies. In particular, considering the two electoral campaigns, Prime Minister Harper considered the Arctic as a “government top priority,”⁵³² while Prime Minister Trudeau accentuated environmental protection and social welfare, envisioning the Arctic as a region where to implement social security measures and sustainable development strategies.

Furthermore, both the leaders recognize the fundamental role the region plays in the definition of the Canadian identity, thus, they consider a good administration of the region a fundamental pillar of their political program. However, Prime Minister Harper considers the historical importance of the region in the definition of the Canadian characters as a grounding notion for the legal meaning and rights of the establishment of a strong sovereignty on the region. In opposition, Prime Minister Trudeau sees the North as a region

⁵³⁰ CBC News, “Justin Trudeau tells Paris climate summit Canada ready to do more,” accessed April 5, 2018, www.cbc.ca/news/politics/trudeau-address-climate-change-paris-1.3343394

⁵³¹ Ibidem

⁵³² CBC News, “Trudeau ends Harper’s tradition of attending Arctic military exercise,” accessed April 6, 2018, www.cbc.ca/news/politics/trudeau-arctic-harper-military-1.3739413

inhabited by Indigenous and Inuit communities, which are the main heirs of ancient pre-colonial Canadian traditions.

According to Prime Minister Harper's administration, the Canadian Arctic was considered a pivotal region to be secured under the institutionalization of a strong sovereign power in the area. The definition of the Arctic strategy "Canada's Northern Strategy: Our North, Our Heritage, Our Future" represented the engagement of the Prime Minister Harper's administration in the implementation of infrastructural and military investments in the region, in order to strengthen the presence of the government and, consequently, its stewardship capacities.⁵³³

More specifically, Prime Minister Harper's vision of the Canadian Arctic was geopolitically oriented. Prime Minister Harper was an advocate of Polar geopolitics, recognizing the great economic potentialities, the national security challenges, and the increasing environmental instability of this region. Consequently, during his government he tried to empower the Canadian political and military presence and international legal capacities, to prevent ecological changes influencing the national interests in the North, such as in the case of the Northwest Passage sovereignty dispute with the United States.

For this reason, among the various initiatives he implemented in the region, the most important were related to the securitization of the Canadian sovereignty on the Northern territories, especially considering the economic opportunities the effects of climate change were opening and the threats to the territorial integrity they were causing. Accordingly, Prime Minister Harper considered climate change as a systemic dysfunction to be addressed through strict mechanisms of control and stewardship in order to preserve the status quo in terms of regional governance. Therefore, it can be said that his

⁵³³ Government of Canada, "Canada's Northern Strategy. Our North, our Heritage, our Future," accessed January 20, 2018, <http://www.northernstrategy.gc.ca/cns/cns-eng.asp>

administration's goals in the Arctic was reinforcing the Canadian position in the North, which means increasing the legal capacity of Canada to establish its jurisdiction on the region and obtaining an international recognition.

According to Prime Minister Trudeau, the Canadian Arctic is a pivotal region in terms of geoeconomic interests. In fact, the new liberal administration has recognized that the precedent conservative administration lacked an efficient social policy aimed at the improvement of the welfare state in the region and a sustainability-oriented policy.⁵³⁴ The Prime Minister Harper's administration privileged the development of the oil and gas sectors, refusing to effectively address the deep ecological changes in the region. Consequently, the conservatives preferred to focus their attention on their geopolitical interests over "the traditional activities of the North's aboriginal peoples."⁵³⁵

For this reason, the liberal victory has not changed the pivotal role of the Canadian Arctic in the determination of the grounding political pillars. Nevertheless, according to Prime Minister Trudeau, the liberal Arctic policies would shift from geopolitically-oriented interpretative paradigms to a more social justice and sustainable development-oriented paradigms.⁵³⁶ This shift is aimed at re-integrating Canada in a multilateral international system, recognizing the political and environmental challenges the North will face due to the effects of climate change.⁵³⁷

3. Trudeau and the Arctic: domestic policy and foreign policy

After his election, the new Liberal government seems to have changed the course of the Arctic Foreign Policy. It appears that Prime Minister Trudeau's government will be

⁵³⁴ CBC News, "North's Liberal vote a rebuke of Harper's Arctic Policy," accessed April 6, 2018, <http://www.cbc.ca/news/canada/north/opinion-sabin-arctic-policy-election-1.3280899>

⁵³⁵ Ibidem

⁵³⁶ Ibidem

⁵³⁷ The Arctic Institute, First Past the Pole: Harper, Trudeau, and Canada's Arctic Values," accessed April 7, 2018, <https://www.thearcticinstitute.org/first-past-the-pole-harper-trudeau/>

able to differentiate its Arctic policy from the “controversial legac[ies]”⁵³⁸ of the precedent Harper government, addressing Northern policies from a cultural diversity and social development perspective.⁵³⁹

Prime Minister Trudeau’s policy can be described as multilateral.⁵⁴⁰ In the Prime Minister’s view, the Arctic region is a fundamental component of the Canadian identity, thus, it should be both protected and developed.⁵⁴¹ According to Prime Minister Trudeau, establishing a strong and solid sovereignty power in the region is not a political priority in the liberal political agenda. Conversely, the Arctic represents the main tool for Canada to develop new international connections in order to work beyond borders to address potential international crisis related or caused by the impacts of the effects of climate change.⁵⁴²

Therefore, the orientation of foreign policies about “actions on issues pertinent to the Arctic,” will be implemented based on the cooperation between various stakeholder groups in Canada and potentially in other countries, considering the interests at stake at each occasion. For this reason, liberal Arctic policies are grounded on two main pillars. The first is “improving [life] conditions in its northern communities.”⁵⁴³ The second is reinforcing the Canadian international legal capacity in the development of an international framework of research on climate change.⁵⁴⁴

⁵³⁸ The Arctic Institute, “A new Canadian government...so what?,” accessed March 25, 2018, <https://www.thearcticinstitute.org/a-new-canadian-government-so-what/>

⁵³⁹ The Arctic Institute, “First Past the Pole: Harper, Trudeau, and Canada’s Arctic Values,” accessed March 26, 2018, <https://www.thearcticinstitute.org/first-past-the-pole-harper-trudeau/>

⁵⁴⁰ Ibidem

⁵⁴¹ Ibidem

⁵⁴² Ibidem

⁵⁴³ The Arctic Institute, “A new Canadian government...so what?,” accessed March 25, 2018, <https://www.thearcticinstitute.org/a-new-canadian-government-so-what/>

⁵⁴⁴ Ibidem

3.1 Domestic policy

Canada's main objective in the Arctic region is the identification of trends of sustainable development in order to improve the "Northerners' welfare."⁵⁴⁵ For this reason, the new liberal government has announced the redefinition of a new Arctic Policy Framework to be "co-developed in collaboration with Indigenous, territorial and provincial partners," to efficiently organize regional priorities for the coming years and identify the major federal activities to be implemented to secure the Canadian Arctic.⁵⁴⁶

In this sense, the government has invested in a series of activities aimed at the development of infrastructures for the amelioration of social life condition and for the increase of scientific knowledge and research about the Arctic ecological mechanisms and their functions. In this sense, Indigenous groups' representations and the Canadian administration have cooperated in order to build within the Arctic Framework a "sustainable Arctic economy."⁵⁴⁷ This Arctic economy is designed as based on principles of environmental and biodiversity conservation and on the support to the Indigenous residents in the region.

Therefore, the government is working with Indigenous representations to identify the major challenges for the future development of the region and the medium-term priorities for the new Arctic Policy Framework, in order to ameliorate the living conditions in the North and to develop a potential long-term efficient economic system for the residents.⁵⁴⁸ As a result, the government is focusing its Arctic policy on the creation of a social and

⁵⁴⁵ Anchorage Daily News, "What does Trudeau victory in Canadian election mean for the Arctic?," accessed March 28, 2018, <https://www.adn.com/arctic/article/blog-what-does-trudeau-win-mean-arctic/2015/10/26/>

⁵⁴⁶ Indigenous and Northern Affairs Canada, "Toward a new Arctic Policy Framework," accessed March 25, 2018, <https://www.aadnc-aandc.gc.ca/eng/1499951681722/1499951703370>

⁵⁴⁷ Ibidem

⁵⁴⁸ Ibidem

economic partnership with Indigenous groups to increment opportunities of cooperation within the regime of the new government-funded Arctic Framework.⁵⁴⁹

3.2 Foreign policy: The United States and Russia⁵⁵⁰

The Canadian government's position internationally can be described as aimed at obtaining a recognized leading role in the research and knowledge about climate change. More specifically, Prime Minister Trudeau has fostered the creation of a strong Arctic foreign policy based on the cooperation with the Arctic Council and the other 'Arctic states' maintaining the principles of sovereignty and security previously implemented by the Prime Minister Harper's administration. Prime Minister Trudeau has focused the liberal Arctic foreign policy on the definition of strong intergovernmental partnerships with two other 'Arctic states', the United States and Russia.

