The London School of Economics & Political Science

Socio-Ecological Coevolution:

an ecological analysis of the historical development of international systems in the circumpolar Arctic

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Declaration

I certify that the thesis I have presented for examination for the MPhil/PhD degree of the London School of Economics and Political Science is solely my own work other than where I have clearly indicated that it is the work of others (in which case the extent of any work carried out jointly by me and any other person is clearly identified in it).

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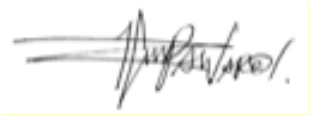

Richard Campanaro

Abstract

The goal of this thesis is to analyse the impact of Arctic ecology on the development of international systems in the circumpolar world. It is a goal pursued in two steps: (i) by developing an analytical approach capable of tracing the mutual constitution of international and ecological systems in world history; and (ii) by using the resulting toolkit to establish a baseline understanding of the international systems of the polar basin. Part One adapts the analytical approach pioneered by Barry Buzan and Richard Little to study international systems in world history, adding a contextual axis to their analytical matrix in order to escape the anthropocentric cul-de-sac that has heretofore limited IR's ability to consider ecology's role in the constitution of international units, processes, and structures. The resulting approach – defined in terms of *Socio-Ecological Coevolution* – describes this relationship in terms of three sources of explanation: coevolutionary process, ecological capacity and biogeographical structure. Part Two uses the toolkit to analyse the past four hundred years of Arctic history, charting the impact of ecological systems on the principles of membership and behaviour that define international systems in circumpolar world. Through discussions of socio-ecological coevolution, ecological capacity and biogeographical structure, the project identifies the Arctic as a region defined by competing sets of Westphalian and imperial principles. The balance between the Arctic's anarchic states system and its hierarchic imperial systems has its fulcrum on a socio-ecological ecotone – a transitional gradient that divides its neo-European and non-European biomes and marks a shift from Westphalian to imperial social principles. Though designed to answer specific questions about the constitution of international systems in the circumpolar North, Coevolution proves itself to be a promising tool for ecological analysis in IR with potential applicability to regions outside of the Arctic Basin.

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List of Abbreviations

ACC	Alaska Commercial Company
CO_2	Carbon Dioxide
EC	Ecological Capacity
EEZ	Exclusive Economic Zone
ES	English School
GEC	Global Environmental Change
GEP	Global Environmental Politics
HBC	Hudson's Bay Company
HGB	Hunter-Gatherer Band
IPCC	Intergovernmental Panel on Climate Change
IPE	International Political Economy
IR	International Relations
ISWH	*International Systems in World History*
KGH	Royal Greenlandic Company (*Den Kongelige Grønlandske Handel*)
kya	thousand years ago
LGM	Last Glacial Maximum
LIA	Little Ice Age
mya	million years ago
MWP	Medieval Warm Period
NPP	Net Primary Production
PAR	Photosynthetically Active Radiation
RAC	Russian America Company
RAIPON	Russian Association of Indigenous Peoples of the North

Acknowledgements

Like many PhD students, I have managed to rack up vast debts over the course of my studies, though most of mine are of an intellectual and personal nature. Family and friends have lent me invaluable support over the past four years and I will be forever grateful to them. I only wish I had another 200 pages to get all their names in print.

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They say that a PhD is a lonely pursuit. Given the number of wonderful people I have met along the way and to whom I owe so much, I am not so sure.

Chapter One

Introduction: Research Question, Anthropocentrism, Plan of Investigation

The goal of this thesis is to analyse the impact of arctic ecology on the development of international systems in the circumpolar world. It is a goal pursued in two steps: (i) by developing an analytical approach capable of tracing the mutual constitution of international and ecological systems in world history; and (ii) by using the resulting toolkit to establish a baseline understanding of contemporary international systems in the polar basin. This will deepen our understanding of circumpolar IR and provide a starting point from which further research into the effects of Global Environmental Change (GEC) on international systems can be pursued, both in the Arctic and beyond.[1] The first step will enlist and adapt the analytical matrix developed by Barry Buzan and Richard Little to disaggregate and analyse the evolution of international systems in world history.[2] The second will use this adapted matrix to uncover the coevolutionary relationships that bind arctic ecology to the constitution of the region's international units, processes, and structures. To balance against International Relations' (IR's) instinctively anthropocentric ontology, I will spend much of what follows looking at ecology's influence on the development of international systems. This should not be interpreted as a return to monocausal environmental determinism. The development of international and ecological systems is not driven by either ecological or social factors alone, but by *Socio-Ecological Coevolution* – an ongoing historical process that describes their mutual constitution.

Like many terms in IR, Coevolution is borrowed from another part of the academy. In Ecology, where it was popularized by Paul Ehrlich and Peter Raven in the mid-1960s, it describes cases in which two or more biological populations affect each other's development through a process of mutual constitution based on repeated interaction.[3]

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[1] This goal derives from research priorities developed in O.A. Anisimov, D.G. Vaughan et. al., '2007: Polar regions (Arctic and Antarctic)', in M.L. Parry, O.F. Canziani et al., *Climate Change 2007: Impacts, Adaptation and Vulnerability, Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge: Cambridge University Press, 2007): 677.

[2] Barry Buzan and Richard Little, I*nternational Systems in World History: remaking the study of international relations* (Oxford: Oxford University Press, 2000): Ch. 4.

[3] John Thompson, 'Coevolution', in *Encyclopedia of Life Sciences* (Chichester: John Wiley & Sons, 2001). [online] February 23, 2012. <http://www.els.net> [doi: 10.1038/npg.els.0001761]; Paul Ehrlich & Peter Raven, 'Butterflies and Plants: a study in coevolution', *Evolution* 18(4) 1964, *passim*.

In this project, it is used in a manner similar to that of Richard Norgaard to describe the means by which human and ecological systems affect one another's development. Coevolutionary explanations of history are characterised by narratives in which 'environmental subsystems are treated symmetrically with [human] subsystems of values, knowledge, social organization, and technology'.[4] This implies a dynamic relationship between human systems and the ecological contexts in which they are embedded. Coevolution therefore links international units and systems to ecological contexts described by the five main subsystems of the planetary ecosphere: the atmosphere, lithosphere, hydrosphere, cryosphere, and biosphere.[5] In IR terms, Coevolution's principal insight is that the present condition of any international or ecological system is contingent on evolutionary influences emanating from the 'other side' of the socio-ecological equation. Humanity's long history of ecological manipulation – discussed in Chapter Two – and the fact of the planet's ecological interconnectedness – discussed in Chapter Three – ensure that neither humans nor nature can claim absolute priority in the chain of causation that links us to the biological, chemical, and physical systems of which we are a part. As one animal population – albeit sometimes a very clever one – among the many that inhabit the natural world, our behaviour is bound up with the ecologies with and within which we interact.[6] As we adapt to our physical environment, our adaptations resonate back into the ecological systems around us, altering their composition and spurring further social and ecological evolution. This interconnectedness must be at the heart any attempt to integrate Ecology into IR's understanding of the world.[7]

Research Question: why Ecology? why the Arctic?

After nearly a century as a recognized social science, IR can lay claim to many achievements. It has developed analytical tools to study the behaviour of international

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[4] Richard Norgaard, *Development Betrayed: the end of progress and a coevolutionary revisioning of the future* (London: Routledge, 1994):36.

[5] These refer, in turn, to 'the gaseous envelope surrounding the Earth', 'the upper layer of the solid Earth', 'liquid surface and subterranean water', 'all snow, ice and frozen ground (including permafrost) on and beneath the surface of the Earth and ocean', and 'all ecosystems and living organisms, in the atmosphere, on land (terrestrial biosphere) or in the oceans (marine biosphere)'. See Susan Solomon, D. Qin, M. Manning et al. (Eds.), *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge: Cambridge University Press, 2007): 941-942, 944, 947-948.,

[6] Jianguo Liu et al., 'Complexity of Coupled Human and Natural Systems', *Science* 317(1513) 2007, p. 1513.

[7] Dennis Pirages, "Ecological Theory and International Relations", *Indiana Journal of Global Legal Studies* 5(1) 1997, p. 53.

actors that include sovereign states, private firms, and international civil society organizations. It has constructed a number of compelling approaches to understand international systems in world history. It has successfully raided other social sciences for concepts useful to its study of the *international*, the spatial construct at the heart of IR that is defined by its position outside the domestic jurisdictions of any one collective actor.

IR has used these tools to address several issues associated with the environment. Much work has been done on the role of international institutions and regimes in mitigating and adapting to Global Environmental Change (GEC), particularly in the field of Global Environmental Politics (GEP). Though its interests are wide-ranging, the dominant strand of GEP focuses on institutional arrangements to manage the immediate effects of anthropogenic environmental degradation.[8] It has generally 'viewed global governance as a function provided primarily by the states-system, through processes of international negotiations and regime building.'[9] This *Institutionalist* tradition has less to say about the effects of historical and impending ecological transformations on the constitution of the units, processes, and structures that make up the international system.[10] By focusing on problems of collective action, Institutionalist GEP often fails to question the ontological bases of its guiding assumptions. As Marc Williams explains of IR's and International Political Economy's (IPE's) approaches to GEC, 'the issue… has served to reproduce orthodoxy in the discipline' without asking sufficient questions about where those orthodoxies come from.[11] IR and IPE alike often ignore fundamental questions about

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[8] This tradition has a number of key literary sources, including Andrew Hurrell & Benedict Kingsbury (Eds.) *The International Politics Of The Environment : actors, interests, and institutions* (Oxford: Oxford University Press, 1992); Oran Young, *Arctic Politics: conflict and cooperation in the circumpolar north* (Hanover: University Press of New England, 1992); Peter Haas, R. Keohane & M. Levy (Eds.) *Institutions for the Earth: sources of effective international environmental protection* (Cambridge MA: MIT Press, 1993); Oran Young, *International Governance: protecting the environment in a stateless society* (London: Cornell University Press, 1994); John Vogler & Mark Imber (Eds.) *The Environment and International Relations* (London: Routledge, 1996); Oran Young, *Creating Regimes: arctic accords and international governance* (Ithaca: Cornell University Press, 1998); John Vogler, *The Global Commons: environmental and technological governance* (Chichester: John Wiley, 2000); Peter Dauvergne (Ed.), *Creating Regimes: arctic accords* (Northampton, MA: Edward Elgar, 2005); John Vogler, 'Environmental Issues', in *The Globalization of World Politics: and introduction to international relations*, John Baylis, Steve Smith & Patricia Owens (Oxford: Oxford University Press, 2010) sixth edition.

[9] Robert Falkner, 'Private Environmental Governance and International Relations: Exploring the Links', *Global Environmental Politics* 3(2) 2003, pp. 75.

[10] Clapp, Jennifer & P. Dauvergne. *Paths to a Green World: The Political Economy of the Global Environment*. (Cambridge, MA: MIT Press, 2005): 227-230; R.K. Pachauri. & A. Reisinger (Eds.), *Climate Change Synthesis Report 2007: Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge: Cambridge University Press, 2007): 45.

[11] Marc Williams, 'International Political Economy and Global Environmental Change', in Vogler & Imber (1996): 42.

the constitutive relationship between international systems and the ecological contexts in which they are embedded.[12]

Matthew Paterson, who works in the *Green* tradition of GEP, argues that adequate explanations of GEC in IR require that we examine the ontological assumptions behind our analyses, which tend to obscure and marginalise the physical environment.[13] The Green tradition tends to focus on the systemic roots of the current ecological crisis rather than the management of issues arising from it.[14] A number of its adherents have considered the issue of ontology. Robyn Eckersley, for one, directly attacks the anthropocentric worldview that dominates mainstream IR. In its place, she constructs an alternative ecocentric approach in which 'the interests of nonhuman species and ecological communities . . . are not ignored... *simply* because they are not human, or because they are not of instrumental value to humans.'[15] Although this project is largely analytic in its goals, ecocentrism has clearly influenced the coevolutionary approach adopted in Part One. This influence is tempered, however, by the fact that even Green GEP is largely interested in the impact of human action on ecological systems, particularly in terms of ecological footprints and the culture of consumption.[16] The question of how ecological systems have contributed to the historical constitution of the planet's international units and systems remains under-theorized and underexplored.

Over the past forty years, a growing chorus of warnings from the scientific community about the potential impact of anthropogenic climate change has forced Ecology into IR's field of view. There is nothing historically novel about anthropogenic ecological transformations radically altering an international system. History is pockmarked with epidemics resulting from changing distributions of pathogen populations – from the Bubonic Plague and Smallpox to Rinderpest – that follow on the heels of social interaction between regional international systems. The Eurasian spread of the Bubonic Plague, for example, was enabled by the construction of an orderly trade

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[12] *Ibid*: 42-43, 48.
[13] Matthew Paterson, 'IR Theory: neorealism, neoinstitutionalism, and the Climate Change Convention', in Vogler & Imber (1996): 69-70.
[14] Matthew Paterson, 'Green Theory', in S. Burchill et al., *Theories of International Relations* 2nd Ed. (London: Palgrave Macmillan, 2001): 79-80, 91.
[15] Robyn Eckersley, *Environmentalism and Political Theory: toward an ecocentric approach* (London: UCL Press, 1992): 22-25, 57. [Italics in original] See also Robyn Eckersley, *The Green State: Rethinking Democracy and Sovereignty* (Cambridge MA: MIT Press, 2004).
[16] Clapp & Dauvergne (2005): 230-238.

corridor across the continent by the Pax Mongolica of the thirteenth and fourteenth centuries.[17] Structural examples of human-induced ecological change also abound, from hominids' early use of fire as a terraforming technology to extend the ranges within which our hunting and gathering lifestyles could flourish, to our genetic manipulation of plant and animal species following their domestication by early agriculturalists.[18] The ecological effects of these anthropogenic transformations have resonated back to affect the development of the planet's human populations, impacting the evolution of international units and systems around the world.

This coevolutionary relationship has not gone unnoticed by the academy. The past twenty years have seen a jump in the number of scholarly histories dealing with topics from the ecological footprint of pre-Columbian Amerindian civilizations to the role of Holocene climatic conditions in the development of agricultural civilization.[19] In Development Studies and Economics, Coevolution has been interpreted as 'an evolutionary process based on reciprocal responses' between a human system and the ecosystem in which it is embedded.[20] IR, however, has remained stubbornly tied to the human side of the socio-ecological equation. As will be discussed later in this chapter, its dominant theories routinely refer to ecological systems as static sets of natural resources whose value to international actors and systems is purely instrumental.[21] This ontological choice is the single biggest obstacle in the way of understanding the role of ecological systems in our discipline. One goal of what follows must therefore be to provide an alternative approach to international analyses of world history; one that maintains the strength of existing IR narratives while folding them into a wider understanding of mankind's coevolutionary relationship with the natural world in which we live. This project's approach is *evolutionary* rather than *revolutionary*

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[17] Ronald Findlay & Kevin O'Rourke, *Power and Plenty: trade, war, and the world economy in the second millennium* (Princeton: Princeton University Press, 2007): 111.
[18] I.G. Simmons, *Global Environmental History: 10,000BC to AD2000* (Edinburgh: Edinburgh University Press, 2008): 30, 54
[19] I.G. Simmons, *Changing the face of the earth: culture, environment, history* (Oxford: Basil Blackwell, 1996) second edition; Neil Roberts, *The Holocene: An Environmental History* (London: Blackwell Publishers, 1998) second edition; Peter Richerson et al., 'Was Agriculture Impossible During the Pleistocene but Mandatory During the Holocene? A Climate Change Hypothesis', *American Antiquity* 66(3) 2001; Brian Fagan, *The Long Summer: how climate changed civilisation* (New York: Basic Books, 2004); Charles Mann, *1491: New Revelations of the Americas Before Columbus* (London: Knopf, 2005).
[20] Richard Norgaard, 'Coevolutionary Agricultural Development', *Economic Development & Cultural Change* 32(3) 1984, p. 528; Norgaard (1994): 196-197; Nick Winder et al., 'The Origin, Diagnostic Attributes, and Practical Application of Co-evolutionary Theory', *Ecological Economics* 54(4) 2005, p. 353.
[21] Eivind Hovden, 'As If Nature Doesn't Matter: ecology, regime theory and international relations', *Environmental Politics* 8(2) 1999, pp. 52-53, 60-61; Andrew Dobson, *Green Political Thought* (London: Unwin Hyman, 1990): 175-192; Susan Board, *Ecological Relations: towards an environmental politics of the Earth* (London: Routledge, 2002): 23-24.

insofar as it builds on the strengths of existing IR analysis while recognizing the need to change the way that we think about our relationship to the planetary ecosphere at the international scale.

Though perceived by many in IR as a marginal region, the circumpolar Arctic should be at the heart of our efforts to understand GEC's effects on the evolution of international systems. It is here, at one of the Earth's ecological extremes, that GEC's effects have been most dramatic, making its impact on units, processes, and structures both more apparent and more pressing than in other, more temperate regions of the globe. While average global temperatures have increased by around 0.6°C since the start of the Industrial Revolution, the Arctic Basin has seen thermometers climb much more rapidly, with autumn increases of up to 5°C above the 1979-2000 average.[22] The resulting changes affect both the international units and systems that inhabit the region and several of the negative feedback loops that normally stabilize the planet's atmospheric, terrestrial, hydrological, and biological systems. Though the climate models developed for the polar basin contain varying degrees of uncertainty, many of their predictions – particularly in terms of sea ice extent – are strongly supported by empirical observation.[23] Such predictions present immediate opportunities for analysis in terms of their effects on the international systems of the region. Beyond their local impact, changes in the Arctic may also indicate the direction of future systemic transformations beyond its southern frontiers, particularly in similarly structured ecological regions such as the Saharan-Sahelian belt of Africa, Amazonia, the Tibetan Plateau and Taklimakan Desert, and Arabia.[24]

It is important to note that the selection of the Arctic as the primary case study with which to test this project's coevolutionary toolkit carries with it certain risks. A successful analysis of Coevolution in an extreme ecological region such as the circumpolar basin does not ensure that the approach will be generalizable across the global international system. Given the heterogeneous constitution of the ecosphere – a

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[22] Martin Sommerkorn, Susan Hassol et al., *Arctic Climate Feedbacks: global implications* (Oslo: WWF International Arctic Programme, 2009) second edition: 23. [online] accessed 23 March 2010 <assets.panda.org/downloads/wwf_arctic_feedbacks_report.pdf.>

[23] John Walsh et al., 'Cryosphere and Hydrology', in Carolyn Symon et al., *Impacts of a Warming Arctic: Arctic Climate Impact Assessment* (Cambridge: Cambridge University Press, 2004): 189-196.

[24] Henry Huntington et al., 'An Introduction to the Arctic Climate Impact Assessment', in Carolyn Symon et al., *Impacts of a Warming Arctic: Arctic Climate Impact Assessment* (Cambridge: Cambridge University Press, 2004): 2, 10-12.

topic that we will tackle in greater detail in Chapter Three – this is an ever-present danger in ecological analysis. Though linked by planetary systems and cycles, Earth's ecological structure varies greatly over time and space, making generalization on a planetary scale very difficult even where analytical tools and empirical evidence abound.[25] This has been made abundantly clear by the four Assessment Reports tabled by the Intergovernmental Panel on Climate Change (IPCC), each of which notes the regional character of GEC's impacts on ecological and human systems alike.[26] Although this specificity may limit the geographical reach of the approach proposed by this project, it is a natural consequence of the fragmented ecological systems with which this project attempts to grapple. Despite these limitations, Chapter Seven argues that our findings *do* have their applications elsewhere, including Saharan-Sahelian Africa. Although neither region is at the core of the global international system, they still deserve study and may indicate avenues of analysis that point more directly towards the temperate biomes at the heart of contemporary IR. Moreover, GEC's impact on several core areas of the international system may result in their transition to more extreme conditions, increasing Coevolution's utility in tracing the course of their development. At a minimum, given Ecology's marginal position in our discipline, any widespread recognition that ecological structures *are* constitutive of the principles of membership and behaviour that bound and define international systems would be an accomplishment.

Developing tools with which to assess the impact of ecological conditions on the development of Arctic international systems is important for at least three reasons. First, it will allow us to develop historical baselines from which future research can proceed into the effects of GEC on the international systems of the circumpolar world. Second, it will illustrate general trends in Socio-Ecological Coevolution that may have resonances in parts of the globe which share the Arctic's ecological structure. Third, and more speculatively, a study of Coevolution in the Arctic may prove useful even farther afield as the Earth's temperate biomes, including those in which its dominant international units and systems are embedded, find themselves altered by the uncertain

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[25] Karl Butzer, *Archaeology as Human Ecology* (Cambridge: Cambridge University Press, 1982): 8-9.

[26] The IPCC, a panel composed of scientists and diplomats coordinated by the World Meteorological Association and United Nations member states, is charged with studying the state of the global climate system, assessing the impact of climate change on natural and human systems, and considering strategies for mitigation and adaptation. [IPCC, *Understanding Climate Change: 22 years of IPCC assessment*, November 2010 [online] accessed 25 June 2011 <http://www.ipcc.ch/pdf/press/ipcc_ leaflets_2010/ipcc-brochure_understanding.pdf>: 4-7] J.H. Christensen et al., 'Regional Climate Projections', in Solomon et al. (2007): 852-853.

effects of anthropocentric climate change. Although Europe is likely to escape radical transformation, the same cannot be said of regions such as the Middle East and parts of North America and East Asia, all of which are likely to experience steeper precipitation gradients and higher temperatures over the next century, affecting the sustainability of international units and the organisation of international systems.[27]

The 'International' & Anthropocentrism

IR has reinvented itself many times over the past ninety years. Since its earliest days as a formal academic discipline in the wake of World War One, it has expanded to include not only the study of diplomatic and military relations between governments – arguably its earliest areas of interest – but also economic, cultural, and societal relations between a variety of state and non-state actors. Other social sciences, such as Political Science, Sociology, and Economics, define themselves largely by the sector of human interaction they investigate – be it political, societal, or economic.[28] IR, meanwhile, tends to define its disciplinary boundaries according to the scale at which human interactions take place. This is defined by *the international*, a scale that exists outside of the domestic jurisdiction of any single collective actor, be it a government or corporate body. Broadly defined, International Relations is the study of units, processes, and structures at this ontological level, regardless of the sector in which its objects of study operate. IR's focus on scale rather than sector has been both a blessing and a curse. It allows the discipline to synthesize lessons from many allied social sciences in order to develop holistic understandings of international relationships. This has made IR into something of a conceptual burglar, taking theories and frameworks from the 'domestic' social sciences and applying them to collective actors at the international scale, saving many in the discipline – this author included – from having to develop completely new ways of imagining human relationships.

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[27] *Ibid:* 870, 883, 890.

[28] This project distinguishes between two very different, if apparently similar terms: 'social' and 'societal'. The first is a description of how human systems are constructed through repeated interactions between individual or collective actors. The second describes a sector of interaction to which those relations can belong, and is comparable to other sectors, such as the economic or political. A social system is one that is constructed by the interaction of its human inhabitants, while a societal system is one concerned with the specific cultural and ideational relationships between them. Thus, according to the arguments of this project, all societal systems are social, but not all social systems are societal.

The most basic objection to IR's use of scale as a bounding device is that the discipline's distinction between domestic and international spheres is not as straightforward as it first appears. Instead of constituting two truly autonomous scales of human interaction, each tightly insulated from the other, the international and the domestic are mutually constituted aspects of a wider reality. A state's domestic conditions can impact its international behaviour. Likewise, the networks of international interaction to which a state belongs can impact its domestic politics, economics, and forms of societal organization.[29] The same is true of firms, NGOs, and other *collective actors*: networks of individuals with sufficiently unified decision-making capacities to (i) reproduce themselves over time and (ii) be treated as actors for the purposes of analysis.[30] While it is true that a collective actor has an 'inside' and an 'outside', the membrane between them is porous, with events on one side invariably bleeding through to affect events on the other. The state is therefore both an actor in IR and a marker that separates the domestic from the international.[31] This distinction can become problematic when viewed in the long lens of history. The states of the Arctic Basin, as I will argue in chapters Four, Five and Six, began their existence as hierarchic imperial international systems in their own rights, only recently moving to close their territorial boundaries and take on a more 'Westphalian' and unit-like appearance.[32] They therefore possess characteristics common to both units *and* systems, straddling the boundary between 'inside' and 'outside' that defines IR. Much of the historical analysis that follows in Part Two compares the influence of Arctic ecology on the convergent and divergent evolution of these imperial international systems, whose interactions within the region's *secondary international system* will – as discussed in Chapter Six – be dramatically affected by the ecological consequences of anthropogenic GEC.[33]

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[29] Fred Halliday, *Rethinking International Relations* (London: Macmillan, 1994): 2-4.
[30] Barry Buzan, *From International to World Society? English school theory and the social structure of globalisation* (Cambridge: Cambridge University Press, 2004): 119.
[31] RBJ Walker, *Inside/Outside: International Relations as Political Theory* (Cambridge: Cambridge University Press, 1993): 134.
[32] The *Westphalian* characteristics of modern states will be discussed at length in Chapter Five. For now, this project will use Buzan and Little's shorthand, which identifies the modern state as a collective actor possessing 'hard' territorial boundaries within which it can make a reasonable claim to centralized sovereign control. [Buzan & Little (2000): 244-245.]
[33] A secondary state system is composed of interacting 'suzerain sate systems' rather than autonomous, Westphalian states. [Martin Wight, 'De Systematibus Civitatum', in Hedley Bull, *Systems of States* (Leicester: Leicester University Press, 1977): 24.] In order to avoid terminological confusion, this project will describe both empires and suzerain state systems as 'imperial systems' in which peripheral units' international relationships are dominated by, but not wholly reducable to, those of a metropolitan state.

IR's focus on the analysis of human relationships at the international scale presents a problem of even more immediate concern to my work: *anthropocentrism*. This ontological assumption asserts that there exists 'a clear and morally relevant dividing line between humankind and the rest of nature, that humankind is the only or principal source of value and meaning in the world, and that nonhuman nature is there for no other purpose but to serve humankind.'[34] Because of anthropocentrism, IR tends to ignore Ecology's influence on the evolution of international units, processes, and structures, relegating it to instrumental status in analyses of human interaction.[35] When this project began, my intention was to latch myself onto an existing theoretical framework in order to understand the impact of changing ecological conditions on the constitution of international systems in the circumpolar North. I was surprised, and more than a little dismayed, to find that no such framework existed within the IR canon. The world-historical approach to the study of international systems developed by Barry Buzan and Richard Little for *International Systems in World History* (*ISWH*) appeared at first to present a viable path to success. It allows its authors to observe patterns and discontinuities in the evolution of units, processes, and structures in international systems stretching back to the earliest days of human society. Even using so broad a brush, however, Buzan and Little are unable to fold ecological relationships into their world-historical model. Although they propose an environmental sector of international interactions – a move with which this project disagrees – they admit defeat when considering the environmental structure of IR.[36] It is an instructive admission with its roots firmly planted in IR's anthropocentric worldview, and a shortcoming that this project is intended to address.

Anthropocentrism has not always ruled IR's roost. Prior to the end of the Second World War, attempts to synthesize international politics and physical geography 'assumed that the physical environment and human activity covaried spatially because human activity was controlled primarily by the physical environment.'[37] Deterministic geopolitical theories, such as those put forward by Halford MacKinder to explain the geographical roots of Britain's imperial power and policies prior to the First World War, were certainly nonanthropocentric – interested as they were in a wide variety of

[34] Eckersley (1992): 51.
[35] Hovden (1999), pp. 60-63.
[36] Buzan & Little (2000): 84.
[37] David Grigg, 'The Logic of Regional Systems', *Annals of the Association of American Geographers* 55(3) 1965, p. 472.

historical causes, including the character of regional drainage, climate, and agriculture. Unfortunately, the resulting analyses were limited by the highly incomplete picture of ecological dynamics available around the turn of the century.[38] This understood the planet to be a relatively stable stage on which the human drama was played out, failing to account for the ongoing dynamism that binds humanity to the natural systems in which we are embedded. As a result of this static view of the ecological world, early geopoliticians fell back on simplified, 'eternal' spatial generalisations about the relationship between geography and international politics. Mackinder, for example, saw the world in terms of a central 'pivot' in European and Siberian Russia whose control was the key to controlling Eurasia and – consequently – the planet.[39] This was typical of the tendency to view geopolitics in terms of a hierarchy of spaces, often capped by the 'superior' nature of Europe and its inhabitants.[40] In Nazi Germany, the work of academics like Friedrich Ratzel and Karl Haushofer did much to sully the reputation of classical geopolitics. Their association with Nazi ideology, particularly ideas relating to *lebensraum* and racial hierarchies, relegated the discipline to the academic sidelines for many decades after 1945, leaving the young field of IR without a means – however imperfect – of integrating physical geography into its narratives.[41] Monocausal geographical determinism thereafter came to be replaced by narratives whose causes and effects were firmly rooted in human interaction.[42] Whereas classical geopolitics was opposed to the idea that human will was the primary determinant of history (a role that it gave to stable natural environments and geographical settings), post-war IR grew to take our ability to control the natural world for granted.[43]

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[38] Geopolitics can be understood as the attempt to '"spatialize" international politics in such a way as to represent it as a "world" characterized by particular types of places, peoples, and dramas.' Gearoid O Tuathail & John Agnew, 'Geopolitics and Discourse: practical geopolitical reasoning in American foreign policy', in *The Geopolitics Reader,* Gearoid O Tuathail, Simon Dalby & Paul Routledge (London: Routledge, 1998): 80.

[39] Halford Mackinder, 'The Geographical Pivot of History', *The Geographical Journal* 23(4) 1904, pp. 434-437. Other important early geopoliticians include Friedrich Ratzel, Rudolf Kjellen (who first coined the term *geopolitics* to describe the role of geographical location, size, and character in determining the nature of state behaviour), Alfred Thayer Mahan, and Nicholas Spykman. [Sven Holdar, 'The Ideal State and the Power of Geography: the life-work of Rudolf Kjellen', *Political Geography* (11:3) 1992, p. 319; Bert Chapman, *Geopolitics: a guide to the issues* (Oxford: Praeger, 2011): Chapter 1 *passim*.]

[40] Klaus Dodds, *Global Geopolitics: a critical introduction* (London: Pearson Prentice-Hall, 2005): 6.

[41] Chapman (2011): 8, 15-16, 21-22.

[42] Dodds (2005): 21-22; Chapman (2011): 7-10, 15-16.

[43] Tuathail & Agnew (1998): 79; Hovden (1999), pp. 52-53, 62-63. The 'critical' incarnation of contemporary geopolitics focuses on the ways in which humans 'spatialize' politics rather than on the ways in which our environment affects our behaviour. As one of its chief proponents explains, 'Rather than defining geopolitics as an unproblematic description of the world political map, [critical geopolitics] treats geopolitics as a discourse, as a culturally and politically varied way of describing, representing, and writing about geography and international politics.' [Gearoid O Tuathail et al, Eds. *The Geopolitics Reader* (London: Routledge, 1998): 3.] Though useful for uncovering the role of power in shaping geopolitical discourse, it is worth considering how little this Foucaultian approach might contribute to overcoming the anthropocentric tendencies of geopolitical debates.

Anthropocentrism has since come to dominate our discipline. Robert Jackson's claim that 'there is no part of [IR] that is natural or supernatural, controlled by non-human forces' is just one illustrative example.[44] At best, as when he admits that 'there are of course plenty of human and physical *circumstances* which limit the choices and actions available in international politics', writers in IR accept ecological systems as a set of instrumental rather than constitutive factors in international systems' development.[45] As such, they affect the range of choices available to actors without generating the principles that drive their action.[46] Jackson helpfully completes IR's anthropocentric line of argument by acknowledging an externalized role for non-human factors, explaining that 'circumstances are not fixed, but shift and change so that at one time or place an opportunity for action might arise which might not exist in another.'[47] Though changeable, ecological context is not seen to drive units' constitution or the structures, processes, and interaction capacities that help to define an international system. Rather, it serves only to open or close one or more evolutionary pathways to affect the direction of humanity's historical development. Although this contextual parsimony produces an elegant image of international systems' evolution, there is a heavy price to be paid. That is the alienation of IR's human subjects and objects from the ecological systems in which they and their interactions are embedded, effectively closing debate on the constitutive dynamics of socio-ecological relationships.[48] Given the importance now being placed on 'the development of standardised baseline human system data for circumpolar regions', including 'integrated multidisciplinary studies" and "regionally specific human vulnerability studies', it is time to reconsider IR's anthropocentric turn.[49]

IR's anthropocentric worldview is evident in each of its dominant theoretical approaches. Though increasingly questioned over the past four decades, Realist discourse has probably done more than any other to define the scope of our discipline. At its heart are several assumptions about the proper subjects of international study, particularly the primacy of the state as a rational, unitary, and power-seeking actor

[44] Robert Jackson, *The Global Covenant: Human Conduct in a World of States* (Oxford: Oxford University Press, 2000): 33.
[45] Jackson (2000): 99. Italics in original.
[46] Eckersley (1992): 97-98.
[47] Jackson (2000): 145.
[48] Eckersley (1992): 21-26. See also Williams (1996): 48.
[49] Anisimov et al. in Parry et al. (2007): 677.

trying to survive in an anarchic international system.[50] Though its different variants disagree about the root causes of state behaviour, they agree that survival is every state's paramount concern. The resulting prioritization of actors' material capabilities for self-preservation demotes ecology to a instrumental means serving IR's ultimate end: state survival.[51] Questions about the impact of GEC on international systems are therefore limited to how it may affect states' power, closing discussion on how ecological conditions affect the constitution of units and the processes and structures that describe the international systems they inhabit. As Hans Morgenthau makes clear in *Politics Among Nations*, natural resources are 'relatively stable' components of power, external to and controllable by the state.[52] Nowhere does Morgenthau or his successors accept a constitutive role for ecological factors in the evolution of the international system. The latter tend to define states as *like units* differentiated by their material capabilities. A state's ecological structure is therefore of no interest except insofar as it is instrumental to those capabilities. The question of ecology's influence on international systems' development is therefore smothered by Realism's decontextualized and ahistorical anthropocentrism.[53]

Before I am accused of duelling with a straw man, Realism's relegation of ecology to the status of an externalised and instrumental factor is mirrored in IR's other major theoretical approaches. Liberal Institutionalists, Marxists, International Political Economists, and members of the English School alike view planetary ecology as a relatively stable and controllable set of resources and conditions. This widespread ontological assumption has its roots in the European Enlightenment, when intellectual and political developments saw the rise of the scientific method and the nation-state as twin pillars of modernity, both presupposing humanity's ability to harness and manipulate the natural world around it for the purposes of human self-realization.[54] The subordination of nature to human ends, internalized by our discipline, fails to account for ecology as a constitutive force in the development of international systems. In determining which facts are significant to our studies – arguably the main function

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[50] Hans Morgenthau, *Politics Among Nations* (New York: Knopf, 1985) sixth edition: 12-13; Jack Donnelly, "Realism", in S. Burchill et al. *Theories of International Relations* (London: Palgrave Macmillan, 2001) second edition: 31-33.
[51] Eric Laferrière & Peter Stoett, *International Relations Theory and Ecological Thought* (London: Routledge,1999): 84-85.
[52] Morgenthau (1985): 109-112.
[53] Halliday (1994): 32-35.
[54] Laferrière & Stoett (1999): 5; Eckersley (1992): 21-25.

of theory – IR tends to find its explanations of human behaviour *in* human behaviour, be it considered in terms of human nature, rational choice, or socially-constituted structures. In so doing, our discipline masks non-human factors that fall outside of its anthropocentric terms of reference.

Marxism, to which many look for the roots of critical theory in IR, is a case in point. Historical Materialism embraces class and the means of production as the primary determinants of our social evolution.[55] Though neo-Marxist writers acknowledge the importance of society's 'historically contingent setting' to its subsequent development, the forces driving that development are still to be found within human society and its socio-economic relationships. Ecology is significant only to the extent that it is claimed and used by classes seeking to control society's means of production.[56] Blindness to the constitutive effects of ecological conditions is one of Marxism's key ontological premises, summed up in Friedrich Engels's dictum on the ability of economic systems to bend nature to their will:

> Capitalist industry has already made itself relatively independent of the local limitations arising from the location of sources of the raw materials it needs…Society liberated from the restrictions of capitalist production can go much further still… in so far as it is conditioned on the most equal distribution possible of modern industry over the whole country.[57]

The *Engels Dictum* is symptomatic of Marxism's blindness to the impact of local ecological conditions on the constitution of the units, processes, and structures that describe any international system. Its assumption of mankind's ability to modify and control nature became a central tenant of Soviet planning in arctic Siberia during the second half of the 20th century, and continues to be an important statement of humanity's relationship to the ecological world.[58]

This understanding of ecology as an instrumental factor in the constitution of international units, processes, and structures is mirrored in IPE. IPE grew out of IR's increasing interest in economic relations during the food, oil, and credit crises of the

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[55] Laferrière & Stoett (1999): 138; Halliday (1994): 63-64.
[56] Laferrière & Stoett (1999): 154-155.
[57] Friedrich Engels, *Herr Eugen Dühring's Revolution in Science* (Moscow: Progress Publishers, 1947) Marxists Online Archive, [online] accessed May15, 2011 <http://marxists.catbull.com/archive/marx/works/download/pdf/anti_duhring.pdf>.
[58] Fiona Hill and Clifford Gaddy, *The Siberian Curse: how communist planners left Russia out in the cold* (New York: The Brookings Institution, 2003): 88-91.

1970s and '80s and embraces a wide range of theoretical positions. Each has a different view of the best way to study the interplay between economics and politics in world affairs, particularly the relationship between authority and market relations. Robert Gilpin identifies three primary approaches – realist, liberal, and Marxist – each of which owes a debt to an associated branch of IR.[59] Ngaire Woods labels these approaches as mercantilist, liberal, and Marxian, but agrees with Gilpin's claim that orthodox IPE owes much of its conceptual scaffolding to the dominant IR theories out of which its variants grew.[60] As a result of their common intellectual heritage, IPE reproduces IR's anthropocentric assumptions by externalising and instrumentalising ecology's impact on the evolution of international economic systems. The result has often been a myopic focus on environmental problem solving. This has left questions of Socio-Ecological Coevolution highly under-theorized. As such, even this innovative approach to IR remains focused on putting out the fires associated with GEC rather than looking at the systemic causes and effects of the conflagration.[61]

Anthropocentrism is even central to the English School (ES), arguably the most historically sensitive branch of IR. The ES interprets IR according a set of historically evolved practices and principles – institutions – that pattern unit interactions and thereby bring some level of order to an otherwise anarchic international society.[62] In the course of its work, the ES has come to see historical relationships between human actors (be they individual or collective) as inherently social, implying actors' acceptance of some level of rule-making, communication, and agreement on common principles and values. Many of its members therefore argue that purely mechanical inter-human relations, devoid of shared social content, do not exist in the real world.[63] Though useful as thought experiments, mechanical understandings of human interaction should be relegated to the worlds of sci-fi alien invasions and – arguably – the impersonal processes of natural selection.[64] The English School's prioritization of social over mechanical relations generates a particular vision of international history,

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[59] Robert Gilpin, *The Political Economy of International Relations* (Princeton: Princeton University Press, 1987): 25-64.
[60] Ngaire Woods, 'International Political Economy in an Age of Globalization', in J. Baylis et al. (2010): 252-254.
[61] Williams in Vogler & Imber (1996): 45-49.
[62] Andrew Linklater & Hidemi Suganami, *The English School of International Relations: a contemporary reassessment* (Cambridge: Cambridge University Press, 2006): 21, 43.
[63] Alan James, 'System or Society?', *Review of International Studies*, 19(3) 1993:, pp. 269-288; Hedley Bull & Adam Watson, *The Expansion of International Society*, (Oxford: Clarendon Press, 1984): 1; Adam Watson, *The Evolution of International Society: a comparative historical analysis* (London: Routledge 2009) second edition: 238.
[64] Buzan (2004): 100.

whose sources of continuity and change are assumed to be endogenous to humanity itself. Having alienated international society from its ecological context, the English School explains systemic evolution in entirely social terms and relegates ecological factors to instrumental status, making them of interest only so long as they impact the means by which IR's human subjects pursue their social ends. Ecological context is still assumed to be largely static, a source of neither social stability nor social change. Robert Jackson – whose work is sympathetic to international society – again sums up this approach when he states that IR 'is entirely a sphere of human experience, nothing more and nothing less… no part of it exists beyond human relations.'[65]

Anthropocentrism is deeply ingrained in contemporary IR, standing easily beside the five ideological assumptions identified by Buzan and Little as being responsible for limiting our discipline's ability to map the historical evolution of the planet's international systems.[66] As argued by writers including Robyn Eckersley, Andrew Dobson, and Marc Williams, anthropocentrism has handicapped efforts to address questions of systemic adaptation to GEC, leading to a myopic focus on climate change mitigation that takes for granted our ability to manipulate and control the natural world in which we live.[67] At the heart of my project lies a profound scepticism about the international system's ability to mitigate the causes (and effects) of GEC. Continued anthropogenic forcing of the environment and the positive feedback mechanisms that this activity appears to be activating make mitigation an ever more complicated and expensive undertaking. This seems to be leading many leading international actors to defer action in the face of imperfect information and free riders, who flout international environmental agreements in order to profit from the ecological responsibility of others. Given the difficulties facing international mitigation efforts and the high likelihood of ecological impacts regardless of their short-term success or failure, it is surely prudent to hedge against the likeliest effects of GEC by considering their potential impact on international units and systems.