In particular, in the first case, between 2015 and 2017, thus during the last years of the presidency of former President Obama, Prime Minister Trudeau worked to build a cooperative relationship with the United States for the creation of an environmental regime for the Arctic and on the development of an efficient socio-economic collaborative system. For this reason, Prime Minister Trudeau and President Obama in December 2016

⁵⁴⁹ Indigenous and Northern Affairs Canada, "Toward a new Arctic Policy Framework," accessed March 25, 2018, <https://www.aadnc-aandc.gc.ca/eng/1499951681722/1499951703370>

⁵⁵⁰ I chose not to analyze the relationship with China because at the moment, the ambiguous character of these policies is making the liberal administration to develop bilateral policies aimed at keeping open window of dialogue with this country. Although the Chinese naval and economic activities in the region have great potentialities for the future, at the moment, China's strategies represent a question mark for Canada. Consequently, according to R. Huebert, Canada should consider the growing relationship with China a "double-edged sword," which implies that a purposely customized set of policies should be developed, aimed at fostering Canada's legal capacity and sovereignty power and at signing potentially fruitful economic bilateral agreements. CBC News, "What does China's new Arctic policy mean for Canada?," accessed April 18, 2018, <http://www.cbc.ca/news/canada/north/what-does-china-s-new-arctic-policy-mean-for-canada-1.4506754>

announced: “a new partnership to embrace opportunities and confront challenges in the changing Arctic.”⁵⁵¹

In this perspective, the Arctic represented for the two states a common area of interest and a common social and economic field of public investment. Thus, the main objective of the two political leaders was to create a strong North American “continental climate strategy,” discussing a bilateral collaboration on “cutting emissions through tighter fuel standards, green technology, and social innovations to spur climate-consciousness in daily decision-making.”⁵⁵²

More specifically, a major socio-economic issue is represented by energy provisions. In fact, fuel provision costs, and fuel prices were considered as “trans-border issue[s]” in both economic and environmental terms. In fact, on the one hand, both Alaskan and Canadian Indigenous people “pay nearly double the national average for [...] diesel fuel.”⁵⁵³ On the other hand, the intensive use of fossil fuels in the region by Indigenous and Alaskan communities increase the impact of greenhouse gases pollution affecting inevitably the ice melting process.⁵⁵⁴

Therefore, Prime Minister Trudeau and President Obama defined an agenda in which they set a series of meetings aimed at “bolster[ing] the knowledge-based economy of the North American Arctic by setting up green technology transfer and technical assistance programs between the US and Canadian Arctic.”⁵⁵⁵ Accordingly, the two leaders and their administrations believed that the creation of a cooperative plan of investments to provide

⁵⁵¹ Justin Trudeau, Prime Minister of Canada, “News – United States-Canada Joint Arctic Leaders’ Statement,” accessed April 2, 2018, <https://pm.gc.ca/eng/news/2016/12/20/united-states-canada-joint-arctic-leaders-statement>

⁵⁵² The Arctic Institute, “Cue Cards for Trudeau: Bringing Arctic Cooperation to DC, Part I,” accessed March 26, 2018, <https://www.thearcticinstitute.org/cue-cards-for-trudeau-bringing-arctic-cooperation-to-dc-part-i/>

⁵⁵³ Ibidem

⁵⁵⁴ Ibidem

⁵⁵⁵ Ibidem

Arctic North American communities affordable greener energy supply would enable the communities to implement a system of economic growth and diversification, consequently, ameliorating life conditions and expectancies of the Arctic people.

Furthermore, the two leaders agreed that the amelioration of the technological infrastructure required for a greater and greener energy supply could foster the economic importance of this field, enhancing the intergovernmental partnership and increase the investments in the field. Thus, this intergovernmental collaboration could have resulted in a potential North American tool for the development of continental research on climate change and potential strategy of adaptation to this phenomenon.⁵⁵⁶

The major achievement of this Canada-United States cooperation for the Arctic was the signature of the “United States-Canada Joint Arctic Leaders’ Statement,” committing their administration to a more environmentally responsible Arctic policy and banning offshore oil and gas activities in the region.⁵⁵⁷ This bilateral agreement was aimed at limiting shipping activities and preventing environmental disasters due to offshore drilling in such a fragile ecosystem.⁵⁵⁸

In the second case, the relationship between Canada and Russia is deeply influenced by international dynamics and events. Contrary to the United States, Russia is still seen as a competitor in the region. Thus, among the prime objective of Arctic foreign policy, the

⁵⁵⁶ The Arctic Institute, “Cue Cards for Trudeau: Bringing Arctic Cooperation to DC, Part II,” accessed March 26, 2018, <https://www.thearcticinstitute.org/cue-cards-for-trudeau-bringing-arctic-cooperation-to-dc-part-ii/>

⁵⁵⁷ CBC News, “Trudeau announces review of Arctic strategic ban with U.S.,” accessed April 2, 2018, www.cbc.ca/news/politics/trudeau-obama-arctic-1.3905933

⁵⁵⁸ It must be highlighted that at the end of the liberal presidency of President Obama, the election of the conservative President Trump changed the predecessor’s environmental legacy. In fact, in the first year of government, President Trump prioritized energy policies on environmental ones. Thus, at the end of April 2017, he signed an executive order aimed at expanding off shore drilling areas in the Alaskan Arctic waters in order to achieve a global leading position in the energy market and “the American energy independence.” CBC News, “Trump signs order to expand drilling in Arctic, Atlantic oceans,” accessed April 18, 2018, <http://www.cbc.ca/news/canada/north/trump-expands-drilling-arctic-atlantic-ocean-1.4090163>

establishment of an internationally recognized sovereignty remains a fundamental objective of the liberal administration.

More specifically, even though both the states recognize the importance of the institutionalization of a cooperative connection to address issues related and caused by the effects of climate change in the region, this one is still very difficult to achieve in a bilateral form due to political frictions. Accordingly, the two countries share interests and economic ambitions in the region, due to the presence of hydrocarbons and oil. However, the deep differences in terms of the political and economic conduct of the two states in the region make the identification of trends of bilateral agreement more difficult to achieve.⁵⁵⁹

Furthermore, the increasing importance of the Russian military power and capacities in the region represent an even greater obstacle for the development of peaceful and collaborative bilateral relations with Canada and the other 'Arctic states.' Accordingly, President Putin has described the Arctic as a critical zone for the achievement of Russia's international interests. In fact, the Arctic represents the shortest itinerary to connect the European, American and Asian continents, which means that this region is considered as an essential shipping route for the future of international globalized commerce.⁵⁶⁰ Therefore, in the Russian President's view, establishing a strong sovereign position in the North implies also a guarantee for Russia's future economic gain.

Consequently, at the moment, Canada-Russia relations are determined in the regime of the Arctic Council, which represents a potential table of negotiations for questions regarding sovereignty and security. However, the Canadian administration is trying to strategically build a system of bilateral alliances through the regime of environmental

⁵⁵⁹ The McGill International Review, "The Northern Sea Route and Trudeau's Russia Problem," accessed April 2, 2018, <https://www.mironline.ca/northern-sea-route-trudeaus-russia-problem/>

⁵⁶⁰ Ibidem

protection, trying to build a series of regulating agreements within the Arctic Council in order to influence the Russian capacities in the region.⁵⁶¹

In this case, an example of the difficulty in building stable and peaceful relations between Canada and Russia is represented by the dispute over the North Pole. Both the countries recently addressed this dispute from a very confrontational perspective, claiming the right of sovereignty on the area due to geographical notions.⁵⁶² However, nothing has been decided on this topic yet.

4. Is Trudeau's Arctic policy sustainable?

Determining the degree of sustainability of the Arctic policy of the current liberal administration means understanding if the economic and social measures of domestic policy will build an efficacious system of human development in the region. In fact, as previously seen, considering the potential environmental dysfunction and unpredictable changes that may occur in the future due to the impact of the effects of climate change, sustainability in the Arctic is represented as the set of economic and environmental parameters that determine the geoeconomic potentiality of the region.

Furthermore, it implies also establishing the degree of sustainability of the Prime Minister Trudeau's Arctic foreign policy, which means analyzing the geoeconomic potentiality of the intergovernmental multilateral agreements that the new administration is fostering. In fact, as previously described, considering the international dynamics entangled with the main ecological changes in the region implies addressing questions of human security, in terms of adaptive capacity and developmental efficiency.

For this reason, I will consider at which level climate change is seen as a social and economic variable in order to understand how these ones contribute to the sustainable

⁵⁶¹ Ibidem

⁵⁶² CBC News, "Russian embassy calls Trudeau's criticism of Putin 'confrontational'," accessed April 2, 2018, www.cbc.ca/news/politics/russia-trudeau-putin-1.4588640

development of the region. Thus, if the liberal domestic and international policies strengthen the state power while adapting efficiently to the increasing effects of climate change, then they will be considered sustainable.

4.1 Domestic Policy

Domestically, the main objective of the liberal Arctic policy seems to be an improvement of the aboriginal residents' living conditions, building an efficient system of the welfare state in order to increase the social and economic adaptive capacity of the region. In fact, differently, from before, Prime Minister Trudeau's administration has recognized the high vulnerability of the Arctic ecosystem. Therefore, they are trying to foresee the potential ecological challenges of the region by implementing a series of cooperative mechanisms of policy making that involve members of the Indigenous communities. The aim is to define strategies for investments and an infrastructural boost to increase the efficiency of the mechanisms of human development, making them potentially resilient to the effects of climate change.

In addition, Prime Minister Trudeau's administration is also fostering the creation of programs of biodiversity conservation and environmental protection, recognizing the fragility of the ecological balance of the region. The main goal is to develop strategies for economic development as much ecologically-oriented as possible.

Therefore, according to Prime Minister Trudeau's initiatives, it can be said that the liberal domestic Arctic policy is distancing from the traditional realist Polar geopolitics. Accordingly, the Arctic is seen as a vulnerable region to be secured from both an ecological and economic perspective, in order to implement measures of human development that do not contribute to increasing the effects of climate change in the ecosystem.

Prime Minister Trudeau seems to be focusing his Arctic domestic policy on the notion of economic security, which means that he is considering climate change as the prime cause

of vulnerability of the Canadian North. Due to climate change, the social organization in the region is deeply impacted, thus, the investment capacity and economic efficiency of the social groups require an external support to become effective. In this sense, Prime Minister Trudeau is fostering measures of support to these communities, in order to activate their economic productivity and consequent capacity of management of the environment where they live.

Moreover, it must be highlighted that the liberal administration is tackling human security in the Arctic in a responsible way, trying to provide not only economic support to the Indigenous and Inuit societies the economic infrastructure they require, but also adaptive means. In fact, fostering programs of research about environmental changes, biodiversity conservation, and ecological dysfunctions caused by climate change represent a potentially efficacious way to provide these emergent economic systems with means of adaptation, making them as much resilient as possible to the effects of climate change.

For this reason, I think that the liberal domestic Arctic policy is quite sustainable. Enhancing the creation of a system of economic infrastructures and investments to respond to the needs of the Indigenous societies and fostering research about the potential ecological phenomena that might affect the positive outcome of these policies represent an efficient plan of geoeconomic sustainable development of the region. In fact, applying these policies the liberal administration is addressing the geoeconomic potential of the region through the governmental support to the social and economic development of Indigenous communities and the recognition of the pivotal role the environment plays in the determination of the positive outcome of these policies.

However, I believe that it is too early to effectively evaluate the outcome of these policies, being the Arctic Framework still in progress. I think that this plan should in the long term increase the research about the environmental conditions that influence the social

development, is the impact of the effects of climate change exponentially increasing in the long term because of its entanglement with the albedo effects mechanism.

Furthermore, I think that in the long term the geoeconomic potential of the region will probably mutate, due to the changing in the environmental conditions of the region. Therefore, I think that the governmental mechanisms of economic and social support should become more flexible, which means adaptable to the different social needs produced by the effects of climate change on the ecosystem. In this way, the degree of resilience of the human development and the degree of vulnerability of the ecosystem will be as much balanced as possible.

4.2 Foreign Policy

Internationally, the liberal administration focused its attention of the redefinition of the role of Canada after the conservative administration of Prime Minister Harper established a confrontational foreign policy aimed at establishing a strong international image of ‘unchallengeable sovereignty’. Prime Minister Trudeau oriented his Arctic foreign policy towards the establishment of bilateral agreements with the United States and Russia and towards the redefinition of the Canadian global representation.

Accordingly, immediately after being elected, Prime Minister Trudeau represented Canada at the United Nation conference on climate change in Paris. Then, he set a series of intergovernmental meetings with the President of the United States Obama for the definition of a cooperative Arctic policy, and he reconsidered the position of Canada in the Arctic Council, in order to potentially open a dialogue with Russia’s President Putin.

In this case, determining the degree of sustainability of the liberal Arctic foreign policy means identifying the geoeconomic potential of each action of the foreign policy initiated by Prime Minister Trudeau’s administration. More precisely, although in this perspective

climate change is seen as a global phenomenon, Canada's Arctic foreign policy is still aimed at the institution of a potential geopolitical and economic gain for the country.

In this perspective, it must be highlighted that Prime Minister Trudeau's administration has not rephrased the notion of Canadian Arctic sovereignty. Canada's sovereign power on the North is still defined as as the earlier conservative administration institutionalized it, thus, the right of accessibility to the local resources grounded on the historical heritage of the pre-colonial era and the responsibility of the security of the region. Consequently, in the liberal Arctic foreign policy, the establishment of a recognized sovereignty did not represent the main declared goal. In fact, Prime Minister Trudeau did not state the establishment of sovereignty as an objective of foreign policy, but he included the international recognition of the Canadian sovereign power in the North as an implicit condition for the implementation of the new liberal Arctic environmental regime.

In the first case, the participation of Canada to the United Nation conference on climate change in Paris in 2015 has signified the major change of perspective for Canada. After the conservative years in which climate change used to be seen as a potential economic opportunity for the country internal development, during the conference Prime Minister Trudeau recognized internationally the importance of a cooperative and targeted solution. In particular, from an 'Arctic state' perspective, Prime Minister Trudeau recognized the importance of programs of research about climate change to find targeted adaptive and potentially mitigating solutions, acknowledging the importance of the Arctic ecosystem for the stability of the ecological balance of the planet.⁵⁶³

In this case, the degree of sustainability of the Canadian Arctic foreign policy is improving compared to the previous conservative policies. In fact, the engagement of

⁵⁶³ Prime Minister Trudeau, Prime Minister of Canada, "Déclaration nationale du Canada à la COP21," accessed April 9, 2018, <https://pm.gc.ca/eng/news/2015/11/30/canadas-national-statement-cop21>

Canada in an international system of conferences and agreements about monitoring and researching climate change represents, as already said, a shift in the grounding principles of Canadian Arctic foreign policy. Nevertheless, as declared at the conference by Prime Minister Trudeau, this involvement of Canada is meant to foster the economy of the country, in order to provide a greener development for the country.⁵⁶⁴ Thus, investments and research are economic-motivated, not ecologically-oriented.

More specifically, in his speech at the conference, Prime Minister Trudeau highlighted the importance of acknowledging climate change as a global phenomenon influencing human development planetarily, but he did not mention what Canada would have done to effectively tackle climate change adaptation.⁵⁶⁵ Prime Minister Trudeau centred his speech on the importance of informing policy options “by the best economic and scientific evidence,”⁵⁶⁶ which, for me, implies that he would have made the economic development of Canada oriented towards mitigating the effects of climate change, not necessarily towards adapting to them.

Furthermore, Prime Minister Trudeau did not reference directly the Arctic region. He recognized the importance of implementing social welfare measures and economic means for human development to the Canadian Indigenous communities, but he did not internationally engage in the implementation of adaptive policies in the region. Therefore, the degree of sustainability of this part of the Arctic policies is deficient.

In the second case, the liberal administration objective of creating strong bilateral agreements with other ‘Arctic states’ is a second great shift in the Canadian Arctic foreign policy. In fact, Prime Minister Trudeau’s administration seems to have put the

⁵⁶⁴ Prime Minister Trudeau, Prime Minister of Canada, “Déclaration nationale du Canada à la COP21,” accessed April 9, 2018, <https://pm.gc.ca/eng/news/2015/11/30/canadas-national-statement-cop21>

⁵⁶⁵ Ibidem

⁵⁶⁶ Ibidem

establishment of a recognized sovereignty as a second order goal, recognizing that without a targeted action for the safeguard and protection of the Arctic ecosystem, no sovereignty claim would be possible.

In the case of the relationship with the United States, the recognition of the importance of a peaceful and cooperative connection is seen as pivotal for the safeguard of the Arctic ecosystem and the interests of both the states in the Arctic region. At the same time, the creation of a mechanism of indirect contact with Russia must be considered as a form of reciprocal form of control to prevent the interests of the states to be threatened by the other and as a guarantee of the reciprocal recognition of territorial sovereignty and geopolitical importance in the region.