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[65] Jackson (2000): p. 29.
[66] The five ideological assumptions identified in IR by Buzan and Little are: presentism, ahistoricism, Eurocentrism, anarchophilia, and state centrism. [Buzan & Little (2000): 18.] Where B&L blame these for IR's general failure to achieve a world-historical perspective on the development of international systems, I consider anthropocentrism to be the ideological assumption most directly responsible for IR's failure to adequately consider these systems' ecological constitution across time and space.
[67] Dobson (1990): 175-192; Eckersley (1992): 23-25; Williams in Vogler & Imber (1996): 48.

IR's anthropocentric approach to planetary ecology need not have the final word. Though flawed, the discipline's instrumental treatment of ecological context can provide a starting point from which to consider deeper constitutive questions. IR has often shown itself willing to reconsider its guiding assumptions in order to account for the influence of heretofore marginalised factors on its objects of study. IPE, for example, locates political systems in their economic environment, enriching the study of the international by acknowledging the role of the economic sector in the development of political relations. In so doing, IPE has altered our understanding of the relationship between IR's classical interests – such as politics and diplomacy – and the worlds of production, trade, and finance. The English School locates the atomistic world of Realism in its social context, allowing it to generate much more compelling historical analyses of international units and systems. I assert that the same feat can be accomplished with regard to the ecological contexts in which all of our international systems are embedded. This need not entail a wholehearted embrace of an ecocentric approach that brings ecological systems into play in every branch of IR. Rather, it means that students and practitioners of IR should *explicitly* state which contexts – social or ecological – they will include in their analyses rather than simply taking for granted that ecological systems have nothing to offer. This project is a first step towards such a synthesis, exploring the impact of Socio-Ecological Coevolution on the international systems of the circumpolar world.

Literature: International Social Systems & Ecology

International Social Systems

My analysis of GEC's effects on Arctic international systems brings together two heretofore separate literatures: international system analysis and Ecology. My approach to the former is rooted in the analytical matrix used by Buzan and Little in their study of international systems in world history. This frames much of the analysis to follow, and traces the influence of Socio-Ecological Coevolution on three aspects of historical and contemporary international systems: their interaction capacities, their interactive processes, and their social structures. Buzan and Little's analysis adopts a theoretically pluralist approach to the historical study of international systems, which are broadly defined as social networks constituted by structured sets of interacting units, two or more of which "have sufficient contact between them, and have sufficient impact on one another's decisions, to cause them to behave – at least in some measure

– as parts of a whole."[68] This definition requires some clarification and will be discussed further in Chapter Two. For now, I would make two general points.

First, I assume that historical international systems are socially rather than mechanically constructed insofar as the actors who inhabit them are always "conscious of certain common interests and common values".[69] These common interests and values generate "a *society* in the sense that [units] conceive of themselves to be bound by a common set of rules in their relations with one another, and share in the workings of common institutions."[70] As argued by Alan James and Alexander Wendt, among others, international units and systems are generated by human interaction.[71] Both are social constructs, bounded and constrained by rules of membership – which identify *who* is included as a member of a given system; and rules of behaviour – which identify *what* kinds of conduct the resulting society (of states, firms, civil society organizations, etc.) will tolerate from its members. These evolving principles mark the boundaries of any international system.[72]

A survey of history makes it clear that such principles are a necessary product of human interaction at any scale. As Adam Watson observes, '[e]ven where states locked into international systems do not constitute what we have called a society, they evolve regulatory rules and institutions and formulate them in capitulatory agreements because they cannot manage without. No system has existed without rules and conventions of some kind, and it is hard to see how one could.'[73] Rather than try to identify a discreet moment at which regulatory rules become the 'rules and institutions consciously based on shared assumptions and theories' (the English School's general definition of an international society), I follow Alan James in arguing that all international interactions take place amidst socially constructed principles, erasing the distinction between systems and societies by folding the former into the latter.[74] International systems exist on a spectrum ranging from *thin* to *thick* forms of society.

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[68] Buzan & Little (2000): 442; Hedley Bull, *The Anarchical Society: a study of order in world politics* (London: MacMillan Press, 1995) second edition: 9.
[69] Bull (1995): 13.
[70] *Ibid*. [italics added]
[71] James (1993), pp. 269-288; Alexander Wendt, 'Anarchy is What States Make of It: the social construction of power politics', *International Organization* 46(3) 1992, pp. 394-395.
[72] Buzan (2004): 167. The sets of practices and principles under discussion are roughly equivalent to the *primary institutions* of the English School.
[73] Watson (2009): 238.
[74] *Ibid*: 121; James (1993), pp. 272-276.

Thus, many conflictual forms of the states-system actually represent 'thin' forms of international society, characterized by 'a relatively low, or narrow, degree of shared norms, rules and institutions amongst the states, where the focus of international society is on creating a framework for orderly coexistence and competition, or possibly also the management of collective problems of common fate (e.g. arms control, environment).'[75] This 'thin' form of society can be set alongside thicker varieties, in which it is possible for actors to cooperate 'over a wider range of issues, whether in pursuit of joint gains (e.g. trade), or realisation of shared values (e.g. human rights).'[76] In the contemporary states system, thick and thin international societies exist side-by-side in different parts of the world: thicker in the case of Europe's international political system, where states have sacrificed some aspects of their sovereignty to the supra-state European Union; thinner in the case of the international political system in South Asia, where the processes that describe international society's purposes and principles are less about cooperation than they are about the maintenance of a balance of power between rivals and enemies.

Second, international systems cannot be described with reference to any single sector of human interaction. They are sectorally layered, with nested political, economic, and societal systems operating alongside and within one another.[77] The visual learner might imagine international systems as webs, their filaments made up of the political, economic, and societal interactions that link us together individually and as units. Some of these webs are small, such as those that connect a family or a firm. Some are enormous, such as the economic networks that bring us cocoa from Côte D'Ivoire, cars from China, and insurance from Lloyds of London. Each of us participates in a huge number of these networks at any one time: as a client of a firm, as a member of a civil society group, and as a citizen of a state. Each network represents a social system in its own right, complete with the rules of membership and behaviour discussed in the previous paragraph. The global international system, taken as a totality, is composed of a huge number of networks with overlapping memberships. In this sense, the global international system is a *system of systems* or, to burgle the vocabularies of Fernand Braudel and Kirti Chaudhuri, a 'set of sets'.[78] Among the global system's subsets are

[75] Buzan (2004): 49.
[76] *Ibid*.
[77] Buzan & Little (2000): 109.
[78] Kirti Chaudhuri, *Asia before Europe: economy and civilisation of the Indian Ocean from the rise of Islam to 1750* (Cambridge: Cambridge University Press, 1990): 431; Fernand Braudel, *Civilization and Capitalism, 15th-18th*

collective actors: the states, firms, and civil society organizations whose interactions are primarily responsible for generating its rules of membership and behaviour. Collective actors are themselves made up of interacting sets of individuals and groups, blurring the boundaries between the international and domestic scales and problematising the inside-outside distinction discussed at the beginning of this chapter. The resulting image of the international scale as constituting an interwoven set of interacting social networks serves my purposes by opening space for a theoretically pluralist conception of international systems, in which processes and structures located in different sectors can be disaggregated and analysed before being recombined to understand the connections between them.[79]

Ecology

The second literature on which this thesis draws is rooted in Ecology, which studies the biological and physical systems in which all life is embedded. Instead of taking a static and classificatory approach to the study of the physical environments in which international systems develop, I will consider ecological context as a dynamic constitutive factor in their evolution. Ecological context plays a key role in the analysis to follow, constituting a third axis to complement and expand the analytical matrix of sectors and levels employed by Buzan and Little. The application of an explicitly ecological framework to this matrix will transform its sources of explanation – process, interaction capacity, and structure. These describe, in turn, what kinds of interactions take place across a given system, how much interaction is possible, and how interacting units are arranged with respect to one another.[80] When reinterpreted for the purposes of ecological analysis, process becomes concerned with the dynamics that link our social and ecological environments – *coevolutionary processes* – and their impact on the Arctic's mutually constituted international and ecological systems.[81] Interaction capacity is reinterpreted in terms of *ecological capacity,* which measures the sustainability of units and systems in a given time and place. Social structure,

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Century: Volume 2, The Wheels of Commerce (London: Collins, 1981): 459, Ch. 5 passim; R.J. Moore, "World History: world economy or a set of sets?", *Journal of the Royal Asiatic Society Series 3*, 3(1) 1993, pp. 103-104.

[79] Buzan & Little (2000): 35. Though more historically accurate than the simple inside-outside distinction that typifies much IR scholarship, this complexity carries with it significant analytical costs insofar as many subsystems normally thought of as 'domestic' reveal themselves to be more international than they first appear. Thus, as we will discuss in the coming Chapters, the imperial states of the circumpolar world may be defined as domestic *and* international systems to the extent that they include a variety of semi- autonomous units that hold subordinate positions in imperial systems. [Adam Watson, 'Systems of States', *Review of International Studies* 16(2) 1990, pp. 102-103.]

[80] *Ibid*, pp. 79, 80, 84.

[81] Butzer (1982): 6-7.

reinterpreted as *biogeographical structure*, is the last source of explanation discussed in *ISWH* and may prove to be the most fruitful area of socio-ecological synthesis. Starting with the distribution of biomes and niches around the circumpolar world, I will develop a model of international systems that links their social constitution to the biogeographical structures in which they are embedded, producing a hybrid of imperial and Westphalian principles to describe the regional international system of the circumpolar North.

Incorporating ecological literature into my analysis of international systems will rely on several theses developed by environmental historians. Though its roots are deep, playing a central role in the work of Herodotus and Thucydides, Environmental History is relatively young branch of that venerable craft, being organised as a coherent subfield in the 1970s. Over the past four decades, it has become one of History's most active disciplines, producing volumes on everything from the general causes of human societies' growth and collapse to specific studies of the role played by individual floral and faunal species in human history.[82] Environmental History is primarily concerned with studying the constitutive impact of ecological and human systems on one another's development, a goal captured by two of its main assumptions:

1. that the ecological systems in which we are embedded affect the ways we live, the technologies we choose to adopt, and the ways in which we relate to the world; and
2. that our lifestyles, technologies, and social relations have immediate and long-term impacts on the ecological systems around us.[83]

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[82] Among those with the most influence on this project are Alfred Crosby, *The Columbian Exchange: Biological and Cultural Consequences of 1492* (Westport CT: Praeger Publishers, 2003) 30th anniversary edition; Alfred Crosby, Ecological *Imperialism: the biological expansion of Europe, 900-1900* (Cambridge: Cambridge University Press, 1986); Joseph Tainter, *The Collapse of Complex Societies* (Cambridge: Cambridge University Press, 1988); Jared Diamond, *Guns, Germs, and Steel: the fates of human societies* (New York: W.W. Morton, 1997); Brian Fagan, *The Little Ice Age: how climate made history 1300-1850* (New York: Basic Books, 2001); J. Donald Hughes, *An Environmental History of the World: Humankind's changing role in the community of life* (New York: Routledge, 2001); Brian Fagan, *The Long Summer: how climate changed civilization* (New York: Basic Books, 2004); Jared Diamond, *Collapse: how societies choose to succeed or fail* (London: Penguin, 2005); Sing C. Chew, *The Recurring Dark Ages: ecological stress, climate changes, and system transformation* (London: Altamira Press, 2007); George Rose, *Cod: the ecological history of the North Atlantic fishery* (St. John's, NL: Breakwater Books, 2007); I.G. Simmons, *Global Environmental History: 10,000 B.C. to A.D. 2000* (Edinburgh: Edinburgh University Press, 2007); Brian Fagan, *The Great Warming: climate change and the rise and fall of civilizations* (London: Bloomsbury Publishing, 2008); Ian Morris, *Why the West Rule – For Now: the patterns of history and what they reveal about the future* (New York: Farrar, Strauss & Giroux, 2010).

[83] J. Donald Hughes, *What Is Environmental History?* (Cambridge: Polity Press, 2006): 4.

These twinned hypotheses describe a constitutive relationship as old as our species. As J. Donald Hughes observes, "humans and the rest of the community of life have been engaged in a process of coevolution that did not end with the origin of the human species, but continues in the present."[84] Although this process has largely been ignored by students and practitioners of IR, environmental historians use it to capture several interesting historical dynamics. For my purposes, the most important derive from Alfred Crosby's 1986 book, *Ecological Imperialism: the biological expansion of Europe, 900-1900*. This looks at the role of biogeographical factors, including specific climatic and biological systems, in constraining and encouraging Europe's overseas expansion.[85] Crosby's analysis folds neatly into the history of the modern international system, itself the product of the centuries-long process by which non-European peoples and territories have been incorporated into international systems centred on Europe and its neo-European colonial extensions.[86] By combining these streams of environmental and international analysis, this project will shed light on the Coevolution of Ecology and IR in the Arctic, providing a baseline against which to judge the likely impact of future ecological changes on associated regional international systems.

Plan of Investigation

Part One of this project puts together the theoretical toolkit for its analysis. This begins in Chapter Two, which establishes *why* IR will benefit from ecologically-grounded analyses of international systems. In doing so, the Chapter (i) identifies some of the analytical tools with which the subsequent sections will define and identify international systems in the historical record, (ii) disaggregates the composite structure of the global international system in terms of levels of analysis and sectors of interaction, (iii) explains the role of ecological and social factors in evolutionary dynamics, and (iv) defines *Socio-Ecological Coevolution* as the key process linking our international social systems to the ecological contexts in which they are embedded. The tools used to identify and trace the evolution of international systems in the circumpolar Arctic are based on the analytical matrix developed by Buzan and Little.

[84] Hughes (2006): 14.
[85] Crosby (1986): 5-6.
[86] Buzan & Little (2000): 241-242; Watson (2009): 201.

This uses three sources of explanation – interaction capacity, process, and structure – to analyse the constitution of international systems, which the authors disaggregate by reference to sectors of interaction and levels of analysis. Once it has examined this matrix in terms of its sources of explanation, sectors, and levels, the chapter considers the mechanisms by which ecological systems affect the evolution of their international counterparts. This is done by highlighting sources of evolutionary stability and change that are endogenous and exogenous to human society. *Endogenous* social factors such as path dependence and sectoral interference are weighed against exogenous influences emanating from ecological contexts. International systems do not exist in an ecologically homogenous world. They are the products of an ongoing process of mutual constitution involving human interactions with and within ecological environments. This process affects both the human systems by which collective actors relate at the international scale *and* the ecological systems in which individuals, units, and systems alike are embedded.

Chapter Three asks *how* we should go about incorporating ecological factors into our analysis. It does so by (i) considering sectors and levels as potential tools with which to achieve a socio-ecological synthesis, (ii) identifying context as a key ontological lens in the analysis of systemic evolution, and (iii) explaining the effects of adding a new ontological axis to *ISWH*'s heretofore socially-contextualised matrix. Firmly in IR's anthropocentric approach to systems analysis, sectors and levels are ill-suited to act as points of contact between international systems and their ecological surroundings. This project therefore proposes adding a third axis to Buzan and Little's two-dimensional matrix. This captures the *context* in which systemic interaction evolves, forcing students and practitioners of IR to explicitly include and exclude ecological contexts from their studies. Its main purpose is to provide a space in which the influence of non-human factors can be considered without compromising the coherence of IR's existing social narratives. One's choice of context can range from the parsimonious to the complex. For the purposes of this project, I identify two dominant varieties: social and ecological. Locating an international system in its social context is a necessary step towards the construction of a historically coherent image of the world – one pursued by Martin Wight, Adam Watson, and Buzan and Little amongst others. It describes the 'common interests and common values' that develop out of repeated human interaction, constraining relations between actors in a

system.[87] The socially-contextualised analyses produced by this ontology correspond closely to the image of international society advanced by the English School. As previously discussed, this focuses on ways in which shared social principles constrain and enable actors' behaviour in a formally anarchic international social system. Social context forces us to reinterpret the atomistic individuals of mechanically-constituted theories – such as liberal economics and neo-Realism – as members of a socially-constructed system in which shared principles shape their roles and behaviours.[88] These principles describe both *who* is part of a given social system (principles of membership) and *how* they should act towards one another (principles of behaviour). Buzan and Little's argument that 'systems defined in military-political terms are normally embedded in economic and societal systems that are often wider in extent and earlier in formation'[89] sets the pattern for this project's claim that international social systems are themselves embedded in an even wider, and older, set of ecological systems.

Chapter Three concludes by summarizing the theoretical toolkit used to analyse this socio-ecological relationship in the circumpolar world, using context in conjunction with the matrix's existing divisions – sectors and levels – to investigate the impact of ecological systems on the sources of explanation that drive social evolution. This is accomplished by reconstructing Buzan and Little's three sources of explanation – interaction capacity, process, and structure – in ecological terms. It begins by considering the general impact of Socio-Ecological Coevolution – a primary socio-ecological process – on the development of international units and systems. Instead of describing the 'dynamics of the interactions among units in the [international] system and the use made of the existing interaction capacity by these units', process becomes a route by which to examine interactions between international systems and the ecological contexts in which they are embedded.[90] This ecological reinterpretation of process has its corollary in interaction capacity, the second of Buzan and Little's sources of explanation. This is defined as a unit's or system's ability to transport ideas, goods, and people across space.[91] Ecological contextualization reconstructs this

[87] Bull (1995): 13.
[88] Kal Holsti, *Taming the sovereigns: institutional change in international politics* (Cambridge: Cambridge University Press, 2004): 19.
[89] Buzan & Little (2000): 78.
[90] *Ibid*: 79.
[91] *Ibid*: 80.

source of explanation as Ecological Capacity (EC), which analyses the sustainability of units and systems at a given site. Its main ecological determinant is Net Primary Production (NPP), which measures the amount of atmospheric carbon fixed by autotrophs in a given area over time. NPP can be thought of as a measurement of a site's potential ecological energy, and is mediated by the physical and social technologies with which we access and supplement it. Thus, EC is determined by three interconnected factors:

i) whether local levels of ecological productivity, measured in terms of NPP, make it easy or difficult to sustain specific international units and systems;
ii) what physical technologies are available for the extraction and utilization of a habitat's energy reserves; and
iii) what social technologies are available for the extraction and utilization of a habitat's energy reserves.

Structure – Buzan and Little's third and final source of explanation – describes the role of units' social environment in shaping a system's rules of membership and behaviour.[92] As with process and interaction capacity, structure is transformed by the act of ecological contextualization. Using the main functional divisions of ecology – biomes – as a starting point, the toolkit draws on Alfred Crosby's work to identify the role of biogeographical structures in the constitution of their embedded international systems.[93] By integrating Crosby's hypothesis into the international history of the Arctic, this project will take an important step towards conceptualizing ecological structure in IR terms, focusing on ways in which the distribution of biomes can be used to understand the constitution and behaviour of their embedded human populations.

Part Two, covering chapters Four, Five, and Six, applies its ecologically contextualized toolkit to analyse the evolution of international systems in the circumpolar Arctic beyond the wedge of medieval European settlement. Its chronology begins at the time of Europe's expansion into terrestrial ecosystems beyond the Ural Mountains and Denmark Strait in the mid- to late-16th century. Chapter Four begins by looking generally at the effects of Socio-Ecological

[92] *Ibid*: 84.
[93] Manuel C. Molles, *Ecology: concepts and applications* (London: WCB/McGraw-Hill, 1999): 14, 235.

Coevolution on the development of early modern Arctic processes and units, be they pre-international indigenous units and systems or the European fur traders and settlers who began to infiltrate Siberia and arctic North America from the 1580s. Long before the arrival of Europeans, preinternational arctic and subarctic indigenous units and systems were profoundly influenced by their Ecological Capacity. This affected both their internal organisation – analysed in terms of their populations and levels of social differentiation – and the processes by which they interacted. The European traders and settlers who subsequently entered the tundra and taiga were faced with a variegated ecological tableau, generating processes of tribute and commodification whose distribution reflects several axes of ecological productivity. These axes produce patterns which can be traced by reference to the distribution of social differentiation among early modern Arctic units, whose physical and social technologies were not yet sophisticated enough to effectively mediate the impact of NPP.

Chapter Five looks at the impact of EC on the organisation of the region's dominant units – the imperial systems that claim and exercise sovereignty over much of the Arctic Basin. These units – including Russia, Great Britain, Denmark, and, more recently, the United States and Canada – inhabit a heterogeneous ecological region. Where neo-European ecologies boosted their EC and permitted the establishment of agricultural settlements, their organising principles of membership and behaviour converged with characteristics that typified their increasingly 'Westphalian' European metropoles, particularly 'hard' territoriality and centralised sovereign control.[94] In non-European arctic and subarctic biomes, limited EC forced these units to adopt a different set of social technologies to protect their sovereign claims. Indirect rule through imperial proxies became the norm – whether through co-opted indigenous leaders or chartered corporations with de jure and de facto rights over circumpolar lands and peoples. The states of the circumpolar world thus began their lives as hierarchic imperial international systems rather than as autonomous and centralised units. They were 'structurally centralized political systems within which core states and elites dominate[d] peripheral societies, serve[d] as intermediaries for their significant interactions, and channel[led] resource flows from the periphery to the core and back to the periphery.'[95] The international units that have since evolved out of

[94] Buzan & Little (2000): 244-245.
[95] Alexander J. Motyl, *Revolutions, Nations, Empires: conceptual limits and theoretical possibilities* (New York: Columbia University Press, 1999): 126.

these imperial systems remain deeply *bifurcated*, with split organisations that mirror the divergent levels of EC that they enjoy in the various biomes they straddle. In their relatively unproductive arctic and subarctic hinterlands, EC has encouraged states to retain characteristics associated with imperial hierarchies, particularly in terms of their frontiers and indirect exercise of sovereignty. In these non-European biomes, Russia, the United States, Canada, and Denmark continue to sit at the centre of their own imperial international systems, and thus inhabit a the grey area between domestic and international systems. Each is dominated by core-periphery relationships 'in which one state controls the effective political sovereignty of another political society.'[96] The latter role is played mainly by the indigenous peoples of the Arctic Basin, who are widely recognised as semi-autonomous nations in direct relationships with their metropoles. As states' metropolitan cores have found themselves better able to access and mobilize EC, their need to maintain these imperial relationships has decreased, leading to as yet incomplete moves away from indirect rule and towards structures that more closely resemble the Westphalian ideal of centralised state sovereignty.

Chapter Six concludes our analysis of Arctic international systems by considering the impact of the Arctic's biogeographical structure on its contemporary international systems, paying particular attention to the influence of *neo-European* and *non-European* biomes on the principles that constrain systemic membership and behaviour. It argues that the Arctic basin's biogeographical structures have shaped attempts to incorporate its lands and peoples into neo-European metropolitan states, preserving some of the bifurcated characteristics described in Chapter Five. As a result of the Arctic's specific environmental history, its international systems are a hybrid of anarchic states-systems and imperial hierarchies – diverging from the Westphalian ideal associated with the global international system. The Chapter addresses these developments in two steps. First, it looks at the impact of social and physical technologies on the development of the Arctic's international system since the Second World War, when states' concerted efforts to bring their hinterlands into line with metropolitan principles of sovereignty and territoriality resulted in the hybrid system we see today. Second, it considers the potential impact of melting sea ice on the socio-ecological dynamics of the region, making an initial foray into the kind of specialized

[96] Michael Doyle, *Empires* (Ithaca: Cornell University Press, 1986): 45.

IR analysis for which the tools and baselines developed in this project have been created.

Chapter Seven considers the implications of the project's findings for the Arctic and IR. It begins by looking at the reasons and framework behind the project, reviewing the approaches taken in previous chapters. It then moves on to consider the project's main conclusions. These include the possibility of (i) a direct correlation between a site's ecological productivity and the characteristics that define its embedded international units and system; (ii) a refined understanding of the coevolutionary relationship between physical and social contexts in the circumpolar world; and (iii) a generalizable explanation of the role of biogeographical structure in shaping the political and economic networks that constitute the international social system. Throughout, the Chapter considers the value of ecologically-contextualized analyses of international units and systems, highlighting potential gains and pitfalls. In the end, its prognosis for Socio-Ecological Coevolution is cautiously optimistic so long as it is used alongside existing social approaches to systems analysis. This project does not argue for an ecocentric approach to IR that will replace current, anthropocentric narratives.[97] Rather, it calls on students and practitioners to make their ontological assumptions regarding Ecology's place in IR explicit, clearly identifying the contexts in which they are locating their analyses and accepting the limitations imposed by those decisions. Socio-Ecological Coevolution is most useful when it is harnessed to the power of social analysis, and vice versa. If used properly, this partnership raises interesting possibilities for future studies into relationships between international systems and the ecological contexts in which they are embedded. These include a deeper understanding of the relationship between hierarchic and anarchic principles of membership and behaviour in the international social system and a new approach to the identification of regions within the global 'set of sets'. Though by no means a panacea, Socio-Ecological Coevolution represents a promising avenue by which IR can synthesize ecological relationships into its existing narratives – strengthening our understanding of each and giving us new tools with which to understand the likely impacts of GEC on the international and ecological systems in which we are embedded.

[97] Eckersley defines ecocentrism as an ontological position in which 'the interests of nonhuman species and ecological communities . . . are not ignored... *simply* because they are not human, or because they are not of instrumental value to humans' [Eckersley (1992): 57.]

Part One

Socio-Ecological Coevolution: a toolkit for the ecological analysis of international systems in world history

Chapter Two

Why Is Ecology Important to the Evolution of International Systems?

Having established the purposes of this project, this Chapter asks *why* ecological relationships should be integrated into IR systems analysis. It begins by considering existing approaches to the study of international systems in world history, looking particularly at the analytical matrix devised by Barry Buzan and Richard Little. Designed to address five shortcomings in previous methods – presentism, ahistoricism, eurocentrism, anarchophilia, and state centrism – Buzan and Little's matrix disaggregates the global international system according to a typology of sectors and levels, each of which describes systemic evolution on the basis of three sources of social explanation: interaction capacity, process, and structure. Though highly effective in addressing the questions posed in *ISWH*, their approach has its limitations. Thanks to its anthropocentric ontology, the matrix is unable to capture the coevolutionary relationships that bind international systems to the ecological contexts in which they are embedded. Understanding the impact of these relationships on the evolution of Arctic international systems will therefore require (i) establishing the analytical tools with which to trace the historical evolution of international systems, (ii) clarifying the role of social and ecological factors in shaping human history, and (iii) defining the mutually constitutive, coevolutionary relationship that links the planet's international and ecological systems.

International Systems: interaction capacity, processes, and structures

This project's ecological analysis of Arctic international systems is based on a particular understanding of what an international system is and how one should be assessed in the historical record. Human systems – of which international systems are one example – are networks constituted by the structured interactions of the humans who inhabit them.[98] In this sense, a human system is more than the sum of its parts. This broad definition leaves room for families and states alike to be considered in

[98] Buzan & Little (2000): 442; Butzer (1982): 6-7.

systemic terms, constituted by the interactions of uncles and sisters, bureaucrats and generals. In both examples, an individual's role depends on their position within the group. These positions are governed by rules of membership and behaviour that structure individuals' interactions and mark the system's boundaries, with those outside of the network excluded from its internal structures and processes.

Michael Mann's definition of a society is a useful referent when thinking about international systems in the historical record. Societies, he says, are 'constituted of multiple overlapping and intersecting socio-spatial networks of power.'[99] Instead of focusing on the units that inhabit a network, Mann focuses on their interactions. He divides these into a typology of ideological, military, economic, and political (IMEP) relationships, each defined by its own network of power relations. The state, for example, is 'only one of four major types of power network' that constitute the overarching concept of a 'society'.[100] Because Mann's societies are composite entities, he argues that they do not actually exist as basic units of study. Rather, they are analytical tools made up of many interacting subsystems, organised networks established by human actors to pursue specific goals. These combine to form the constantly-shifting 'social' unit, whose evolution is influenced by competing influences radiating out of ideological, military, economic, and political networks of power. As opposed to Mann's dynamic picture of multicausal human social systems, his contemporaries tend to reify human systems, treating them as stable, even static totalities.[101] Much of the systems analysis that follows takes its cue from Mann's work. Given the argument in Chapter One that all human systems are fundamentally social, and given the goal of this project to trace the evolution of ecologically-contextualized international systems in world history, the equation of Mann's societies with contemporary international systems should come as no surprise.

International systems are distinguished from other varieties of interactive network by the scale at which their interactions take place. As discussed in Chapter One, 'the international' is a tricky concept to pin down. Early IR literature identifies it with Europe's system of states, with its legal roots in the Peace of Augsburg (1555) and the

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[99] Michael Mann, *The Sources of Social Power: a history of power from the beginning to 1760, vol. I* (Cambridge: Cambridge University Press, 1986): 1.
[100] *Ibid*: 2.
[101] *Ibid*: 2, 4-5.

Peace of Westphalia (1648). These settlements helped to establish the boundaries of Europe's international system by defining *who* could be a member – by describing the roles and rights of sovereign states – and *how* units could legitimately act within it – via mutual recognition and non-interference in one another's domestic affairs. From this early conception of an international system, Hedley Bull develops his definition of an international system as a network in which 'two or more states have sufficient contact between them, and have sufficient impact on one another's decisions, to cause them to behave… as parts of a whole.'[102]

Though international systems of various sizes and types have existed through much of the past six thousand years, the contemporary global system has been dominated for some time by the states that inhabit it and whose sovereignty helps to define the inside-outside distinction that bounds the international scale. Interactions that take place within a state's borders are domestic and are therefore said to fall outside of IR's sphere of interest. As a result, the state holds a privileged position at the heart of international systems analysis, defining what 'international' means.[103] This privileged position has often masked the influence of non-state actors, which lack the sovereign state's domestic-international divide. For many years, this left IR ill-equipped to deal with an array of non-state actors. Since the 1970s, however, developments in the discipline have extended the range of units that we imagine inhabiting the international system to include multinational firms, intergovernmental actors, and international non-governmental organizations.[104]

States may have lost their exclusive position as the sole participants in the international system, but the inside-outside distinction defined by their borders remains central to how we think about IR. As the range of economic and societal international systems included in IR analyses has increased, the traditional inside-outside distinction has continued to define the international scale in these non-political – and therefore non-state centric – international systems. This leads to confusion about the boundaries of non-political international systems, which have a tendency to penetrate states' sovereignty and thereby problematise the international scale. Though not sovereign in

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[102] Bull (1995): 9. These interactions are described as systemic *processes*, the dynamics of interaction amongst actors in a system.
[103] Buzan (2004): 91.
[104] Bob Reinalda et al, 'Non-State Actors in International Relations: Do They Matter?', in *Non-State Actors in International Relations*, Bas Arts et al. (Hants UK: Ashgate Publishing, 2001): 1-2.

the sense of territorial states, non-state actors such as multinational firms have insides and outsides. The ways in which they make decisions and organize themselves internally is very different from the ways in which they relate to 'outside' actors. At some point, their internal decision making processes give way to external ones. In these external relationships, the entire firm or state becomes a *collective actor*; acting as a client, supplier, service provider, lobbyist, or litigant in a wider system of economic, political, and social relationships. While states, firms, and civil society organisations vary widely in their goals and functions, they are all collective actors insofar as they can:

(i) reproduce themselves over time, and
(ii) be treated as actors for the purposes of analysis.[105]

Because collective actors have insides and outsides, they are important referents in efforts to identify the international as an ontological reality.[106] States still retain much of their former, privileged position. As the historical analysis that follows will show, however, other collective actors, often acting as state proxies, have played key roles in determining the extent of the international system in the Arctic and beyond. Collective actors will therefore be used throughout this project to trace the evolution of the different kinds of international systems that they inhabit.

Beyond identifying international systems as networks formed by the structured interaction of collective actors at the international scale, the analysis that follows will trace the evolution of dynamic international systems by reference to three *sources of explanation*. These describe essential social elements of any international system, be it global or regional. The first is interaction capacity, which describes the amount of interaction that can occur between units in a system. The second is process, which describes the ways in which units choose to interact. These might include political processes like diplomacy, economic processes like trade, and social processes like proselytizing. The third source of explanation used to describe the evolution of international systems is structure. This describes the way in which units' behaviour is affected by the construction of their environment, including the ways in which units

[105] Buzan (2004): 119.
[106] Buzan & Little (2000): 71.

are arranged in a system, how they are differentiated from each other, and how they stand in terms of their relative capabilities.[107] Together, interaction capacity, process, and structure make up three key sources of explanation in any dynamic human system, describing *how much* interaction can take place within it, *what kinds* of interactions are typical, and how those interactions are affected by the *environments* in which they take place.[108]

Interaction Capacity

The first source of explanation that will be used to analyse the social evolution of international systems is their *interaction capacity (IC)* – their ability to move ideas, goods, and people across space. Interaction capacity answers specific questions about the nature of the system under analysis: what can be moved, across what distances, at what speed, and at what cost? At least three factors mediate a system's interaction capacity:

(i) whether geographical factors make movement easy or difficult;
(ii) what physical technologies are available for transportation and communication; and
(iii) what social technologies are available for transportation and communication.[109]

International systems with relatively unsophisticated physical or social technological will be more exposed to geographical factors than those with more sophisticated adaptations. As technological sophistication increases, so will a system's ability to overcome geographical obstacles that otherwise limit its interaction capacity. For example, until Europeans' development of the physical and social technologies associated with oceanic navigation in the fifteenth century, the Atlantic Ocean represented an almost impenetrable barrier between the Old World and the Americas. Within a century, however, the development of post rudders and caravels, discoveries associated with the fundamentals of navigation, and the evolution of collective actors with sufficient capital to back expensive and risky transoceanic ventures transformed the Atlantic barrier into a highway, greatly increasing the interaction capacity of international systems associated with early-modern Europe, allowing them to contact –

[107] In this sense, an *environment* refers to the context in which an actor is embedded. As might be expected from an anthropocentric discipline, IR tends to equate the term with a unit's social milieu rather than the physical systems of which it is a part. Though this thesis disagrees with IR's customary, anthropocentric construction of *environment*, it will continue to use the term to denote a system's overall social and physical context. It will employ the term *ecology* to refer to the specifically physical environments associated with Earth's planetary systems.
[108] Buzan & Little (2000): 81-86.
[109] *Ibid*: 81.

and eventually overlay – those of the Americas. Interaction capacity can therefore help to explain three defining parameters of any international system: how large it can be; how its units are distributed; and what kinds of processes are possible within it. Systems with higher interaction capacity are able to interact effectively across longer distances, extending their range. The ways in which geography and technology relate also affect the distribution of units within the system, with units spatially distributed to take advantage of geographies well-suited to their existing technological adaptations. Finally, different varieties of interaction require different levels of interaction capacity, leading to the development of different interactive processes. For example, trade in bulk goods is more demanding than the exchange of ideas, and therefore requires a higher level of interaction capacity in order to develop within an international system. In addition to these effects, interaction capacity affects the way in which structure affects systemic interactions, with higher levels of interaction capacity normally translating into higher levels of structural influence. [110]

Processes

The systems created by the interaction of collective actors at the international scale are inherently social insofar as they produce patterns of behaviour that recur over time. These patterns are evidence of *processes*, which describe the means by which actors relate to one another – be it through trade, tribute, diplomacy, or war. Actors' choices depend on the dynamics of interaction within the systems they inhabit, including their interaction capacities. As previously argued, a system whose technological capacities make it unable to move heavy goods over large distances is unlikely to develop bulk trade. It is also unlikely to experience large-scale warfare, as armies require even higher levels of interaction capacity than do commodities such as lumber or wheat.[111]

Over time, the processes through which units interact can become entrenched in formal and informal codes of systemic behaviour, generating principles that describe (i) *who* can legitimately act within a system, and (ii) *what* they can legitimately do. Until very recently, only some states were permitted to take part in diplomatic discussions, with firms and civil society organizations being excluded. Though this membership rule has since weakened, diplomacy still takes place within the context of social principles that privilege states over non-states. While such principles of membership determine

[110] *Ibid*: 80-84.
[111] *Ibid*: 79-81.

who can act, principles of behaviour, such as respect for diplomatic immunity, specify what is expected of systemic participants. Both varieties of principle can be formal or informal, written down in treaties or based on precedent. In this sense, processes give rise to the social principles that bound a system – *institutions* in the English School sense of the term. These pervade all historically-constructed international systems and are constituted the social content of an international system, and are generated by the repeated interaction of its constituent actors.[112]

International systems' social content is an inescapable product of human interactions. Even in the midst of the most horrific wars of the twentieth century, unit interaction generated shared social principles. On the Western Front of World War One, truces and prisoner exchanges continued to describe the 'rules of war' despite the unrelenting slaughter, showing the power of social content to regularize even the most horrific processes. On the Russian Front of World War Two, more sanguinary principles evolved in which neither side expected or gave any quarter to the other. Even this mutual dehumanization still contained a social element in which the sides arrived at a set of expected behaviours in the context of their dealings. This leads us to an important point for understanding the nature of the principles that derive from social processes: the content generated by systemic interaction need not be peaceful or cooperative. As Alexander Wendt argues in *Social Theory in International Politics*, international systems constituted by the interaction of units can range from convergent to adversarial, depending on how units act towards one another (i.e. as friends, rivals, or enemies).[113] The systemic 'rules of the game' that develop out of repeated processes can vary from those aimed at cooperation between actors to those that describe the ways in which they fight. Only wars of total extermination, in which one collective actor seeks the annihilation of another without any communication between them, could generate a truly asocial system. In the few historical cases where such systems can be identified, they are short-lived, giving way to socially constrained forms of combat as victors begin to demand tribute from or rule over defeated territories and populations. In reality, asocial wars of extermination are best studied through their frequent use in science fiction and fantasy. Tolkien, not Thucydides, describes international systems devoid of social content. The true history of the

[112] Adam Watson, *The Evolution of International Society* (London: Routledge, 2009) second edition: 238; Bull (1995): 68-71; Holsti (2004): 18-22.
[113] Alexander Wendt, *Social Theory in International Politics* (Cambridge: Cambridge University Press, 1999): 247.

international system is resolutely social, characterized by processes that become sedimented over time, giving rise to the principles of membership and behaviour that describe systemic relationships at the international scale.[114]

Structure

The third and final source of explanation that Buzan and Little use to analyse the evolution of international systems in world history is structure. In the context of their work, structure is a function of a system's social environment – encouraging units to act in ways that may be at odds with their internal processes and ensuring that an international system is more complex than the sum of its parts. Whereas processes describe the ways in which units interact, structures describe the influence of environmental conditions on 'the principles by which units are arranged into a system, how units are differentiated from each other, and how they stand relative to each other in terms of relative capabilities.'[115] For Hedley Bull, the absence of a supreme arbiter or judge in the global states-system defines an anarchical structure in which no actor holds a hierarchically superior position in regards to decision-making and conflict resolution. This anarchical structure encourages units in the system to pursue processes, such as war, that they might avoid were their relationships arranged in such a way as to permit alternative forms of conflict resolution, such as is sometimes found in domestic and hierarchic political systems.[116]

IR's highly developed use of structure to describe the influence of social environments on the evolution of international systems masks the discipline's continuing inability to explain the structural implications of physical environments. Even theoretical pluralists like Buzan and Little 'admit defeat in trying to conceptualize [ecological] structure in IR terms.' Their reasoning is straightforward and instructive, citing the fact that ecological structures fall 'outside the social realm that is [their] subject', leading them to marginalize physical context except 'in terms of its consequences for international systems.'[117] This instrumental use of ecological structure results in a model of historical evolution that treats international systems as ecologically homogenous – relatively unaffected by differences in climate, precipitation, or soil

[114] Buzan (2004): 100.
[115] Kenneth Waltz, *Theory of International Politics* (Reading, Mass: Addison-Wesley, 1979): chapter 5, *passim* [as used in Buzan & Little (2000): 84].
[116] Bull (1995): 49-50.
[117] Buzan & Little (2000): 84.

chemistry except insofar as these constrain or encourage social sources of systemic evolution. Though unproblematic when applied to topics unconcerned with ecological causes and effects, their anthropocentric approach is unsuited to the socio-ecological analysis to which this project is dedicated. A new approach, capable of folding Buzan and Little's social ontology of into an ecological framework, is needed if we are to account for Ecology's constitutive role in systemic evolution.