Although the type of relationship that the liberal administration is trying to build with the United States and Russia is very different, the Arctic foreign policy strategy applied is the same. Even though Prime Minister Trudeau is taking some distances from the traditional Polar geopolitics methods and goals, Canadian sovereignty and access to the Arctic resources have not been re-discussed by the liberal administration.

Conversely, Prime Minister Trudeau has recognized the importance of the development of efficient bilateral relationships with influential partners in the region in order to see the Canadian sovereignty rights recognized implicitly. Therefore, Prime Minister Trudeau's Arctic foreign policy is oriented toward the creation of a collaborative political and economic arena in which Canada's role is essential for the maintenance of an international order. In this term, the development of an agreed intergovernmental environmental regime is the tool of the liberal Arctic foreign policy.

In this case, the degree of sustainability of the Canadian Arctic foreign policy has slightly improved from the previous conservative policy. In fact, even though the liberal administration is fostering the creation of an international environmental regime for the

safeguard of the Arctic ecosystem, the goals of territorial sovereignty, resource access, and interests' security are still national priorities.

For example, the "United States-Canada Joint Arctic Leaders' Statement" can be seen from two different angles. On the one hand, it can be said that it was agreed based on the willingness of the leaders to prevent an environmental irreversible disaster in the region limiting shipping activities and offshore drilling. On the other hand, it can also be seen as a limitation in the potential economic and commercial activities in the ice-free Northwest Passage. In fact, among the various committees of the bilateral agreement, the two leaders decided to "build a sustainable Arctic economy basing policy decisions about commercial activities in the Arctic on scientific evidence, [...] The two countries will work together on establishing low impact shipping corridors."⁵⁶⁷ Thus, the Canadian sovereignty on the Northwest Passage will not be discussed, but it will be internationally recognized based on the country's responsibility to protect the environment.

As a result, in the case of the Canadian Arctic foreign policy, it can be said that the geoeconomic potentiality of the region is dependent on the environmental condition of the region, not on climate change. The main political and economic objectives of the liberal administration have not completely changed. As mentioned, Prime Minister Trudeau has changed the methods to achieve his objectives, committing Canada to intergovernmental multilateral agreements and goals of regional development, but his policies are not identifiable as sustainable yet.

In fact, even though some steps have been made towards the recognition of the essential role that the Arctic ecosystem plays in the definition of the planetary balance and its

⁵⁶⁷ Jerald Sabin, "PM Trudeau and President Obama Release Joint Statement on Arctic," *Northern Public Affairs* (2016), accessed April 9, 2018, <http://www.northernpublicaffairs.ca/index/pm-trudeau-and-president-obama-release-joint-statement-on-arctic/>

vulnerability to the effects of climate change, it seems to me that the grounding principles of the Canadian Arctic policy have not completely shifted.

In this sense, I think that the degree of sustainability of the liberal Arctic foreign policy could improve progressively through a shift from a realist geopolitics orientation to a sustainable development orientation, which implies a change from geopolitical aims to geoeconomic goals. For example, I think that an amelioration of the Arctic foreign policy could be the inclusion in the international Arctic environmental regime of measures of economic adaptation towards the unpredictable environmental and climatic changes to foster the protection of the regional biodiversity and the consequent survival of life in the region.

Conclusions

In this work I chose to analyze the environmental and climatic situation of the Canadian Arctic and the geopolitical response of the last 20 years. I began from analyzing the Arctic region from both an ecological and a geopolitical perspective, in order to obtain a deeper understanding of this context. Then, through the theories of sustainability science and geoeconomics, I identified a model of sustainable development customized for the Arctic, in order to understand the main trend of investments that will lead to a sustainable future for the region. Finally, I analyzed the latest Arctic domestic and foreign policies promoted by the liberal administration elected in November 2015.

In the first chapter, I described climate change as the prime trigger of the regional qualitative climatic alterations happening in the region. Using the theory of ecology first and the theory of planetary tipping points secondly, I identified the systemic mechanisms that are more affected by climate change.

In the first case, I considered the Arctic as an ecosystem, whose regional specificities characterize its ecological balance, which means the environmental equilibrium necessary for the development of life. More specifically, according to this vision, two fundamental mechanisms characterize the Arctic, the sea-ice seasonal formation and the albedo feedback mechanism. On the one hand, the sea-ice is the variable that determines the sensitivity of the ecosystem to the effects of climate change. In fact, the sea ice seasonally alternates processes of ice melting and ice forming, depending on the weather conditions. On the other hand, the degree of reflectivity of the albedo feedback mechanism depends on the sea-ice thickness. The more the sea-ice is thick, the higher is its reflectivity, thus, the less it melts. In fact, the degree of reflectivity of the albedo feedback mechanism influence directly the seasonal melting-forming alternation.

Changing the degree of reflectivity of the sea ice surface means producing a perturbation in the ecological balance of the ecosystem.

In the second case, I considered the Arctic as a unity in a system of balanced ecosystems, which entangled determine a planetary a living biosphere. In this perspective, the Arctic ecosystem represents a fundamental ‘planetary apparatus’ responsible of the ecological equilibrium of the biosphere. According to this vision, changing the mechanisms of interrelation among the ecosystems or their internal systemic balance means producing an irreversible change affecting directly the biosphere, producing a tipping point. A tipping point is a critical climate threshold, which means a systemic perturbation producing non-linear dysfunctions in the ecosystem balance.

According to this vision, the Arctic ecosystem must be seen as a planetary tipping point because of its importance in the definition of the planetary climate system. In fact, the extreme temperatures range and weather conditions that characterize the region are the drivers of wind currencies from the poles to the tropics and vice versa.

However, according to this model, the Arctic is potentially reaching an irreversible tipping point, due to the impacts of the effect of climate change on the internal structure of the ecosystem. More specifically, climate change influences the ecological seasonal cycle of sea ice melting-formation altering the systemic weather patterns and, consequently, modifying the degree of reflectivity of the sea-ice.

In the second chapter I analyzed the geopolitical situation of the Arctic region. In this chapter, climate change is seen as the ecological phenomenon that opens new economic opportunities internationally. The objective of this chapter was demonstrating that considering the geographical position and the great availability of resources in the region, the influence of the effects of climate change on the sea ice is shaping geopolitical strategies and governments capacities of accessing the region.

I used the theory of Polar geopolitics, a framework grounded on the notion of traditional realist geopolitics aimed at pinning down claims of sovereignty and security. In fact, since the late 1980s, technological developments and greater military and infrastructural investments have increased the international legal capacities of some of the 'Arctic States', making the Arctic as a vast reserve of natural resources. For this reason, the Arctic has become a contended land, in which rising security issues and potential economic gains have caused an intensification of the interests in the region internationally.

Polar geopolitics is based on two main pillars, Arctic sovereignty and Arctic security. In the former case, Arctic sovereignty is described as the tool that guarantees the access to the energy and natural resources in the region. Thus, it is the foundation of the Arctic policies states develop in order to reach their interests in the region. In the latter, Arctic security is defined as the driver of the Arctic policies implementation. Thus, it is the underpinning of the implementation of military measures for the preservation of the state territorial integrity and social stability.

According to this theory, Canada is a pivotal actor in the Arctic context. It represents the second largest country bordering the Arctic circle (the first one is Russia), since the North covers about the 40 percent of the Canadian national territory. In the Canadian case, Arctic sovereignty is described as the historical heritage of the country, to be enclosed in definitive and undisputable borders due to the importance of the North for the definition of the Canadian identity and for the Canadian social and economic development. In the same context, Arctic security is labelled as the series of potential threats to the Canadian territory both in geopolitical and environmental terms.

As a result, the major threat for the Canadian sovereignty and security is represented by the increasing international interests in the Arctic. From this perspective, climate change

is seen as a prime trigger of the Arctic potential development. In fact, according to some scientists, the possibility of a seasonal ice-free Arctic is a possibility for the future.

Consequently, Canadian Arctic Polar policies have been twofold. On the one hand, policies focused since the late 1980s on the securitization of the Arctic environment through bilateral and multilateral agreements assuring Canada the responsibility of the protection of the Northern ecosystem. On the other hand, policies are aimed at fostering the creation of a regional system of alliances that will assure Canada a prominent and essential role internationally recognized.

However, considering the increasing degree of influence and unpredictability of the effects of climate change in the region, it seems to me difficult to evaluate the Canadian Polar geopolitics strategies as efficacious. I believe that the lack of the inclusion of a strong ecological consciousness of the potential dangers of a deep ecological modification of the region at a planetary level makes Polar geopolitics a limited analytical framework. Accordingly, I believe that Polar geopolitics' analytical tools are not flexible enough to adapt to the pace at which geographical and systemic changes occur.

More specifically, I think that limiting the analysis of the Arctic ecosystem to questions of sovereignty power, resource accessibility, and national security does not provide a complete vision of the complexity and dynamism of this region. In fact, in the Polar geopolitics perspective, environmental policies are seen as tools to achieve sovereignty increasing the national legal capacity or means to implement security measures through territorial stewardship. Nevertheless, in this perspective the state is not considered responsible or accountable for the survival of the ecosystem and its internal balance mechanisms.

For this reason, in the third chapter I proposed a new set of tools based on the theory of sustainability science and geoeconomics. My aim was demonstrating that integrating

notions of sustainability science to the field of Arctic policymaking would have produced a more efficient set of national economic and social development policies.

In fact, I recognize that Polar geopolitics traditional analytical tools do not provide a complete representation of the Arctic, not considering the region's ecological dynamicity and complexity. Nevertheless, I think that considering the Arctic region only as a potential planetary tipping point is also a limiting analytical framework. In fact, it seems to me unrealistic not to consider the developmental and economic potentialities of region due to its physical composition and geographical location. I believe the two fields should be seen a complementary, like two sides of the same coin. Consequently, in the third chapter I presented a set of analytical tools aimed at the identification of common elements between the two frameworks to be integrated obtain a complete vision of the region's systemic mechanisms and of the congruent economic and developmental investments that will produce fruitful results with a low level of harm to the ecosystem.

Therefore, at first I analyzed the concept of sustainability. I defined sustainability as a multidisciplinary concept addressing the intersection between human development and systemic ecological needs of a region. Then, I connected it with the notion of geoeconomics, a recently developed theoretical framework aiming at rephrasing the traditional neorealist geopolitics in terms of economic strategies. Geoeconomics is an analytical framework developed to reach a deep understanding of the main geopolitical interests of a state and to evaluate their potential economic gain.

More specifically, to determine the ecological needs and trend of sustainability of the Arctic region I used the sustainability science theory. According to sustainability science, an ecosystem is characterized by a certain degree of adaptive capacity, which means the capacity of the ecosystem to absorb external changes maintaining its ecological

balance in equilibrium. An ecosystem with a high degree of adaptive capacity is said to be resilient. An ecosystem with a low degree of adaptive capacity is said to be vulnerable.

The Arctic is a vulnerable ecosystem, in which human development and climate change are two entangled phenomena that have caused systemic dysfunctions. Considering the Arctic to be vulnerable is fundamental to identify the main trends of sustainability that should characterize the future development of the region. Climate change is considered the prime cause of the human-environment systemic dynamic. In fact, impacting directly on the systemic ecological balance of the region, climate change is shaping human development in terms of social and economic growth. Human development is the series of human activity mechanisms aimed at providing the human species with security, which means the series of ecological and anthropogenic conditions for a group to pursue its ends.

For this reason, I concluded the chapter defining Arctic sustainability as the set of economic and environmental parameters that determine the geoeconomic potentiality of the region, which means provide human development with the economic means for its growth and the ecological conditions for its social expansion. As a demonstration, I presented a case study in the fourth chapter. I analyzed the recent Arctic policy of the liberal administration under Prime Minister Trudeau.

My evaluation of Prime Minister Trudeau's administration Arctic domestic and foreign policies showed that applying the notion of geoeconomic potentiality and considering climate change an economic parameter I analyzed the degree of sustainability of these policies. Thus, I concluded that at the moment, the domestic Arctic policy must be considered quite sustainable, however, the Arctic foreign policy degree of sustainability should be improved in the future.

I recognized two main limitations in my research. First, I did not tackle in this thesis the issues related to the Indigenous and Inuit people living in the Canadian Arctic and their

rights. Second, I focused my case study strictly on the Prime Minister Trudeau's administration Arctic policies, even though I recognized that Canadian energy policies might not be as sustainability oriented as the Arctic ones. Thus, being the Arctic about the 40 percent of the Canadian territory, energy policies might still be oriented at reaching the resources and hydrocarbons available in the region. In fact, following nine years of conservative administration, whose energy policies were oriented at the Canadian energy independence and potentially leading role in the energy resources exportation market, re-orienting these policies towards a more sustainable paradigm will take longer than the first two years of mandate for the new liberal administration. Nevertheless, I believe my research gave a contribution in the field of sustainability studies and Arctic research.

I believe that aiming at sustainability should represent the goal of the field of policy making in the Anthropocene. I think that the main strength of this research is the attention on both the ecological framework and the geopolitical framework to identify the trends of human development to foster and the ones to avoid. I chose the Arctic context because I see it as one of the most endangered region of the planet.

Furthermore, I found intriguing the twofold character of this region. Even though according to the theory of tipping points the Arctic is a fundamental component of the ecological balance of the planet, which means that its instability will have consequences all over the world, it is also a region rich in energy and natural resources, thus, at the center of great economic and geopolitical strategies internationally. As a result, it is unrealistic to think about avoiding human development in the region, but it is also dangerous for the survival of the planet thinking about developing it without considering the systemic mechanisms that regulates the ecological balance of the ecosystem.

I think the integration of the theory of sustainability science and geoeconomics to obtain a 'customized' definition of sustainability represents a potential 'springboard' for

my future studies. I believe that deepening the definition of geoeconomic potentiality for the achievement of sustainability will represent a good starting point for the effective development of sustainability-based policies in the Arctic. The ecological and geopolitical exceptionalities of this region have accompanied me in my last year of research and hopefully will in the future.

BIBLIOGRAPHY

- Agarwal, S., and W. Moon, and J. S. Wettlaufer. "Decadal to Seasonal Variability of Arctic Sea Ice Albedo," *Geophysical Research Letters* 38, no. 20 (2011)
- Anchorage Daily News. "What does Trudeau victory in Canadian election mean for the Arctic?." Accessed March 28, 2018. <https://www.adn.com/arctic/article/blog-what-does-trudeau-win-mean-arctic/2015/10/26/>
- Anisimov, Oleg, and Blair Fitzharris. *Polar Regions*. Available in Bates, Bryson, and Zbigniew Kundzewicz, J. P. Palautikof, Shaohong Wu. *Climate Change and Water. Technical Paper of the Intergovernmental Panel on Climate Change*. Geneva: Intergovernmental Panel on Climate Change Secretariat, 2008
- Arctic Council. "Canada." Accessed January 15, 2018. <https://www.arctic-council.org/index.php/en/about-us>
- Arctic Council. *Arctic Resilience Interim Report 2013*. Stockholm: Stockholm Environment Institute and Stockholm Resilience Centre, 2013
- B.L Turner. "Vulnerability and resilience: Coalescing or paralleling approaches for sustainability science?." *Global Environmental Changes* 20 (2010): 570-576
- Barnett, Jon, and Simon Lambert, Ian Fry. "The Hazards of Indicators: Insights from the Environmental Vulnerability Index." *Annals of the Association of American Geographers* 98, no. 1 (2008): 102-119. Available in <http://www.jstor.org/stable/25515101>
- Barnett, Jon, Simon Lambert, and Ian Fry. "The Hazards of Indicators: Insights from the Environmental Vulnerability Index." *Annals of the Association of American Geographers* 98, no. 1 (2008): 102-19. <http://www.jstor.org/stable/25515101>
- Bates, Bryson, and Zbigniew Kundzewicz, J. P. Palautikof, Shaohong Wu. *Climate Change and Water. Technical Paper of the Intergovernmental Panel on Climate Change*. Geneva: Intergovernmental Panel on Climate Change Secretariat, 2008
- Becker, Per. *Sustainability Science. Managing Risks and Resilience for Sustainable Development*. Waltham: Elsevier, 2014
- Bell, Simon, and Stephen, Morse. *Sustainability Indicators. Measuring the Immeasurable?* New York: Earthscan, 2008
- Bert J. M. de Vries. *Sustainability Science*. New York: Cambridge University Press, 2013
- Blackwill, Robert D. and Jennifer M. Harris. *War by other means, geoeconomics and statecraft*. Cambridge: The Belknap Press of Harvard University Press, 2016
- Blew, Roger D. "On the Definition of Ecosystem." *Bulletin of the Ecological Society of America* 77, no. 3 (1996): 171-173
- Boid, Emily. "Exploring adaptive governance for managing tipping points." Available in Tim, Lenton, and Tim, O'Riordan. *Addressing Tipping Points for a Precarious Future*. Oxford: Oxford University Press, 2013