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International systems are networks formed by the structured interactions of collective actors at the international scale, whose interactive processes generate principles of systemic membership and behaviour. Their evolution can be analysed in terms of three fundamental sources of explanation: interaction capacity, process, and structure. The international economic system responsible for the global trade in petroleum products, for example, can be described in terms of its ability to move oil and capital around the globe, the ways in which its participants interact, and structural features generated by the social environment that affect actors' positions and relative capabilities – such as the nature of the market system that determines prices. By tracing changes to these three sources of explanation, it becomes possible to analyse the evolution of the international systems that they describe.

International Systems: levels of analysis, sectors, & the matrix

Now that we have identified criteria by which international systems' evolution can be analysed, we must return to a fundamental question: how many international systems are there? The obvious answer is: more than one. 'The' international system is not a discrete historical entity. As was hinted at through our use of Michael Mann's definitions, a system is a composite made up of numerous interacting networks ranging from the states system to the international economy. These 'subsystems' are themselves constituted by the structured interaction of collective actors at the international scale. Thanks to this complex layering, it is not enough to identify the sources of explanation by which international systems' evolution can be traced. We also need some means by which to identify and analyse the different functional and

regional subsystems out of which 'the' international system – taken as a whole – is constructed. Fortunately, two tools are ready at hand: levels of analysis and sectors.

Levels of Analysis

Levels of analysis are ontological referents that disaggregate international systems according to the spatial scales at which one locates their sources of explanation and outcomes. Different levels of analysis portray the world in terms of different referents. Some in IR choose to locate their sources of explanation for systemic behaviour at the level of the individual. The individual, they might argue, sits at the centre of an expanding set of concentric circles 'which starts with the family, moves out to the neighbourhood, then to the city, the state, and finally the human race.'[118] In this worldview, interactive processes among families, neighbourhoods, cities, states, and humanity can all be explained in terms of the individual human beings who make them up, with each concentric circle locating explanations and outcomes at the individual level of analysis.

There is nothing about the use of levels that suggests a necessary pattern of priority among them. Choices of explanatory level simply reflect analysts' interests and the topics that they choose to pursue.[119] In descending order of scale, IR's levels of analysis include:

1. *International Systems*, which signify the largest communities of interacting units. Although the rise of widely-accepted behavioural principles has led some students and practitioners of IR to focus on the presence of a single, monolithic international system, both the historical and the contemporary record indicate that – at any one time – several international systems are operating simultaneously around the world;
2. *International Subsystems*, which signify groups of units within an international system that are distinguished from the system as a whole by the nature or intensity of their interactions. Some may be territorially coherent, in which

[118] *Ibid*: 68.
[119] Barry Buzan, Ole Waever & Jaap de Wilde. *Security: a new framework for analysis* (London: Lynne Rienner Publishers, 1998): 5.

case they are regional subsystems. Others focus on relations in a single sector;[120]

3. *Units*, which are collective actors made up of interacting sets of organizations and individuals. In terms of IR, a unit must be (1) organized enough to be capable of cohesive decision-making and (2) sufficiently autonomous in its decision-making to have independent standing among the highest levels of collective actor, such as the state and the firm. As discussed earlier, units play an important role in defining the boundaries of the international scale by tracing the outlines of the inside-outside distinction on which it is based;
4. *Subunits*, which are collective actors operating within a unit. They are often capable of affecting their parent units' behaviour, though they lack the autonomy to operate on par with other, higher-level collective actors;
5. *Individuals*, which are the most basic unit of study. Their interactions constitute each of the levels above them and are, in turn, affected by the structural constraints and incentives that their interactions generate.[121]

Levels of analysis describe the ontological scale at which an analyst chooses to locate sources of explanation and outcomes in their description of an international system. Thus, a unit-level analysis will locate its explanation of individual and systemic decision-making at a spatial scale described by units' internal constitutions. Alternatively, the analyst may focus on the influence of system-level interaction capacities, processes, and structures. The levels of analysis can be applied to the same subject matter in a variety of ways. A political scientist might identify an individual state as the 'system' they wish to study – composed of the structured interaction of individual citizens and 'domestic' groups. A student of IR is more likely to identify the systems level with a regional or global international system in which states themselves are individual 'units'. One person's unit can be another person's system, and vice-versa. As Buzan and Little explain, 'each level can be represented as a unit within a larger system, or as a system embracing the units of a lower level.'[122]

[120] As will be discussed in the next section, the principles and practices linking these international subsystems necessarily incorporate units, processes, and structures from a range of sectors, though one may appear dominant.
[121] Buzan & Little (2000): 69.
[122] Ibid.

If levels provide us with an ontological tool with which to analyse specific sources of explanation and locate their outcomes, how do the three sources of explanation discussed in the previous section relate to the level at which analysis takes place? Each of our three sources of explanation can be located at any level of analysis. The development of structures can be explained in terms of the individuals, units, or systems whose interactions with their social environment generate structural constraints. The same is true for interaction capacity and process. Levels of analysis illustrate how the global international system, often referred to in monolithic terms, can be reimagined as a series of interacting and overlapping regional subsystems, each of which can be described in terms of its own social sources of explanation.

Sectors

The various components out of which 'the' international system is constructed can also be organised into a typology based on the *sector* of interaction to which units, processes, and structures belong. Whereas levels are ontological referents that describe the spatial scale at which an analyst chooses to locate her sources of explanation and outcomes, sectors are analytical tools that disaggregate human relationships into a manageable typology of political, economic, and societal interactions.[123] They are means of managing information by analysing the global international system 'in terms of the types of activities, units, interactions, and structures within it.'[124] Sectors generate particular visions of reality according to the types of unit, process, and structure chosen for analysis. Classical Marxists, for example, prioritize relations in the economic sector, using a unit's or system's class relationships to explain its political and societal interactions. Sectors paint different pictures of international systems in the same way that different lenses change an observer's view, emphasizing and masking aspects of the world before them. Buzan and Little explain sectors by reference to this metaphor, explaining that,

> [e]ven though the observed object remains the same (ignoring Heisenberg), different lenses highlight different aspects of its reality. The naked eye sees mostly exterior shape and colour. The infrared sees the pattern of heat. The X-Ray sees patterns of physical density. The electron microscope sees molecular structure. The function of sectors is the same as that of these physical lenses: each one gives a view of the whole that emphasizes some things, and de-emphasizes, or even hides completely, others.[125]

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[123] Fernand Braudel, *Civilization and Capitalism 15th-18th century: Vol. 3, The Perspective of the World*, Trans. Sian Reynolds (London: Phoenix Press, 1984): 17.
[124] Buzan & Little (2000): 72.
[125] *Ibid*: 73.

Sectors, then, are analytical tools used to disaggregate the infinite complexity of human interactions, allowing relatively simple political, economic, and societal dynamics to be analysed in isolation from the broad sweep of human history.

Though analytically powerful, sectors are not without their shortcomings. The neat categories into which sectors divide reality belie the complex interdependencies at the heart of international systems. Reality cannot be divided into neat typologies without doing considerable violence to the connections that – in reality – link political, economic, cultural, and military systems. Despite their utility as analytical tools, sectors "lack the quality of independent existence. Relations of coercion do not exist apart from relations of exchange, authority, identity, or environment."[126] Rather, the practices and principles that define membership and behaviour in an international system tend to spill over sectoral boundaries, spreading the impact of activity in one sector to every other part of the wider system under investigation. Sectoral interference, in which such spillage allows causes in one sector to generate effects in another, adds to an international system's inherent complexity by generating *emergent outcomes*. These arise from of the interaction of a system's constituent units, processes, and structures, allowing unforeseen effects to radiate through an interactive network from a single, apparently isolated sectoral subsystem.[127] An analysis of the Communications Revolution might identify the impact of online networking, a practice located in the societal sector, on the way that firms operate in the economic sector. As evidenced by the role of information technology in the Arab Spring, these societal and economic processes can also have unintended political consequences, neatly illustrating the ways in which phenomena in one sector spill over to affect the evolution of others.

When applied to international systems, different sectors highlight different varieties of unit, process, and structure. They provide a handy analytical device with which to organise the planet's functionally defined international subsystems in terms of the units and interactions that they embody. An international system located in the political sector will feature *political* units interacting via *political* processes, influenced by *political* structures derived from their social environment. An international system

[126] Buzan, Waever & de Wilde (1998): 8.
[127] Simmons (2007): 232.

located in the economic sector will likewise be described in terms of economic units, processes, and structures. As has already been discussed, sectors do not represent well-defined divisions between historically distinct international systems. They are parts of a much more complex whole, in which one unit can play a number of different roles in a number of different sectoral subsystems. Despite their contested position in the international system, states remain the most influential unit in the political sector where they hold a structurally superior position to most firms and civil society organizations. At the same time, states are actors in the international economic system. Here, their structural position has recently been shown to be less-than-dominant – as evidenced by several downgrades of their sovereign credit ratings by private-sector economic actors such as Moody's and Standard & Poor's.

Finally, sectors help us to understand the influence of interaction capacity on the varieties of process that are possible within a given international system. Processes such as cultural exchange – located in the societal sector – require relatively low levels of interaction capacity, as ideas are generally easy to transport. Trade in low-volume, high-status items requires somewhat more interaction capacity, making economic systems more susceptible to the limitations imposed by interaction capacity than are their societal counterparts. Political interaction, such as the establishment of permanent embassies, requires high levels of interaction capacity. Considerable physical technology is needed to allow embassies to communicate regularly with their metropolitan state and they require social technologies such as differentiated state institutions and knowledge of their hosts' language and customs to support and make use of diplomatic processes. If maintaining state representatives in foreign embassies requires considerable interaction capacity, then the maintenance of armies in the field requires even more. War – located in the military sector – is therefore even more sensitive to interaction capacity than are the other sectoral processes mentioned so far. This is illustrative of the fact that, although interaction capacity is a fundamental property of all systems, its consequences vary from sector to sector, making sectors useful tools with which to identify and analyse the levels of interaction capacity present within functionally defined international systems.[128]

[128] Buzan & Little (2000): 81.

The Analytical Matrix

Together, levels and sectors are useful tools with which to disaggregate the complexity of the global international system. As ontological referents, levels locate explanations and outcomes at specific spatial scales in a nested hierarchy of systems, subsystems, units, subunits, and individuals. Sectors divide international interactions into a number of analytical categories defined by the types of units, processes, and structures under investigation. Different approaches to IR make use of these tools to describe different aspects of global affairs. For example, Samuel Huntington's 'Clash of Civilizations' focuses on a systems-level explanation of interactions that take place among a specific type of societal actor. Hans Morgenthau locates his explanations of international political systems at the individual level of analysis – explaining the international system as a function of the nature of the individuals whose interactions constitute its networks. Most IR theorists have carved out a specific academic niche that can be described in terms of the levels and sectors included in their work. In so doing, they locate their sources of explanation in different parts of the analytical matrix depicted below, emphasizing varieties of interaction and locating their explanations and outcomes at different ontological scales. (See figure 2.1)

Levels/Sectors	Economic	Political	Societal
Individual		Morgenthau	
Subunit			
Unit	Tilly		
Subsystem	Strange		
System		Waltz	Huntington

Figure 2.1 – A matrix of levels and sectors in the analysis of international systems, locating selected IR theorists in their respective 'boxes'[129]

This matrix provides a useful starting point for analyses of international systems in the historical record. As discussed earlier in this Chapter, international systems can be described in terms of three anthropocentric sources of explanation – interaction capacity, process, and structure. As these terms are imported into each of figure 2.1's boxes, they take on new meanings. Kenneth Waltz describes systems in terms of

[129] Adapted from *Ibid*: 77. See also Samuel Huntington, 'The Clash of Civilizations?', *Foreign Affairs* 72(3) 1992, pp. 22-50; Morgenthau (1993); Kenneth Waltz, *Man, the State, and War: a theoretical analysis* (Chichester: Columbia University Press, 2001) third edition; Charles Tilly, 'War Making and State Making as Organized Crime', in *Bringing the State Back In*, Peter Evans et al. (Cambridge: Cambridge University Press, 1985): 169-187; Susan Strange, *States and Markets* (London: Blackwell Publishers, 1988).

system-level sources of explanation in the political sector. For him, the interaction of political units – states – can be described in term of political processes – war and diplomacy – in a system defined by systemically-derived political structures – namely, international anarchy amongst functionally undifferentiated political units. Each of the approaches listed in figure 2.1 generates its own internally-coherent image of the international system based on a specific understanding of the sectors and levels it prioritizes. Each also pays a price for its precision. By excluding some sectors, they mask the influence of the other functionally-defined international subsystems. In doing so, they marginalize units, processes, and structures located in any but their preferred sector. Likewise, the prioritisation of explanations and outcomes in a single level of analysis can diminish the perceived impact of influences emanating from others spatial scales. Waltz's prioritization of systems over units, for example, blinds him to the influence of units' internal constitutions on their international behaviour. Limiting analysis to a single combination of sectors and levels forces many of IR's dominant theories to make do with impoverished understandings of the complete international system they seek to describe, leaving them ill-equipped to account for the wide range of subsystems that have evolved within it and continue to affect the course of its social evolution.[130]

The Evolution of International Systems

If this project is to analyse Ecology's role in the evolution of Arctic international systems, it is important that we understand the relationship between the social and ecological environments in which those systems are embedded. Evolution does not entail a process of improvement or betterment. As Stephen Jay Gould explains, 'Evolution, to professionals, is adaptation to changing environments, not progress.'[131] Since IR's anthropocentric turn following the Second World War, the discipline's conception of the international system has focused on the impact of human action on human systems composed of human individuals and units. Systemic evolution has therefore been a function of anthropogenic adaptations to changing social environments described in terms of social processes and social structures. The story of social constraint developed by the ES – with its focus on the role of institutions –

[130] Buzan & Little (2000): 67.
[131] Stephen Jay Gould, *Beautiful Life: The Burgess Shale and the nature of history* (London: Vintage Books, 2000): 32.

remains one of IR's most compelling historical narratives, capable of capturing and explaining much of the dynamism that drives systemic evolution. Like the rest of IR, however, its alienation of international units and systems from their physical environments has been problematic, leaving them floating in an ecologically decontextualized world.

Contrary to what IR's anthropocentrism would have us believe, the ecologies in which our lives are embedded have direct and perceptible influences on the evolution of the interaction capacities, processes, and structures that define our international systems.[132] This influence is reinforced by our tendency to modify our physical surroundings, often leading to the replication of ecosystems and biomes that suit the continued survival of existing social adaptations. This socio-ecological relationship – in which ecological systems are modified to meet social needs while social systems simultaneously adapt to changing ecological conditions – has received little attention in IR. Much of this may have to do with the relatively short timescales our discipline generally studies. Given the relative stability of planetary systems over years and decades, a static view of Ecology does not present much a problem for systemic analyses that accept existing systems as historical givens. The issue becomes more troublesome when one looks into their constitution, whose roots lay much deeper in the historical record and are therefore impacted by ecological changes that normally occur over the medium term and the *longue durée*.[133] Instead of investigating this dynamic relationship between humans and their ecological environments, IR's students and practitioners have generally assumed ecosystems to be either static or slowly depleting collections of resources, a misplaced presentism reinforced by the radically different timescales over which human and ecological systems normally evolve.[134]

The sections that follow take steps to remedy this situation by considering how social and ecological factors combine to influence systemic evolution. In human systems,

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[132] Ecological systems describe the physical environments in which we live, including Earth's biological communities and the physical and chemical systems that support them [Gordon Dickinson & Kevin Murphy, *Ecosystems* (Oxford: Routledge, 1998): 1-3.]

[133] In this case, the *longue durée* is used in the Braudelian sense to refer to the extended timeframe over which geographical and ecological systems impact the relatively stable institutional bases of human society. It can be contrasted with *episodic history*, which occurs over the very short term, and social *conjunctures,* such as economic cycles, that can stretch over the medium term. [Fernand Braudel, *The Mediterranean and the Mediterranean World in the Age of Phillip II: volume I*, Trans. Sian Reynolds (London: University of California Press, 1995): 23, 353-354.]

[134] Buzan & Little (2000): 18-19.

continuity and change are not functions of social forces alone. Ecological factors, exogenous to society, play an important role in driving and constraining social change. Understanding these dynamics is a necessary precondition for the historical analysis that follows in chapters Four, Five and Six.

Social Factors in Systemic Evolution

As discussed in the preceding sections, IR tends to discount material causes of systemic continuity and change, preferring to explain its evolution in anthropogenic terms. As a result, systemic stability is generally thought to be rooted in endogenous evolutionary mechanisms that generate negative feedback and thereby constrain change. The same holds true for the perceived roots of systemic dynamism in IR, whose anthropogenic causes have been linked to the influence of sectoral interference on the evolution of systems' social environments, driving adaptation in their interaction capacities, processes, and structures. Let us look at these negative- and positive- feedback mechanisms in turn.

One of the fundamental characteristics of socially-constructed international systems such as those described in this thesis is their tendency to generate *path dependent* histories: self-reinforcing behaviours that can lead society down non-reversible evolutionary pathways. In path dependent histories, past actions constrain a society's range of possible futures. *Path independent* processes are not so encumbered and can develop in any direction at any time without reference to past conditions. Path dependent evolution, meanwhile, excludes a set of alternatives from its range of possible future adaptations. Path dependence reflects what in physics and maths is referred to as *sensitivity to initial conditions*, in which a system's past plays a central role in shaping its future.[135] Conceived of in terms of social systems, path dependence is a consequence of incentives and disincentives generated by repeated interaction.[136] In his study of the processes that drive technological innovation, W. Brian Arthur identifies four such self-reinforcing mechanisms: setup costs, learning effects, coordination effects, and adaptive expectations.[137] Each refers to a set of incentives that promote social continuity by raising the political, economic, social, or cultural

[135] Paul A. David, "Path Dependence, its critics, and the quest for 'historical economics'", *Working Papers 00011*, (Stanford University: Department of Economics, 2000): 4, 6.
[136] Peter Hall & Rosemary Taylor, 'Political Science and the Three New Institutionalisms', *Political Studies* 44(5) 1996, p. 941.
[137] W. Brian Arthur, 'Self-Reinforcing Mechanisms in Economics' in Kenneth Arrow & David Pines, *The Economy as a Complex Evolving System* (Reading MA: Addison-Wesley, 1988): 10.

costs of deviant behaviour while, at the same time, raising the returns accruing to those who adapt to and adopt socially accepted behaviour. While no mechanism can guarantee systemic stability, each helps to explain the evolutionary constraints that generate negative systemic feedback and thereby help processes and structures to persist over time, making them 'sticky'.[138]

Setup costs refer to the effort needed to generate new varieties of process, something that requires the adoption of novel practices and principles by members of a socially-constructed system. Arthur observes that once a pattern of behaviour is learned, it is only abandoned with difficulty. Having borne the costs associated with its adoption, individuals and collective actors are unlikely to replace it with an entirely novel set of practices and principles so long as the process in question continues to fulfil its social functions.[139] Setup costs therefore represent the power of social inertia: the resistance of a social process or structure to changes in its current state. By this reasoning, it is much more difficult to generate a novel practice or principle than it is to adapt existing forms. The practical result of setup costs is a general preference for gradual change over revolutionary upheaval.

Learning effects also play a key role in generating path dependence and, therefore, systemic stability. Once an actor has invested the capital required to learn and adopt practices associated with a particular process, she is unlikely to abandon them. Learning institutional skills requires an investment of time, labour, and/or capital. As an actor becomes more familiar with a specific process, the political, economic, societal, or cultural returns she realizes from its use will likely increase, making dramatic reversals ever more unlikely.[140] Thus, as the People's Republic of China has become more aware of, and engaged with, processes associated with international trade, both the Chinese state and Chinese firms have translated their improved knowledge into increasing economic returns. This reduces the likelihood of either the state or the firms abandoning what – to them – appears to be an increasingly profitable international economic system.

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[138] G. John Ikenberry, 'Institutions, Strategic Restraint, and the Persistence of American Postwar Order', *International Security* 23(2) 1998-1999, pp. 43, 55.
[139] Douglass North, *Institutions, Institutional Change and Economic Performance* (Cambridge: Cambridge University Press, 1990): 95.
[140] Douglass North, 'Institutions', *Journal of Economic Perspectives* 5(1) 1991, pp. 110-111.

At the level of interacting units, *coordination effects* reinforce path dependence and the stability of a human system by granting advantages to cooperating actors.[141] The processes by which units in a system interact serve particular purposes in human relations. At any time, units might choose to abandon current practices, so perceptions of their utility help to ensure their long-term survival. In general, the principles of systemic membership and behaviour described earlier in this Chapter can be thought of as social technologies that circumvent the imperfect information that often hampers social interaction. By replacing a potentially infinite range of actions with a bounded set of accepted behaviours, these 'rules of the game' limit social uncertainty and lower the costs – and risks – of cooperation. The more widely a set of socially-constructed principles is accepted, the greater this effect and the less likely actors are to accept dramatic redefinitions of the 'rules' by which they regularise their interactions.

This leads to *adaptive expectations*, Arthur's fourth and final self-reinforcing mechanism contributing to path dependent social constraint. Adaptive expectations result when widespread acceptance of a specific process – such as the exchange of diplomatic representatives – reduces uncertainty over its long-term durability. This lowers actors' perceptions of risk and makes them more willing to invest in the learning and coordination necessary to realize social returns. Actors are therefore more likely to adopt the social and physical technologies required for systemic participation, and will coordinate their activities with other actors when they believe that the processes in question will be a durable part of their system for the foreseeable future. These adaptive expectations feed back into Arthur's other path dependent mechanisms, generating a negative feedback loop that bolsters the stability of the social systems in question.[142]

Thanks to these constraints, even narrowly accepted processes – such as the use of Latin in the Roman Catholic Church – can endure over extended periods despite competition from other processes – such as the use of the vernacular. Having paid the setup costs associated with the adoption of Latin, including education of the clergy and the translation of key texts, the Church was able to harness the learning and coordination effects of their *lingua franca* to cooperate in the pursuit of shared goals.

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[141] North (1990): 95.
[142] Arthur in Arrow & Pines (1988): 10.

The long-term stability of Latin as the language of the Church lowered the risks run by individuals in pursuing a Latin education for the purpose of joining the clergy. These then fed back into the system's learning and coordination effects to help Latin survive for more than a millennium and a half after its decline in lay society. In several regions of the world, path dependence has helped processes that evolved prior to the overlay of European international principles to endure as localized patterns of behaviour, differentiating their experiences of the international system by stabilising regional principles of membership and behaviour that differentiate them from the global system.

The systemic continuity engendered by the constraints of path dependence must be set alongside endogenous sources of social dynamism. One of the many strengths of Buzan and Little's approach to the study of international systems is its ability to account for historical change. Thus, even while systems' processes and structures generate relatively stable path dependent histories, their evolution is continually being driven by alterations to their social environment caused by sectoral interference. As described in the previous section, this occurs when causes or effects in one sector spill over to affect developments in another. Even minor social changes tend to spill over the international system's analytical divisions to impact its other functional subsystems.[143] Sectoral interference therefore adds to systemic complexity and works against the stabilizing power of path dependence by generating *emergent patterns* – outcomes of structured systems that arise, unforeseen, from the interaction of their component parts.[144] This positive feedback alters the social environment in which a system have evolved, altering the utility of its existing principles and thereby encouraging further adaptation.

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Social evolution is affected by at least two endogenous factors: path dependence and sectoral interference. The first tends to constrain evolutionary adaptation by raising the costs of abandoning the status quo. The second describes how units, processes, and structures are continually buffeted by influences arising in other functional

[143] James March and Johan Olsen, 'The Institutional Dynamics of International Political Orders', *International Organization*, 52(4) 1998, pp. 954-955.
[144] Simmons (2007): 232.

subsystems. By spilling over sectors' analytical boundaries, these alter social environments and thereby affect the utility of systems' existing adaptations, encouraging the adoption of novel practices and principles to meet new social conditions. Together, these mechanisms can generate narratives of historical social change. Without accounting for the evolutionary impact of exogenous factors, however, these narratives remain incomplete.

Ecological Factors in Systemic Evolution

Ecological context enters the story of international systems when human interactions are removed from their theoretical isolation and embedded in a specific historical environment. This affects systemic evolution in at least three respects. First, ecological context describes the initial conditions under which social systems evolve, with important ramifications for the future direction of their path dependent histories. Second, ecological systems tend to change across geological and climatic rather than human timescales, enabling and reinforcing path dependence by buttressing individuals' adaptive expectations. This encourages investments in existing processes, which are geared to the challenges and opportunities of existing physical environments. Finally, rapid changes to an ecosystem can radically alter the utility of a given social adaptation, leading to moments of *punctuated equilibrium* in which an individual, unit, or system shifts abruptly from one state to another. Such instances force systems to adopt new behaviours or face the possibility of collapse when their principles of membership and behaviour prove unsustainable. As the growing literature on social collapse indicates, physical environments have been prime movers in the transformation and downfall of international systems in world history.[145] That being said, ecology has also been responsible for stabilizing and preserving humanity's international systems. Thus, there is a parallel body of work that looks at the role of relatively stable Holocene Era ecological conditions in enabling and encouraging many of the social adaptations on which international systems now depend.[146]

As indicated in our previous discussion of path dependence, international systems are sensitive to the *initial conditions* in which they develop. Ecosystems constitute the permissive material contexts in which international systems originate and evolve, defining the surpluses and deficits that a human unit or system has to manage in order

[145] Chew (2006); Diamond (2005); Tainter (1988).
[146] Roberts (1998); Fagan (2004); Richerson et al. (2001).

to reproduce itself. For example, the floral communities of the Neolithic Near East and China provided a necessary material cause for their subsequent urbanization. The presence of wheat, rye, and rice grains constituted an initial condition for the subsequent evolution of Near Eastern and Chinese agriculture by giving their early agricultural populations access to excellent sources of carbohydrates, protein, fats, and essential vitamins that could be domesticated and improved through selective breeding. These floral communities permitted their associated human populations to accumulate sufficient caloric and nutritional surpluses to support urban polities and, via evolutionary processes reaching down to the present, the principles of the modern state.[147] The more labour-intensive and protein-, fat-, and vitamin-deficient food sources available to early agriculturalists in New Guinea led them down different evolutionary pathways. Their principal crop, harvested from the heart of the sago palm, is composed almost entirely of carbohydrates, with little protein, fat, or vitamin content. The relatively small caloric and nutritional surpluses harvested from this crop forced large segments of New Guinean society to dedicate their time to agricultural production when compared to the more productive floral species of mainland societies. This initial condition limited the ability of New Guinean socio-economic systems to sustain urban populations, encouraging the evolution of a largely agrarian society in place of the urban polities of the Near East.[148]

At the ecological extreme, the power of a human system's physical environment to mould the course of its social evolution is even more apparent. In the circumpolar Arctic, the tundra's abiotic nutrient cycles have made the local development of agriculture almost unthinkable, affecting the course of its embedded societies. Instead of locking organic matter in the soil, as occurs in agriculturally productive biomes, the majority of the tundra's organic matter accumulates in surface deposits of peat and humus. These support large herbaceous mammals, such as reindeer and muskox, which, in turn, constitute the primary prey species for the region's large terrestrial predators.[149] This nutrient cycle leaves tundra soils with very little surplus organic material to form the basis for agricultural production, which cannot develop until physical or social technologies are adapted to overcome this ecological constraint. Arctic ecosystems therefore set their embedded collective actors and systems on

[147] Simmons (2007): 56; Hughes (2001): 30-2.
[148] Diamond (1997): 147-150.
[149] Molles (1999): 39-40.

historical pathways that incentivized social adaptations associated with hunting and gathering, such as mobility and population dispersal, while creating disincentives around agricultural institutions more suited to the world's more temperate regions.[150]

The impact of initial ecological conditions on the evolution of social principles has been reinforced by a second factor – human perceptions of time. As we will discuss in the next Chapter, the ecological systems that we inhabit are never still. Rivers move and disappear, as the Saraswati is believed to have done during the late Harappan period of the Indus valley civilization.[151] Coastlines grow through sedimentation and tectonic uplift and retreat through erosion and rising sea levels. Mountains are thrust upward and worn away over the course of geological time.[152] As we are now learning, even the chemical composition of the atmosphere, hydrosphere, and lithosphere are liable to change, influencing the distribution of ecosystems around the globe by shifting patterns of precipitation and temperature.[153] These changes mark the ecological history of our planet. They are also well beyond common human experience. In terms of an individual human lifespan, the planetary ecosphere appears to be a stable system. This is far from the case. Ecosystems are constantly being transformed and remade. Fortunately, since many of their components change over eras counted in many human generations, units and international systems normally have time to adapt to new ecological conditions without being forced into abrupt evolutionary step-changes.[154] The longue durée over which ecological transformations often occur reinforces our expectations of ecological stability, constituting a permissive context without which societies' adaptive expectations, and the path dependence they engender, could not develop.

The impact of the Holocene Era on the units, processes, and structures that constitute our global international system is built into the evolutionary legacy of humanity's early agricultural polities. Since its beginning around 11,500 years ago [11.5kya], the Holocene has been marked by climatic stability and relatively high levels of

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[150] Simmons (2007): 28.
[151] Chew (2007): 63.
[152] G. Tyler Miller, *Environmental Science: Sustaining the Earth* (Belmont, CA: Wadsworth Publishing, 1991) third edition: 442-3.
[153] Molles (1999): 18-19. The distribution of terrestrial ecosystems is now understood to be a function of numerous abiotic processes, the most important of which are temperature and precipitation. Aquatic ecosystems appear to be influenced mainly by temperature, depth, and salinity. Ecosystems with similar biotic communities and abiotic processes belong to *biomes*, functionally defined ecological regions such as deserts, grasslands, tundra, and boreal forests. (*Ibid*: 18-19, 52-4, 481)
[154] Hughes (2001): 33.

atmospheric carbon dioxide (CO_2).[155] In contrast, the Pleistocene Era that preceded it was one of extreme climatic instability, including four major glaciations between 1.8mya and 11.5kya that led to major reductions in global rainfall and CO_2. It was during the Pleistocene that *homo sapiens* first emerged from Africa, probably around 120kya. The first fully modern humans followed around 90kya, becoming the only surviving member of our genus by the time of the last glacial maximum (LGM) around 22-20kya.[156] For most of our history, humanity has been a species of hunters and gatherers. Agriculture remains a brief experiment in human social organization. The earliest archaeological evidence of domesticated crop production by settled groups is from Abu Hureya in Syria, occupied at the turning of the short-lived Younger Dryas – the final major cooling event of the Pleistocene – and the Holocene around 11.5kya.[157] Why, after at least eighty thousand years as hunters and gatherers, did human societies alter their organising principles? Glacial and seabed cores give us a clue. These demonstrate the extent of the Pleistocene's extreme temperature variability, which featured significant decadal swings and thereby made the development of sustained agricultural societies highly unlikely.[158] (See figure 2.2)

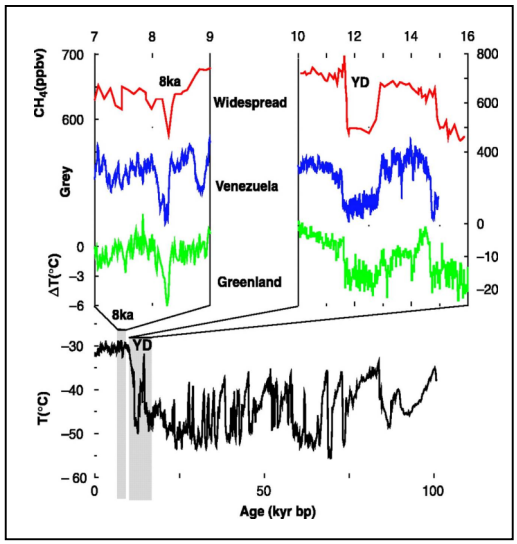

Figure 2.2 - Temperature and CH_4 concentrations in Greenland, Venezuela, and Globally, 100kya to present [159]

[155] This thesis will utilize the abbreviation *kya* to denote 'thousands of years ago' and *mya* to denote 'million years ago'.
[156] Simmons (2007): 26.
[157] *Ibid*: 55.
[158] Richerson et al. (2001): 391-392.
[159] R. B. Alley et al. 'Abrupt Climate Change', *Science,* 299(5615) 2003, pp. 2005-2010. Paleoclimatic data showing abrupt climate changes, after (45) and other sources. The lower panel is the history of temperature in central Greenland over the last 110,000 years. Details of temperature for the Younger Dryas (YD) event and for the cold event about 8200 years ago (8kya) are shown as deviations from the temperature averaged over the intervals from 7 to 8kya and 8.4 to 9kya years ago. Methane concentrations reflect production in global wetlands, including important tropical sources. Gray-scale of a sediment core from the Cariaco Basin, offshore Venezuela, is plotted here so that a down-ward shift corresponds to the effects of stronger winds over the basin or decreased rainfall on

This variability became much less pronounced after the Younger Dryas (YD in figure 2.2). The Holocene's relative stability is illustrated by comparison with the 20°C swings evident in Pleistocene temperature records from Greenland ice cores and sediment records from Venezuela's Cariaco basin. Following the end of the Younger Dryas, global temperatures stabilized around today's levels, marking the end of the Pleistocene's massive fluctuations. This stability is particularly evident in the upper left hand panel of figure 2.2, which illustrates the most dramatic cooling event of the Holocene. This saw global temperatures drop by an average of 6°C, massive by modern standards but small when set beside the enormous swings of the previous geological era.

Holocene stability permitted the adaptation of physical and social technologies associated with agriculture, allowing early farmers to produce larger quantities of food and encouraging population expansion and further investments in agricultural adaptations. Though not sufficient in and of themselves to explain the course of humanity's social evolution, the Holocene's ecological conditions are certainly a *necessary cause*. Agriculture was not a viable socio-economic option in the ecological conditions that predominated during the late Pleistocene. Dry and highly variable climates typified by low concentrations of CO_2 and rapid, high amplitude temperature swings occurring over human timescales worked against its development. Holocene ecology incentivised agriculture by providing an apparently stable physical environment in which populations could innovate and improve agricultural processes, giving rise to increasingly intensive forms of subsistence.[160] Humans living prior to 11.5kya were no stupider we are. Indeed, we are physiologically identical. Our ancestors merely faced ecological conditions that made agriculture and its associated units, processes, and structures unsustainable, incentivizing other modes of resource production. The adoption of agricultural production during the Holocene was not inevitable. Neither are endogenous social evolutionary mechanisms enough to explain its evolution. Rather, agriculture arose in specific physical contexts enjoying relatively stable initial ecological conditions, affecting the direction of humanity's path dependent evolution by constituting a stable physical environment in which specialised adaptations could develop.

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adjacent land. Note differences in scales in the detailed figures; the scale for the Cariaco Basin record is not shown, but has twice the range for the YD as for the 8ka event.

[160] Richerson et al. (2001): 388.

While ecosystems are important sources of institutional stability, they can also drive processes of systemic change. This is particularly true of punctuated ecological transformations, in which new ecological conditions force units to adapt their social and physical technologies or face the possibility of systemic collapse. The introduction of Europeans' *portmanteau biota* into the ecosystems of the Americas and its disastrous effect on the pre-international systems of America's indigenous units constitutes one example of this phenomenon. Europeans' conquest of the Americas was notable for the key role played by the plants, animals, and pathogens that citizens of the 'Old World' brought with them to the 'New'. Flora, fauna, and microbes were at the vanguard of European expansion, undermining the ecological systems on which American systems depended for their survival. By displacing native flora and fauna, including killing off large sections of the indigenous human population, these species helped to recreate 'neo-European' ecosystems, where units, processes, and structures from the Old World could operate in familiar physical surroundings.[161]

The most effective foot soldier of European conquest was not Francisco Pizarro, Jacques Cartier, or Walter Raleigh, but the *variola* virus, the carrier of smallpox. Although the numbers of indigenous people whom it killed remains a hotly debated topic, smallpox's effects are plainly written across the Native American systems it attacked. Lacking natural immunity and without either the physical or social technologies needed to control its spread, these could not stop smallpox from running rampant across the continent. Outpacing all but the quickest of its human fellow-travellers, smallpox moved along existing trade routes from Hispaniola, north to the Great Lakes and south to the Pampas, burning back and forth through populations in the worst series of epidemics of recorded history. Smallpox pulled units and systems apart at their seams. Mortality rates, estimated above fifty percent in the continental United States west of the Mississippi, were probably far higher in the Andean highlands and the Valley of Mexico.[162] When Hernando De Soto travelled along the Mississippi River between 1539 and 1542, he found a land of villages and city-states, featuring hierarchically and functionally differentiated societies, large-scale trade, and

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[161] Crosby (1986): 183-184, 208.
[162] Hughes (2001): 116. Continental population decline was even more severe, plummeting from an estimated 50 million in 1492 to less than six million by 1650. [William Denevan, 'The Pristine Myth: The Landscape of the Americas in 1492', *Annals of the Association of American Geographers* 82(3) 1992, pp. 370-371.]

monumental architecture. When settlers began to penetrate the Mississippi region from New France and British North America over a century later, they found a very different scene. Where De Soto had seen cities and fields of maize, all was wilderness. One-time centres of Mississippian culture were abandoned and overgrown, giving rise to the myth of a virgin continent untouched by human industry.[163] What these incoming settlers saw was not a primordial forest however, but a post-apocalyptic wasteland stripped of its people by a punctuated environmental change – the introduction of a new biological population – with which their units, processes, and structures could not cope.

Punctuated systemic change can also result from alterations to the physical and chemical processes on which biological populations depend, such as those that stressed Greenland's Norse settlements to the point of collapse in the late medieval period. When Erik the Red discovered, explored, and settled the Southern and Western coasts of Greenland around AD982, he did so during a relatively short-lived climatic episode known as the Medieval Warm Period [MWP]. This occurred between the ninth and fourteenth centuries, with localized effects around the North Atlantic raising temperatures 0.5°C above those recorded in the first half of the twentieth century.[164] This apparently small change brought increased oceanic evaporation and precipitation to Western and Southern Greenland, shifting its distribution of ecosystems and creating productive niches amidst the island's otherwise extreme Arctic biomes. This permitted Norse settlers to transpose their political, economic, and societal processes into these niches, whose terrestrial ecosystems experienced increased plant growth, precipitation, and lengthened growing seasons. When the MWP sputtered out in the North Atlantic around AD1300, the marginal climatic conditions on Greenland became increasingly difficult for the Norse population to manage, a situation made worse by severe soil erosion stemming from the Scandinavians' land use.[165]

The Norse could not maintain their socio-economic practices in the Little Ice Age [LIA] that followed from around AD1300 to the middle of the nineteenth century. Refusing or unable to adopt alternative systemic principles, they were eventually

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[163] Crosby (1986): 210-211.
[164] Malcolm Hughes, 'Was There a Medieval Warm Period, and if so, Where and When?', *Climatic Change* 26(3/4) 1994, p. 116.
[165] T. Amorosi et al., 'Raiding the Landscape: Human Impact in the Scandinavian North Atlantic', *Human Ecology* 25(3) 1997, pp. 495-496; J. Edward Schofield, 'Environmental impacts around the time of Norse landnám in the Qorlortoq valley, Eastern Settlement, Greenland', *Journal of Archaeological Science* 35(6) 2008, p. 1643.

outcompeted by Thule Inuit, who had been migrating eastward from the Bering Strait since around AD1000. Climate change and soil erosion did not kill off the Norse. It simply altered the relative utility of their units, processes, and structures, handicapping them in their relations with the cold-adapted practices of the Thule Inuit, who displaced their more technologically sophisticated Norse neighbours and came to dominate the region for the next three hundred years.[166]

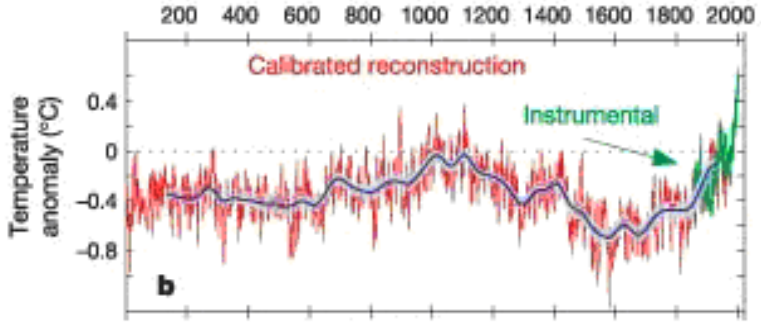

Figure 2.3 – temperature variations in the late Holocene (c.AD1 – AD2000), covering the Medieval Warm Period and the Little Ice Age, including instrumental recordings for the period AD1856-1979[167]

By radically altering the biotic and abiotic components of the ecosystems on which societies depend for their sustenance, punctuated environmental changes can challenge the sustainability of a social system's most fundamental adaptations, forcing them to alter the constitution of their units, processes, and structures. For much of the past eleven and half thousand years, moments of punctuated environmental change have been relatively rare, interspersed with long eras of relatively gradual social adaptation.[168] As anthropogenic forcing continues to alter the composition of the planet's chemical and physical systems, however, Earth's ecology will become ever-more prone to dramatic fluctuations, forcing its human systems to alter the ways in which they interact or face the possibility of similar crises.[169]

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[166] P.D. Jones & M. E. Mann, 'Climate Over Past Millennia', *Reviews of Geophysics* 42(RG2002) 2004, pp. 13, 19; P.C. Buckland et al., 'Bioarchaeological and Climatological Evidence for the Fate of Norse Farmers in Medieval Greenland', *Antiquity* 70(267) 1996, pp. 94-95; Amorosi et al. (1997), pp. 505-509.

[167] Anders Moberg, 'Highly variable Northern Hemisphere temperatures reconstructed from low- and high-resolution proxy data', *Nature* 433(7027) 2005, p. 616.

[168] Humanity's social evolution has featured aspects of both gradual and punctuated change, the former closely associated with Charles Darwin's original theory of evolution as outlined in *The Origin of Species* and the latter with Stephen Jay Gould's twentieth century theory of punctuated evolutionary change, first published in 1972. [Hendrik Spruyt, 'Diversity or Uniformity in the Modern World? answers from evolutionary theory, learning, and social adaptation', in *Evolutionary Interpretations of World Politics*, Ed. William R. Thompson (London: Routledge, 2001): 114-116; Niles Eldredge & Stephen Jay Gould, 'Punctuated Equilibria: an alternative to phyletic gradualism', in *Models in Paleobiology*, Ed. Thomas Schopf (San Francisco: Freeman, Cooper & Co, 1972): 82-84; Charles Darwin, *The Origin of Species* (London: William Pickering, 1988) sixth edition. [electronic copy] Charlottesville NC: InteLex Corporation, 2011.]

[169] K.E. Trenberth et al., 'Observations: Surface and Atmospheric Climate Change', in Solomon et al. (2007): 316.

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The relationship between international systems and the ecosystems that they inhabit is complex and reciprocal. Ecological systems reinforce societies' path dependence and drive moments of punctuated change. By the same token, ecosystems are continuously affected by their human inhabitants, who can radically redraw the ecologies in which they are embedded. This mutually constitutive relationship cannot be described by reference to either anthropogenic or ecological factors alone.[170] If this project is to describe the evolution of international units and systems in ecological terms, it must develop an analytical framework capable of capturing *both* sides of this socio-ecological equation.

Socio-Ecological Coevolution: the case for an ecological synthesis

Humans' capacity to affect the physical environment is a fundamental characteristic of our species. The punctuated changes wrought on Native American societies by the introduction of smallpox were initiated by international processes that drove European expansion in the fifteenth and sixteenth centuries, including colonialism and trade. Earlier epidemics bear similar hallmarks of human causation. As noted earlier, the migration of bubonic plague from its Central Asian heartland to the Far East, South Asia, Near East, and Europe depended on international political and economic systems that spanned Eurasia.[171] Thus the economic, societal, and political processes that drove Europeans across the Atlantic and linked Eurasia's centres of population were necessary causes behind their associated epidemics in much the same way as those epidemics were necessary causes behind to the subsequent international histories of the regions they ravaged.

This relationship is indicative of the power of *Socio-Ecological Coevolution*: the mutually constitutive process by which human populations and ecological systems interact over time, with changes in one leading to changes in both. Environmental History provides a particularly rich vein of examples of such interaction. One of the earliest attempts to consciously alter a physical context is signified in the archaeological record by hominids' use of fire to create and expand environmental

[170] March & Olsen (1998), p. 955.
[171] Findlay & O'Rourke (2007): 110-111.

systems conducive to their particular mix of hunting and gathering units, processes, and structures.[172] The adoption of fire as a tool around 1mya has been identified with *homo erectus*, who evolved in Africa between 1.8 and 1.5mya, and whose range stretched from East Asia to Europe by 500kya.[173] Archaeological evidence indicates that, by this time, fire was already a terraforming technology being consciously applied to the planet's ecosystems in order to modify and improve hominids' natural environments. From his observations of natural fire regimes, *homo erectus* would have learned about the effects of fire on his ecosystems, particularly on the grassland-forest *ecotone* where he is thought to have spent the majority of his time.[174] Natural fire is a common feature in this ecological environment and gave early hominids plenty of opportunities to learn about its effects on plant and animal life. These are well worth observing. Modern studies have shown that the quality and quantity of forage available to herbivorous ungulates such as antelope and elk increases by 300-700% in deciduous forests following a fire. Such productivity gave our hominid ancestors ample reason to harness this technology, making them the planet's first known genus to consciously alter the ecosystems around them to improve their standard of living.[175]

Coevolution implies a mutually-constitutive process linking international systems to the ecosystems in which they are embedded, with changes in either affecting the evolutionary course of both. As discussed earlier, the introduction of virulent Old World pathogens into the Americas as part of the European *portmanteau biota* in the sixteenth century tore apart many of the continent's existing social systems. However, other outcomes should also be noted. In the midst of the ecological transformations resulting from the introduction of Eurasian species, Coevolution provided some Native American units with new opportunities. Microbes were only the vanguard of Europe's socio-ecological expansion, emptying lands and opening ecological niches.[176] Some of these were taken over by local fauna such as the bison, which shifted its habitat eastwards to the Mississippi and beyond.[177] Others were filled by Europeans'

[172] Peter Crutzen, 'How Long Have We Been in the Anthropocene Era?', *Climate Change* 61(3) 2003, pp. 251-252.
[173] Simmons (1996): 36-38.
[174] Ecotones are transitional zones between major ecological systems and will be discussed in the introduction to basic ecological concepts presented in Chapter Three.
[175] Simmons (1996): 38-42.
[176] A niche describes the physical space occupied by an organism, the organism's functional role within the wider ecological system, and the ways in which it is constrained by the other organisms and abiotic factors. [Butzer (1982): 15.]
[177] Erhard Rostlund, 'The Geographical Range of the Historic Bison in the Southeast', *Annals of the Association of American Geographers* 50(4) 1960, p. 401.

portmanteau biota, particularly plants and animals first domesticated in Eurasia during the Neolithic Revolution of the early to middle Holocene. Animals, including pigs, cattle, sheep, and horses, were intentionally released into the wild or escaped from European colonies and ranches, spreading beyond the bounds of European settlement. The introduction of the horse into the grasslands of North America was of particular significance in that it defined new 'native' cultures in the wake of the human tragedies of the sixteenth, seventeenth, and eighteenth centuries. Between 1680 and 1880, three dozen different North American First Nations adopted a horse-powered socio-economic system based on bison hunting that allowed them to harvest far more of these massive herbivores than had previously been possible. The horse's arrival and adoption also changed the balance of power between the tribes of the North American plains.[178] Unseen on the continent since its disappearance during the Quaternary Extinction Event that affected the Americas around 11kya, horses became the cultural and socio-economic focus the Great Plains' indigenous units. Their introduction (more properly, their *reintroduction*) to the Americas redefined native units' relative status and the ways in which they related to one another. The Comanche, in particular, benefitted from their decision to focus on processes incorporating the horse and the bison, allowing them to emerge as one of the most powerful tribal confederacies in the American West – an emergent systemic outcome of changes wrought on American ecology and its embedded human units and systems by the arrival of Europe's *portmanteau biota*, itself a consequence of international processes connected to colonization and trade.[179]

The causal link between international systems and the ecological contexts in which they are embedded is not marked by a simple, deterministic relationship in which either Ecology or IR can claim absolute priority. Rather, path dependent evolution is initiated and reinforced by the ecologies they inhabit. At the same time, human activities in a variety of sectors alter the ecologies in which human units and systems are embedded, transforming the environments in which they evolve. This coevolutionary relationship generates emergent outcomes in our international and ecological systems alike. An adequate description of international systems' historical evolution must, therefore, incorporate aspects of social *and* ecological analysis if it is

[178] Dan Flores, 'Bison Ecology and Bison Diplomacy: The Southern Plains from 1800 to 1850', *The Journal of American History* 78(2) 1991, p. 466.
[179] *Ibid*, p. 471.

to account for the true range of endogenous and exogenous factors that influence the units and systems at the heart of IR.

Conclusion

This Chapter has sought to establish *why* IR needs to pursue ecological analyses of international systems, preparing the way for Chapter Three's construction of a theoretical approach capable of applying coevolutionary principles to the historical record of the Arctic Basin. It has done so by identifying the basic characteristics of human and international systems, illustrating ecology's role in systemic evolution, and defining the process of Socio-Ecological Coevolution that lies at the heart of the analysis to follow.

The analytical matrix devised by Barry Buzan and Richard Little is of central importance to this project's goals, providing a powerful tool with which to describe the world's international systems – constituted by the structured interaction of collective actors at the international scale – in terms of the levels and sectors in which their interaction capacities, processes, and structures operate. Of proven value to systemic analyses, their approach has little to say about the role of ecology in the constitution of international systems; a relationship masked by the anthropocentric ontology in which our discipline is rooted. As a result, their analytical matrix is blind to the fact that international and ecological systems are mutually constituted, with each contributing its own forms of positive and negative feedback to the dynamic relationship that links international systems to the ecological contexts in which they are embedded. These evolutionary mechanisms include the dynamic influence of sectoral interference and ecological transformation, and the constraining influence of initial ecological conditions, social path dependence, and the relative stability of ecological systems over human timescales. Socio-Ecological Coevolution is the key process that links these mechanisms together, explaining the mutual constitution of international and ecological systems over time. Before we move on to explore the ways in which Coevolution has affected the development of international and ecological systems in the Arctic Basin, we therefore need to synthesize its central tenets into Buzan and Little's analytical matrix. This will be the main goal of the next Chapter.

Chapter Three

How to Integrate Socio-Ecological Coevolution into Analyses of International Systems?

Having established *why* ecological relationships should be integrated into IR's analyses of international systems, this Chapter considers *how* to go about synthesizing the two halves of Socio-Ecological Coevolution. It approaches the problem in three steps. First it looks at the possibility of using existing tools in Buzan & Little's matrix to do the job. Unfortunately, sectors and levels prove unsuited of the task, based as they are on a fundamental misreading of the relationship between international and ecological systems. Explaining this relationship therefore falls to the second section, which uses a brief introduction to Ecology – particularly the dynamics of New Ecology – to frame its arguments about the relationship between international systems and the ecological contexts in which they are embedded. This reveals the need for an ontological lens capable of capturing humanity's place as one biological population amongst the many that inhabit the planetary biosphere. This lens is provided by *context*, defined in the third section of the Chapter as the social and/or material environment within which evolution takes place. Grafting a contextual axis onto Buzan and Little's existing matrix forces students and practitioners of IR to explicitly state which social and/or ecological factors they consider in their analyses, unmasking the ways in which our discipline conceptualizes international units and systems without forcing all IR scholars to become ecologists. Finally, by embracing ecological context, this Chapter reconstitutes the matrix in such a way as to highlight the interactions that take place between international and ecological systems, producing three new sources of explanation with reference to which subsequent chapters will trace systemic evolution in the circumpolar North – *ecological capacity, socio-ecological coevolution,* and *biogeographical structure*.

Existing Frameworks: why not an ecological sector or level?

Given the constitutive relationship between ecological and international systems, how can we go about integrating the influence of the former into our analyses of the latter?

Two possibilities immediately suggest themselves from the matrix in Figure 3.1 (see below). The first is the construction of an ecological sector, the strategy employed by Buzan and Little. As discussed earlier, sectors are analytical tools that disaggregate and describe functionally defined international subsystems. They are therefore ill-suited to the task of socio-ecological synthesis, which is an ontological rather than an analytical problem. Levels of analysis – the ontological axis used by Buzan and Little to trace the historical evolution of international systems – might be better suited to our needs. Unfortunately, the ways in which levels divide reality into nested spatial scales at which sources of explanation and outcomes can be located is unlike the approach needed for ecological analysis. Socio-Ecological Coevolution – the process that describes the mutual constitution of human and ecological systems – does not occupy an ontological level above or below that of the individual, subunit, unit, subsystem, or system. Neither does it occupy any one sector. It affects the development of international systems across *all* sectors and *all* levels of analysis. Its influence cannot be limited to a single column or row of Buzan and Little's matrix, necessitating a rethink of the ways in which we conceive of socio-ecological interaction.

	Economic	**Political**	**Societal**
Individual	IC/P/S	IC/P/S	IC/P/S
Subunit	IC/P/S	IC/P/S	IC/P/S
Unit	IC/P/S	IC/P/S	IC/P/S
Subsystem	IC/P/S	IC/P/S	IC/P/S
System	IC/P/S	IC/P/S	IC/P/S

Figure 3.1 – Buzan and Little's Analytical Matrix.[180]

An Ecological Sector?

The x-axis of the analytical matrix in figure 3.1 disaggregates the global international system according to the functional variety of interaction of interest to the analyst – be it political, economic, or societal. The systems constituted by these interactions include networks such as the international economic system and the international political system, each of which highlights a different variety of international unit interacting through a sectorally differentiated set of processes and structures.[181] Buzan and Little make the case for an analytically distinct ecological sector that describes 'the relationship between human activity and the planetary biosphere as the essential

[180] Buzan & Little: 77. Note the sources of explanation listed in each 'box' of the matrix, including interaction capacity (IC), process (P), and structure (S).
[181] Braudel (1984): 17.

support system on which all other human enterprises depend.'[182] This adds an ecological column to their matrix, expanding the range of functionally defined subsystems described by its x-axis to include an international ecological system, analytically distinct from its economic, political, and societal fellows. (See figure 3.2) Though attractive insofar as it proposes an elegant solution to the problem of ecological analysis, the construction of an ecological sector and its associated international ecological subsystem throws up as many problems as it solves.

	Economic	Political	Societal	Ecological
Individual	Economic IC/P/S	Political IC/P/S	Societal IC/P/S	Ecological IC/P/S
Subunit	Economic IC/P/S	Political IC/P/S	Societal IC/P/S	Ecological IC/P/S
Unit	Economic IC/P/S	Political IC/P/S	Societal IC/P/S	Ecological IC/P/S
Subsystem	Economic IC/P/S	Political IC/P/S	Societal IC/P/S	Ecological IC/P/S
System	Economic IC/P/S	Political IC/P/S	Societal IC/P/S	Ecological IC/P/S

Figure 3.2 – A hypothetical analytical matrix describing international systems' interaction capacity (IC), process (P), and structure (S) in terms of four sectors (x-axis), including one dedicated to ecological interactions.[183]

The most important of these has to do with the sources of explanation. According to *ISWH*, all sectorally defined international interactions can be described in terms of interaction capacity, process, and structure. For an ecological sector to be analytically effective, it must be able describe the international ecological system in terms of these variables. Unfortunately, as Buzan and Little admit, the ecological sector is of no help in attempts to describe structure in ecological terms. The same is actually true for all three sources of explanation, which are hampered by a fundamental misreading of the relationship between international systems and the wider and older ecological systems in which they are embedded. Unlike international economic, political, and societal systems, those located in an ecological sector would not be constituted by the interaction of human actors. Instead, they would generated by the interaction of human communities with the biological, chemical, and physical systems in which they are embedded. Ecological units, processes, and structures are fundamentally different from those found in other sectors insofar as ecological systems necessarily include the interactions of *all* biological populations with the non-living systems that support them. As argued in previous chapters, political, economic, and societal international systems generate social structures through the repeated interaction of human actors. An ecological system, however, would necessarily include a mixture of social *and*

[182] Buzan & Little (2000): 73-74.
[183] Adapted from *Ibid*: 77.

mechanical interactions. This leads to significant problems for a sectoral approach to ecological analysis.

Chapter Two made the case that the use of sectors requires two steps in order to be successful. First, the researcher isolates and analyses patterns of interaction in one or more sectors, each of which describes a variety of functionally defined international subsystem. The analyst then reassembles a broader international system from the constituent sectors into which it was divided in order to understand the relationships that link the selected subsystems together.[184] This second step is relatively straightforward for the anthropocentric sectors that fill the first three columns of figure 3.2. Each describes an element of a socially defined totality and, therefore, a system constituted by similar processes and structures. Indeed, one could imagine a much wider range of sectors than those listed in the current matrix, including military, ideological, and cultural varieties. Each would divide the international 'set of sets' according to a different analytical logic, yet each would describe essentially similar, socially-constituted referents.[185] By comparing anthropocentric apples with anthropocentric apples, the economic, political, and societal (and military, ideological, and cultural) sectors are relatively easy to recombine. An ecological sector would throw nonanthropocentric oranges into the mix, making the reconstitution of a coherent and wider system highly problematic. Buzan and Little's socially-contextualized approach to international systems in world history simply cannot embrace the ecological sector's mechanical interactions. Instead, it relegates them to instrumental status in the constitution of international systems, allowing them to affect the means by which units and systems pursue their goals without affecting the constitution of the units or systems themselves. This exclusion has its roots in the European Enlightenment and IR's anthropocentric turn after 1945, and has been at the heart of IR's understanding of international systems ever since.[186] By removing non-human factors from the roll of causes and effects that constitute an international system, anthropocentrism remains the single biggest stumbling block in the way of effective ecological analyses. Until IR deals with this ontological issue, a successful incorporation of ecological units, processes, and structures into its systems analysis

[184] Buzan, Waever & de Wilde (1998): 7-8.
[185] Mathias Albert & Barry Buzan, 'Securitization, Sectors and Functional Differentiation', *Security Dialogue* (42:4-5) 2011, pp. 415-416; Braudel (1981): 459, Ch. 5 *passim*.
[186] Eckersley (1992): 21-26.

will continue to elude the discipline. What we need is an ontological device capable of extending IR's worldview to include the biological, chemical, and physical contexts in which humanity's international systems are embedded. Sectors – as analytical devices – are simply not designed for the job. We must look elsewhere for the right tool.

An Ecological Level of Analysis?

Given these ontological roadblocks, the levels of analysis might represent a solution to our anthropocentric problem. Levels in IR are nested ontological referents that categorize the world according to the spatial scales at which an analyst locates the explanations and outcomes of international behaviour. Someone who focuses on individual-level analyses will locate the causes of unit and system behaviour in the character of the individual actors who constitute their most basic components. Ideas of human nature as essentially combative, competitive, and cooperative often play a central role in these sorts of narratives. A systems-level analysis inverts these sources of explanation and outcomes, describing individual and unit behaviour in terms of systemic influences and pressures that exist outside of any one individual or unit. The central role played by society's mode of production in determining Marxist analyses of socio-economic systems is one such systemic case, with individual behaviour being a function of the class to which she or he belongs – a typology which is itself determined by the class's position in its society's overall mode of production. As described in Chapter Two, the levels of analysis include:

1. The Individual,
2. The Subunit,
3. The Unit,
4. The International Subsystem, and
5. The International System.[187]

In this scheme, each level can be embedded in the levels below it or disaggregated into components described by the levels above it. Analyses rooted in the subsystem level are therefore interested *both* in the ways that subsystems combine to constitute the wider international system, *and* in the ways that units', subunits', and individuals' behaviours are influenced by the subsystemic processes and structures in which they

[187] Buzan & Little (2000): 69.

are embedded. Given this project's regional interest in the systems of the circumpolar Arctic, much of the analysis to follow is located at this ontological level.

The quest for eternal laws of international behaviour has led to a preference within parts of the discipline for the study of ahistorical global systems that are thought to be stable across space and time. Although many such traditions – including Neo-Realism – argue that human interactions incorporate mechanical relationships, the historical record makes clear that all human-to-human relations are intrinsically *social*. They are not ruled by non-negotiable, externally devised rules of behaviour and membership that emanate down from a static system-level of analysis. Rather, the human interactions that constitute an international system generate social content in the form of patterned processes and social structures.[188] This social content, continuously renegotiated by a system's constituents, generates the system's interaction capacities, processes, and structures: the three sources of explanation used by Buzan and Little to analyse systems' evolution. Stripping human interactions of their social content simplifies theoretical explanations of systemic behaviour by implying the existence of general laws to describe human behaviour across time and space – a pseudo-scientific conceit that has led to the ahistorical trend in IR noted and derided in *ISWH*.[189]

Buzan and Little avoid this particular pitfall by inserting intermediary spatial scales – the subunit and the subsystem – between the three spatial categories included in Kenneth Waltz's classical rendering of the levels of analysis. These new referents, particularly subsystems, help to address IR's fixation with global systems and the marginalization of regional and sub-global networks.[190] Through the vast majority of human history, historical international systems have been regional rather than global, with systems in China, the Mediterranean, and Mesoamerica separated by vast distances and imposing physical and social obstacles. Armed with relatively unsophisticated transportation and communications technology, few inter-regional international systems were able to develop before the modern age. Those that did were focused around sectors that required relatively low interaction capacity, such as exchanges of ideas and economic trade in low-bulk, luxury goods. Intermediary levels address an ontological shortcoming in IR's interpretation of the historical record by

[188] Wendt (1992), pp. 422-425; James (1993), pp. 269-288; Watson (2009): 238.
[189] Buzan & Little (2000): 19-20.
[190] Buzan (2004): 16-17.

unmasking the regional subsystems heretofore hidden beneath the historically novel, *global* international system. Buzan and Little's addition of subsystems to the levels of analysis presents students and practitioners of IR with an explicit ontological choice: to include or exclude regional subsystems from their analyses of contemporary IR. Could an ecological level of analysis do a similar job, opening space in which to consider ecological relationships heretofore masked by IR's anthropocentric ontology?

The inspiration for such a step might be found in Ecology, which – like IR – uses a set of vertically nested levels of analysis to identify scales at which sources of explanation and outcomes are located in the natural world. Ecology's levels of analysis bear marked similarities to those described by Buzan and Little. In ascending order of scale, they include:

1. *The Organism*, which is an individual life form and the most basic unit of ecological study;
2. *A Population*, which is a group of individuals from a single species, often inhabiting a specific area and differentiated on the basis of location and/or behaviour;
3. *A Community*, which is a group of interacting and interdependent populations inhabiting a defined area;[191]
4. *An Ecosystem*, which is a geographically defined environment consisting of a biological community *and* the chemical and physical systems that support and enable their interactions; and[192]
5. *The Ecosphere*, which is the totality of all the Earth's ecosystems, including their constituent biotic communities and the chemical and physical systems that support them.[193]

A preliminary synthesis of Ecology's levels of analysis with those described in *ISWH* is informative. At their narrowest scales, both schemes accept an individual organism as their basic unit of study, the main difference being that Ecology does not require this referent to be human. The synthesis continues at the level of international units and biological populations. Buzan and Little's subunits and units are differentiated from one another by their memberships and the 'thickness' of the social content

[191] Molles (1999): 303-304. Taken together, all of Earth's biological communities constitute the global biosphere.
[192] Miller (1991): 63-65.
[193] Molles (1999): 164.

generated by their internal and external relations, delineating units' insides and outsides. In a similar vein, biological populations are differentiated from one another by a combination of physical and behavioural characteristics, depending on whether the researcher wishes to focus on an entire species (unit), or a component population defined by its geographical range or behaviour (subunit). Like units and subunits, populations have insides and outsides, with some organisms included and others excluded from a group by their location and/ or physical and behavioural characteristics. In ecological terms, the units that inhabit the international system represent distinct ecological populations interacting to create a biological community.

An ecological analysis of international systems will associate Buzan and Little's bottommost levels with ecological communities. International systems and subsystems and ecological communities alike evolve processes and structures through the repeated interaction of their constituent units/populations. The structural effects of ecological interaction can be traced through its impact on the number of populations that constitute a community, the variety and relative abundance of those populations, and the ways in which they relate to one another.[194] These are remarkably similar to the structural effects described by Waltz in reference to international systems, including the principles by which units are arranged into a system, how they are differentiated, and how they stand relative to each other in terms of capabilities.[195] Even IR's differentiation of various subsystems is echoed by Ecology's disaggregation of the global community of life into its component communities, on the basis of geographical range (equated with regional subsystems) or behaviour (equated with functional subsystems). Together, the planet's component communities constitute the global biosphere, a totality equated with the global international system.

Ecology's first three levels of analysis – the organism, the population, and the community – concentrate on nested spatial scales of biological interaction, focusing on relationships such as a community's predator-prey dynamics or a population's growth rates. These ecological referents align remarkably well with IR's levels of analysis, which focus on the ontological scales at which humans, units, and systems interact. Important differences emerge only when we venture into Ecology's deepest levels. Ecosystems and the ecosphere are fundamentally dissimilar from the levels above

[194] Butzer (1982): 14, 252.
[195] Waltz (1979): 79-81.

them. They integrate biological communities into the physical and chemical systems that support them. At these levels of analysis, non-living planetary systems – such as the water and carbon cycles – constitute dynamic mechanical contexts in which biological interactions take place. These non-biological contexts differentiate ecosystems from the communities and populations that inhabit them. Communities and ecosystems do not necessarily vary by their geographical ranges. They can be, and often are, coterminous.[196] Rather than being differentiated on the basis of spatial scale, Ecology's deepest levels of analysis are differentiated from their shallower fellows by the incorporation of factors that do not emanate from its most basic unit of analysis: the organism. Without this ontological leap, Ecology would exclude the planet's chemical and physical systems from its analyses of living organisms, populations, and communities. In doing so, it would fall into a biocentric trap equivalent to the anthropocentric one that continues to limit analyses of non-human factors in IR.

With this difference in mind, we might revise IR's levels of analysis to incorporate the influence of non-human ecological factors at a level beneath that of the socially constituted system. This would leave Buzan and Little's five levels intact, with individuals embedded in subunits, subunits in units, units in subsystems, and subsystems in systems. To achieve a synthesis like that in Ecology, IR's socially constructed international systems would need to be embedded in the planet's mechanically constituted ecological systems. These would occupy levels 'below' that of the international system, embedding IR's social referents in the biological, chemical, and physical contexts that constitute their ecological surroundings. (see figure 3.3)

[196] John Kricher, 'Lecture 1: Ecology and the Big Picture', *The Ecological Planet: An Introduction to Earth's Major Ecosystems*, Recorded at Wheaton College, Norton MA, 2008. The habitat of the marten, for example, includes the entire range of the boreal ecosystem that rings the planet at subarctic latitudes in Russia, Canada, Alaska, and Fennoscandia. [John Kricher, 'Lecture 7: Boreal Forest', *The Ecological Planet: An Introduction to Earth's Major Ecosystems* (2008)]

	Economic	Political	Societal
Individual	Economic IC/P/S	Political IC/P/S	Societal IC/P/S
Subunit	Economic IC/P/S	Political IC/P/S	Societal IC/P/S
Unit	Economic IC/P/S	Political IC/P/S	Societal IC/P/S
Subsystem	Economic IC/P/S	Political IC/P/S	Societal IC/P/S
System	Economic IC/P/S	Political IC/P/S	Societal IC/P/S
Ecosystem	Economic IC/P/S	Political IC/P/S	Societal IC/P/S
Ecosphere	Economic IC/P/S	Political IC/P/S	Societal IC/P/S

Figure 3.3 – A hypothetical analytical matrix describing international systems' interaction capacity (IC), process (P), and structure (S) in terms of six levels of analysis (y-axis), including two dedicated to regional and planetary ecological interactions.[197]

At first glance, the construction of an ecological level of analysis achieves a number of goals: emphasizing the importance of ecological factors to the constitution of international systems while leaving students and practitioners of IR free to include or exclude them from their analyses. It does so by separating ecological interactions – with their messy non-human components – from those of human systems, units, and individuals. The relationships of interest to Buzan and Little's ecological sector, meanwhile, fall to level occupied by the ecosystem and ecosphere. This avoids the thorny issue of systemic reconstitution discussed in reference to the creation of an ecological sector.

However, the construction of ecological levels separate from those that describe socially constituted human systems imposes costs that outweigh their added value to IR theory. Socio-Ecological Coevolution impacts individuals, units, and systems alike. As discussed earlier, the initial development of the urban units that helped to define the international systems of the ancient Near East depended on the productive flora and fauna then available for domestication and large-scale agricultural production. Units in the New Guinean highlands, meanwhile, were constrained by their much lower ecological capacity – influenced by the crops, animals, and social and physical technologies available. This limited the amount of energy available to sustain their processes and structures, leaving them more prone to adopt agrarian forms of social, economic, and political organization than their Mesopotamian contemporaries. This unit-level development, influenced by the ecological context in which it took place, would be masked by the construction of an ecological level of analysis below that of

[197] Adapted from Buzan & Little (2000): 77.

the international system – a step which would associate all coevolutionary developments with developments at the systems level. Because of the importance of *spatial* scale to IR's levels of analysis, a clear synthesis with Ecology's own formulation is of limited value, undermining as it does the clarity of Buzan and Little's matrix.

IR's and Ecology's levels of analysis divide the world according to different logics. The construction of an ecological level below that of the international system therefore fails to bridge the conceptual gap between Ecology and IR any more effectively than an ecological sector. Because Coevolution affects individuals, units, and systems alike, every spatial scale in Buzan and Little's scheme must have its ecological counterpart. These counterparts need to incorporate *both* non-human actors (flora, fauna) *and* the physical and chemical systems on which they depend. The construction of a single ecological level only serves to further alienate individuals and units from their ecological contexts by locating all ecological interactions below the level of the international system.

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Socio-Ecological Coevolution affects international systems across *all* levels and *all* sectors. As a result, it cannot be adequately described by reference to either axis of figure 3.1 in isolation. Coevolution is a universal process that affects human interactions – be they unit-level or systemic, political or economic – and the ecological contexts in which they are embedded. Sectors and levels fail to capture this dynamic because they misinterpret the relationship between humanity and Ecology, either embedding the latter as one variety of functional international subsystem or limiting Coevolution's effects at the broadest levels of IR analysis. By misreading humanity's relationship with our ecological surroundings, both options fail to fold the concept into Buzan and Little's matrix. Understanding humanity's relationship with our ecological surroundings is, therefore, a necessary precondition for Coevolution's integration into our analyses of international systems in world history.

Ecological Systems: an introduction to key concepts

The failure of sectors and levels to integrate Socio-Ecological Coevolution into Buzan and Little's analytical matrix is due to fundamental flaws in the way that IR understands Ecology. For example, an ecological sector implies the existence of an ecological subsystem *within* the 'set of sets' that constitutes the international system.[198] This locates the ecosphere as a subsystem of the international social system, inverting the true relationship between them. In reality, international systems constitute embedded aspects of wider and older ecological contexts. Locating planetary ecology as one variety of international subsystem creates a logical paradox, like trying to fit an egg inside of its own yolk, fatally weakening the ecological sector as a tool for ecological analysis. Attempts to construct an ecological level are similarly flawed in that they reinforce the walls that divide human relations from the physical contexts in which they are embedded. This alienates Coevolution's constitutive effects from the individuals, subunits, units, and subsystems that exist above it in IR's nested typology of ontological referents, masking ecology's relationship with these narrower spatial scales. In the end, both strategies are hampered by IR's misreading of ecological concepts. We would therefore do well to take some time to understand the ways in which Ecology understands the world around us.

Humanity constitutes one biological population amongst the many that can inhabit an ecosystem – a geographically defined environment consisting of a biological community and the chemical and physical systems that constitute a dynamic physical context for its interactions. The size of an ecosystem is arbitrary, defined by the object that one wishes to study.[199] It can vary in scale from a puddle to an ocean, the main criteria being the presence of a biological communities *and* non-living chemical and physical support systems. Because of this project's regional interest in the circumpolar Arctic, the ecosystems of most immediate interest are the tundra and taiga. These are two of the planet's main *biomes*: functionally defined ecosystems that will

[198] *Ibid*: 73-74.
[199] G. Tyler Miller, *Living in the Environment: principles, connections, and solutions* (London: Brooks-Cole Publishing, 2000) eleventh edition: 83-84, 87.

be seen to play a major role in constituting the boundaries of their related international systems.[200] Figure 3.4 outlines the main biomes of the planet.

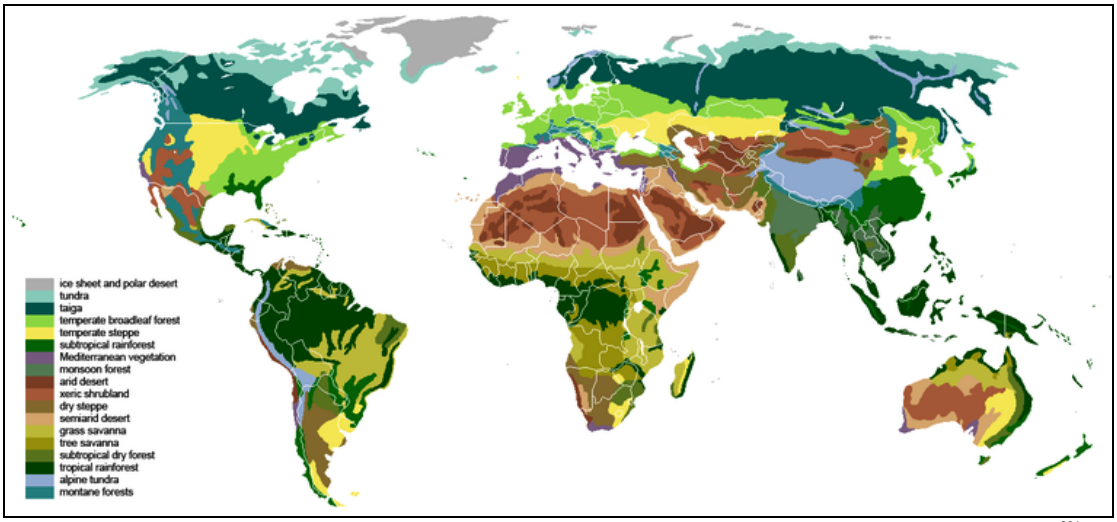

Figure 3.4 – A map of the main terrestrial biomes of the planet, overlaid on a political map of state borders[201]

Though much of the analysis to follow will be interested in the mutual adaptations undertaken by international and ecological systems, we should not make the mistake of thinking that there is an optimal equilibrium towards which these systems are evolving. The study of Ecology has been fundamentally transformed since the 1980s by an increasing focus on disequilibria and dynamic instabilities in biophysical environments, moving away from earlier theories that sought to identify natural equilibria and homeostasis in the natural world.[202] This *New Ecology* – no longer as 'new' in the second decade of the 21st century – altered many of the accepted truths of environmental science. Its understanding of historical change is particularly important to the current study. By explaining adaptation in terms of a static set of environmental conditions, traditional systems ecology favoured narratives of homeostasis and stability over those of dynamism and change. Its image of evolution was teleological, explaining past developments as necessary steps towards present – presumably stable – conditions. As a result, traditional systems ecology ran into difficulty when faced with rapidly changing ecological conditions, the 'new normal' in the present age of GEC. New Ecology presents a different understanding of the world – one in which irregular periodicities rather than the regular, cyclical developments define systemic evolution. New Ecology 'turns toward evolutionary and organismal biology and away from

[200] Butzer (1982): 15.
[201] Ville Koistinen, "The Main Biomes in The World" *Wikimedia Commons: Vegetation.png*. 2007. [online] November 2, 2011. <http://commons.wikimedia.org/wiki/File:Vegetation.png.>
[202] A good introduction to traditional systems ecology can be found in H. Odum, *Fundamentals of Ecology* (New York: Wiley Publishing, 1971) third edition.

ahistorical systems ecology; toward individual organisms, species and populations… and away from undifferentiated ecosystems.'[203] It asserts that as a population adapts to meet environmental conditions, it alters the very environment that is affecting it, spurring further adaptation and environmental change. This ecological variation on Heisenberg's Uncertainty Principle ensures that neither organisms nor ecosystems will achieve a stable equilibrium, but will be constantly dynamic and changeable. It also bears a marked similarity to the fundamental principles of Environmental History and Socio-Ecological Coevolution.

The evolving concept of *carrying capacity* illustrates both the shortcomings of traditional systems ecology and the means by which New Ecology has improved the science's understanding of historical change. Traditional systems ecology postulates that an ecological site – a particular locale within an ecosystem – will eventually exist in equilibrium with the biological communities that inhabit it, resulting in a regular demographic pattern fluctuating around an upper value *k* that represents the limits of the site's carrying capacity. Traditional systems ecology argues that it should be possible to calculate the *k* value for each population inhabiting a site – a measurement that can then be generalized across the entire ecosystem of which the site is a part. Neither hypothesis has been borne out by empirical evidence. Population dynamics and the spatial distribution of environments are highly variable across space and time, affected by a combination of cyclical and aperiodic developments in biological, chemical, and physical systems. Generalized carrying capacity is therefore affected by the spatial and temporal unevenness of the sites in which it is measured. New Ecology replaces the teleological narratives favoured by traditional approaches with more dynamic and historically grounded narratives that have since come to define the discipline.[204] It is this historically sensitive form of Ecology, itself the basis for much of the Environmental History that has emerged since the 1980s, that will constitute the foundation for the discussion of ecological systems that follows.[205] IR can learn from this development by acknowledging the heterogeneity of ecological spaces across the planet, possibly indicating a related heterogeneity in the international systems that inhabit them.

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[203] Karl Zimmerer, 'Human Geography and the "New Ecology": the prospect and promise of integration', *Annals of the Association of American Geographers* 84(1) 1994, p. 111.
[204] *Ibid*, pp. 112-113.
[205] I.G. Simmons, 'Human Societies and Change: The Long View', in R.J. Johnson, *The Challenge for Geography: a changing world, a changing discipline* (Oxford: Blackwell, 1993): 110.