- Borgerson, Scott G. "Arctic Meltdown - The Economic and Security Implications of Global Warming." *Foreign Affairs* 87, no. 2 (2008): 63-64
- Broadhead, Lee-Anne. "Canadian Sovereignty versus Northern Security." *International Journal* 65, no. 4 (2010): 913-930
- Brooks, David J. "What Is Security: Definition through Knowledge Categorization." *Security Journal* 23, no. 3 (2009): 225-239
- Brosnan, Ian G., and Thomas M. Leschine, and Edward L. Miles. "Cooperation or Conflict in a Changing Arctic?." *Ocean Development & International Law* 42, no. 1-2 (2011): 173-210
- Brutschin, Elina, and Samuel R. Schubert. "Icy Waters, Hot Tempers, and High Stakes: Geopolitics and Geoeconomics of the Arctic." *Energy Research & Social Science* 16 (2016): 147-159
- Bruun, Johanne M., and Ingrid A., Medby. "Theorising the Thaw: Geopolitics in a Changing Arctic." *Geography Compass* 8, no. 12 (2014): 915-929
- Byers, Michael, and Canadian Electronic Library. *Who Owns the Arctic? Understanding Sovereignty Disputes in the North*. Vancouver: Douglas & McIntyre
- Cai, Yongyang, and Timothy M. Lenton, Thomas S. Lontzek. "Risk of multiple interacting tipping points should encourage rapid CO2 emission reduction." *Nature* vol 6 (2016): 61. doi:10.1038/nclimate2964
- Canada's Northern Strategy. "Canada's Northern Strategy." Accessed February 12, 2018. <http://www.northernstrategy.gc.ca/index-eng.asp>
- Canadian Northern Economic development. "About the North." Accessed February 16, 2018. <http://www.cannor.gc.ca/eng/1368816431440/1368816444319>
- Caradonna, Jeremy L. *Sustainability. A History*. Oxford: Oxford University Press, 2014
- CBC News, "Trump signs order to expand drilling in Arctic, Atlantic oceans," accessed April 18, 2018, <http://www.cbc.ca/news/canada/north/trump-expands-drilling-arctic-atlantic-ocean-1.4090163>
- CBC News. "Canada pulls out of Kyoto Protocol." Accessed April 5, 2018. www.cbc.ca/news/politics/canada-pulls-out-of-kyoto-protocol-1.999072
- CBC News. "Justin Trudeau tells Paris climate summit Canada ready to do more." Accessed April 5, 2018. www.cbc.ca/news/politics/trudeau-address-climate-change-paris-1.3343394
- CBC News. "North's Liberal vote a rebuke of Harper's Arctic Policy." Accessed April 6, 2018. <http://www.cbc.ca/news/canada/north/opinion-sabin-arctic-policy-election-1.3280899>
- CBC News. "Russian embassy calls Trudeau's criticism of Putin 'confrontational'." Accessed April 2, 2018. www.cbc.ca/news/politics/russia-trudeau-putin-1.4588640

CBC News. "Trudeau announces review of Arctic strategic ban with U.S." Accessed April 2, 2018. www.cbc.ca/news/politics/trudeau-obama-arctic-1.3905933

CBC News. "Trudeau ends Harper's tradition of attending Arctic military exercise." Accessed April 6, 2018. www.cbc.ca/news/politics/trudeau-arctic-harper-military-1.3739413

CBC News. "What does China's new Arctic policy mean for Canada?." Accessed April 18, 2018. <http://www.cbc.ca/news/canada/north/what-does-china-s-new-arctic-policy-mean-for-canada-1.4506754>

Charles K., Ebinger, and Evie, Zambetakis. "The Geopolitics of Arctic Melt." *International Affairs* 85, no. 6 (2009): 1215-1232

Connolly, Gerald E. *Political Committee Report. NATO and Security in the Arctic 2017*. Available in <https://www.nato-pa.int/document/2017-nato-and-security-arctic-connolly-report-172-pctr-17-e-rev1-fin>

Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [C.B., Field, V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. *IPCC, 2014: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects*. New York: Cambridge University Press, 2014

Crawford, R. M. M. "Arctic Climate History." Available in Crawford, R. M. M. *Tundra-Taiga Biology*. First ed. 2014

Dalby, Simon. "Climate Change: New Dimensions of Environmental Security." *The RUSI Journal* No. 3 (2013): 34-43

Dalby, Simon. "Geopolitical Identities: Arctic Ecology and Global Consumption." *Geopolitics* No. 1 (2003): 181-202

Dalby, Simon. "Rethinking Geopolitics: Climate Security in the Anthropocene." *Global Policy Volume* 5 (2014): 1-9

Depledge, Johanna, and, Farhana Yamin. "The Global Climate Change Regime: a Defence." Available in Dieter, Helm, and Cameron, Hepburn, *The Economics and Politics of Climate Change*. Oxford: Oxford University Press, 2013

Dodds, Klaus and Mark Nuttall. *The scramble for the poles*. Cambridge: Polity Press, 2016

Dodds, Klaus. "Graduated and Paternal Sovereignty: Stephen Harper, Operation Nanook 10, and the Canadian Arctic." *Environment and Planning D: Society and Space* 30, no. 6 (2012): 992-995

Dryzek, John S. *The Politics of the Earth*. Oxford: Oxford University Press, 2013

Dunn, Christopher, and Canadian Electronic Library Distributor. *Harper without Jeers, Trudeau without Cheers: Assessing 10 Years of Intergovernmental Relations*. DesLibris, IRPP Insight 8 Documents Collection, 2016

Edenhofer, O., and R. Pichs-Madruga, Y. Sokona, S. Kadner, J. C. Minx, S. Brunner, S. Agrawala, G. Baiocchi, I. A. Bashmakov, G. Blanco, J. Broome, T. Bruckner, M. Bustamante, L. Clarke, M. Conte Grand, F. Creutzig, X. Cruz-Núñez, S. Dhakal, N. K. Dubash, P. Eickemeier, E. Farahani, M. Fischedick, M. Fleurbaey, R. Gerlagh, L. Gómez-Echeverri, S. Gupta, J. Harnisch, K. Jiang, F. Jotzo, S. Kartha, S. Klasen, C. Kolstad, V. Krey, H. Kunreuther, O. Lucon, O. Masera, Y. Mulugetta, R. B. Norgaard, A. Patt, N. H. Ravindranath, K. Riahi, J. Roy, A. Sagar, R. Schaeffer, S. Schlömer, K. C. Seto, K. Seyboth, R. Sims, P. Smith, E. Somanathan, R. Stavins, C. von Stechow, T. Sterner, T. Sugiyama, S. Suh, D. Ürge-Vorsatz, K. Urama, A. Venables, D. G. Victor, E. Weber, D. Zhou, J. Zou, T. Zwickel. Technical Summary. In *Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J. C. Minx (eds.)]. Cambridge: Cambridge University Press, 2014

Elliot-Meisel, Elizabeth B. "Still Unresolved after Fifty Years: The Northwest Passage in Canadian-American Relations, 1946–1998." *American Review of Canadian Studies* 29, no. 3 (1999): 407-430

Emmerson, Charles. *The future history of the Arctic. How climate, resources, and geopolitics are reshaping the north, and why it matters to the world*. London: Vintage, 2011

Fagan, Madeleine. "Security in the Anthropocene: Environment, Ecology, Escape." *European Journal of International Relations* Vol. 23 No. 2 (2017): 292-314

Finger, Matthias. "The Arctic Laboratory of the Anthropocene." Available in Lassi, Heininen, *Future Security of the Global Arctic: State Policy, Economic Security and Climate*. New York: Palgrave Pivot, 2016

Folke, Carl, and Reinette Biggs, Albert V. Norström, Belinda Reyers, and Johan Rockström. "Social-ecological Resilience and Biosphere-based Sustainability Science." *Ecology and Society* 21, no. 3 (2016): 30.
<http://www.jstor.org/px.units.it/stable/26269981>

Ford, James D., and Barry, Smith. "A Framework for Assessing the Vulnerability of Communities in the Canadian Arctic to Risks Associated with Climate Change." *Arctic* No. 4 (December 2004): 389-400

Giovannoni, Elena, and Giacomo Fabietti. "What is Sustainability? A review of the Concept and Its Applications." 21-40. Available in C. Busco et al. (eds.). *Integrated Reporting* 2013. DOI 10.1007/978-3-319-02168-3_2

Global Affairs Canada. "Statement on Canada's Arctic Foreign Policy." Accessed February 14, 2018. http://www.international.gc.ca/polar-polaire/canada_arctic_foreign_policy_bookletla_