Though ecosystems, such as the biomes depicted in figure 3.4, are often shown as neatly delineated ecological units, the preceding discussion indicates that this is not truly the case. Natural ecosystems do not have distinct boundaries. They are separated from one another by *ecotones* – transitional zones between ecosystems in which the biological, physical, and chemical systems of one give way to those of another.[206] These frontiers can vary in width from a few centimetres, such as that found along the shoreline of a lake, to over a hundred kilometers, such as that found along the northern treeline of the boreal forest.[207] Within these boundary zones, ecological conditions gradually shift from one biome to the next. Moreover, biomes themselves can be divided into an almost infinite number of overlapping habitats and sites – locally defined ecological systems with subtly different biological, chemical, and physical constituents. They are never homogenous, but vary over small and large scales. At the same time, they are interconnected features of a single, planetary system. This interconnectedness is a fundamental premise of modern Ecology.[208]

Ecosystems describe a combination of biological, chemical, and physical systems: the biotic and abiotic components of any physical environment. If we are to use these composite systems in our analysis of IR in the circumpolar North, we would do well to appreciate some of the concepts by which they are understood. Key abiotic variables in terrestrial ecosystems include (i) the amount of photosynthetically active radiation (PAR) available to their primary producers, (ii) available soil nutrients, (iii) temperature levels, (iv) available precipitation, and (v) the seasonality of their climates.[209] Together, these determine an ecosystem's total energy allowance, impacting the number, variety, and relationships of the species within it. A rough approximation of an ecosystem's energy allowance is given by its Net Primary Productivity (NPP), the rate at which primary producers – mainly photosynthesizing plants – are able to fix atmospheric carbon, measured in terms of weight per square meter per year. This is important insofar as primary producers, by fixing solar energy through photosynthesis, provide the main source of energy to a site's consumers and

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[206] Miller (1990): 87-89.
[207] Timoney et al. (1992), pp. 5-6.
[208] Victor Shelford, *The Ecology of North America* (Urbana: University of Illinois Press, 1963): 1-2.
[209] Primary producers are those organisms that make their own food from compounds obtained from their ecological surrounding. On land, the vast majority of these are green plants that use photosynthesis to convert carbon dioxide, water, and sunlight into sugars and oxygen. [Miller (1990): 91.]

decomposers. In a terrestrial ecosystem, NPP is constrained by at least two main factors: the nutrient availability of its soil, and local rates of *evapotranspiration* – a combined measurement of temperature and water availability.[210] Though only an approximation of productivity across large-scale ecosystems, NPP provides a useful synthesis by which to gauge the constraints and opportunities presented by ecological systems at a given site. Figure 3.5 provides a global overview of NPP. Note its uneven distribution across several of the biomes mapped in figure 3.4. Even at this very broad scale, these discontinuities illustrate a fundamental flaw in the equilibrium assumptions of traditional systems ecology. Rather than representing firmly demarcated ecological zones, the biological, chemical, and physical systems that describe the planet's biomes vary both within and across the ecotones that bound them. They likewise vary over time, as shifting ecological conditions alter locations' productivity.

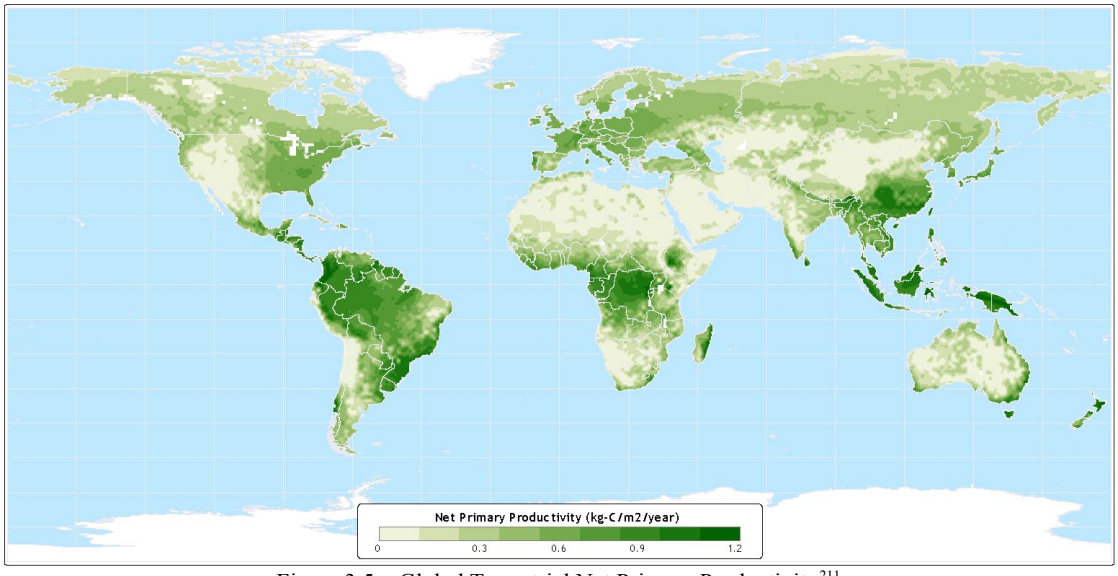

Figure 3.5 – Global Terrestrial Net Primary Productivity[211]

NPP plays an important role in our ecological analysis of international systems in the circumpolar North. The extreme seasonality of the ecosphere at high latitudes, which brings with it low temperatures and low levels of photosynthetically active radiation (PAR), represents the main constraint on its energy allowances.[212] NPP is therefore

[210] Molles (1999): 343-346. Evapotranspiration predicts that the highest levels of productivity will occur in warm, wet ecosystems. Ecosystems with deficits in wither category will experience lower NPP. A severe deficit of both, as occurs in the high Arctic tundra, will negatively impact those biomes' overall energy allowance.
[211] Centre for Sustainability and the Global Environment (SAGE), 'Global Net Primary Production', in *Atlas of the Biosphere: Nelson Institute for Environmental Studies, University of Wisconsin – Madison*. [online] Last updated 2002. < http://www.sage.wisc.edu/atlas/data.php?incdataset=Net Primary Productivity> (accessed September 12, 2010). See also C.J. Kucharik et al., 'Testing the performance of a dynamic global ecosystem model: water balance, carbon balance and vegetation structure', *Global Biogeochemical Cycles* 14(3) 2000, pp. 795-825.
[212] Molles (1999): 137-138.

depressed across all varieties of tundra – the dominant biomes of the northern polar basin. Its productivity varies from less than one hundred grams of organic material fixed per square meter per year (<100 g $m^{-2}yr^{-1}$) in the polar desert, to 100-250 g $m^{-2}yr^{-1}$ in the high tundra, to 250-500 g m^{-2} yr^{-1} in areas closest to the tundra-taiga ecotone. In comparison, the mean NPP of a hot desert dune is between 100-150 g $m^{-2}yr^{-1}$.[213] Other biomes' NPP varies upward, with 650-2000 g $m^{-2}yr^{-1}$ of carbon fixed in a temperate deciduous forest, and over 2000 g $m^{-2}yr^{-1}$ fixed in the tropical rain forests of Thailand.[214] In marine environments, nutrient availability is a much more important limiting factor than temperature, making Arctic waters relatively productive thanks to vertical mixing in the water column. The productivity of Arctic waters complicates what – in traditional systems ecology – might be thought of as a straightforward North-South axis of increasing NPP. The resulting, patchy distribution of productivity helps to explain the uneven spread of international units and processes in the Arctic Basin, providing an empirical basis for measurements of Ecological Capacity – a socio-ecological source of explanation that will be discussed in more depth in the next section.

Now that we have considered a few of Ecology's main concepts, let us return to the problems associated with ecological sectors and levels. Earlier, this Chapter claimed that the failure of the ecological sector to integrate Coevolution into its analyses of international systems is due to a fundamental misunderstanding of the relationship between humans and the ecological systems in which we are embedded. Sectors describe functional varieties of international subsystems. An ecological sector therefore locates ecological relationships as a subset of the international system with which they interact. In reality, Ecology is not an embedded component of any international system. Rather, international systems are embedded components of ecologies. The inversion of this socio-ecological relationship reflects IR's anthropocentric ontology, which limits its ability to understand the place of Ecology in its analyses. An ecological sector would embed the biotic and abiotic components of a complete ecological system *within* a system constituted by just one of its biological

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[213] Patrick Webber, "Tundra Primary Production" in Jack Ives & Roger Barry, *Arctic and Alpine Environments* (London: Methuen & Co., 1974): 447-9, 455-6, 459.
[214] Charles Krebs, *Ecology: the experimental analysis of distribution and abundance* (New York: Harper Collins College Publishers, 1994): 609.

communities – a logical paradox that fatally undermines the utility of a sectoral approach to ecological analysis.[215]

The construction of an ecological level is likewise undermined by IR's misreading of ecological realties. Unlike the nested ontologies of IR's levels of analysis, an ecosystem does not need to be inclusive of the levels above it. An ecologist may define the boundaries of an ecosystem as she sees fit, the only criteria being that she considers both biotic and abiotic components in her analysis. A drop of water containing a population of amoebas can be defined as an ecosystem so long as the researcher analyses the relationships between the drop's biological populations and the non-living chemical and physical systems on which they rely. Rather than being differentiated by their superior or subordinate position in a nested set of ontological referents, ecosystems are differentiated from their neighbouring levels by the inclusion of alternative sources of explanation. IR's levels of analysis – a nested set of ontological referents that describe the spatial scales at which one locates explanations and outcome – divide the world according to a different logic than their Ecological alternatives. Moreover, they utilize a single set of social sources of explanation – interaction capacity, interactive process, and social structure – to explain the development of international systems in world history. The construction of ecological levels of analysis below that of the international system will do nothing to redraw these sources of explanation and effectively limits Socio-Ecological Coevolution to the widest of IR's ontological scales.

Ecological Context: creating and operationalising a new ontological axis

In order to facilitate my ecological analysis of international systems in the circumpolar North, I propose to add a third axis to the analytical matrix pictured in figure 3.1. This new ontological category will describe the *context* in which human interactions take place, providing a means by which the different sources of explanations important to various social or ecological environments can be considered. Though the range of contexts surrounding international systems is potentially vast, this thesis will focus on two – the social and the ecological. These impact systemic evolution across all sectors

[215] Chaudhuri (1990): 431.

and levels, shaping the sources of explanation by which we trace the development of their embedded international systems. Buzan and Little's three sources of explanation – interaction capacity, process, and structure – reflect the *social* context in which they locate their historical analysis. By embedding the analysis that follows in its ecological context, I propose a second troika of sources – *ecological capacity*, *coevolutionary process*, and *biogeographical structure* – that will hereafter be used to trace the coevolution of Arctic international and ecological systems in the historical record.

Defining Context

Contexts are ontological referents used to locate the explanations and outcomes of international phenomena in terms of the environments in which they take place. They come in many varieties, ranging from the parsimonious to the complex. For the purposes of this project, I identify two dominant forms: social context and ecological context. The former describes the ontological approach of writers like Watson, Bull, James, Buzan and Little, and Wendt. In a socially contextualized world, international behaviour at every level of analysis and in every sector is affected by the patterned interactions of human individuals, units, and systems. The matrix described in the last Chapter is rooted in this social milieu, from which its three socially-constructed sources of explanation emanate. Ecological context functions in a similar manner, highlighting ways in which physical environment affect the constitution of their embedded international systems.

Theoretically, the range of contexts that might be used to describe systemic evolution is vast. Some are mind-bogglingly difficult to capture. Cosmological context, for example, might describe the influence of stellar phenomena – such as sun spots and planetary orbits – on international systems, a goal well beyond the scope of this thesis. At the other end of the scale, one might adopt an atomistic definition of context, in which actors are alienated from all aspects of their social and physical environments. In such a world, atomistic actors – indivisible and autonomous – see one another as means to their own ends, their interactions failing to generate any repeated social processes or structures. They are therefore contextualized only by their relative material capacities, which determine their ability to resist or dominate others. This is the most parsimonious of worldviews, alienated from the social and ecological environments that actually influence all human interactions. The mechanical systems

described by Neo-Realism come close to this atomistic interpretation of IR, marginalising most discussion of socially constructed practices and principles in favour of studies into units' relative power capabilities. Though difficult to visualize given its stark simplicity, the old trope of billiard balls rolling around on a green baize table illustrates the basic mechanics of this atomistic world. As shown by Neo-Realism's insights over the past forty years, this image has its place in systems analysis so long as you are content to forget the influence of the rules of the game and room's slanting floor on the course of play.

Embedding an international system in its social context is a necessary step towards the construction of a historically coherent image of the world. Social context is described by the 'common interests and common values' that regularize and order relations between actors, providing a level of explanation for the patterns of continuity and change that describe systems' evolution. [216] Historical Sociology is a rich source of such historical narratives. Michael Mann's description of human societies as individuals linked by overlapping networks of ideological, military, economic, and political interaction is one example – describing the evolution of socially-constructed systems across all sectors, with sources of explanation that highlight the evolutionary influence of one's social milieu.[217] The English School (ES) shares a lot with Mann's multi-sector approach, though the ES tends to locate its explanations of international phenomena at the systems level. The ES describes its international societies in terms of their *institutions*. These are principles and practices that emerge out of repeated interactions between units, describing both *who* is included in the society (principles of membership), and *how* they should act towards one another (principles of behaviour).[218] An international system analysed in its social context corresponds closely to the ES understanding of an international society, focusing on ways in which shared social practices and principles constrain and incentivize actors' choices of ends

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[216] Bull (1995): 13.

[217] Mann (1986): 1-4. See also Bull (1995): 13. Subsequent approaches to Historical Sociology in IR, particularly those identified with the 'eventful' approach to International Historical Sociology (IHS), have highlighted how inter-social relations produce different pathways of historical development and 'how historical *events* enable social formations to emerge, reproduce, reform, transform and break down.' The coevolutionary approach adopted in this project may contribute to this strand of historical analysis in IR by providing an additional form of socio-ecological 'event' through which to observe continuity and change in the historical record. [John Hobson, George Lawson & Justin Rosenberg, 'Historical Sociology', in *The International Studies Encyclopaedia* (Wiley-Blackwell / International Studies Association, 2010): 25 [online book section] accessed February 26, 2012 <http://eprints.lse.ac.uk/28016/>.]

[218] These have been referred to in many ways by ES theorists over the years: as primary and secondary institutions and as fundamental and procedural institutions to name but two variants. [Buzan (2004): 172.]

and means.[219] Whereas atomistic contexts paint actors as fully autonomous units, social contexts force us to focus on an international system in terms of the shared practices and principles that shape actors' roles and behaviours within it. Though not avowed members of the English School or dedicated historical sociologists, Buzan and Little's approach is clearly influenced by their socially-embedded understandings of international history. This is illustrated by the three sources of explanation they use to trace and explain historical patterns of systemic behaviour – interaction capacity, process, and structure – each of which is constituted by the patterned interaction of human individuals, units, and systems.

Buzan and Little's contention that 'systems defined in military-political terms are normally embedded in economic and societal systems that are often wider in extent and earlier in formation' identifies the role that they ascribe to social interaction in international history.[220] It also sets the pattern for my own claim that these socially-constructed international systems can be embedded in even wider and older ecological contexts. The challenge facing this claim is how to embrace ecological context without abandoning the strengths of the social approaches already discussed. Rather than throwing the baby out with the bathwater, I want to retain the analytical strengths of Buzan and Little's social approach while grafting an additional level of explanation onto its evolutionary narratives. It is a matter of complementing rather than replacing their analysis. Embedding international systems in their ecological context is not a matter of replacing social explanations of international phenomena with some form of monocausal ecological determinism. Early works by Mackinder – who goes much farther than many subsequent geopolitical writers in recognizing the heterogeneity of the planet's physical environments – make this mistake by focusing on ways in which physical contexts influence systems' development without considering the influence of humanity's social systems on the geographies and ecologies in which they are embedded.[221] To avoid this deterministic trap, any move from a socially to an ecologically contextualised image of systemic evolution must preserve the integrity of international systems' social context, which continues to influence their development even after they are embedded in their ecological milieu. Rather than replacing IR's social narratives, ecological analysis should be used to redress IR's anthropocentric

[219] Holsti (2004): 19.
[220] Buzan & Little (2000): 78.
[221] Mackinder (1895), p. 376, *passim*.

biases, incorporating social analyses into a wider understanding of the ways in which ecological conditions affect the development of interaction capacities, processes, and structures at the international scale.

To achieve this synthesis, I propose adding a new ontological axis onto Buzan and Little's existing matrix. By forcing students and practitioners of IR to explicitly include or exclude contextual elements from their analyses, this axis has the potential to open new avenues of inquiry to IR – questions heretofore masked by the discipline's relegation of Ecology to instrumental status in the constitution of its atomistic and social international systems. Sectors and levels, used to disaggregate and analyse the explanations and outcomes of evolution in Buzan and Little's matrix, continue to play this role in ecologically-contextualised analyses. After all, the purpose of analysis remains the same despite its new ecological grounding: to understand the patterns of continuity and change that describe the development of international systems in world history. Instead of affecting the matrix's analytical and ontological divisions, ecological contextualization transforms the sources of explanation by which the evolution of levels and sectors is understood. This allows ecological factors to be effective across all sectors of interaction and levels of analysis – a requirement identified in the first section of this chapter – while embedding systems' social interactions within the wider and older ecological realities of which they are a part. The added value of this axis is to transform the sources of explanation by which Buzan and Little trace systemic development. This transformation will be discussed further in the next section. For now, however, figure 3.6 illustrates the basic shape of a contextualised approach to the study of international systems in world history. Note the continuing importance of levels and sectors as tools with which to disaggregate and study specific aspects of ecologically-contextualised international systems.

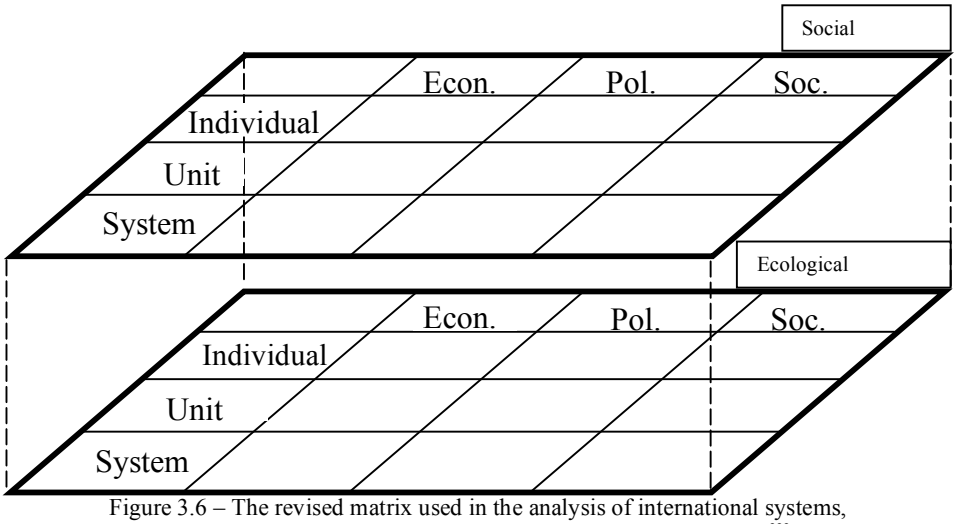

Figure 3.6 – The revised matrix used in the analysis of international systems, including sectors (x-axis), levels (y-axis), and contexts (z-axis)[222]

Ecological contextualization opens space in which we can trace the patterns and discontinuities linking the international and ecological systems in which our lives are embedded. As nested ontological referents, contexts can be organised according to the diversity of features and influences that they take into account. Contexts are complementary – with each continuing to operate when embedded in an ever-expanding set of ontological vistas. Organised hierarchically from most parsimonious to most complex, we might imagine our choice of contexts to include:

1. *Atomistic context*, in which the inhabitants of a system are evaluated according to their relative capabilities rather than any socially constructed processes or structures;
2. *Social context*, in which systems – while still possessing different relative capabilities – are also influenced by processes and structures generated by their ongoing social interaction; and
3. *Ecological context*, in which systems – while still possessing different relative capabilities and influenced by socially constructed processes and structures – are also affected by the influence of the ecological systems in which they are embedded.

[222] For the sake of visual simplicity, this schematic lacks the subunit and subsystem levels of analysis described by Buzan and Little (2000). However, both should be read as present and active in any subsequent use of the levels of analysis.

Though far from an exhaustive list, this describe the three varieties of context of most immediate interest to the present study. Of the three, this project sees little use for atomistic conceptions of international systems in world history. An atomistic view of IR recycles the misconceptions of traditional systems ecology, with its focus on stable equilibria and homogeneity. Like the New Ecology movement of the 1980s, this project denies the historical reality of either of these concepts in systemic evolution, opening space in which IR can consider the influence of the planet's dynamic and heterogeneous social and ecological systems on the evolution of its embedded human populations.

The relative influence of ecological and social context is impossible to generalise – each side of the socio-ecological equation being constitutive of the other. Contexts are nested ontological referents without any necessary order of priority. As a result, their relative influence varies over time and space. Over the course of our analysis, however, a few trends will be observed. First, systems with relatively low levels of social and physical technology are generally more exposed to local ecological pressures than are those with more sophisticated toolkits. Second, societies embedded in extreme ecosystems will be more exposed to ecological effects than those of similar sophistication in more productive biomes. Finally, societies that encounter novel ecological conditions, be it through migration or ecological change, often find the utility of their existing social and physical technologies compromised – forcing them to adapt to new conditions.

Operationalizing Context

The added value of ecological context comes from its redefinition of the sources of explanation used to explain systemic evolution. These shed new light on the coevolutionary relationship that links the evolution of international and ecological systems, a process heretofore masked by IR's anthropocentric ontology. Ecological context transforms Buzan and Little's sources of explanation (interaction capacity, social process, and social structure), recasting them as *ecological capacity*, *coevolutionary process*, and *biogeographical structure.* Whereas interaction capacity describes the ability of an international system to move ideas, goods, and people across space, *ecological capacity* describes the ability of an international system to sustain itself and its principles of membership and behaviour across physical environments of varying ecological productivity. Among its many effects are an influence on the

variety and distribution of units and systems across different habitats. In socially contextualized analyses of international systems, process represents the means by which collective actors relate to one another – and can include interactions such as diplomacy and trade. Ecological contextualization shifts our focus to *coevolutionary processes*, which describe the pervasive influence of Socio-Ecological Coevolution on (i) the ways in which ecologies affect how we relate to one another and (ii) the ways in which those relationships affect the ecologies in which we are embedded. Finally, whereas structure in a social context refers to socially-constructed behavioural constraints and incentives that result from human interaction, *biogeographical structure* describes the impact of the planet's ecological divisions on the principles by which units are arranged into a system, pointing towards the possible link between the ecological construction of the ecosphere and the social construction of its embedded international social system. The effects of this transformation on Buzan and Little's sources of explanation is visualised in figure 3.7 and discussed in greater detail below.

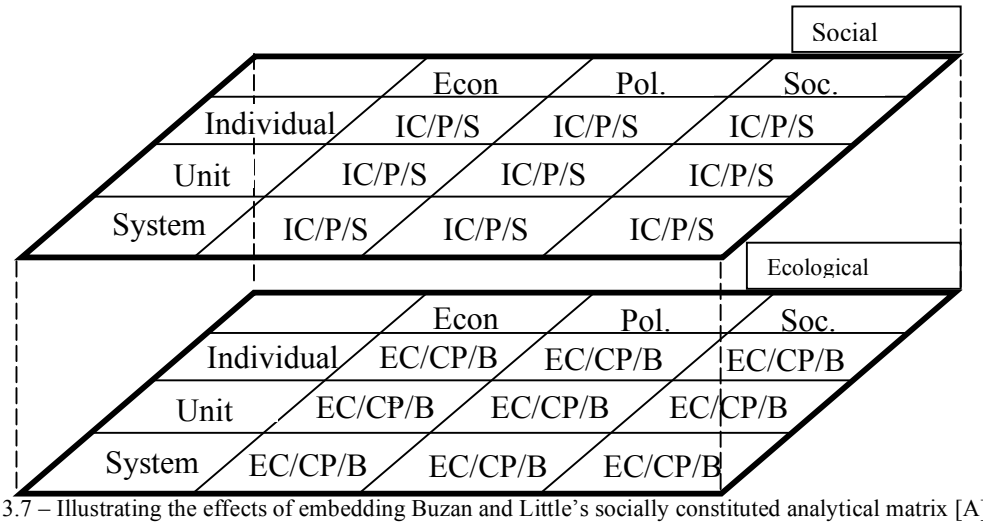

Figure 3.7 – Illustrating the effects of embedding Buzan and Little's socially constituted analytical matrix [A] in its ecologically context, transforming their socially-contextualised sources of explanation [interaction capacity (IC), social process (P), and social structure (S)] into their socio-ecological counterparts [ecological capacity (EC), coevolutionary process (CP), and biogeographical structure (BG)].[223]

i. Ecological Capacity

Where interaction capacity describes the ability of a system to move ideas, goods, and people across space, Ecological Capacity (EC) refers to a system's ability to sustain its population and organising principles in a given habitat. It is a socio-ecological source

[223] For the sake of visual simplicity, this schematic lacks the subunit and subsystem levels of analysis described by Buzan and Little (2000). However, both should be read as present and active in any subsequent use of the levels of analysis.

of explanation, determined by the amount of energy available in a given habitat *and* the kinds of physical and social technologies available to extract and supplement it.

The distribution of EC is not homogenous across space or time. Spatially, it is complicated by the fact that energy availability, measured in terms of NPP, varies widely between and across ecosystems. Even apparently insignificant variations in local ecological conditions can lead to significant differences in net productivity. A small increase in altitude or the colonization of a particular slope face can expose arctic and alpine biota to extreme swings in temperatures and wind conditions, constraining the growth of floral populations and their associated consumers and decomposers.[224] This ecological heterogeneity is complicated by the fact that international units and systems possess different varieties of physical and social technology with which to overcome energy constraints by harnessing additional sources of local NPP or by subsidizing shortfalls from surpluses located elsewhere. Buzan and Little measure the interaction capacity of international systems on the basis of three mediating factors:

i) whether geographical factors make movement easy or difficult;
ii) what physical technologies are available for transportation and communication; and
iii) what social technologies are available for transportation and communication.[225]

I propose a similar set of mediating factors to assess their EC:

i) whether local levels of ecological productivity, measured in terms of NPP, make the sustainability of specific international units and systems easy or difficult;
ii) what physical technologies are available for the extraction and utilization of a habitat's energy reserves; and
iii) what social technologies are available for the extraction and utilization of a habitat's energy reserves.

Different international units and systems require different levels of ecological productivity. As Joseph Tainted argues, more *complex* units – measured in terms of

[224] Roger Barry & Jack Ives, 'Introduction', in Ives & Barry (1974): 3.
[225] Buzan & Little (2000): 81.

their population sizes and levels of functional and hierarchical differentiation – require more energy to maintain their processes and structures.[226] Highly differentiated territorial states with large populations, developed divisions of labour, and differentiated socio-economic hierarchies require higher levels of ecological productivity than do small, nomadic bands of hunter-gatherers. The same is true for the systems constituted by their interactions. Where local NPP is insufficient for their maintenance, modern units and systems must turn to physical and social technologies to supplement energy deficits by accessing additional sources of local NPP or by subsidizing shortfalls through energy importation. EC helps to describe the types of international unit and system that can be supported in any given locale.

Just as interaction capacity is fundamental to our idea of an international system – describing the amount of communication, trade, and migration that is possible within it – EC must be fundamental to our understanding of a socio-ecological system – describing the sustainability of human units and systems in a given physical environment. Without sufficient EC, it is impossible to maintain high-energy units such as cities and states. Even where technologies are available to expand or subsidize local NPP, the cost of sustaining high-energy units and systems in otherwise inhospitable environments can prove prohibitive. The thin international economic system that linked the fur trading posts of the subarctic taiga and low tundra from the sixteenth to the twentieth centuries was relatively easy to maintain in those low- to moderate-energy habitats. The industrial systems of the twentieth-century tundra and taiga have a more troubled history. Even where physical and social technologies exist to support their complex units and processes, their cost is often such that they prove unsustainable over the medium- to long-term. The consequences of unsustainability are scattered across Arctic Siberia, much of it in the form of empty and decaying cities.[227] In ecologies as unproductive as those found throughout much of the circumpolar world, the establishment and maintenance of highly differentiated international units and systems has proved challenging and expensive, requiring high levels of technological intervention to overcome local energy constraints.

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[226] Tainter (1988): 1-3; Joseph Tainter, 'Sustainability of Complex Societies', *Futures* 24(4) 1995, pp.398-399.
[227] Hill & Gaddy (2003): 198-199.

Disaggregating the Arctic's regional international system by sector produces a general pattern that describes the expansion of Europe's international system into the region. In it, subsystems that require relatively low levels of EC run ahead of those with higher energy requirements, acting as a vanguard for the expansion of more energy-intensive sectors. While EC is not differentiated by sector – energy requirements being a fundamental property of all economic, political, and societal systems – its consequences are. Because of their lower energy requirements, societal and economic networks generally run ahead of more energy-intensive political and military interactions. As examples over the next three chapters will show, EC has had perceptible effects on the distribution of both indigenous and European units and systems, including: (i) a bunching of European and neo-European actors along corridors of ecological productivity that has left indigenous peoples to make do in less productive habitats, and (ii) the empowering of non-state units in less energy-intensive economic and societal sectors to act as proxies for states claiming sovereign authority over relatively low-energy hinterlands.

ii. Coevolutionary Process

In socially contextualized analyses of international systems, *processes* describe the means by which individuals, units, and systems interact. These include trade, tribute, war, and diplomacy. Ecological analyses concern themselves with the mutually constitutive relationship between human units and systems and the ecologies in which they are embedded. This relationship describes Socio-Ecological Coevolution, the process by which humanity interacts with the planet's biological, chemical, and physical systems. It is of fundamental importance to both EC and biogeographical structure, representing the means by which each of these sources of explanation operate. It will therefore take priority in the three empirical chapters to follow.

Drawing on this Chapter's bank of ecological concepts and our recent discussion of EC, processes associated with Socio-Ecological Coevolution can be described with reference to four general principles:

1. international systems react to ecological changes by adapting their physical and social technologies to address new ecological contexts;

2. biological, chemical and physical systems are themselves altered by the technological adaptations of their embedded human populations, creating an on-going dynamic of mutually constitutive social and ecological change;
3. the relative impact of ecology and society on one another tends towards increasing human influence as humans become more technologically sophisticated, bolstering social systems' ability to alter the natural systems in which they are embedded; and
4. IR and Ecology respond to Coevolution at varying rates, with effects radiating down their levels of analysis from individuals and organisms to the international systems and the planetary ecosphere. These general principles describe the coevolutionary processes by which our units and systems interact with the ecological contexts in which we live.

Many in IR, particularly members of the English School, have observed that the ways in which international actors relate to one another change over time. As shown by Bull, Watson, Holsti, and Buzan and Little – and discussed at length in Chapter Two – one of the advantages of a socially contextualized image of international systems over its atomistic counterpart is its ability to explain endogenous sources of systemic change.[228] Coevolution adds to the depth of IR's existing evolutionary narratives by highlighting the importance of ecological location to actors' interactions, making *where* as important a question as *when* in determining a system's dominant units, processes, and structures. The processes that define regional subsystems will differ from habitat to habitat. *Where* units interact affects *how* units interact.

Coevolution suggests that international systems change unevenly over space and time, with processes hanging on in some parts of the world long after they have been abandoned in others. Processes that have disappeared near the core of the global international system may continue to operate at its ecological peripheries, insulated against change by their suitability to the ecological challenges and opportunities presented by specific habitats. Imperialism is a good example of this phenomenon. Once a preferred means of interaction between European and non-European units, it has declined as a primary process within the global international system.[229]

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[228] See Watson (2009); Holsti (2004); Bull & Watson (1984).
[229] James Mayall, *World Politics: progress and its limits* (Cambridge: Polity Press, 2000): 20-22.

Nevertheless, it continues to exist in many regions of the globe. In the circumpolar Arctic, the sovereign claims of the littoral states mask the continuing existence of imperial structures in the region, where 'inclusive systems of order [are] organized around a dominant state whose role is accepted as being quite indispensable to the functioning of the system as a whole'.[230] As will be argued in Part Two, this persistence has been enabled by the Arctic's unforgiving ecologies, which have encouraged the region's littoral states to remain imperial systems in all but name in order to address the ecological challenges posed by the circumpolar basin.

If EC is concerned with the sustainability of units and systems in particular habitats, then coevolutionary process analyses the mutually constitutive relationship between the planet's biological, chemical and physical systems, and the units and systems at the heart of IR. Socio-Ecological Coevolution is predicated on the idea that international units and systems adapt their social and physical technologies to meet the challenges and opportunities presented by their ecological contexts, altering those contexts in the process. As physical and social technologies develop, their ability to alter their ecological environment increases, reducing their exposure to its immediate effects. The effects of these alterations filter back through ecological and international systems at different rates, leading to staggered feedbacks as impacts radiate down the levels of analysis. It is important to note that mankind's ability to change an environment is not tantamount to controlling it. Changing an environment often leads to unanticipated consequences for those instigating a change. Contemporary GEC, a delayed atmospheric feedback relating to mankind's centuries-long use of fossil fuels to subsidize local energy shortfalls, is a case in point. Few would argue that the dramatic changes now underway in the planet's atmosphere are examples of increased human control over the ecosphere. Rather, GEC is indicative of our increased ability to alter the biological, chemical, and physical systems in which we are embedded – changes whose complexity have led to unanticipated consequences and emergent ecological outcomes.

iii. Biogeographical Structure

The preceding discussions of EC and Socio-Ecological Coevolution illustrate two of the ways in which ecological systems affect the distribution of international units and

[230] Michael Cox & Ken Booth, 'Introduction', in *Empires, Systems and States: great transformations in world politics*, Eds. Michael Cox, Tim Dunne & Ken Booth (Cambridge: Cambridge University Press, 2001): 12.

systems. Both illustrate the idea that 'ecology matters' insofar as *where* a system is located will help to determine the challenges and opportunities with which it must grapple. In low-energy habitats, social and physical technologies are needed to subsidize the energy requirements of 'complex' units, such as territorial states, and the systems constituted by their interactions. Where technological solutions prove unsustainable, units and systems often retreat into more productive ecosystems, evolve towards lower-energy forms, or disappear altogether. Coevolution highlights the fact that Ecology also matters insofar as where one is located will help to determine the preferred processes by which they interact with units around them. War and trade in bulk commodities are unlikely to emerge as dominant processes in ecosystems that lack the ecological capacity to maintain large armies in the field or permit easy transportation across sea or land. These realities are indicative of the role played by the planet's biogeographical structure in shaping the principles that define its international social systems.

The planet's biogeographical structure, it turns out, is a fair predictor of the kinds of international system that may develop in a given location. By encouraging units to act in ways that may be at odds with their internal processes, structure helps to explain:

(i) the principles by which units are arranged into a system,
(ii) the ways in which they are differentiated from one another, and
(iii) how they stand in terms of their relative capabilities.[231]

Most international systems analysis accepts structure as a social construct generated by the patterned interaction of human individuals, units, and systems. When placed in its ecological context, structure reveals itself to be even more complex in its causes and effects. The structures that shape unit action in an international system are generated by the patterned interaction of individuals, units, and systems in specific biological, chemical, and physical – that is, biogeographical – surroundings. As already argued, ecological context helps to determine a unit's choice of social and physical technology and the processes by which it interacts with other units. It is impossible for a unit or system to act with complete disregard for its habitat without endangering its own, and its habitat's, sustainability. Units' ecological surroundings will therefore affect the

[231] Buzan & Little (2000): 84.

way in which they are organised into an international system – be it a hierarchical imperial system or an anarchical states system – the ways in which they are differentiated – whether units are distinguishable by status or function – and how they stand in terms of their relative capabilities – for example, whether they are in the core or periphery of a given system.

Environmental History is a rich source of narratives dealing with issues of systemic organization, differentiation, and capabilities. One of the most important attempts to describe international history in terms of its structural relationship with the planetary ecosphere is Crosby's account of Europe's ecological imperialism. He generates a particular image of Europe's post-Columbian overseas expansion by pointing out Europeans' preference for familiar, *neo-European* biomes – ecosystems in which existing social and physical adaptations, particularly the plant and animal communities domesticated during the Neolithic Revolution, retain their utility. This preference, he argues, produces a structural relationship that has seen European settler colonies established in biomes that resemble those of their metropolitan states, permitting existing social and physical adaptations to be imported with little need of further adaptation.[232] Through the ensuing centuries, these colonies have gained a measure of independence from their metropoles, becoming territorial states in the European model. On the flip-side, Europeans have been less likely to settle in *non-European* biomes unless drawn to them by the presence of specific resources, such as fur, gold, and oil, which might be traded for the ecological surpluses of more productive sites.[233] The effect of this socio-ecological relationship on Arctic international systems has led to the creation of a hybrid international system comprising imperial and Westphalian elements across its neo-European and non-European ecosystems.

Conclusion

The anthropocentrism that continues to impede ecological analyses of international systems is a function of IR's decontextualized image of the planetary ecosphere, which the discipline generally assumes to be static and homogenous across space and time.

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[232] Crosby (1986): 1-35 *passim.*

[233] As argued by New Ecology, biomes are made up of multiple overlapping habitats and niches and defined by spatial and temporal heterogeneity. Nevertheless, particularly at broader spatial scales, their functional unity makes them a fair indicator of a site's biogeographical structure, making them a useful tool for tracing the impact of ecological structure on IR in the Arctic Basin. [Butzer (1982): 15.]

This Chapter has investigated some of the ways in which IR can overcome its ontological blind spot by integrating ecological factors into the matrix developed by Buzan and Little for the study of international systems in world history. Neither sectors nor levels prove well suited to the task of socio-ecological integration. As an analytical tool, the former cannot overcome the ontological inversion of international and ecological systems that results from the latter being identified as a subset within the former. Levels, though initially promising, also prove ill-suited of the task at hand by virtue of the way in which they divide reality into a nested set of anthropocentric individuals, units, and systems. Moreover, neither move can transform the social sources of explanation used by Buzan and Little to trace systems' evolution. What we need is an ontological tool that divides reality on the basis of the environments in which international systems are embedded, be they atomistic, social, or ecological. These *contexts* describe the impact of a system's environment on the sources of explanation used to trace its evolution. In a socially contextualised system, sources of explanation – interaction capacity, process, and structure – are shaped by the interaction of human individuals, units, and systems. In an ecologically contextualized system, these are replaced by *ecological capacity*, *coevolutionary process*, and *biogeographical structure*, each of which describes one aspect of the mutually constitutive relationship between international systems and the ecologies in which they are embedded. The three chapters that follow trace these sources of explanation through the international and environmental history of the circumpolar North, analysing at their impact on the Arctic's dominant evolutionary dynamics and establishing a baseline understanding of the units and systems that define IR in the region.

Part Two

Socio-Ecological Coevolution: a historical analysis of international systems in the circumpolar Arctic

Chapter Four

Socio-Ecological Coevolution: axes of productivity, convergent evolution, and the fur trade era in the circumpolar North

Over the course of the next three chapters, this project will apply its matrix to analyse the influence of ecological systems on the evolution of international systems in the circumpolar Arctic. This Chapter explores the primary process by which this influence operates – Socio-Ecological Coevolution – illustrating the mutually constitutive relationship between the Arctic's international units and systems, and the ecological systems in which their interactions are embedded. In Ecology, Coevolution describes cases in which two or more biological populations affect one another's development through a process of mutual constitution based on repeated interactions.[234] In this project, it is used in a manner similar to that first introduced by Richard Norgaard in the field of Ecological Economics to describe complex, reciprocal relationships between human systems and the ecological contexts in which they are embedded.[235] Its principal insight for IR is that the development of international and ecological systems is always contingent on influences emanating from the 'other side' of the socio-ecological equation. Humanity's long history of ecological manipulation and the fact of the planet's ecological interconnectedness ensure that neither humans nor nature hold a claim to absolute priority in the chain of causation that links us to the biological, chemical, and physical systems of which we are a part. As one animal population among many, humanity both *affects* and is *affected by* the planetary systems in which we live. Neither human nor ecological factors are exogenous to the evolutionary process that guides our adaptation to our changing physical environment. This fact must be at the heart any attempt to integrate Ecology into IR's analyses of international systems in world history.[236]

The development of arctic international and ecological systems reflects the four principles of Socio-Ecological Coevolution discussed in Chapter Three. First, human societies react to their ecological contexts by adapting social and physical technologies

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[234] Thompson (2001).
[235] Norgaard (1994): 35-37; Norgaard (1984), p. 528; Winder et al. (2005), pp. 353-355; Giorgos Kallis, 'When Is It Coevolution?', *Ecological Economics* 62(1) 2007, pp. 1-2; Giorgos Kallis & Richard Norgaard, 'Coevolutionary Ecological Economics', *Ecological Economics* 69(4) 2010, pp. 691-692.
[236] Pirages (1997): 53.

to address challenges and opportunities that emerge from their social and ecological environments. Second, ecosystems are altered by the social and physical technologies adopted by their embedded human populations. This generates the mutually constitutive cycle that defines Socio-Ecological Coevolution. Third, the relative impact of ecology and humanity on one another's evolution tends towards increasing human influence as our societies become more differentiated and technologically sophisticated. What Joseph Tainter identifies as *complex* physical and social adaptations provide us with increasingly powerful tools with which to mediate the impact of ecological constraints, though at the cost of higher energy requirements that must often be met by subsidizing local energy deficits from the surpluses of other ecosystems.[237] Fourth, Ecology and IR react to one another's influences at varying rates, with effects radiating down each discipline's levels of analysis. In Ecology, individual organisms respond to humanity's inputs more rapidly than the populations they constitute. Communities – groups of interacting and interdependent populations inhabiting a defined area – react more slowly still, with effects being felt last at the widest levels: the ecosystem and the ecosphere. This means that the planet's biological systems will react to human influences before the chemical and physical systems that support them, a premise now being corroborated by our experience of Global Environmental Change (GEC).[238] The human corollary to this principle points out that – in human systems – individuals react to ecological influences more rapidly than units, which in turn react more rapidly than the broader systems constituted by their interactions. Thus, as individuals and units adapt their social and physical technologies to meet environmental challenges and opportunities, the systems-level social and ecological structures that constrain their behaviour tend to remain relatively stable, continuing to influence the evolutionary constraints discussed with reference to path dependence in Chapter Two.

It is important to remind ourselves that 'evolution' does not mean 'improvement' in any normative sense. Hendrik Spruyt captures this lesson neatly when he argues, following Stephen Jay Gould, that,

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[237] Joseph Tainter, 'Energy, Complexity, and Sustainability: a historical perspective', *Environmental Innovation and Societal Transitions* 1(1) 2011, pp. 89-90; Joseph Tainter, 'Social Complexity & Sustainability', in *Ecological Complexity* 3(2) 2006, p. 92; Tainter (1988): 23.
[238] Molles (1999): 303-304; Miller (1991): 63-65.

> Contrary to some popular interpretations of Darwinist theory, evolution thus does not entail progress. There is no reason to believe that later stages in evolutionary phases yield more complex, or more intricate solutions to environmental challenges. The visual conceptualization of an evolutionary ladder is mistaken. All evolution is contingent, and consists of random mutation to the external environment.[239]

Thus, Coevolution in IR does not imply that international units and systems are either improving or moving toward some ideal equilibrium. As indicated by our earlier discussion of New Ecology, such equilibria are anathema to the natural world and should be viewed likewise in IR. Although units and systems – ecological and social – may appear stable over long periods of time, change and variability are ever-present aspects of their existence. Variability, rather than any inevitable march toward uniformity in the social principles that define systemic boundaries, seems to be the natural condition of every international system.[240]

The purpose of this Chapter is to observe the basic mechanisms of Coevolution in action in the pre-contact and early modern history of the circumpolar Arctic. It begins with a short introduction to the ecology of the Arctic Basin. It then considers the influence of Coevolution on the distribution and organisation of the Arctic's pre-international indigenous populations, whose interactions with their ecological contexts were largely unmediated by sophisticated social or physical technology. As implied the third principle of Coevolution and our definition of Ecological Capacity, this left them exposed to the full impact of their habitats' limited productivity, measured in terms of Net Primary Production (NPP). As a result, the principles by which they were organised and distributed around the polar basin closely mirrored the region's distribution of NPP, a pattern that would become a sedimented aspect of the Arctic's early modern international units and systems following the arrival of more technologically sophisticated European units from the late sixteenth century. Europeans' arrival is the subject of the Chapter's next section, which considers Coevolution's role in the development of the fur trade – the primary process by which European units interacted with, and eventually came to dominate, the Arctic's peoples and landscapes. Finally, the Chapter considers some of the ecological consequences of these interactions, including the depletion of the region's natural capital and the arrival of new species, closing the mutually constitutive coevolutionary loop.

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[239] Spruyt in Thompson (2001): 114. See also Stephen Jay Gould, *The Panda's Thumb* (New York: W.W. Norton, 1980): 13.
[240] Gould (2000): 32-35; Spruyt in Thompson (2001): 116.

The pre-contact and early-modern periods of Arctic history are important to our study insofar as they establish the tools with which we will trace the Coevolution of international and ecological systems through to the modern day. They also hint at the importance of our other sources of explanation – Ecological Capacity (EC) and biogeographical structure – and uncover the roots of the region's imperial international systems, exposing the *systemic* – as opposed to *unit-level* – origins of today's littoral states.

A Short Introduction to Arctic Ecology

The Arctic is a region defined by its ecology. (See figure 4.1) The most visible ecological characteristic is the *ecotone* that marks the transition from treeless tundra to forested taiga – the treeline.[241] This term is a bit misleading. As an ecotone, the treeline is not a line at all. Rather, it is a transitional zone between biomes. Imprecise to the extent that it does not demarcate a neat division between the main terrestrial biomes of the arctic and subarctic, it captures a snapshot of several interacting climatic factors, particularly temperature, precipitation, and the availability of Photosynthetically Active Radiation (PAR). Across the Canadian Arctic, the tundra-taiga ecotone varies in width from 112km ± 41km between the Mackenzie River delta and Great Slave Lake to 179km ± 81km between Great Slave Lake and the coast of Hudson Bay.[242] Above it stretch the high and low tundra, the defining biomes of the arctic landscape. Below it stretches the northern boreal forest – the taiga – the dominant biome of the subarctic.

Tundra and taiga alike are divisible into several biotic zones. The *polar desert* is the most northerly of these and the most extreme form of tundra, possessing less than 25% percent vascular plant cover. Even in its southern reaches, mean July temperatures rarely exceed 5°C and precipitation levels are often less than 8cm per year. Today, the polar desert is confined to the Russian and Canadian arctic islands and the

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[241] In Arctic ecology, a *tree* is taken to refer to "a perennial woody plant with a single central stem at least 2 m tall." [Barry & Ives in Ives & Barry (1974): 5.] This thesis will not be using the Arctic Circle as a guide to the region for the simple reason that it bears little relationship to either its ecological structure or its international systems. [Carina Keskitalo, *Negotiating the Arctic: the construction of an international region* (London: Routledge, 2004): 30-32; Carina Keskitalo, 'International Region-Building: Development of the Arctic as an International Region', *Cooperation & Conflict* 42(2) 2007, pp. 192-193.]

[242] Timoney et al, (1992): 5-6.

northernmost regions of Greenland and the Taimyr Peninsula.[243] South of the polar desert, one encounters the *high tundra*. This is distinguished by an almost continuous cover of summer herbaceous plants on its well-drained (*mesic*) soils, interspersed with isolated prostrate woody plants. Together, the polar desert and high tundra are referred to as *barren ground,* and constitute two of the least productive ecosystems on Earth.

Figure 4.1 – Circumpolar terrestrial vegetation zones[244]

Between these ecosystems and the treeline, one finds the *low tundra*. This is home to a higher density of dwarf shrubs such as birch and willow on mesic sites, and features polygonal bogs in poorly drained areas. As described in Chapter Three, NPP is low across all of these biotic zones, from 100-250 g $m^{-2}yr^{-1}$ in the high tundra, to 250-500 g m^{-2} yr^{-1} in areas closest to the tundra-taiga ecotone.[245]

[243] Samuel Rieger, "Arctic Soils" in Ives & Barry (1974):759.
[244] United Nations Environmental Programme. "Vegetation zones in the Arctic." *UNEP/GRID-Arendal Maps and Graphics Library*. 2005. UNEP/GRID-Arendal. [online] 5 Mar 2010 <http://maps.grida.no/go/graphic/vegetation-zones-in-the-arctic>.
[245] Patrick Webber, "Tundra Primary Production" in Ives & Barry (1974): 447-9, 455-6, 459.

Of the many subordinate zones within the belt of boreal taiga that circles the globe, only two need worry us for the purposes of this project: the treeline and the northern boreal woodlands.[246] The treeline tends to follow a band traced by the 10°C isotherm – a climatic zone defined by the extent of mean July temperatures above 10°C. As one proceeds through this ecotone, PAR, precipitation, and temperatures increase. Nevertheless, total evapotranspiration rates remain relatively low, leaving significant amounts of standing water that can convert the boreal forest into lichen woodland: wetland forests interspersed with muskeg bogs and swamps whose total productivity is lower than that of their mesic neighbours. Their soggy state is compounded by the presence of permafrost, permanently frozen ground that is continuous under much of the tundra and patchier beneath the taiga. This plays a key role in constraining the productivity of both biomes – limiting root depth and sealing lower soil horizons against drainage.[247] Thanks to the taiga's broad geographical range, which includes the more southerly middle and closed boreal forests as well as the northern woodlands, its NPP varies across a wide range of values, from less than 400 to almost 800g C m^{-2} yr^{-1}. In the subarctic and northern taiga, values fall at or below the mean for the biome, leaving us with a measurement ≤ 600g C m^{-2} yr^{-1}.[248] The Hudson Bay lowlands, with their immature drainage and resulting lichen woodland patchwork, boast a paltry 250 g m^{-2} yr^{-1}.[249] (see plots TUN, BW and BF figure 4.2)

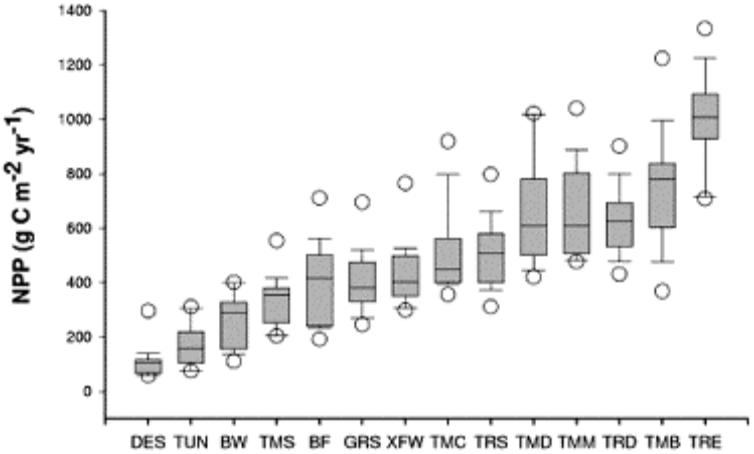

Figure 4.2 - Box plots comparing model estimates among biomes for mean NPP.[250]

[246] Barry & Ives in Ives & Barry (1974): 7.
[247] James Larsen, "Ecology of the Northern Forest Border" in Ives & Barry (1974): 349-351.
[248] Krebs (1994): 609.
[249] Toby Morantz, "Economic and Social Adaptations of the James Bay Lowlanders" in Shepard Krech III, *The Subarctic Fur Trade: native social and economic adaptations* (Vancouver: University of British Columbia Press, 1984): 58.
[250] W. Cramer et al., 'Figure 7, Report #5: Net Primary Productivity Model Intercomparison Activity', *IGBP/GAIM Report Series*. 1994/1995. [online] May 5 2011, <http://gaim.unh.edu/Products/Reports/Report_5/> . Biomes included are: arid shrublands/deserts (DES), tundra (**TUN**), subarctic boreal woodlands (**BW**), temperate savannas (TMS), northern boreal forests (**BF**), grasslands (GRS), xeromorphic woodlands (XFW), temperate coniferous

Perhaps the most important constraint on human activity in both biomes is their soil structure. Tundra and taiga alike lock the majority of their organic matter in their plant cover, leaving few nutrients in the ground as a base for agricultural production. As a result, their main 'agricultural' product is their herbivorous fauna, particularly caribou/reindeer and musk ox in the tundra, and woods buffalo, woodland caribou/reindeer, and moose in the treeline and northern taiga.[251] These animals convert herbaceous and woody plant matter into forms of energy that can be metabolized by humans, making them essential to the region's indigenous hunter-gatherer bands (HGBs). Other sources of human food include the snowshoe hare, rodents, and martens, along with abundant but highly seasonal supplies of fish and fowl. By locating themselves near the ecotone, many pre-contact indigenous bands have been able to harvest a number of niche resources on a rotating basis, taking advantage of numerous prey species to produce a countercyclical subsistence regime that can substitute out one or more food sources during their periodic population crashes.[252]

At the centre of the Arctic's concentric belts of tundra and taiga is the Arctic Ocean, whose waters are a valuable source of food and resources for the inhabitants of the coastline's relatively unproductive terrestrial biomes. This is particularly true around the three main channels that drain the Arctic Basin: the Bering Strait, the Davis Strait, and the Greenland/Norwegian Seas. In marine environments, nutrient availability is a much more important factor in determining NPP than temperature, making many Arctic waters highly productive thanks to vertical mixing that cycles nutrient-rich waters at the base of the water column into the photoactive layer near the top. This supports large populations of primary producers (algae and plankton) and consumers

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forests (TMC), tropical savannas (TRS), temperate deciduous forests (TMD), temperate mixed forests (TMM), tropical deciduous forests (TRD), temperate broad-leaved evergreen forests (TMB), and tropical evergreen forests (TRE). Bars within the boxes represent median values. The bottom and top of the box represents the 25th and 75th percentile, respectively. The bars outside the box represent the 10th and 90th percentiles. Open circles represent statistical outliers.

[251] Rieger in Ives & Barry (1974): 761; Arthur Ray, "Periodic Shortages, Native Welfare, and the Hudson's Bay Company, 1670-1930" in Krech (1984): 2-3.

[252] Populations of arctic fauna are susceptible to dramatic peaks and troughs. The snowshoe hare has a population cycle of only ten years, with three-year maxima and minima. Populations rise and fall rapidly, leaving HGBs that rely on them vulnerable to periodic starvation. Increasing reliance on snowshoe hares among the Dene following their northward and westward migration in the eighteenth and nineteenth centuries led to regular famines among Mackenzie valley populations, increasing their reliance on the fur trade for access to food. This socio-ecological process will be discussed further in Chapter 6. [See Ray in Krech (1984): 18 n.; T. Griffith Taylor, *Canada: a study of cool continental environments and their effect on British and French settlement* (London: Methuen & Co., 1957) third edition: 356-357.]

(fish, birds, marine mammals), making the region's oceans significantly more productive than their neighbouring terrestrial biomes.[253]

Coevolution: pre-contact indigenous units

Understanding the history of Arctic international systems requires that we begin by looking at the indigenous units and systems that constituted the region's first actors and networks. The circumpolar North is inhabited by a wide array of indigenous peoples. (see Figure 4.3) In the pre-contact era, most of these were organized into fluid social groups, ranging in size from nuclear families, though multi-family local bands, to semi-permanent regional bands of fifty to five hundred individuals.[254] Where they lacked access to a stable and sufficient food source – as was the case throughout most of the Arctic Basin – these peoples spent the majority of their time in small groupings, spreading the ecological risks associated with life in relatively unproductive biomes.[255] Thanks to the Basin's mosaic distribution of sites and niches, its indigenous units' social and physical technologies varied greatly, from nomadic HGBs of the taiga such as the Even- and Evenk-Tungus of Central Siberia to the semi-permanent whale-hunting villages of the North Slope Inupiat of Alaska. Their forms of internal organisation also varied from site to site. Most often, pre-contact Arctic units were differentiated along *segmentary* lines, with each individual or sub-group being equal – and functionally similar – to all others. A few Arctic units, such as the Yakut/Sakha of the Lena River valley and the Inupiat of Alaska exhibited *stratificatory* forms of social organisation, in which the formal equality of segmentary societies gives way to structural social hierarchies.[256] Prior to European contact, indigenous arctic and subarctic units did not adopt *functional* modes of differentiation, with their specialised divisions of labour across societal, political, and economic sectors.[257] As a result, they never became *complex* units as understood by Joseph Tainter – defined by 'the size of a society, the number and distinctiveness of its parts, the variety of

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[253] Molles (1999): 348-349; Miller (1991): 71-75, Chapter 5 *passim*.
[254] David Riches, *Northern Nomadic Hunter-Gatherers: a humanistic approach* (London: Academic Press, 1982): 78.
[255] David Damas, 'The Diversity of Eskimo Society', in Richard B. Lee and Irven DeVore, *Man the Hunter: the first intensive survey of a single, crucial stage of human development – man's once universal hunting way of life* (New Jersey: Aldine Transaction, 2009) second printing: 111.
[256] Mathias Albert and Barry Buzan, 'Differentiation: A Sociological Approach to International Relations Theory', *European Journal of International Relations* (16:3) 2010:, pp. 318-319; Niklas Luhmann, 'The Paradox of System Differentiation and the Evolution of Society', in Jeffery C. Alexander and Paul Colomy, *Differentiation Theory and Social Change: Comparative and Historical Perspectives* (New York: Columbia University Press, 1990): 423-425.
[257] Buzan & Little (2000): 116-119.

specialized roles it incorporates, the number of distinct social personalities present, and the variety of mechanisms for organizing these into a coherent, functioning whole.'[258]

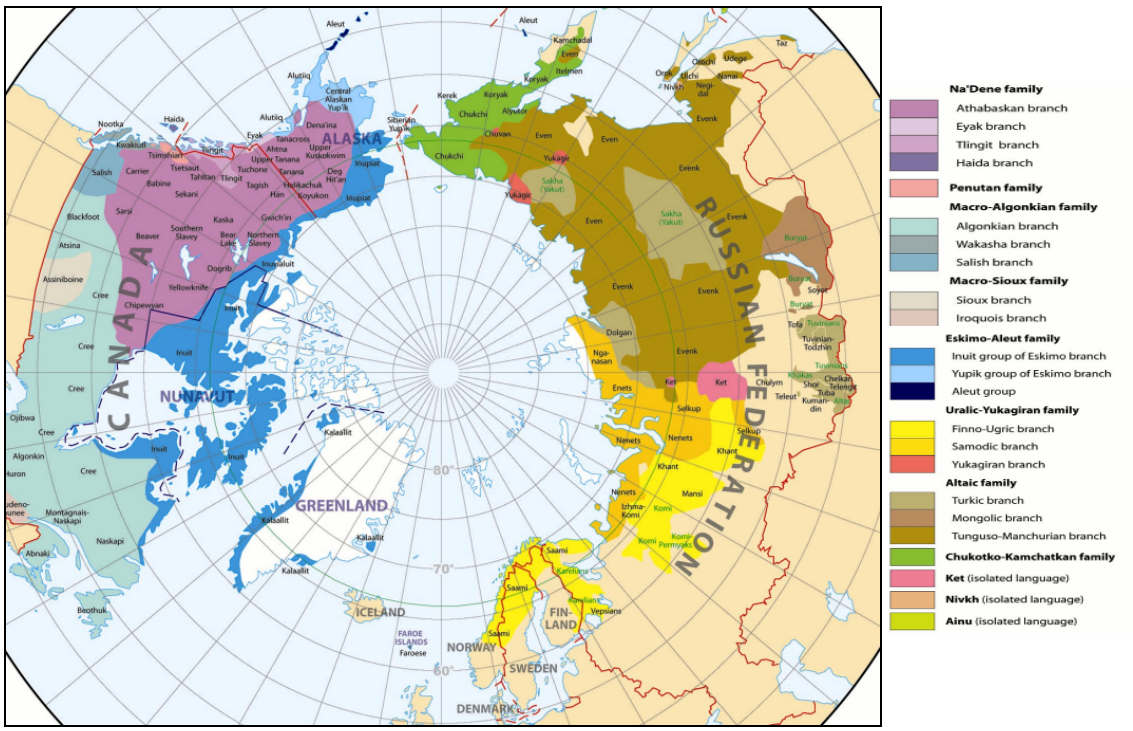

Figure 4.3 – Indigenous Peoples of the Arctic Basin[259]

The organisation and distribution the Arctic's pre-contact indigenous units were decisively influenced by Socio-Ecological Coevolution. Though not *determined* by their ecological contexts, their social and material evolution was certainly *constrained* by their need to wring energy from the natural systems in which they were embedded – affecting their EC and creating covariance between the social and biogeographical structures of their environment. As discussed in Chapter Three, a unit's EC is mediated by three factors. These are:

i) whether local levels of ecological productivity, measured in terms of NPP, make the sustainability of specific international units and systems easy or difficult;
ii) what physical technologies are available for the extraction and utilization of a habitat's energy reserves; and
iii) what social technologies are available for the extraction and utilization of a habitat's energy reserves.

[258] Tainter (1988): 23.
[259] W.K. Dallman, "Indigenous Peoples of the Arctic Countries", *Arctic Council Map Archive* [online], 2002, Norwegian Polar Institute. 2 May 2009 <http://arctic-council.org/filearchive/AHDRmap_lan-3..jpg>. Notes: Overlapping populations are not shown. In the Russian Federation, indigenous peoples have a special status as 'Samll Peoples of the Arctic' only when they number less than 50,000. Names of larger indigenous peoples are written in green.

The Arctic's pre-contact indigenous peoples possessed highly specialised social adaptations to minimize ecological risks, including inter-band food sharing and the tendency to spread resource-gathering across a number of different ecological niches. Nevertheless, they lacked the social and physical technologies needed to actually *increase* their energy allowances, as is possible through large-scale trade with more productive ecosystems. This left their EC highly constrained by the NPP of their surroundings, affecting their ability to support the hierarchies, divisions of labour, and large populations that define social complexity.[260]

Recalling our discussion of New Ecology in Chapter Three, the Arctic is not homogenously unproductive. Conditions vary from site to site, producing corridors and islands of ecological productivity where relatively complex stratificatory units can sustain themselves in the midst of less differentiated social groups. Given our previous discussion of Arctic Ecology and the correlation between EC and units' levels of hierarchical and functional differentiation, three socio-ecological axes can be deduced. First, NPP – and with it levels of social complexity – will tend to increase as one moves from North to South thanks to rising temperatures and levels of PAR. Units closer to the pole are, in general, able to sustain smaller populations and lower levels of differentiation than their southern neighbours. This neat North-South distribution is interrupted by a second socio-ecological axis stretching from continental to maritime climates, where increased precipitation and moderated temperatures boost the energy available to embedded human populations. Finally, NPP increases along an axis running from tributary uplands to mature river valleys and coastlines. This is particularly important in the Arctic, whose rivers run from South to North (see figure 4.4), bringing organic matter and nutrients to the relatively sluggish ecosystems of the northern taiga and tundra and thereby boosting soil fertility, improving drainage, and bringing an influx of organic matter, fish, and flora.[261] Coastlines, meanwhile, give access to the region's relatively productive marine ecosystems.

The distribution and organisation of indigenous units around the Arctic basin mirrors these socio-ecological axes, providing inductive support for our hypothesized

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[260] David Damas, 'The Arctic from Norse Contact to Modern Times', in Bruce Trigger et al., *The Cambridge History of the Native Peoples of the Americas* (Cambridge: Cambridge University Press, 1996): 359-360; Simmons (1997): 17, 29-30; Tainter (2011), pp. 89-90; Tainter (2006), p. 92; Tainter (1988): 37-38.
[261] Miller (1991): 69-71.

correlations between NPP, EC, and the organisation of pre-contact units. According to the archaeological and anthropological records, indigenous groups exhibiting low levels of hierarchical and functional differentiation have historically been found along northern and upland portions of the continental taiga and tundra, in areas lacking access to either marine or riverine resources. For example, the inland Yukagir of northeastern Siberia and the Even/Evenk Tungus of the Central Siberian Plateau lived in small HGBs scattered over vast stretches of continental upland, lacking permanent leadership hierarchies and using small-scale pastoralism – a form of *on the hoof* food storage imported from the southern steppes – to steady the seasonal vagaries of their hunting and gathering lifestyles.[262] Downstream from these upland groups lived stratificatory groups such as the Yakut/Sakha of the middle Lena River – a society of cow and horse pastoralists with traditions of private property and social hierarchy that reached back to their initial northward migration around AD1000.[263]

Figure 4.4 – Map indicating the major rivers draining into the Arctic Ocean.[264]

The evolution of the principles that define Yakut society provides an opportunity to observe how changing ecological contexts affect units' organisation. As the Yakut migrated north from the middle to the lower Lena – and then to the even more extreme

[262] James Forsyth, *A History of the Peoples of Siberia: Russia's North Asian Colony 1581-1990* (Cambridge: Cambridge University Press, 1992): 49-51, 74-75.
[263] Aleksei P. Okladnikov, *Yakutia Before its Incorporation into the Russian State*, Trans. Henry Michael (Montreal: McGill-Queens University Press, 1970): 395-399, 381.
[264] Conservation of Arctic Flora and Fauna, 'Major River Systems in the Arctic', *Global Environmental Outlook 3* [online] 2012, United Nations Environmental Programme. Accessed 26 February 2012 < http://www.grida.no/graphicslib/OpenFile.aspx?id =3e032e9a-b0ea-4adc-a17d-d1774857bb0c>. Numbers indicate their annual discharge of fresh water in cubic kilometers.

continental climates of the Anabar, Yana, Indigirka and Kolyma basins – their stratificatory social hierarchies converged with the segmentary social arrangements of their Tungus and Yukagir neighbours. In doing so, these Yakut groups evolved along paths that diverged from the stratificatory organisation of their southerly Yakut brethren, even abandoning carnivorous pastoralism in favour of a segmentary hunting-herding lifestyle.[265] The tendency of carnivorous pastoralists to accumulate individual wealth and create hierarchies of leadership – a trait much less common in mixed herding and hunter-gatherer bands – meant that the northern Yakut experienced a sharp reduction in hierarchical differentiation as they adopted social technologies more adapted to their new ecological contexts. These northern Yakut also converged with their Yukagir and Tungus neighbours at a material level, with Yakut lodges being replaced by Tungus tents while their clothing became a mixture of traditional Yakut and Yukagir designs.[266] Thus, under pressure from their low-energy ecological surroundings, the Yakut evolved towards simpler forms of social organisation – a pattern that would be repeated by successive waves of European migrants over the next four hundred years, and which illustrates the powerful impact of NPP on the spatial distribution of units, systems, and complexity around the Arctic Basin.

This interplay between social organisation, material technology, and ecological productivity combined to produce several dynamics of Socio-Ecological Coevolution that remain important in the modern era. First, where initially dissimilar units find themselves embedded in similar ecosystems, Socio-Ecological Coevolution will push them onto convergent evolutionary pathways, leading to the development of similar forms of segmentary, stratificatory, or functionally differentiated social organisation. Likewise, where initially similar societies become embedded in fundamentally different ecosystems, they will tend to diverge, reflecting the pressures brought to bear by their dissimilar ecological contexts. In both cases, social differentiation covaries alongside a site's NPP, marking a direct correlation between EC and the social principles adopted by a biome's embedded units and systems. The divergence of the

[265] Carnivorous pastoralism refers to the mode of production in which a society primarily relies on its herds for meat, rather than earlier forms of pastoralism in which domesticated animals supplemented hunting by providing milk and transport. Only in times of famine would these groups kill and eat their herds. [Knut Odner, *The Varanger Saami: habitation and economy AD 1200-1900* (Oslo: Scandinavian University Press, 1992): 32-33.]
[266] Robert Paine, 'Animals as Capital: Comparisons among Northern Nomadic Herders and Hunters', *Anthropological Quarterly*, 44(3) 1971, pp. 168-169; Okladnikov, Chapter III.1.6 'Northern Elements in the Culture of the Yakuts' (1970): 291-303.

Copper and Iglulik Inuit cultures in the central Canadian Arctic during the centuries before European contact is a case in point. (see figure 4.5)

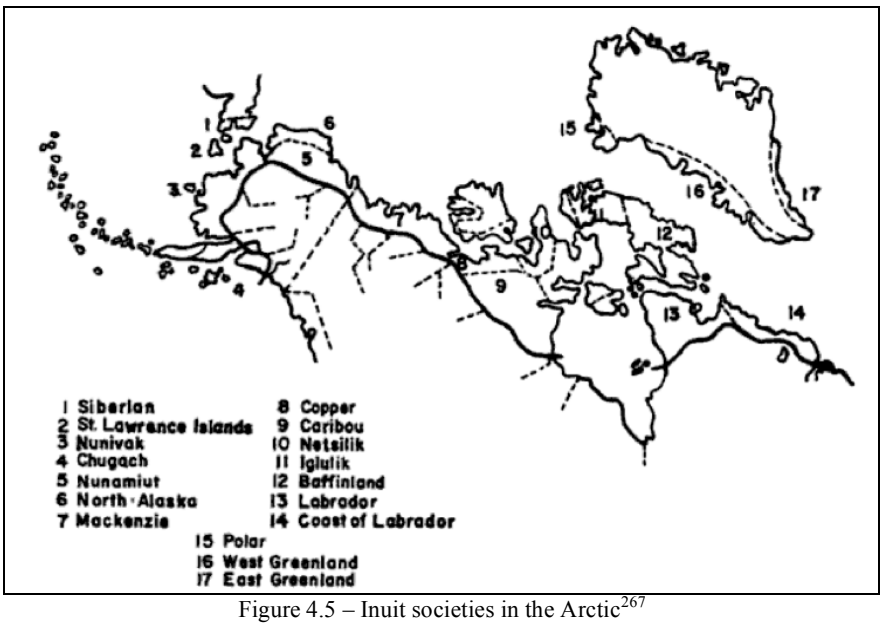

Figure 4.5 – Inuit societies in the Arctic[267]

Like other Inuit societies, the Copper and Iglulik Inuit trace their descent to the Thule Eskimos, a relatively complex culture of Arctic whale hunters whose social units resembled those of the North Alaskan Inupiat. By storing significant quantities of whale meat over the winter months, the Thule were able to maintain permanent communities of up to 500 individuals with leadership hierarchies and a limited division of labour between men and women, hunters and shamans.[268] The Thule people originally migrated across the Canadian Arctic to Greenland during the Medieval Warm Period (MWP).[269] When the MWP gave way to cooling conditions during the Little Ice Age (LIA), Inuit groups across Arctic North America and Greenland found themselves exposed to different local ecological regimes, producing divergent social adaptations among their once-similar units.[270]

The Copper Inuit, inhabiting lands around Coronation and Queen Maud gulfs, found themselves in sites where land-fast ice blocked access to marine resources through most of the year, limiting their ecological energy base to the summer caribou hunt and

[267] Damas in Lee & DeVore (2009): 112.
[268] Robert McGhee, *Ancient Peoples of the Arctic* (Vancouver: University of British Columbia Press, 1996): 20-23, 184-185.
[269] Robert McGhee, 'The Timing of Thule Migration', *Polarforschung* 54(1) 1984, pp. 2-3.
[270] David Riches, 'The Netsilik Eskimo: A Special Case of Selective Female Infanticide', *Ethnology*, 13(4) 1974, p. 359.

wintertime ring seal breathing-hole hunting.[271] In the face of chronic energy shortfalls and regular periods of famine, they were unable to maintain the large bands and hierarchies that had been typical of Thule culture, adapting instead highly fluid social arrangements in which much smaller multi-family groups were 'experimentally constructed' from a wide pool of nuclear families for one or two seasons, with less concern for kinship than for hunting success.[272] The Copper Inuit went so far as to abandon named leadership positions among their multi-family units, with authority becoming increasingly ephemeral as their bands' constitutions became increasingly unstable.[273] Constrained by the NPP of their surroundings, they went on to adopt a *segmentary* form of social organisation, in which each individual and sub-group was socially equal, and functionally similar, to all of the others.[274] Meanwhile, the Iglulik Inuit, whose territories on the Melville Peninsula and western Baffin Island border the more productive maritime ecosystems of Baffin Bay and Foxe Basin, faced a more moderate environmental regime during the LIA, allowing them to retain a greater degree of Thule-era social complexity. Using sea kayaks and group hunting, physical and social technologies abandoned by the Copper Inuit, the Iglulik were able to access large bearded seals and walruses to supplement the caribou and breathing-hole hunting techniques they shared with their southwestern neighbours.[275] These additional energy sources allowed them to maintain larger populations and many of the hierarchical institutions that had characterized Thule culture.[276] Iglulik multi-family and regional bands not only displayed a higher level of social cohesion than those of the Copper, but also featured a hierarchical system of food redistribution through the person of the *isumataaq*, "intelligent one", indicating a greater level of stratificatory differentiation than was to be found among their ecologically disadvantaged Copper brethren.[277]

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[271] David Damas, 'Central Eskimo Systems of Food Sharing', *Ethnology* 11(3) 1972, pp. 220-221.
[272] Riches (1982): 83.
[273] Damas (2009): 114.
[274] Albert & Buzan (2010), p. 318. Though we tend to think of hierarchically and functionally differentiated units as somehow superior to those exhibiting this sort of segmentary organisation, this is not the case in regions where maintaining hierarchies (much less strict divisions of labour) leaves a group dependent on too few hands to feed too many mouths with too undependable a food supply. As the Yakut found during their northward migration along the Lena, 'simpler' units and practices are sometimes better than more complex alternatives.
[275] Damas (1972), p. 221.
[276] Riches (1974), p. 359.
[277] Riches (1982): 68-69; Damas (2008): 115; Luhmann (1990): 424; Albert & Buzan (2010), pp. 318-319.

Socio-Ecological Coevolution had a decisive impact on the organization and distribution of pre-contact indigenous units around the Arctic Basin. In pre-contact Siberia and arctic North America, social differentiation covaried with regional NPP along several axes of ecological productivity, the number and variety of which made the polar basin's distribution of segmentary and stratificatory groups complex and intermingled. Along one axis, social differentiation increased from North to South thanks to increasing levels of PAR and temperature. Along a second, differentiation increased from continental to maritime climates thanks to moderated temperatures and increased precipitation. Along a third, differentiation increased from tributary uplands and areas of immature drainage to mature river valleys and coastlines.[278] By means of these ecological axes, Coevolution had a perceptible impact on geographical patterns of convergent and divergent evolution among the Arctic's pre-contact indigenous units. Where initially similar units found themselves embedded in different ecological contexts, their social technologies tended to diverge, leading to the evolution of different principles of social organization. Conversely, where initially dissimilar units found themselves embedded in analogous ecological contexts, their social technologies tended to converge around parallel sets of social principles. This coevolutionary dynamic meant that units could become either more or less differentiated over time, indicating that unit evolution does not necessarily move in the direction of increasing complexity and technological sophistication. Though constrained by path dependence – as discussed in Chapter Three – societies' endogenous sources of stability can be overcome by ecological pressures, encouraging the adoption of less differentiated social technologies in order to cope with acute resource shortfalls. In some cases, such as the northern Yakut and Copper Inuit, these evolutionary pressures require units to move toward lower levels of differentiation in order to reduce their energy requirements, replacing what we in the progress-obsessed modern world think of as 'superior' social technologies with simpler forms of organisation more carefully adapted to new ecological contexts.

Coevolution: early-modern units & systems

Socio-Ecological Coevolution affects the development of both units and the social systems constituted by their interactions. One source of explanation for its

[278] Miller (1991): 69-71; J.C. Yerbury, *The Subarctic Indians and the Fur Trade, 1680-1860* (Vancouver: University of British Columbia Press, 1986): ix.

effectiveness is tied to the impact of EC – the ability of an actor to mobilize energy resources in a given physical context. Coevolution is also active at the systems level, leading to covariance between a region's biogeographical structures – defined by its biological, chemical and physical systems – and the principles of membership and behaviour that define its social structures. One international process has been particularly important to the evolution of Arctic international systems – *trade*. In Siberia and Arctic North America, European traders were drawn into arctic and subarctic biomes by the presence of fur – a product of the taiga's and tundra's specific environmental history. The Coevolution of international and ecological systems in the circumpolar North resulted in a distribution of units and processes closely related to the three axes of ecological productivity described in the last section. As traders and settlers soon learned, Socio-Ecological Coevolution means that *where* you interact has a clear and present effect on *how* you interact.

Pre-international Systems of Exchange

Long before the arrival of Europeans East of the Urals and West of the Denmark Strait, the Arctic was home to a variety of pre-international systems comprising elements of socio-cultural, economic, and even politico-military interaction. The most expansive of these were primarily societal – occupying the least intensive sector in terms of its interaction and ecological capacity requirements – though all were typified by a mixture of socio-cultural, economic, and even politico-military relationships.[279] These systems exchanged goods, ideas, and people over large areas, almost certainly by means of linear relay systems that linked unit to unit in a series of short hops between immediate neighbours. This permitted remarkably extensive networks to develop despite the restrictions placed on interaction capacity and EC by groups' limited social and physical technologies and challenging ecological contexts.[280]

For example, well before the arrival of Europeans along the northern coast of Arctic America in the nineteenth and twentieth centuries, soapstone lamps made by the Copper Inuit from the region around Coronation Gulf in the central Canadian Arctic were a standard feature in Inuit and Eskimo households as far away as Cape Prince of Wales and Kotzebue Sound on the Bering Strait.[281] (See Figure 4.6)

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[279] *Ibid*: 81.
[280] *Ibid*: 96-97.
[281] Morrison (1991), pp. 239-246.