- Government of Canada. "Canada's Northern Strategy. Our North, our Heritage, our Future." Accessed January 20, 2018. <http://www.northernstrategy.gc.ca/cns/cns-eng.asp>
- Government of Canada. "Conservation of Arctic Flora and Fauna." Accessed February 18, 2018. <https://www.canada.ca/en/environment-climate-change/corporate/international-affairs/partnerships-organizations/conservation-arctic-flora-fauna.html>
- Government of Canada. "Contribution to Intergovernmental Panel on Climate Change." Accessed February 17, 2018. <https://www.canada.ca/en/environment-climate-change/services/climate-change/contribution-intergovernmental-panel.html>
- Government of Canada. "Adapting to the Effects of Climate Change." Accessed February 17, 2018. <https://www.canada.ca/en/services/environment/weather/climatechange/climate-action/adapting-to-effects.html>
- Grant, Shelagh D. *Polar Imperative. A History of Arctic Sovereignty in North America*. Vancouver: Douglas and McIntyre, 2011
- Griffiths, Franklyn. "Arctic Security. The Indirect Approach." In James, Kraska, *Arctic Security in an Age of Climate Change*. Cambridge: Cambridge University Press
- Haruhiko, Kashiwase and Kay I. Ohshima, Sohey Nihashi, Hajo Eicken. "Evidence for Ice-Ocean Albedo Feedback in the Arctic Ocean Shifting to a Seasonal Ice Zone." *Scientific Reports* 7, no. 1 (August 15, 2017): 8170. <https://doi.org/10.1038/s41598-017-08467-z>
- Heinen, Lassi. "Security of the Global Arctic in Transformation." In Lassi, Heinen, *Future Security of the Global Arctic: State Policy, Economic Security and Climate*. New York: Palgrave Pivot, 2016
- Heinen, Lassi, and Matthias, Finger. "The "Global Arctic" as a New Geopolitical Context and Method." *Journal of Borderlands Studies*, 2017
- Hudson, Stephen R. "Estimating the Global Radiative Impact of the Sea Ice–albedo Feedback in the Arctic." *Journal of Geophysical Research: Atmospheres* 116, no. D16 (2011)
- Huebert, Robert. "Climate Change and Canadian Sovereignty in the Northwest Passage." *Isuma* 2, no. 4 (2001)
- Huebert, Robert. "Polar Vision or Tunnel Vision the Making of Canadian Arctic Waters Policy: The Making of Canadian Arctic Waters Policy." *Marine Policy* 19, no. 4 (1995): 343-363
- Huebert, Robert. "Submarines, Oil Tankers, and Icebreakers: Trying to Understand Canadian Arctic Sovereignty and Security." *International Journal* 66, no. 4 (2011): 809-824
- Huebert, Robert. "Canada and the Changing International Arctic. At the Crossroads of Cooperation and Conflict." Available in Franklyn, Griffiths, and Robert Huebert, and P. Whitney, Lackenbauer, *Canada and the Changing Arctic: Sovereignty, Security, and Stewardship*. Waterloo, Ont.: Wilfrid Laurier University Press

Huebert, Robert. "Canada and the Newly Emerging International Arctic Security Regime." Available in James, Kraska, *Arctic Security in an Age of Climate Change*. Cambridge: Cambridge University Press

Huebert, Robert. "Climate Change and Canadian Sovereignty in the Northwest Passage." Available in Ferris, John Robert, P. Whitney Lackenbauer, University of Calgary, and Centre for Military and Strategic Studies. *Canadian Arctic Sovereignty and Security: Historical Perspectives*. Calgary: Centre for Military and Strategic Studies, University of Calgary, 2008

Huntington, Henry P., and Eban Goodstein, Eugénie Euskirchen. "Towards a Tipping Point in Responding to Change: Rising Costs, Fewer Options for Arctic and Global Societies." *Ambio* 41, no. 1 (2012): 66-74. <http://www.jstor.org/stable/41418340>

Indigenous and Northern Affairs Canada. "Canada's Arctic Policy Framework." Accessed February 17, 2018. <https://www.aadnc-aandc.gc.ca/eng/1503687877293/1503687975269>

Indigenous and Northern Affairs Canada. "Toward a new Arctic Policy Framework." Accessed March 25, 2018. <https://www.aadnc-aandc.gc.ca/eng/1499951681722/1499951703370>

Ingram, Moisio, and Dittmer, Klaus, Dodds, "Have You Heard the One about the Disappearing Ice? Recasting Arctic Geopolitics." *Political Geography* 30, no. 4 (2011): 202-214

Intergovernmental Panel on Climate Change. "Reports – Assessment Reports." Accessed February 13, 2018. www.ipcc.ch/ipccreports/tar/wg2/index.php?idp=689

Järvenpää, Pauli and Tomas Ries. "The Rise of the Arctic on the Global Stage." Available in James, Kraska, *Arctic Security in an Age of Climate Change*. Cambridge: Cambridge University Press

Jenks, Andrew. "Canada-Denmark-Finland-Iceland-Norway-Russian Federation-Sweden-United States: Joint Communiqué and Declaration on the Establishment of the Arctic Council." *International Legal Materials* 35, no. 6 (1996): 1382-1390

Justin Trudeau, Prime Minister of Canada. "News – United States-Canada Joint Arctic Leaders' Statement." Accessed April 2, 2018. <https://pm.gc.ca/eng/news/2016/12/20/united-states-canada-joint-arctic-leaders-statement>

Justin Trudeau, Prime Minister of Canada. "Prime Minister Justin Trudeau." Accessed April 4, 2018. <https://pm.gc.ca/eng/prime-minister-justin-trudeau>

Käpylä, Juha, and Harri Mikkola. "The Promise of the Geoeconomic Arctic: A Critical Analysis." *Asia Europe Journal* 14, no. 2 (2016): 203-220

Kirkey, Christopher. "Smoothing Troubled Waters: The 1988 Canada-United States Arctic Co-operation Agreement." *International Journal* 50, no. 2 (1995): 401-426

Knight-Lenihan, Stephen. "Benefit cost analysis, resilience and climate change." *Climate Policy* 16:7 (2016): 909-923. DOI: 10.1080/14693062.2015.1052957

- Knudsen, Samuel. "The Arctic." *Greenlandic text*, Kangarsuatssaat (2002)
- Lackenbauer, P. W. "Polar Race or Polar Saga?." Available in James, Kraska, *Arctic Security in an Age of Climate Change* Cambridge: Cambridge University Press
- Lajeunesse, Adam. *Lock, Stocks and Icebergs. A History of Canada's Arctic Maritime Sovereignty*. Vancouver: UBC Press, 2016
- Leal Filho, Walter, and Haruna, Musa, Gina, Cavan, Paul, O'Hare, Julia, Seixas. *Climate Change Adaptation, Resilience and Hazards*. Springer International Publishing
- Lenton, Tim, and Tim, O'Riordan. *Addressing Tipping Points for a Precarious Future*. Oxford: Oxford University Press, 2013
- Lenton, Tim. *Earth System Science. A Very Short Introduction*. Oxford: Oxford University Press
- Lu, and Park, Choi, Oh. "An Economic Analysis of Container Shipping Through Canadian Northwest Passage." *International Journal of E-Navigation and Maritime Economy* 1 (2014): 60-72
- Luke, Timothy W. "The (Un)Wise (Ab)Use of Nature: Environmentalism as Globalized Consumerism." *Alternatives: Global, Local, Political* 23, no. 2 (1998): 175-212
- Luszczuk, Michal. "Military cooperation and enhanced arctic security in the context of climate change and growing global interest in the Arctic." Available in Lassi, Heininen, *Future Security of the Global Arctic: State Policy, Economic Security and Climate*. New York: Palgrave Pivot, 2016
- Marshall, Tim. *Prisoners of Geography. Ten maps that explain everything about the world*. New York: Scribner, 2016
- Maslin, Mark. *Climate Change. A Very Short Introduction*. Cambridge: Cambridge University Press
- McCannon, John. *A History of the Arctic Nature, Exploration and Exploitation*. London: Reaktion Books
- McEvoy, Darryn, and Hartmut Fünfgeld, and Karyn Bosomworth. "Resilience and Climate Change Adaptation: The Importance of Framing." *Planning Practice & Research* 28:3 (2013): 280-293. DOI: 10.1080/02697459.2013.787710
- Mendez, Tessa. "Thin Ice, Shifting Geopolitics: The Legal Implications of Arctic Ice Melt." *Denver Journal of International Law and Policy* 38, no. 3 (2010): 527-547
- Messamore, Barbara J. "Justin Trudeau and Canada's 2015 Election." *The Round Table* 105:1 (2016): 81-84. DOI:10.1080/00358533.2015.1126958
- NASA Global Climate Change. "Responding to Climate Change." Accessed February 15, 2018. <https://climate.nasa.gov/solutions/adaptation-mitigation/>
- National Wildlife Federation. *The Arctic Environment*. Available in www.nwf.org/~media/PDFs/Be%20Out%20There/Schoolyard%20Habitats/WhereinArctic.pdf - 34k

Ostroff, Joshua. "Canada Now Has A Minister Of Climate Change." *The Huffington Post Canada* (2015). Accessed April 18, 2018.

https://www.huffingtonpost.ca/2015/11/04/canada-minister-of-climate-change-catherine-mckenna_n_8473828.html

Pearce, Fred. *With Speed and Violence. Why Scientists Fear Tipping Points in Climate Change*. Boston: Beacon Press

Perry, Mike. "Rights of Passage: Canadian Sovereignty and International Law in the Arctic." *U. Det. Mercy L. Rev.* 74 (1996): 657-683

Petrov, Andrey N., and Shauna, BurnSilver, F. Stuart Chain III, Gail, Fondahl, Jessica K., Graybill, Kathrin, Keil, Annika E., Nilsson, Rudolf, Riedlsperger, and Peter, Schweitzer. *Arctic Sustainability Research: Past, Present and Future*. New York: Routledge Research in Polar Regions, 2017

Pharand, Donat. "The Arctic Waters and the Northwest Passage: A Final Revisit." *Ocean Development & International Law* 38, no. 1-2 (July 2007): 3-69.