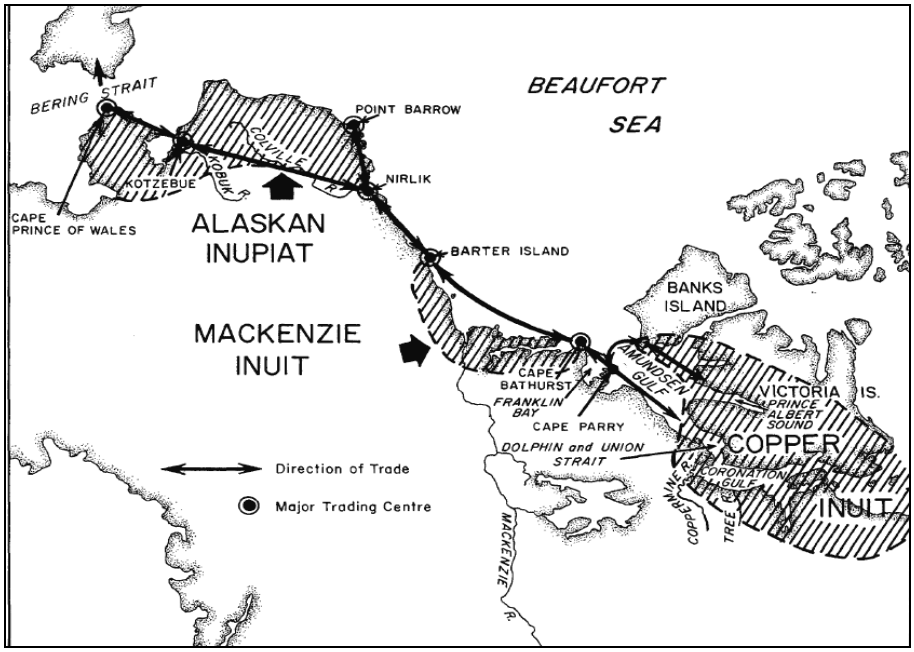

Figure 4.6 – Pre-international linear relay trade routes in the western and central North American arctic[282]

Pre-international systems such as those which moved lamps over 2500km from the central Canadian Arctic to the Bering Strait display aspects of economic interaction – namely, the exchange of goods. However, they were never purely economic. They were *pre-international* to the extent that their interactions lacked firm distinctions between sectors and tended to penetrate deeply into the 'domestic' structure of participating units.[283] As discussed in the last section, the indigenous units whose interactions constituted these interactive systems were most often differentiated along segmentary lines. A few exhibited stratificatory forms of social organisation, though none demonstrated the full functional differentiation characteristic of units and systems with specialized divisions of labour among the societal, political, and economic sectors. The absence of these functional divisions makes it impossible to differentiate between discrete sectoral processes, problematising the issue of structure in pre-international systems.[284] Exchange processes such as that which transported soapstone lamps across Arctic North America included elements of economic, societal, and political interaction, allowing units to penetrate deeply into one another's internal processes and problematising the inside-outside distinction at the heart of IR's definition of 'the international'. Exchanges of this kind were as important for their

[282] David Morrison, 'The Copper Inuit Soapstone Trade', *Arctic* 44(3) 1991, p. 240. The 'major trading centres' represented in the map indicate the presence of a seasonal hunting and trading camp among the relatively complex Inuit/Eskimo cultures of the Beaufort coast. Note the absence of such sites among the segmentary bands of the Copper Inuit.
[283] Buzan & Little (2000): 123-130.
[284] Albert & Buzan (2010), pp. 130-133, 318-319; Luhmann (1990): 423-425.

role in reinforcing kinship and reciprocity relationships as they were for moving goods, bolstering vital social technologies that ensured the survival of ecologically-constrained HGBs in the event of local resource shortfalls even as they provided an important physical technology to the peoples of the Bering Strait.[285]

Environmental History & the Fur Trade

The arrival of European units and processes in Siberia after 1581 and Rupert's Land after 1670 – lured by the wealth of furs to be had in the taiga, treeline, and tundra – did not undo the coevolutionary relationships responsible for the spatial organisation of indigenous peoples' pre-international units and systems. Ecosystems' coevolutionary impact on incoming European units – and the systems constituted by their interactions – was similar to their impact on the region's pre-international indigenous units and systems. Socio-Ecological Coevolution encouraged their systems to adapt to ecological challenges and opportunities with social technologies that varied along the three axes of socio-ecological coevolution described earlier in this Chapter, substituting indigenous proxies for complex European units where ecology made the latter unsustainable. This laid the groundwork for the state-centred imperial international systems that will be discussed further in Chapter Five.

Russia's infiltration of Siberia began in earnest during the early 1580s, when Ermak Timofeevich – a Cossack mercenary in the private employ of the commercially powerful Stroganov family – crossed the Urals from Verkhoturye near the headwaters of the Tura River with a force of just over 800 men.[286] From the establishment of Tyumen in 1586, it took only sixty-three years for a line of Russian forts, *ostrogs*, and small winter blockhouses, *zimoves*, to reach across 6,500 kilometers of boreal taiga to the Sea of Okhotsk and to the Anadyr River on the Chukotka Peninsula. (see figure 4.7) One should not mistake this scattering of isolated posts in the wilderness for a state in the Westphalian sense of a collective actor possessing sovereign power over domestic affairs and international interactions within a well-demarcated territory. Rather, each ostrog and zimove was an island of Russian activity in a sea of trees and

[285] Morrison (1991), p. 244.
[286] Yuri Semyonov, *Siberia: its conquest and development*, Trans. J. R. Foster (London: Hollis and Carter, 1963): 46. For translation of related texts, see George Lantzeff and Richard Pierce, *Eastward to Empire: exploration and conquest on the Russian open frontier to 1750* (Montreal: McGill-Queen's University Press, 1973): 89.

tundra and a main point of contact with the 200,000 or so indigenous people of Siberia.[287]

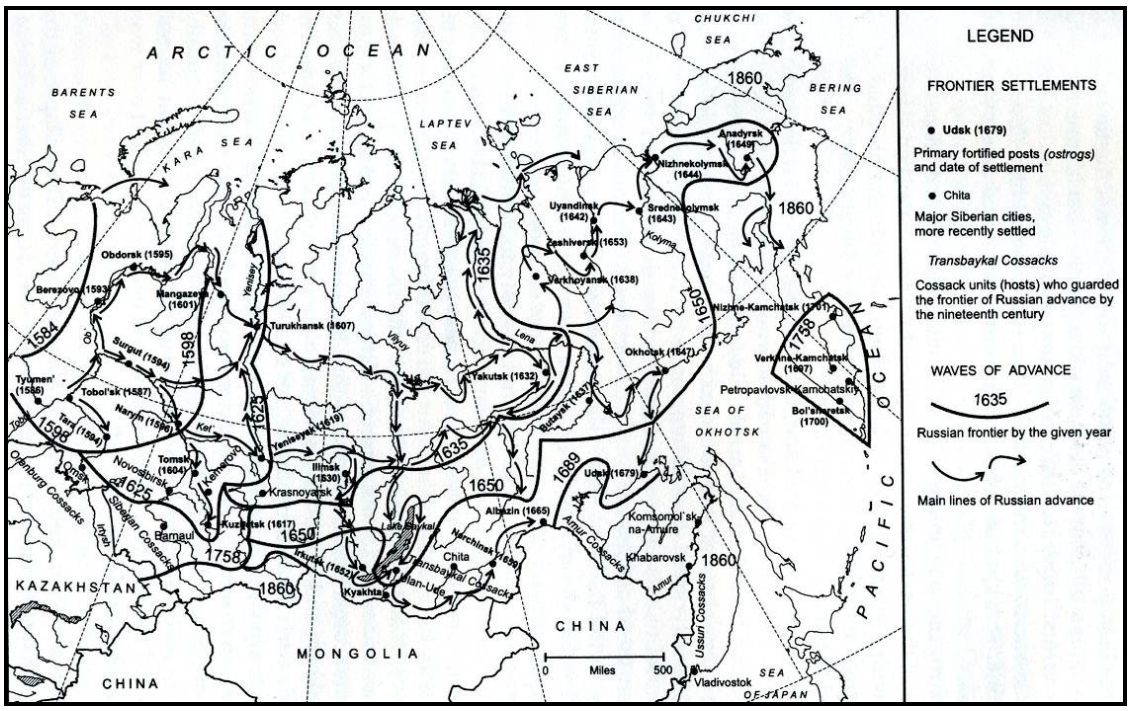

Figure 4.7 – Map of Russian Expansion across Siberia from 1586-1860, showing the riverine Southern and Northern trans-Siberian transportation routes via Yeniseysk and Turukhansk.[288]

Socio-Ecological Coevolution played a key role in shaping the processes by which this expansion took place. It is a remarkable story by any standard, motivated by the quest for fur.[289] By the end of the sixteenth century, a single sable pelt was worth more than the annual income of a peasant family in European Russia, pushing independent fur trappers and state agents further and further East.[290] Where demand pushed, supply pulled private and state hunters across the continent. After securing positions along the Ob River and either trapping available fauna or enforcing fur-tribute – *yasak* – on its indigenous peoples, Russian trappers and state agents reached the lower Yenisei River via Mangazeia on the River Taz in 1607. Eight hundred kilometers further south, units from Tobolsk reached the upper Yenisei via a portage from the Ob in 1608.[291] The depletion of fur bearing animals along the main courses of the Taz and lower Yenisei in the 1620s pushed yasak men and traders eastward from Mangazeia into the taiga-tundra ecotone at the base of the Taimyr Peninsula and up the Lower Tunguska River. From there, privately-funded fur parties portaged to the middle Lena

[287] Lincoln (1993): 45.
[288] Adapted from Victor Mote, *Siberia: Worlds Apart* (Oxford: Westview Press, 1998): 42.
[289] This is one of the very few points on which historians of Siberia – Russian and western, communist and capitalist – generally agree.
[290] Lincoln (1993): 43, 50-51.
[291] Lanteff & Pierce (1973): 127-129, 137.

River, where they began to hunt the valley's substantial sable and fox populations and extract yasak from the Yakut and Tungus peoples of the region.[292] In 1628, the first state expedition set out from Yeniseysk to secure the Lena fur lands opened by these private traders, erecting an ostrog at the site of present-day Yakutsk in 1632.[293] Yakutsk became the eastern terminus of the northern and southern trans-Siberian routes and the administrative centre of Eastern Siberia – a huge area defined as all of the lands east of the Yenisei and north of the Amur River basin. This was the richest storehouse of furs yet discovered, the presence of which would subsidize Yakutsk's severe ecological deficits for decades to come. Yakutsk was also the jumping-off point for expeditions into the Yana, Indigirka, and Kolyma basins in the harsh northeastern corner of Asia. These basins held fewer saleable furs thanks to the depressed productivity of their northern, continental, and upland climates, removing the primary motivation behind the Russian advance.[294] Still searching for alternative fur sources, the ostrog of Okhotsk was founded on the Pacific coast in 1641, and a party led by Semyon Dezhnev rounded the northeastern cape of Asia in small open boats from the Kolyma in 1648, founding an ostrog, Anadyrsk, on the middle Anadyr River in 1649.[295] Neither Anadyrsk nor Okhotsk proved profitable and for the rest of the century they remained geographically and ecologically isolated outposts of Russian power. By 1731, Okhotsk had shrunk to a garrison of 30 Cossacks, who subsisted – like their indigenous Lamut neighbours – on local fish and roots.[296] Anadyrsk fared no better, and the ostrog founded by Dezhnev on the Anadyr was abandoned and destroyed in 1764. Chukotka was not truly brought under direct Russian control until after years after the Bolshevik Revolution in 1917.[297]

Socio-Ecological Coevolution played a key role in shaping the distribution of the fur trade in Siberia, with consequences for the subsequent course of Russian rule across northern Asia. The fur resources that drew Russian units across the Urals to the Bering Strait are a product of the Arctic Basin's specific environmental history. The taiga's

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[292] Raymond Fisher, *The Russian Fur Trade, 1550-1700* (Berkley: University of California Press, 1943): 97-98, 106.
[293] Forsyth (1992): 62.
[294] *Ibid*: 76.
[295] Terrance Armstrong, *Russian Settlement in the North* (Cambridge: Cambridge University Press, 1965): 23-25. Anadyrsk should not be confused with the modern settlement of Anadyr at the mouth of the eponymous river. It is interesting to note that official records of Dezhnev's 1648 expedition remained buried in government offices until discovered by G.F. Muller, the father of Siberian history, in 1736. [Forsyth (1992): 55.]
[296] Yuri Slezkine, *Arctic Mirrors: Siberia and the small peoples of the North* (Ithaca: Cornell University Press, 1994): 62; Olson (1994): 224.
[297] Armstrong (1965): 54-55; Forsyth (1992): 262-265.

fur-bearing fauna, which have some of the densest and warmest coats in the animal kingdom, have evolved in direct response to the climatic systems of the boreal forest and treeline. These experience the most dramatic seasonality of any ecosystems on Earth, selecting individuals and species best able to survive in extreme cold through the basic mechanisms of Darwinian evolution.[298] At their most extreme, temperatures in the subarctic taiga vary from as low as -70°C in the winter to over 30°C in summer, an annual swing of 100°C.[299] Over evolutionary timescales, this extreme seasonality forced the winter coats of the region's fur-bearing fauna to become incredibly thick, making their pelts highly desirable among the wealthy classes of Europe and China – the two most important markets for Russian furs. This is especially true of the sable (*martes zibellina*), a subarctic variety of Asian marten whose luxuriant brown fleece became the standard against which all other Siberian furs came to be judged. At a fundamental level, the fur trade could not have begun without the specific environmental history that made these adaptations possible.[300] Though other commodities – say, gold or salt – may have eventually lured the Tsarist state across the Urals, only furs were geographically dispersed throughout the subarctic boreal taiga and treeline in such a way as to draw its agents from the Urals to the Pacific in a matter of decades. It is no coincidence that the ecotones dividing the boreal forest from its neighbouring biomes were largely coterminous with the borders of Russian control for two hundred years after Siberia's 'conquest'.[301] This biome-wide distribution meant that hunters and state fur collectors could use the same technological toolkits from the Ural Mountains to the Pacific Ocean. The ecological conditions of the taiga thereby constituted the socio-ecological borders of Russian rule in Siberia – feeding into the setup costs, learning effects, coordination effects, and adaptive expectations described with reference to path dependence in Chapter Two.[302]

A similar story can be told in subarctic and arctic North America, where the North American beaver (*castor canadensis)* was the fur trade's preferred prey species. Though widely distributed across most of present-day Canada and the United States,

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[298] Darwin (1988): 62-105.
[299] Molles (1999): 37, 40. Compare these measurements from Verkhoyansk on the Yana with the 35-45°C swings more common in the tundra to the North, where more maritime conditions mean that summer temperatures do not climb as high and winter temperatures do not fall as low. This is mainly due to the taiga's continental climate and much lower albedo, the rate at which light is diffusely reflected from the ground, which allows the forest to warm up relatively quickly in the long days of the Arctic summer.
[300] Robert S. Hoffmann, 'Terrestrial Vertebrates', Ives & Barry (1974): 485.
[301] Mote (1998): 41-44.
[302] Lincoln (1993): 57; Arthur in Arrow & Pines (1988): 10.

the best furs came from the most cold-affected systems, where coats were evolutionarily selected to become thicker and warmer.[303] Although beaver numbers were lower in the cooler boreal forest than in more productive southern woodlands, the biome's extreme climatic variability made it home to the most valuable pelts, encouraging the fur trade's expansion into this challenging ecosystem. At the same time, however, the boreal forest provided very few local energy resources on which to base even a modest trading post. Even the indigenous Cree considered the northern boreal lowlands around the Bay to be 'sterile', making them loath to overwinter there for fear of starvation.[304] By 1800, the European footprint in present-day Western and Northern Canada was constituted by fur trading posts strung along the southern borders of the boreal forest – located in such a way as to take advantage of easy access to the relatively productive parklands and prairies – and along with the river valleys that cross and connect them, representing sites and corridors of heightened ecological productivity in the midst of otherwise depressed boreal ecosystems.[305]

Environmental History & International Systems in Russian Siberia

The impact of the planet's biological, chemical, and physical systems on the dominant states of the circumpolar basin will be discussed in more detail in Chapter Five. For now, suffice it to say that the ability of European units to exercise power over the peoples and territories of the tundra and taiga has never been absolute, but has increased alongside the three axes of ecological productivity that run from North to South, from continental to maritime climates, and from tributary uplands to mature river valleys and coastlines. Over the course of the seventeenth and eighteenth centuries, this relationship had a perceptible impact on the organisation of the politico-economic processes that laid the groundwork for the subsequent development of imperial international systems around the region.

In Siberia, ecological productivity covaried alongside a transition from areas of indirect resource exploitation and rule by indigenous proxies to regions in which neo-European conditions permitted direct Russian colonization and exploitation. In the

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[303] E.E. Rich, *The Hudson's Bay Company 1670-1870: volume 1, 1670-1763* (London: Hudson's Bay Company Record Society, 1958): 231.
[304] Arthur Ray, *Indians in the Fur Trade: their roles as trappers, hunters, and middlemen in the lands southwest of Hudson Bay, 1660-1870*, (Toronto: University of Toronto Press, 1974): 36.
[305] Ann M. Carlos and Frank D. Lewis, 'Indians, the Beaver, and the Bay: The Economics of Depletion in the Lands of the Hudson's Bay Company, 1700-1763', *The Journal of Economic History* 53(3) 1993, pp. 465, 472-475; Ray (1974): 127 [map], 201 [map].

latter, the means by which resources were mobilised converged with the dominant economic principles of metropolitan Russia, leading to the establishment of an economic system based on sedentary peasant agriculture and an increasingly centralized and homogenized political apparatus to organize and tax the resulting production and trade.[306] Fur resources in these regions were quickly 'hunted out', and local indigenous people were displaced from particularly productive ecological niches. In terms of the principles by which their units and systems were organised, the Russian population of these neo-European ecological sites came to live in colonial extensions of Russia's metropolitan core – huddled around corridors and islands of relative productivity in which the agricultural toolkits of European Russia could be deployed with little modification.[307]

Outside of these neo-European ecosystems, Russian settlements could only grow up around important trade hubs. These subsidized their local ecological shortfalls by exchanging fur for food – 'trading away' from NPP constraints by accessing *ghost acreage* (large additional acreages in more productive ecosystems) in European Russia and its neo-European colonial extensions.[308] A town such as Mangazeia – located in the northern treeline on the Taz River (see figure 4.7) – could only be sustained as long as the trade on which its energy subsidies depended continued. When this trade declined due to a failure of supply, it sank into obscurity and disappeared.[309] Following Martin Wight's oft-quoted argument concerning the importance of common culture to the establishment of viable international societies (read *international systems* for the purposes of this analysis), it should come as no surprise that the 'thickness' of the principles of membership and behaviour that came to define the boundaries of

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[306] Lieven (2002): 222-224, 251-253. At the same time, European Russia itself 'appeared to be converging more and more with European political, social, and cultural norms', dragging settled regions of Siberia along with it. [*Ibid*: 248.]

[307] Crosby (1986): 36-39. Crosby denies Siberia the status of a neo-Europe due primarily to its failure to produce agricultural surpluses in the mode of the American Midwest and eastern Australia. While this is true of Siberia as a whole, it is not true of the productive wedge of agricultural settlement that stretches from the Ural Mountains to Lake Baikal. Crosby's comments reflect an unfortunate tendency to view Siberia as a single ecological unit rather than as a heterogeneous collection of ecosystems and biomes covering a wide variety of climatic and ecological zones. If subdivided into its ecologically productive and unproductive sites, a strong case for neo-European analysis of specific regions can – and will – be made.

[308] Georg Borgstrom, 'The Food and People Dilemma', in Paul Pearson & J. Richard Greenwell, *Nutrition, Food, and Man: an interdisciplinary perspective* (Tucson: University of Arizona Press, 1972): 72; Eric Jones, *The European Miracle: Environments, Economies and Geopolitics in the History of Europe and Asia*, (Cambridge: Cambridge University Press, 2003) third edition: 83-84.

[309] Lincoln (1993): 60-61; Semyonov (1963): 174; Fisher (1943): 97-99.

Russia's international imperial system in the Arctic was deeply influenced by the regional distribution of Russian colonization.[310]

Where sites' biogeographical structure constrained settlers' ability to either directly access and mobilize ecological resources or 'trade away' from local energy deficits, indigenous peoples were left *in situ* and integrated into Russia's expanding imperial international system as semi-autonomous actors whose positions within that system were 'centred on, but certainly not reducible to' the dictates of the metropolitan state.[311] This indirect integration was accomplished first through the imposition of *yasak*: a sectorally undifferentiated form of resource mobilisation that forced Siberia's indigenous units to swear allegiance to the Tsar and annually deliver a set number of furs to state agents, making them indirect – and involuntary – agents of Russian political and economic power. By the end of the seventeenth century, yasak constituted up to 80% of the state's fur revenue and tied together the vast hinterlands of northern, continental, and upland Siberia.[312] As a matter of course, yasak agents held members of bands or family groups as 'collateral' against non-payment, often using these hostages as leverage to extract additional furs for their own private sale.[313] As the yasak system became institutionalized, indigenous groups in marginal ecosystems were able to parlay their politico-economic positions into limited forms of autonomy within this emerging imperial international system, reinforcing their semi-independent status within it. They gained increasing de jure rights over local order and justice – foreshadowing the formal system of indirect rule in Siberia that will be discussed further in Chapter Five. This 'outsourcing' of political and economic power in northern, continental, and upland sites of low NPP remained largely unchanged until the second quarter of the twentieth century.[314] Perched at the unproductive ends of the ecological axes that describe productivity in the Arctic Basin, indigenous groups remained locked into a largely undifferentiated system of resource mobilisation until its abolition by the Bolshevik government after 1917. Only then, thanks to a combination of modern transportation and communications technology and the Soviet state's application of subsidized central planning, was the Russian state able to boost

[310] Wight (1977): 33.
[311] Hobson & Sharman (2005), p. 71.
[312] Fisher (1943): 117-118.
[313] *Ibid*: 49-52, 147-148.
[314] Lantzeff (1943): 99-102; James Olson, *An Ethnohistorical Dictionary of the Russian and Soviet Empires* (London: Greenwood Press, 1994): 504, 508.

its Ecological Capacity enough to 'effectively occupy' larger segments of the Arctic through direct colonization – a key aspect of the Soviet Union's and Russian Federation's de jure claims to territorial sovereignty.[315]

The imposition of yasak also began the transition of indigenous units from pre-international to international status. Indigenous groups' responsibilities vis-à-vis the imperial centre brought with it pressure to fulfil yasak obligations in increasingly depleted ecosystems. This decreased the time available for traditional subsistence hunting, undercutting their ability to insulate themselves against the periodic collapse of various prey populations through the seasonal harvest of different ecological niches. Yasak thereby increased indigenous dependence on Russian trade goods, realigning exchange processes through Russian hubs and undercutting the linear relay systems of reciprocity that linked indigenous populations together around the Arctic Basin.[316] Finally, the incorporation of indigenous actors into Russia's imperial international system increasingly defined them as discrete units with 'insides' and 'outsides'. Yasak collectors had to know how many hunters were in a band in order to assess their annual tribute, leading the state to formalize the previously fluid constitution of many segmentary units and spell the beginning of the end of their undifferentiated, pre-international status.

Environmental History & International Systems in Rupert's Land

The Environmental History of units and processes in Siberia has it corollary in arctic North America, where early modern socio-economic international systems were fundamentally shaped by the ecological contexts in which they evolved. The similarities that bind Siberia and arctic America are often masked by the different forms of resource mobilisation used to access their ecological capital. These different systems were – in part – products of the different European states that operated on the two continents. Russia represents (even defines) Charles Tilly's coercive model of state development. England, meanwhile, employed more capital-intensive means of resource mobilisation in its arctic territories, with moves towards a mixed capital-coercive form of mobilisation constrained by its units' low EC in non-European

[315] Shelagh Grant, *Polar Imperative: a history of arctic sovereignty in North America* (Vancouver: Douglas & MacIntyre) 2010: 30-31; Hill & Gaddy (2003): 66. The exercise of sovereignty, including the Soviet state's subsidization of Arctic settlement, will be discussed at length in Chapter Five.
[316] Forsyth (1992): 63-64.

biomes.[317] These divergent means of resource mobilisation mask an underlying similarity in the organisation of the imperial international systems they began to constitute. These became organized through increasingly indirect means as interactive processes moved into less productive regions, where European units' EC was constrained by low NPP and unfamiliar biogeographical conditions.

There is no denying that the capital-intensive methods used by England's commercial agents to mobilize resources in the Hudson Bay and Mackenzie River drainage basins was markedly different from the coercive processes of Russian Siberia. Whereas the latter relied first on the state's ability to coerce indigenous groups, the English state employed corporate proxies to draw indigenous peoples into the fur trade through commercial carrots rather than coercive sticks. The key unit in what became arctic and subarctic Canada was the Hudson's Bay Company (HBC), a joint-stock enterprise chartered by King Charles II on May 2nd, 1670.[318] In its royal charter, the HBC was granted permanent title to 3.9 million square kilometers of land that drained into Hudson Bay and Hudson Strait, a vast region named Rupert's Land in honour of the Company's first Governor, Prince Rupert of the Rhine.[319] (see figure 4.8) Within this territory – larger than all but seven countries in the world today – the Company was granted de jure rights to make diplomatic treaties with indigenous groups, establish order and justice, defend against encroachment by other European actors, and monopolize trade.[320] These rights exceeded even those of the East India Company insofar as the HBC was given rights of dominion and propriety over its chartered territory and the peoples thereof, making it both a de facto sovereign and an imperial proxy of the English state.[321]

Following the advice of two French fur traders – Pierre-Esprit Radisson and Médard des Groseilliers – the founding partners of the HBC opened their first post at Rupert River on James Bay in 1669. Their subsequent foundations along Hudson and James

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[317] Tilly (1992): 94, 137-143, 151-156.
[318] The HBC was founded 89 years after Yermak crossed the Urals, 22 years after Dezhnev rounded Siberia's eastern tip, and 307 years to the day before the author was born.
[319] Barry M. Gough, 'The Adventurers of England Trading into Hudson's Bay: a study of the founding members of the hudson's bay company, 1665-1670', *Albion: A Quarterly Journal Concerned with British Studies* 2(1) 1970, p. 38.
[320]Rich (1958): 53-56; Hudson's Bay Company Committee, *Hudson's Bay Company, Incorporated 2nd May 1670: a brief history* (London: Hudson's Bay Company, 1934): 1-8.
[321] Rich (1958): 266; See also John S. Galbraith, *The Hudson's Bay Company as an Imperial Factor: 1821-1869* (Berkley: University of California Press) 1957.

bays were located at the nexus of indigenous relay trade routes and Europe's North Atlantic shipping lanes. The former connected the tributary uplands of the Saskatchewan, Churchill, Albany and Rupert rivers to the lowlands around the Bay, and had long been responsible for the pre-international exchange of silica from Ungava in northern Quebec, copper from the Coppermine River in the Central Canadian Arctic, obsidian from the Pacific Northwest, and shells from the eastern and western seaboards.[322] The HBC's posts were sited in such a way as to tie oceanic shipping lanes into these continental linear relay systems, taking advantage of English maritime technologies to minimize the costs of bulk transportation back to markets in Europe.[323]

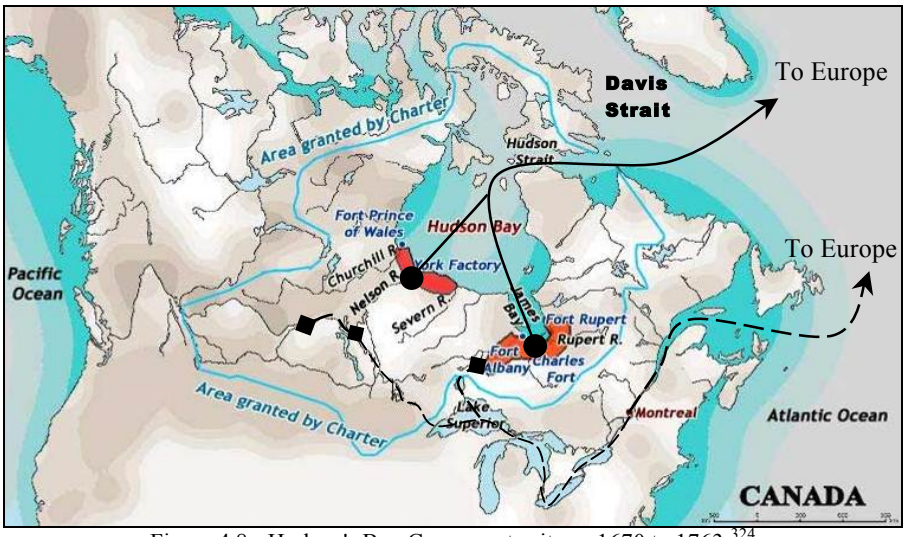

Figure 4.8 - Hudson's Bay Company territory, 1670 to 1763.[324]

This greatly increased the Company's EC at the Bayside, allowing it to mediate the depressed NPP of the lowland forests in which its posts were sited.[325] By 'trading away' from its ecological constraints, the HBC followed in the footsteps of Siberia's fur trading hubs – overcoming local NPP shortfalls by importing energy from more productive ecosystems. Unlike Siberia, however, access to this ghost acreage did not initially extend inland, where very different transport technologies were required to move goods and people. The most important of these were birch and cedar bark canoes, craft that could be paddled up- and downriver, carry a significant cargo, yet

[322] R. Cole Harris & Geoffrey J. Matthews, *Historical Atlas of Canada: from the beginning to 1800* (Toronto: University of Toronto Press, 1987): 34-35; Buzan & Little (2000): 97.
[323] William Glover, 'Hudson Bay', in John Kumerchik, *Seas and Waterways of the World: an encyclopedia of history, uses, and issues* (London: ABC-CLIO, 2009): 147-148; Rich (1958): 184.
[324] Natural Resources Canada. 'Hudson's Bay Company territory 1670 to 1763' [online] 2001, 'Canadiana: Exploration, the fur trade, and Hudson's Bay Company'. September 21, 2010. < http://www.canadiana.ca/hbc/_popups/PAMhbc1670-1763_e.htm>. Rupert's Land is outlined in blue and the extent of sustained HBC occupation shaded in red. Routes to Europe via Hudson Bay (solid) and Montreal (dashed) are added by the author. Areas of de facto Company control are marked in red.
[325] See section 1 of this chapter, 'A Short Introduction to Arctic Ecology'.

were light enough to be portaged for many kilometers around the region's rapids and across its heights of land. This socio-ecological dynamic was reinforced by the floral communities of ecosystems around Company posts. Situated in the immature muskeg of the Hudson Bay lowland boreal forest, these lacked adequate access to the birch and cedar trees required for canoe construction. This ecological shortage was particularly pronounced around York Factory and Fort Prince of Wales, the two most strategically situated points of entry into the continental hinterland. As one of the HBC's pioneers, Samuel Hearne, told Company Directors in 1774, "The greatest obstacle that is likely to prevent the Company from getting goods inland is the want of proper canoes, to procure which I am at a loss what measures to take."[326] A single, very specific ecological deficit – measured in terms of two floral species – thereby constrained the HBC's ability to trade upriver, limiting the sustainability of any posts it attempted to situate in the interior.[327]

While the technologies available to the HBC encouraged it to take advantage of the oceanic trade routes running to their posts on the Bay, traders out of Montreal followed their own path dependent histories into the interior via the Great Lakes watershed. Following in the wake of earlier *voyageurs*, Pierre Gaultier de Varennes and Sieur de la Vérendrye crossed the height of land separating the Lake Superior basin from that of Lake Winnipeg in 1731, establishing a direct if lengthy route to the Saskatchewan basin from Montreal. (see figure 4.8) Using their long acquaintance with canoes and indigenous languages – key physical and social technologies – French and Canadian traders established a string of small posts along inland waterways from the Forks of the Saskatchewan River to the headwaters of the Albany River, siphoning off the best furs from indigenous groups before they reached the HBC's posts farther downstream.[328] Montreal traders thereby came to control the hinterlands immediately behind establishments such as York Fort, forcing the latter's fur returns down from 52,000MB in 1731 to 32,000MB in 1732.[329] The HBC, still tied to the Bay by its limited EC and path dependent preference for oceanic transportation, could do little to intervene.[330]

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[326] J.B. Tyrell, ed. *Samuel Hearne and Philip Turnor, Journals* (Toronto: Champlain Society, 1934): 118.
[327] Rich (1959): 42.
[328] Ray (1974): 14-16, 51-53; See also The National Atlas of Canada, "Post of the Canadian Fur Trade", *Natural Resources Canada Map Archives*, 1974 [online] accessed 15 January 2010. <http://geogratis.cgdi.gc.ca/download//atlas/archives/english/4thedition/historical/079_80_pdf.zip>.
[329] MB refers to *made beaver*, the unit of barter established by the Company to facilitate record keeping. 1 MB was equivalent to one prime winter beaver skin, with a value that rose and fell depending on the time and place at which trade was conducted. [Ray (1974): 61-62.]
[330] Rich (1958): 529.

As a result, its fur receipts remained severely depressed until it penetrated the interior later in 1774/5 after Samuel Hearne finally purchased canoes from local indigenous Cree and received permission from the Company Directors to establish Cumberland House on the Saskatchewan River in order to bypass the Montrealers' stranglehold on the inland trade.[331]

As in Siberia, the biogeographical structure of Rupert's Land affected the organisation of its early international systems. Despite the HBC's chartered right to administrative sovereignty over Rupert's Land, the constraints imposed by its limited EC meant that its trade was organised around an indirect system of indigenous trappers and middlemen through whom it accessed the hinterland's ecological capital. Indeed, the rapid expansion of the fur trade was largely thanks to entrepreneurial spirit of indigenous middlemen, some of who would travel over two thousand kilometers in a six-month round trip to collect and deliver pelts from isolated upland trapping bands to HBC posts.[332] Thus, Rupert's Land saw its fur resources mobilised through indirect relay trade in all but the immediate environs of its posts.

The organisation of the fur trade in arctic and subarctic North America therefore reflected the axes of socio-ecological productivity first described in Chapter Three, with indigenous economic proxies becoming increasingly important in northern, continental, and upland ecosystems. Conditioned by the English preference for capital-intensive means of resource mobilisation, this led to a predominantly socio-economic (capitalistic), as opposed to politico-military (coercive), system based on indigenous commodification.[333] Commodification is an ideational process whereby exchange and use values are assigned to natural objects, an ontological development closely linked to Europe's dualist conception of the relationship between man and nature. It abstracts an article from its ecological context, justifying its exploitation by human actors without regard for the impact of that exploitation on natural systems.[334]

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[331] Hudson's Bay Company Committee (1934): 14-15; Rich (1959) 60-65.
[332] Arthur Ray, 'Some Thoughts About the Reasons For Spatial Dynamism in the Early Fur Trade, 1580-1800', in Henry Epp et al., *Three Hundred Prairie Years: Henry Kelsey's "Inland Country of Good Report"* (Saskatoon: Canadian Plains Research Centre, 1993): 114-116.
[333] Tilly (1992): 16-20.
[334] Stephen A. Mrozowski, 'Colonization and the Commodification of Nature', *The International Journal of Historical Archaeology* 3(3) 1999, pp. 155-157; Thomas Hall, 'Incorporation in the World-System: towards a critique', *American Sociological Review* 51(3) 1986, pp. 390-402, *passim*; Jon D. Carlson, 'The 'Otter-Man' Empires: The Pacific Fur Trade, Incorporation and the Zone of Ignorance', *Journal of World-Systems Research* (8:3) 2002, pp. 430-436.

Commodification is therefore both an international process in its own right *and* a social technology affecting units' EC.[335] Though infused with economic consequences, commodification is not a clearly defined sectoral process.

The commodification of indigenous units in Rupert's Land began closest to the Bayside posts, leading to the development of concentric rings of functionally differentiated indigenous units with varying degrees of access to the ecological surpluses of non- and neo-European ecosystems. Trade goods – particularly store food – provided indigenous units with access to Europe's ghost acreage, allowing them to subsidize local ecological deficits with energy from more productive ecosystems. Typically, indigenous units of the fur trade are placed in a typology of expanding rings around each post. Closest were the Home Guards, living at or near posts and provisioning them from local hunting and gathering in return for primary access to trade goods and emergency foodstuffs. Middlemen ran farther afield, carrying the trade into the non-European hinterland in return for the right to extract profits from the peoples of the interior. Most distant of all were Trappers, who caught and processed furs at their source and could only access European trade goods via Middlemen.[336] The result was a radially-organised linear relay system, resembling the hexagonal lattice model with which Buzan and Little describe the simplest pre-international networks of exchange; the main difference being the specialised functions played by each indigenous unit in the emerging international economic system of seventeenth and eighteenth century subarctic and arctic North America.[337] This distinction is significant insofar as it shows how pre-international systems were beginning to replace their purely segmentary organisations with higher-energy alternatives. While their incorporation into the trade helped Middlemen and Home Guards to improve their access to European ghost acreage, the increasing complexity of their social arrangements made indigenous units more vulnerable to disruptions in the case of resource shortfalls. In essence, commodification had the same effect on indigenous unit's Ecological Capacity as the coercive yasak system in Siberia, undermining the pre-international systems that had heretofore protected bands against short- and long-term productivity deficits while increasing their access – and their dependence – on energy resources imported from European and neo-European biomes.

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[335] Mrozowski (1999), p. 199.
[336] Yerbury (1986): 11-15.
[337] Buzan & Little (2000): 120-122.

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The Environmental History of the Arctic Basin had a clear impact on the organisation of the main process by which European international systems spread around the region between 1581 and the nineteenth century – trade. In both Siberia and Rupert's Land, the region's specific environmental history was a necessary cause in the evolution of the fur-bearing animals most sought after by European markets. The distribution of Ecological Capacity – influenced by the interaction capacities of Russian, English, French, and indigenous units – produced patterns of increasingly indirect resource mobilisation along the three axes of socio-ecological productivity. Where European units were able to settle, they either used their preferred means of resource mobilisation – coercive in the Russian case, capitalistic in the British and French – to extract furs directly from local producers or simply hunted for them themselves. Where EC constrained their ability to sustain complex units and systems in northern, continental, and upland sites, they outsourced the trade to indigenous proxies. These became organised into linear relay trading systems that radiated out from neo-European ecological sites, bounding indigenous groups as discreet units and undermining the pre-international relationships of reciprocity that had heretofore mediated their exposure to local resource shortfalls. In the process, indigenous units came to rely on European ghost acreage to supply their ecological deficits, laying the groundwork for the core-periphery relationships that would dominate Arctic state-building in the nineteenth and twentieth centuries.

Closing the Coevolutionary Loop: the early modern Arctic

Socio-Ecological Coevolution describes a mutually constitutive relationship between human units and systems and the ecological contexts in which they are embedded. The previous sections have focused on the impact of Ecology on the spread and organisation of pre-international and international units and systems in the Arctic Basin. Understanding Coevolution's impact on Arctic history requires that we close the mutually constitutive loop that binds the two sides of the socio-ecological equation by looking at how the region's human units and systems have affected the development of their ecological contexts. As indicated by the fourth principle of

Coevolution, the ecological consequences of human adaptation are felt first among an ecosystem's biological constituents, only later moving down Ecology's levels of analysis to affect the chemical and physical systems that support them. Our analysis therefore begins by looking at (i) the depletion of the faunal populations on which the fur trade depended, and (ii) the spread of pathogen populations among the systems' constituent actors.

Socio-Ecological Coevolution & Faunal Depletion

The spatial organisation of faunal depletion in Siberia and Rupert's Land during the early fur trade reflects the organisation of the international systems on which that trade relied. Where EC permitted European units' direct involvement in the trade, competition led to precipitous – and, in the case of neo-European pockets of agricultural settlement, permanent – faunal depletion. Much of this can be laid at the feet of Europeans' commodified approach to resource management, which saw trappers compete furiously for whatever they could catch – be it from their own traps or via the indigenous proxies on whom the trade relied in less productive ecosystems. In an unregulated environment, competition among European actors led to an archetypal 'tragedy of the commons', in which the absence of a management regime permitted actors to deplete a common property resource in order to maximize their own personal returns.[338] Competition for fur-bearing animals in the marginally productive biomes of the taiga and tundra proved to be a disaster for local faunal populations, with the long-term effect of encouraging the formation of monopolies – economic units which proved more effective than competitive markets at maintaining sustainable yields.[339] In ecosystems where NPP and European units' low EC discouraged their direct participation in the harvest of fur resources, depletion tended to be more gradual. In these cases, indigenous units' possession of fairly well defined hunting territories from which they were encouraged to exclude other hunters meant that fauna located at these sites constituted an early form of excludable resource, in which common property was jointly managed and regulated by the community by whom it was held.[340] This early form of international management regime – defined as 'an institution or, more precisely, a set of norms, principles, rules and decision-making

[338] Vogler (2000): 2, 10-12. See also Garrett Hardin, 'The Tragedy of the Commons', *Science* 162(3859) 1968, pp. 1243-1248.
[339] Carlos & Lewis (1993), pp. 483-4, 490-491; Ann M. Carlos and Frank D. Lewis, 'Property Rights, Competition, and Depletion in the Eighteenth Century Canadian Fur Trade: the role of European markets', *The Canadian Journal of Economics* 32(3) 1999, pp. 707-709, 725.
[340] Vogler (2000): 4-5.

procedures that govern a particular issue area, such as trade, money or more relevantly the use of the global commons' – protected the long-term viability of the resources on which their ecologically adapted social and physical technologies relied by discouraging wasteful competition.[341]

Faunal depletion was most dramatic in Siberia, which experienced far more direct European settlement than did Rupert's Land. In Siberia's corridors and islands of ecological productivity, depletion of sable and black fox – the two most valuable furs – followed close on the heels of Europeans' arrival. Depletion's spatial distribution traced Siberia's riverine paths of conquest, impacting forested lands along main river channels long before the tributary uplands that drained into them. Once sable and black fox populations in these narrow corridors declined below easily-harvested levels – normally within the first ten years of their opening – Russians would shift their trapping activity to other parts of the main river or onto its largest tributaries. *Promyshlenniks* (trappers) rarely lingered to harvest the smaller streams that ran into these basins from their tributary uplands, preferring the easy returns and higher interaction and ecological capacities afforded by the largest valleys. On each of Siberia's rivers, this coevolutionary process of faunal depletion was repeated – with relatively productive main valleys being wrung dry quickly, followed by a leap to the next river.[342] Depletion therefore followed the same axes of ecological productivity that influenced the organisation of the units and processes associated with the trade itself – beginning first in southern, maritime, and riverine or coastal ecosystems before moving on to northern, continental, and upland sites.