<https://doi.org/10.1080/00908320601071314>

Powell, Richard C. "Lines of Possession? The Anxious Constitution of a Polar Geopolitics." *Political Geography* 29, no. 2 (2010): 74-77

Powell, Richard C., and Klaus, Dodds, and Edward Elgar Publishing. *Polar Geopolitics? : Knowledges, Resources and Legal Regimes*. Cheltenham: Edward Elgar Pub

Pratt, C.R. and U.L. Kaly, J. Mitchell. *Manual: How to Use the Environmental Vulnerability Index (EVI)*. SOPAC Technical Report 383, 60 pp; 1 appendix, 2 figures. United Nations Environment Programme (UNEP). South Pacific Applied Geoscience Commission (SOPAC) 2004, 1. Available in <http://islands.unep.ch/EVI%20Manual.pdf>

Pratt, C.R., and U.L. Kaly, and J. Mitchell. *Manual: How to Use the Environmental Vulnerability Index (EVI)*. SOPAC Technical Report 383, 60 pp; 1 appendix, 2 figures, United Nations Environment Programme (UNEP). South Pacific Applied Geoscience Commission (SOPAC) 2004. Available in <http://islands.unep.ch/EVI%20Manual.pdf>

Prime Minister Trudeau, Prime Minister of Canada. "Déclaration nationale du Canada à la COP21." Accessed April 9, 2018. <https://pm.gc.ca/eng/news/2015/11/30/canadas-national-statement-cop21>

Rogers, Peter. "Climate Change and Global Warming." *Environmental Science and Technology* 24, no. 4 (1990): 428-430

Rothwell, Donald. "The Arctic in International Affairs: Time for a New Regime?." *The Brown Journal of World Affairs* 15, no. 1 (2008): 241-253.

<http://www.jstor.org/stable/24590963>

Ruel, Geneviève King. "The (Arctic) Show Must Go On: Natural Resource Craze and National Identity in Arctic Politics." *International Journal* 66, no. 4 (2011): 825-833. <http://www.jstor.org/stable/23104395>

Sabin, Jerald. "PM Trudeau and President Obama Release Joint Statement on Arctic." *Northern Public Affairs* (2016). Accessed April 9, 2018.

<http://www.northernpublicaffairs.ca/index/pm-trudeau-and-president-obama-release-joint-statement-on-arctic/>

Schröter, Dagmar, and Colin Polsky And Anthony G. Patt. “Assessing Vulnerabilities to The Effects of Global Change: An Eight Step Approach.” *Mitigation and Adaptation Strategies for Global Change* No. 10 (2005): 573-595

Serreze, Mark C. “Climate change: Rethinking the sea-ice tipping point.” *Nature* 471 (03 March 2011) doi:10.1038/471047a

Shalizi, Zmarak, and Franck Lecocq. “To Mitigate or to Adapt: Is that the Question? Observations on an Appropriate Response to the Climate Change Challenge to Development Strategies.” *The World Bank Research Observer* Vol. 25, No. 2 (August 2010): 95-321

Stephen, Smith, *Environmental Economics: A Very Short Introduction*. Oxford: Oxford University Press

Stockholm Environment Institute [Jakob, Granit, Henrik, Carlsen, Marcus, Carson, Karl, Hallding, Oliver, Johnson, Kevin, Rosner and Nina, Weitz], and Swedish Defence Research Agency (FOI) [Mikael, Eriksson, Christer, Andersson, Birgitta, Liljedahl, Malin, Mobjörk, Michael, Tulldahl, and Annica, Waleij]. *Stockholm Environment Institute, Working Paper 2015-14. Integrating sustainable development and security: An analytical approach with examples from the Middle East and North Africa, the Arctic and Central Asia*. Stockholm: Stockholm Environment Institute and Swedish Defence Research Agency (FOI), 2015

Sustainable Canada Dialogues and McGill University. *Rating Canada's Climate Policy. Sustainable Canada Dialogues Reports on 2016 Progress*. Montreal: McGill University, 2016

The Arctic Institute. “A new Canadian government...so what?.” Accessed March 25, 2018. <https://www.thearcticinstitute.org/a-new-canadian-government-so-what/>

The Arctic Institute. “Cue Cards for Trudeau: Bringing Arctic Cooperation to DC, Part I.” Accessed March 26, 2018. <https://www.thearcticinstitute.org/cue-cards-for-trudeau-bringing-arctic-cooperation-to-dc-part-i/>

The Arctic Institute. “Cue Cards for Trudeau: Bringing Arctic Cooperation to DC, Part II.” Accessed March 26, 2018. <https://www.thearcticinstitute.org/cue-cards-for-trudeau-bringing-arctic-cooperation-to-dc-part-ii/>

The Arctic Institute. “First Past the Pole: Harper, Trudeau, and Canada's Arctic Values.” Accessed March 26, 2018. <https://www.thearcticinstitute.org/first-past-the-pole-harper-trudeau/>

The Canadian Encyclopedia. “The Arctic Archipelago.” Accessed February 16, 2018. www.thecanadianencyclopedia.ca/en/article/arctic-archipelago/

The McGill International Review. “The Northern Sea Route and Trudeau's Russia Problem.” Accessed April 2, 2018. <https://www.mironline.ca/northern-sea-route-trudeaus-russia-problem/>

- Turner, B. "Vulnerability and resilience: Coalescing or paralleling approaches for sustainability science?." *Global Environmental Change*, 20(4), (2010): 570-576
- UN General Assembly. *Convention on the Law of the Sea*, 10 December 1982. Accessed January 27, 2017. <http://www.refworld.org/docid/3dd8fd1b4.html>
- UN General Assembly. *United Nations Framework Convention on Climate Change: resolution / adopted by the General Assembly*, 20 January 1994, A/RES/48/189. Available at: <http://www.refworld.org/docid/3b00f2770.html> [accessed 7 February 2018]
- UNESCO. *Climate Change and Arctic Sustainable Development: Scientific, social, cultural and educational challenges*. Paris: UNESCO
- United Nations Environment Program. "Mitigation." Accessed February 15, 2018. <https://www.unenvironment.org/explore-topics/climate-change/what-we-do/mitigation>
- Vaidyanathan, Rajini. "Canada election: Seven things Justin Trudeau believes in." *BBC News Toronto* (2015). Available in <http://www.bbc.com/news/world-us-canada-34580420>
- Vanderzwaag, David, and John Donihee, and Mads Faegtegorg. "Towards Regional Ocean Management in the Arctic: From Co-Existence to Cooperation." *University of New Brunswick Law Journal* 37 (1988): 1-33
- Wadhams, Peter. *A Farewell to Ice. A Report from the Arctic*. New York: Oxford University Press, 2017
- Waltz, Kenneth N. "America as a Model for the World? A Foreign Policy Perspective." *Political Sciences and Politics* 24 (1991): 669-670. Accessed November 19, 2016, stable URL: <http://dx.doi.org/10.2307/419401>
- Wassmann, Paul, and Timothy M. Lenton. "Arctic Tipping Points in an Earth System Perspective." *Ambio* 41, no. 1 (2012): 1-9. <http://www.jstor.org/stable/41418334>
- Worland, Justin. "Why Justin Trudeau's Election is Good News for the Fight Against Climate Change." *Time* (2015). Available in <http://time.com/4080073/canada-climate-change-justin-trudeau/>
- Young, Oran. "The Arctic Council at Twenty: How to Remain Effective in a Rapidly Changing Environment." *UC Irvine Law Review* 6, no. 1 (2016): 99-120