This socio-ecological pattern of depletion was exacerbated by agricultural settlement. This resulted not so much from intense trapping – though this played a role – as it did from ecological processes associated with agricultural development. By converting forest to field, settlers destroyed the habitats on which fur-bearing populations depended, undermining their ability to recover in many of Siberia's most ecologically productive sites. Thus, agriculture undercut the initial source of ecological wealth that had drawn Russia across the continent, leaving hunting and pastoral peoples unable to

[341] *Ibid*: 17.
[342] Fisher (1943): 105-107; Lincoln (1993): 55.

access the capital – furs – required to pay their annual tribute and maintain themselves in Siberia's most productive niches.[343]

The North American trade, though different in its primary means of resource mobilisation, experienced a convergent pattern of faunal depletion in ecosystems in which HBC and Montreal-based traders were in direct competition.[344] In these areas – whose location tends to mirror the three axes of socio-ecological productivity described earlier – the Company encouraged indigenous trappers to 'hunt out' local forests by raising the prices paid per pelt.[345] For Middlemen and Trappers, this led to increasing harvests and rising consumption of trade goods, particularly store food. This would not have been possible without the commodification of these indigenous units, a process whose distribution radiated out from the posts of the HBC and its competitors along the axes that described Rupert's Land's corridors and islands of ecological productivity. For many decades, this commodified dynamic went unappreciated by historians of the trade, who assumed that indigenous hunters would react to higher prices by decreasing their harvests to the minimum level required to purchase necessities, thereby increasing the amount of time they could spend in leisure or subsistence activities. However, as Carlos and Lewis show in regard to the productive hinterlands of forts Albany and York, where competition with Montreal traders was rife, and the severely constrained ecosystems around Prince of Wales fort, where the HBC held a near-monopoly, the spatial distribution of commodification – itself a product of socio-ecological coevolution – had significant feedback effects on the behaviour of the trade's indigenous commercial proxies, leading to the most severe depletion events in the most ecologically productive regions of Rupert's Land.[346] As in Siberia, the ecological 'pull' factors that affected Europeans' initial trading forays into Rupert's Land led to a spatial distribution of depletion events that mirrored the socio-ecological axes discussed in previous sections, affecting subarctic and arctic America's corridors and islands of ecological productivity before its energy-constrained northern and continental uplands.

[343] Slezkine (1994): 24; Forsyth (1992): 43.
[344] Carlos & Lewis (1999), p. 707.
[345] Galbraith (1957): 78-79.
[346] Ann M. Carlos and Frank D. Lewis, 'Trade, Consumption, and the Native Economy: Lessons from York Factory, Hudson Bay', *The Journal of Economic History* (61:4) 2001, pp. 1038-1039, 1061; Conrad E. Heidenreich & Arthur J. Ray, *The Early fur Trade: A Study in Cultural Interaction* (Toronto: McClelland and Stewart, 1976): 48; Carlos & Lewis (1999), p. 708 [chart].

Socio-Ecological Coevolution & the Impact of Pathogen Populations

The effects of coevolutionary developments on the Arctic's early modern international systems can also be observed with reference to the effect of European pathogens on the peoples of the region. Following the discovery and exploration of the Americas in the late fifteenth and sixteenth centuries, a biotic wave of flora and fauna flowed out of Europe, displacing indigenous American species.[347] This *portmanteau biota* included several pathogens such as smallpox, measles, and tuberculosis – products of the Neolithic Revolution during which most of Eurasia's cereals crops and animals had been domesticated. Domesticated plants and animals played a vital role as physical technologies in the history of early agriculture and pastoralism, boosting the EC of pre-international units in the Nile, Mesopotamian, Indus, and Yangtze river valleys.[348] Beyond being a necessary cause in the development of urban populations and early international units, the Neolithic Revolution exposed the peoples of southern Eurasia to new sets of pathogens, most of which were mutated strains of diseases that originated in domesticated livestock. Though virulent in the settled societies in which they evolved, millennia of contact led to human-pathogen coevolution (in the ecological sense of the term), providing a level of immunity in settled Eurasian populations that eventually moderated the severity of epidemics.[349]

Lacking this immunity, the indigenous peoples of the circumpolar world were left exposed to the full virulence of outbreaks. The death rates in the *virgin land epidemics* that followed were catastrophically high. The semi-sedentary Yukagir of the Yana, Indigirka, and Kolyma basins in northwestern Siberia are a case in point. Without the Neolithic toolkits that gave Russians some level of resistance, the Yukagir went into headlong decline between 1700 and 1850.[350] Already in 1694, the zimove on the Omolon River – a tributary of the Kolyma – was shut because the yasak-paying Yukagir of the area 'all died in the smallpox pestilence. And from now on there are no great sovereign's [Tsar's] Omolon Yukagir from whom to take yasak.'[351] In the two years following an outbreak of smallpox in 1633, up to two-thirds of the Enets

[347] Crosby (2003): 18-20
[348] For more on biota as technology, see Edmund Russell, 'Can Organisms Be Technology?', in Martin Reuss & Stephen Cutliffe, *The Illusory Boundary: environment and technology in history* (London: University of Virginia Press, 2010): 249-259.
[349] Crosby (1986): 19-31.
[350] Olson (1994): 742.
[351] Slezkine (1994): 27.

Samoyeds living on the Khantaika River, a tributary of the lower Yenisei near present-day Norilsk, are thought to have perished.[352] These fatality rates are in line with estimates of mortality in the Americas following European contact, where smallpox acted as an imperial vanguard, wiping out population centres and fatally weakening indigenous units' ability to organize effective defences.[353] The disruption of indigenous units and systems was a social consequence of the introduction of new species into Arctic biomes and played a leading role in the conquest of areas such as Kamchatka. There, attempts by Itlemen to organize and resist Russian advances were undermined by their exposure to an array of diseases imported by their invaders, which accounted for most of the forty-five percent decrease in their numbers between 1697 and 1738, reducing their ability to resist yasak and incorporation into Russia's imperial international system.[354]

The North American boreal forest and tundra escaped the brunt of the early virgin land epidemics that spread smallpox from Hispaniola to the Great Lakes in the sixteenth century. However, as arctic and subarctic units were incorporated into the linear relay systems that spread out ahead of Europe's expanding socio-economic international systems, they could not escape infection. The first major smallpox epidemic to flare across northern Cree and Na Dene bands ignited in 1781, wiping out up to 95% of the Home Guard population around the inland HBC post at Cumberland House on the middle Saskatchewan.[355] The full extent of this and subsequent epidemics may never be known, records being so scant as to be almost non-existent. In one of the few first-hand accounts of the epidemic, Samuel Hearne records up to 90% mortality among several groups of "Northern Indians", which included the Na Dene nation and some northern Cree.[356] Though likely inflated by 10-20%, these figures are roughly in line with estimates from similar virgin land epidemics, and were probably boosted by a number of interrelated social and ecological factors. These include malnutrition caused by the disruption of traditional subsistence patterns and the organisation of the trade itself, which saw sedentary populations of Home Guard hunters settle around

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[352] *Ibid*: 26.
[353] Alfred Crosby, "Ecological Imperialism: The Overseas Migration of Western Europeans as a Biological Phenomenon" in Donald Worster, *The Ends of the Earth: perspectives on modern ecological history* (Cambridge: Cambridge University Press, 1988): 106.
[354] Forsyth (1992): 139.
[355] C. Stuart Houston, 'The First Smallpox Epidemic on the Canadian Plains: in the fur-traders' words', *The Canadian Journal of Infectious Diseases* 11(2) 2000, p. 113.
[356] Samuel Hearne, A Journey From Prince of Wales Fort in Hudson's Bay to the Northern Ocean in the Years 1769, 1770, 1771, and 1772, Ed. J.B. Tyrell (Toronto: Champlain Society, 1911): 200.

trading posts, creating large pools of potential infection. These were visited by Middlemen, who transported pathogens between infection hotspots and the homes of upland Trappers who might otherwise have been insulated by their isolation.[357] The disruptions caused to indigenous units' subsistence activities were intensified by the introduction of parallel diseases into various animal populations, including the beaver.[358] The combined effect of these human and animal epidemics left commodified groups of Trappers, Middlemen, and Home Guards increasingly reliant on the resources of the trading post – deepening indigenous dependence on Europe's ghost acreage while simultaneously undercutting their ability to access the capital required to pay for it.[359]

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The immediate ecological consequences of Coevolution in the arctic and subarctic biomes of Siberia and Rupert's Land followed the same corridors of ecological productivity as the fur trade and its associated politico-economic and socio-economic processes. In both regions, productive sites witnessed the earliest faunal depletions, leaving indigenous groups – who had previously enjoyed relative affluence[360] – with neither the ecological capital needed to access European trade goods nor the traditional systems of reciprocity and risk-sharing that had heretofore mediated their exposure to local resource deficits. This socio-ecological crisis was compounded by the arrival of European pathogen populations – diseases to which subarctic peoples' environmental history had given them no immunity. The result was a series of virgin land epidemics that often killed between fifty and seventy-five percent of the indigenous people infected, clearing ground for Europeans to impose their own coercive (Russia) or capitalist (English) modes of resource production on the units that remained. The combined effects of these ecological events deepened indigenous units' dependence on European trade goods, including store food, even as they undermined the ecological

[357] Shepard Krech III, 'The Trade of the Slavey and Dogrib at Fort Simpson in the Early Nineteenth Century' in Krech (1984): 134-136; David S. Jones, 'Virgin Soils Revisited', *The William and Mary Quarterly Third Series* 60(4) 2003, p. 704. The absence of sedentary settlements in the boreal forest prior to the fur trade is one of the main reasons for the region's early escape from pandemics in the sixteenth century, when the sparseness of human occupation made it difficult for the disease to transmit from population to population.
[358] Ray (1974): 119-120.
[359] Krech in Krech (1984): 137-142.
[360] Affluence, following Sahlins, refers to the relatively small amount of time that HGBs well-adapted to life in relatively productive ecological niches devote to basic subsistence. See Marshall Sahlins, *Stone Age Economics* (Chicago: Aldine Press, 1972): *passim*.

resource base on which those units depended for access to the ecological surpluses of European and neo-European ecosystems.

Conclusion

The impact of Coevolution on the units and systems of the circumpolar world before and during the fur trade era illustrate several socio-ecological dynamics that remain central to the story of international relations in the circumpolar world. First, there appears to be a direct if complex correlation between ecosystems' productivity and the distribution of social differentiation among both units and the systems constituted by their interactions. Both tend to become more differentiated as one moves into increasingly productive ecosystems, which follow at least three axes running from northern, continental, and upland ecosystems to southern, maritime, and riverine or coastal sites. Second, ecological context has a clear impact on unit- and system-level patterns of convergent and divergent evolution. Simply put, initially similar units and systems placed in different ecological contexts will tend to diverge, while initially dissimilar units and systems in similar ecological contexts will tend to converge. Third, following in the footsteps of Alfred Crosby, the organisation of units and processes that resulted from overlay of European international systems during the fur trade indicates that European systems were successfully recreated in neo-European biomes, where their existing physical and social technologies were already adapted to meet ecological challenges and opportunities. Their EC deficits in non-European biomes could be mitigated by trade, which provided them with access to ghost acreage from which to make up their energy shortfalls. However, as we will discuss in the next Chapter, this strategy carried with it the risk of collapse should the trade on which they relied fail through resource depletion or a dramatic environmental change. Finally, social adaptations affected the evolution of the ecosystems in which indigenous and European units and systems were embedded, creating a complex dynamic of socio-ecological feedback that disrupted indigenous units' existing adaptation strategies, making them increasingly dependent on European trade and closing the mutually constitutive loop that defines Socio-Ecological Coevolution in the historical record.

Chapter Five

Ecological Capacity and the Evolution of Bifurcated States in the Arctic to 1945

The State is a tree with its roots in the land.[361]

The unit-level impact of Socio-Ecological Coevolution on Arctic states has led to their convergent evolution around a set of characteristics that differentiate them from the dominant sovereign and territorial polities of the global international system. This Chapter explores ways in which Ecological Capacity (EC), one of the three sources of explanation introduced into our ecologically-contextualized analytical matrix, has contributed to this development. Arctic states have all been impacted by this coevolutionary mechanism, which describes units' and systems' abilities to sustain social complexity in given ecological contexts. EC is closely tied to three axes of increasing Net Primary Productivity (NPP), which run from North to South, from continental to maritime climates, and from tributary uplands to major river valleys and coastlines. Its influence has resulted in the construction of a series of imperial international systems around the Arctic Basin centred on their respective metropolitan capitals, characterized by principles of membership and behaviour that distinguish the Arctic as a region within the global international system. Though NPP plays a central role in the evolution of social complexity, its influence has been mediated to varying degrees by the social and physical technologies that Arctic units and systems deploy to access and subsidize their local energy allowances. This has been particularly important for the empires of the circumpolar world, whose principles of sovereignty and territoriality vary across the neo- and non-European biomes that they straddle.

None of the states of interest to this study – Russia, the United States, Canada, and Kalaallit Nunaat-Denmark – are *exclusively* arctic (or even subarctic) in their ecological constitution. Each straddles multiple biomes, ranging from the temperate forest-steppe ecotone to the polar desert. This divided ecological structure has affected the principles by which they are organized, contributing to their convergent evolution as bifurcated imperial units whose internal organisations vary across the productivity gaps that divide their neo-European and non-European ecological contexts. Where

[361] Richard Cantillion, 'Essai sur la Nature du Commerce en Générale' in Hughes (2006): 28.

they have been able to deploy sufficient EC – namely, in neo-European ecosystems – these organizing principles have converged with those developing in the global (née European) international system. This is particularly true in terms of characteristics associated with hard territoriality and sovereignty.[362] In non-European ecosystems, the region's imperial states have adopted one of two approaches to deal with their ecological constraints. Where ready supplies of saleable resources permit, they have mediated low NPP through trade, using this social technology to import energy surpluses – in the form of food, fuel, and other goods – from ghost acreage in more productive ecosystems. At such sites, trade-dependent colonies have risen out of the tundra and taiga – converging with the principles by which states are organized in their metropolitan cores. Where the resources required for trade are lacking, the principles by which the Arctic's imperial states organise themselves have diverged from the global norm, leading them to adopt alternative principles of organisation in order to mediate their depressed EC and maintain their de jure rights to Arctic lands and people. Until the early to mid-twentieth century, this was accomplished mainly by incorporating indigenous units into state-centred imperial systems in which metropolitan powers sacrificed a degree of domestic sovereignty over semi-autonomous peripheral units in order to maintain their Vattelian-Westphalian and international legal claims.[363]

Over more than four centuries of Coevolution, the socio-ecological bifurcation that separates the Arctic Basin's neo-European and non-European biomes has become a sedimented characteristic of its regional international system, with divergent principles of membership and behaviour that trace its main ecological divisions. Though the arrival of modern social and physical technologies in the region in the early to mid-twentieth century has mediated Ecology's influence on the principles that define these state-centred systems, the Arctic's dominant units – and the secondary states system constituted by their interactions – continue to display a remarkable core-periphery dynamic in relations between their neo-European cores, their trade-dependent colonial extensions, and their non-European imperial hinterlands.

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[362] Buzan & Little (2000): 332-333.
[363] This 'unbundling' of sovereignty will be discussed at length later in this Chapter.

Characteristics of Bifurcated Arctic States: Sovereignty & Borders

States – which can be thought of as socially constituted sets of 'administrative, policing, and military organisations headed, and more or less well-coordinated, by an executive authority' – mobilize human and financial capital to administer and defend their domestic jurisdictions.[364] Two key characteristics define the state as an ideal sovereign unit in the global international system: domestic hegemony and international autonomy. These describe (i) a state's ability to exercise effective sovereignty over its populations, and (ii) its ability to exclude other actors from intervening in its domestic affairs and foreign policy decisions. They also help to define the 'inside-outside' distinction discussed in Chapter One. Sovereign states did not emerge, fully-grown and indivisible, at a specific moment in international history. The Peace of Westphalia, though an important step along the route to creating autonomous and mutually recognized sovereign units, was not a moment of genesis.[365] Rather, they have evolved out of many different international units, converging around a shared set of principles that define their membership and behaviour in the international system – first in Europe and later in neo-European colonies and non-European imperial possessions. Over several centuries, these units have converged around principles of centralised sovereign control, mobilising a mixture of coercive and capital resources to strengthen their rule at home and their autonomy abroad.[366] This evolution has depended on the development of complex social organizations – large populations, socio-economic hierarchies, and functionally differentiated executives, bureaucracies, judiciaries, and military arms – and has never been completely successful insofar as all states' sovereignty remains constrained and incomplete.[367] The purpose of this section is to investigate some of the ways in which Coevolution – explained in terms of EC – has contributed to this development.

As Alfred Crosby notes in *Ecological Imperialism*, the most attractive ecological contexts during the age of European imperial expansion were those suited to Europe's existing technological adaptations, particularly those related to agricultural production.

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[364] Skocpol (1979): 29; Tilly in Evans et al. (1985): 181-184.
[365] Stephen Krasner, *Sovereignty: organised hypocrisy* (Princeton: Princeton University Press, 1999): 79-82.
[366] Tilly (1992): 1-37; Barry Buzan, 'The Present as a Historic Turning Point', *Journal of Peace Research* 30(4) 1995, pp. 390-392.
[367] Tainter (1988): 23; Halliday (1994): 84.

Neo-European biomes allowed units and systems to follow their path dependent instincts and avoid costly innovations, building sustainable population and resource bases to meet their capital and coercive needs.[368] The next best thing to neo-European biomes were sites featuring a saleable commodity with which a state could 'trade away' from local energy deficits, allowing for the establishment of trade-dependent colonies amidst otherwise inhospitable landscapes. As noted in the last Chapter, these islands of colonial settlement spelled trouble for local indigenous peoples, who were often displaced from their vicinity or found their livelihoods disrupted – and in some cases destroyed – by their new neighbours. Where saleable resources were unavailable, states looked to alternative principles of organisation to maintain their sovereign claims to non-European ecosystems. The most common of these was indirect rule, which devolves domestic authority onto local proxies in return for ensuring the state's access to their ecological surpluses and their recognition of the metropole's superior position within the imperial hierarchy. By recognizing these peripheral units as collective actors in direct relationship with the metropole, indirect rule constituted early modern Arctic states as imperial international systems, unmasking the historical contingency of statehood as ideally defined in IR. Though mediated by increasingly sophisticated social and physical technologies, the tripartite division of imperially-integrated neo-European cores, trade-dependent resource colonies, and non-European hinterlands still describes the Arctic's dominant units over four hundred years after Russia's initial foray across the Urals and three hundred years after the HBC's first establishment on James Bay.

Indirect Rule & Sovereignty in Siberia

The evolution of the Russian state in northern Asia has been deeply influenced by its ability to access ecological energy across Siberia's disparate biomes. This socio-ecological dynamic has historical roots as deep as Russia's leap across the continent in search of ecological capital: 'pulled' by Siberia's apparently endless and uncontested supply of furs and 'pushed' by booming demand for sable and marten and fox in the markets of Europe and China.[369] Thanks to their climates and soil profiles, neither tundra nor taiga is well-suited to European agriculture – the main technology with which European units and systems have historically accessed the energy potential of

[368] Crosby (1986): 5-7.
[369] Fisher (1943): 105-107; Armstrong (1965): 14; Mote (1998): 40; Slezkine (1993): 11-13; Lieven (2002): 206.

their surroundings.[370] In such regions, trade has provided a means by which to convert ecological products, most notably fur, into other forms of matter and energy. This gave Russian units access to vital ghost acreage: the ecological surplus of more productive biomes with which they subsidized localized EC shortfalls.[371] Trade has subsequently become a sedimented aspect of circumpolar governance, a key process via which the Russian state has mediated its limited EC to support complex units and politico-military processes in sites that otherwise lack sufficient NPP. Where trade was limited by local resources, the Russian state devolved domestic authority onto local proxies, constructing an imperial international system with itself at the hub of a set of core-periphery relationships that extended like spokes into the non-European biomes of northern, continental, and upland Siberia.[372]

The effects of Ecological Capacity on the international units and systems of Russian Siberia – and the Arctic Basin in general – are best understood by unpacking the concept of sovereignty. Sovereignty is a key principle in the contemporary international system, most simply defined as a state's possession of domestic hegemony and international autonomy. Most often associated with developments around the time of the Peace of Augsburg and the Peace of Westphalia in 1555 and 1648, its possession defines the contours of the modern state for the purposes of analysis and shapes the ways in which it interacts with other international units.[373] Sovereignty is therefore both a principle of behaviour and a principle of membership within the socially-constituted international system.[374] According to Stephen Krasner, sovereignty can be disaggregated into at least four different components: domestic sovereignty, international legal sovereignty, Vattelian-Westphalian sovereignty, and interdependence sovereignty. *Domestic* sovereignty refers to the state's ability to control and deploy political authority within its borders. *International legal* sovereignty refers to states' mutual recognition of one another as legal actors in the international system. *Vattelian-Westphalian* sovereignty refers to a state's right to exclude external actors from its territory. Finally, *interdependence* sovereignty refers

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[370] David Moon, 'Peasant Migration and the Settlement of Russia's Frontiers', *The Historical Journal* 40(4) 1997, pp. 874-876; James Larsen, 'Ecology of the Northern Continental Forest Border', in Ives & Barry (1974): 349-352; Samuel Rieger, 'Arctic Soils', in Ives & Barry (1974): 749-751, 757-759.
[371] Borgstrom (1980): 72; Jones (2003): 83-84.
[372] Yale Ferguson, 'Approaches to Defining "Empire" and Characterizing United States Influence in the Contemporary World', *International Studies Perspectives* 9(3) 2008, p. 275. These imperial systems closely resemble the suzerain state systems decribed earlier by Wight. [Wight (1977): 23-24; Watson (1990), pp. 102-103.]
[373] Halliday (1992): 78.
[374] Buzan (2004): 8.

to a state's ability to practically control its borders and to regulate interactions with other jurisdictions.[375] As Krasner notes, states generally possess all of these types in some degree. However, they are not all-or-nothing propositions. Sovereignty is something that states gain and lose over time, depending on when and where one looks.[376] This typology provides a useful starting point from which to analyse the different forms of indirect rule that typify the imperial structures of the Arctic's bifurcated international systems.

Where EC has permitted, states have tended to converge around principles of membership and behaviour that have been successful in the core of the global (née European) international system. Russia's southward expansion across Siberia's forest-steppe ecotone in the late eighteenth and nineteenth centuries opened up new neo-European lands to peasant settlement; a vital step in Russia's consolidation of its contiguous land empire.[377] These settlements were organized around principles similar to those that defined state activity in metropolitan Russia, using their agricultural production to boost EC and establish some degree of control over all four categories of sovereignty. Away from the neo-European corridor along the forest-steppe ecotone, the state was forced to adopt alternative strategies to maintain its exclusive rights to its arctic and subarctic hinterlands. Where it could not 'trade away' from NPP deficits, it devolved administrative responsibility onto designated local proxies. In a classic 'sovereignty bargain', control over order and justice in these non-European biomes fell to indigenous proxies who wielded domestic sovereignty on the state's behalf in return for the payment of yasak and taxes to the metropolitan capital and recognition of its Vattelian-Westphalian sovereignty and *banal authority*: its final right to override their domestic authority when they were deemed to be in breach of their obligations.[378] The resulting division between directly and indirectly ruled territories established the bifurcated framework by which Siberia would be incorporated into a Russia-dominated imperial international system until well after the Bolshevik Revolution.

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[375] Krasner (1999):12-13, 20.
[376] Stephen Krasner, "Problematic Sovereignty," in S. Krasner, *Problematic Sovereignty* (New York: Columbia University Press, 2001): 2.
[377] James Gibson, 'Russian Imperial Expansion in Context and by Contrast', *Journal of Historical Geography* 28(2) 2002, p. 183.
[378] Karen Litfin, 'Sovereignty in World Ecopolitics', *Mershon International Studies Review* 41(2) 1997, pp. 169-170; Benno Teschke, 'Geopolitical Relations in the European Middle Ages: History and Theory', *International Organization*, 52(2) 1998, pp. 349-351.

The ecological gap between Siberia's neo-European extensions – where practices and principles converged with those of Russia's metropolitan core – and its non-European imperial hinterlands roughly followed the band of agricultural productivity that continues to run from the around 60°N at the Ural Mountains to 50°N near Lake Baikal, with riverine extensions stretching down the subcontinent's major river valleys. This socio-ecological structure remains a visible feature of Siberia today, marking the limits of settlement by ethnic Russians and an ecotone north of which the state's EC declines sharply. (See Figure 5.1)

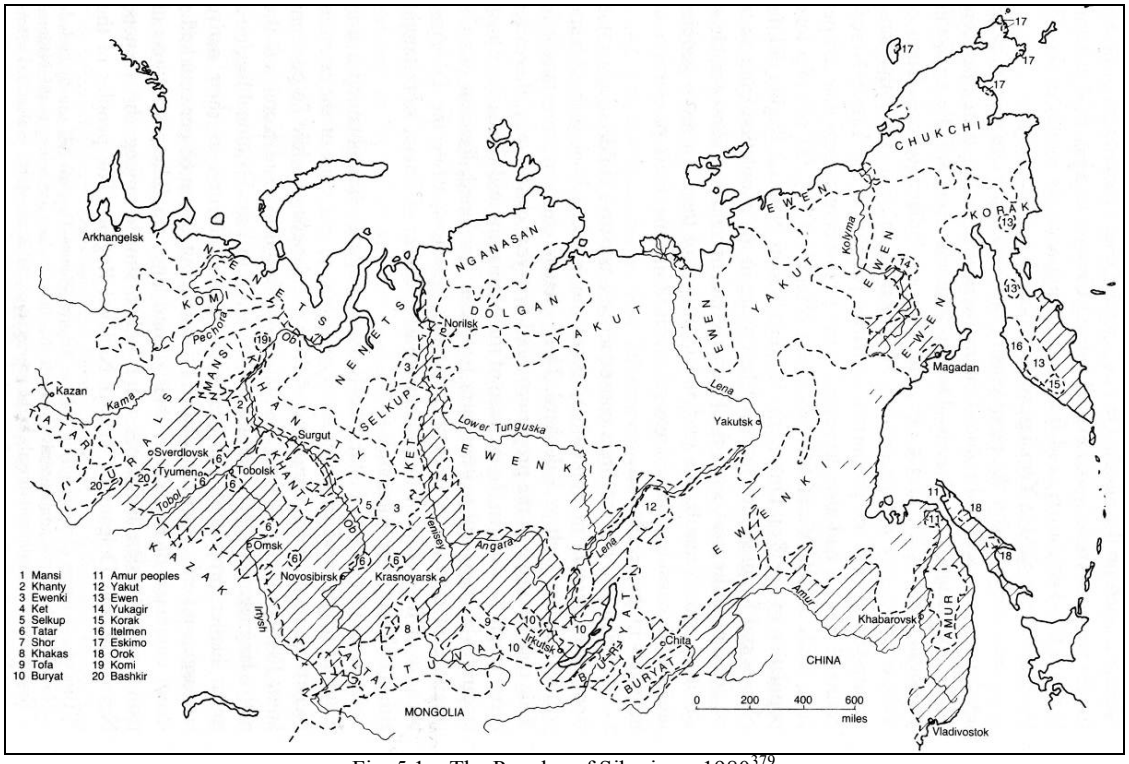

Fig. 5.1 – The Peoples of Siberia, c. 1980[379]

The consequences of this socio-ecological bifurcation were evident from the early days of Russian expansion, when the state's political and military apparatus began to nucleate around Siberia's neo-European ecological sites. In the seventeenth century, politico-military power coalesced around four seats of regional administration, the *razriads*. Each razriad was deliberately centred on an administrative hub – Tobolsk, Tomsk, Yeniseysk, or Yakutsk – that could boast an energy surplus in the form of food or furs.[380] As the seventeenth century progressed, their military governors (*voevodas)* became Moscow's primary state agents in Siberia, exercising domestic sovereignty through the delivery of taxes and the maintenance of order in the subordinate regions,

[379] Forsyth (1992): 387. Shaded areas have majority Russian populations.
[380] Lantzeff (1943): 34-39.

uzeds, of their razriads.[381] Natural limitations on their EC meant that effective taxation and justice often required the voevoda to devolve administrative responsibilities onto still smaller political units – *volosts*. Where these represented indigenous groups, volosts came to be organized under *lushchie liudi,* 'best men'. In 1677 and 1678, these replaced the authority of the uzed in matters of indigenous justice, order, and administration. Initially chosen by the voevoda, a best man would often find himself suddenly elevated above his peers to a position of hierarchically superior authority.[382] This system of imperial integration was highly successful among the Yakut chiefdoms, whose stratificatory social institutions were already hierarchically differentiated. It was less so among indigenous HGBs with segmentary social structures, such as the Tungus and Yukagir. Among these groups – the least complex of the five basic international units identified by Buzan and Little – best men rarely possessed de facto authority beyond their immediate families.[383] In extreme cases, responsibility for segmentary units had to be transferred to stratificatory indigenous units, as when responsibility for the nomadic Samoyed-Nenets of the lower Ob was handed to more southerly and differentiated Khanty princelings in the late eighteenth century.[384]

Although the use of semi-autonomous proxies to maintain territorial cohesion was not novel in Russian history, the system's fundamental importance in Siberia's non-European biomes up to 1917 marks a dramatic break with contemporaneous trends in European Russia, its neo-European colonial extensions along the steppe-forest frontier, and in the trade-dependent colonies scattered across the taiga and tundra. In the late European Middle Ages, devolved and overlapping authorities were commonplace in the heartland of European Russia, with vassalage creating complex patterns of domestic and Vattelian-Westphalian sovereignty. The evolutionary predecessor of Siberian indirect rule is found in Russia's colourfully named medieval tradition of *kormlenie*, 'feeding', whereby an official received domestic lordship over the population and surpluses of a specific geographical area. These officials were responsible for the delivery of taxes, the maintenance of order, and enforcement of the same banal rights as were later recognized by Siberia's indigenous proxies.[385] This

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[381] *Ibid*: 39-42.
[382] Forsyth (1992): 61-62; Lantzeff (1943): 91-93.
[383] These are: HGBs, tribes (including clans and chiefdoms), city-states, empires, and modern states. [Buzan & Little (2000): 103.]
[384] Slezkine (1993): 68-69.
[385] Teschke (1998), p. 349, n.44.

feudal system helped to 'gather in' Muscovy's rapidly expanding territories in the late sixteenth century, a period in which the government lacked the administrative capacity to establish direct rule over its sprawling lands.[386] Though effective as a short-term solution to Muscovy's administrative deficits, kormlenie eventually undermined the principality's territorial integrity, fragmenting authority by dividing sovereign power among semi-autonomous fiefdoms. Attempts to rein in the system began by granting charters to subject populations in the fourteenth and fifteenth centuries, outlining subjects' rights vis-à-vis their feudal overlords. It also led to the limitation of administrative terms to a single year, blocking the possibility of kormlenie grants becoming hereditary possessions. By the end of the sixteenth century, kormlenie was in terminal decline as a means of state control in the core of European Russia.[387] When Russia entered Siberia, it attempted to avoid a resurgence of the kormlenie system, which was now viewed as a threat to the integrity of the state. Military governors' terms were limited and Moscow kept as close an eye on its officials' activities as possible (not an easy task where a return trip from European Russia to Yakutsk could take up to four years).[388] However, as fur income in Western, Central and Eastern Siberia waned, kormlenie provided a useful blueprint on which to base the nascent imperial system of northern, continental, and upland Siberia – placing order and justice in the hands of dedicated proxies in return for the regular delivery of yasak and taxes and recognition of Moscow's Vattelian-Westphalian rights.[389] Meanwhile, in Siberia's neo-European southern, maritime, and riverine ecological niches, domestic sovereignty became concentrated the hands of the state's official representatives, converging with the increasingly Westphalian principles by which the state was becoming organised in European Russia.[390]

As northern fur trade receipts declined in the second half of the seventeenth century following the depletion of sable and black fox populations, Russian administration in northern Siberia increasingly diverged from the principles of territoriality and sovereignty that were then taking root in its European core and neo-European extensions. Thanks to the high costs of their upkeep, state offices above Siberia's band of neo-European settlement (see figure 5.1) became chronically understaffed. This

[386] Lantzeff (1943): 205.
[387] *Ibid*: 22-23.
[388] Forsyth (1992): 66.
[389] Lantzeff (1943): 205.
[390] Simon Dixon, *The Modernization of Russia 1676-1825* (Cambridge: Cambridge University Press, 1999): 67.

undermined the state's administrative capacity and threatened its territorial integrity in marginal ecological regions, encouraging governors to make further sovereignty bargains with local groups – surrendering components of the state's domestic sovereignty in order to strengthen its Vattelian-Westphalian rights and international legal claims against other international actors such as China and England.[391] As opposed to contemporaneous developments in European Russia and its neo-European colonial extensions, northern, continental and upland Siberia witnessed the construction of an imperial international system with the Russian state at its heart and a variety of semi-autonomous indigenous collective actors playing the role of subordinate units.

The incidence of indirect rule in Siberia increased as Russia expanded into more northerly, continental, and upland ecosystems, reflecting the continuing influence of Chapter Four's axes of ecological productivity. Under the terms of Mikhail Speranskii's 1822 reforms, the bifurcation that split Siberia's neo-European and Arctic territories was formalized within the region's administrative apparatus. These reforms were meant to address what Speranskii saw as Siberia's three main challenges: the breadth of its geography, the range of its climates and resources, and the diversity of its peoples. In large and sparsely settled areas, particularly the taiga and tundra, simplified provincial administrations linked local authorities directly to the imperial centre without the intermediary levels of provincial and regional governance that were put in place along Siberia's settled, neo-European southern fringe.[392] Direct contact with the imperial centre was meant to insulate non-European biomes' mainly indigenous populations from undue interference by provincial administrators. Their internal affairs remained largely autonomous under the authority of the clan administration, *rodovaia rasprava*, who advised the regional 'land captain' on matters of judicial and administrative concern.[393] The result was a formalized system of indirect rule, in which increased autonomy was granted to indigenous units as a reward for loyalty to the metropole – loyalty signified by the continued payment of tribute and peripheral units' acceptance of the Tsar's superior position in the imperial hierarchy. Under Speranskii's regulations, legally separate systems of native justice were

[391] Litfin (1997): 169-170; Armstrong (1965): 71.
[392] Marc Raeff, *Siberia and the Reforms of 1822* (Seattle: University of Washington, 1956): 71-72; Peter L. Roudik, 'From Legal Custom to Court of Law: specific of the judicial reform implementation in Siberia', in Eva-Maria Stolberg, *The Siberian Saga* (Frankfurt: Peter Lang, 2005): 87-98.
[393] Raeff (1956): 80-81.

reinforced or, where absent, introduced. The payment of yasak was made a clan responsibility – payable in cash, kind or service – and the clan leadership among nomadic and semi-sedentary HGBs became increasingly formalized as its chiefs transformed into a hereditary elite based on their access to salaries, subsidies, pensions, and the ecological surpluses of ghost acreage within the Empire. Because Siberia lacked either a landed gentry or widespread serfdom (neither of these complex institutions successfully crossed the Urals) local indigenous grandees filled an important role by administering justice and ensuring their units' service to the Tsar.[394]

Beyond its formalization of the relationships that defined the boundaries of the imperial international system by which the Russian state exercised sovereignty over non-European biomes and populations, Speranskii's reforms defined Siberian indigenous groups as bounded units. Recalling our discussion in Chapter Four, the Arctic Basin's *pre-international* systems allowed units to penetrate deeply into one another's internal processes, problematising the inside-outside distinction that remains at the heart of IR's definition of 'the international'. Indirect rule reordered this aspect of pre-international indigenous relations, defining HGBs and chiefdoms as bounded collective actors in direct relationship to the Russian metropole. This completed the overlay of international characteristics onto the pre-international units and systems that had previously defined relations in the region, replacing linear relay networks of mutual aid and reciprocity with direct, imperial ties to the metropolitan 'hub' in Moscow or St. Petersburg. As Motyl explains, in imperial systems, '[t]he nonnative state's elite located in the core coordinates, supervises, and protects the peripheral native societies, which… interact with one another only via the core. Empires, then, are structurally centralized political systems within which core states and elites dominate peripheral societies, [and] serve as intermediaries for their significant interaction'.[395] The peoples and territories of non-European Siberia were thereby incorporated into the emerging global international system *not* as part of a state in the Westphalian sense, but as part of an imperial system whose dominant unit – Tsarist Russia – was also a member of what Wight calls a 'secondary international system' composed of the other states and imperial systems of Europe.[396] Among the other

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[394] *Ibid*: 80-86, 100-101; Donald Treadgold, *The Great Siberian Migration: government and peasant in resettlement from emancipation to the first world war* (Princeton, Princeton University Press, 1957): 21-22.
[395] Motyl (1999): 126.
[396] Wight (1977): 23-26; Buzan &Little (2000): 177-178.

imperial international systems with which the Russian metropole interacted were the other empires of the Arctic Basin, particularly that of England (after 1707, Great Britain).

Russia's ability to exercise sovereignty in arctic and subarctic Siberia varied as its EC rose and fell across time and space. During resource booms, the state had no problem subsidizing direct involvement in Arctic affairs through trade-dependent colonial settlements, allowing it to claim high degrees of control across all four of Krasner's categories of sovereignty. When the collapse of either supply or demand undercut the state's ability to trade away from local NPP shortfalls, it became unable to maintain its high-energy, functionally differentiated units and processes. Focused as Russia was on coercive forms of resource mobilization – discussed in Chapter Four – its ability to operate in the politico-military sector is a good indicator of its EC across the region. During the sixteenth century 'fur rush', the state was able to bring considerable force to bear on indigenous HGBs like the hunting-herding Nenets-Samoyeds of the tundra between the Urals and the Taimyr Peninsula. (see Figure 5.1) Traditional Nenets-Samoyed hunting and herding ranges cover valuable fur lands around the mouths of the Ob, Yenisei, and Taz rivers. From the time of its first incursions in the sixteenth century, the state was wary of these Neolithic HGBs, who resented the extraction of yasak and whose nomadic existence made it difficult for Russian authorities to enforce regular payments.[397] Nenets rebellions were quickly quashed in the early days of Russian rule. In 1601, Nenets parties attacked and killed thirty Cossacks who were attempting to erect the first ostrog at Mangazeia. Subsequent rebellions in 1604 and 1606 were crushed and the Nenets-Samoyeds were coerced into quiescence.[398] For the next forty years, Mangazeia was the premier fur market of Siberia, seeing more private trade pass through its customs house every year in the 1630's than the state managed to extract as annual yasak from the rest of Siberia.[399] This steady source of tax income sustained Moscow's direct rule in the region, more than covering the costs of bureaucratic and military control. Following the depletion of Mangazeia's immediate hinterland and a territorial reorganization that cut it off from rich fur-bearing lands of the Vilyui and lower Lena rivers, however, fur receipts in 1646 fell to barely a third of

[397] Fisher (1943): 58-9.
[398] Forsyth (1992): 45.
[399] Fisher (1943): 170-171.

what they had been a decade earlier.[400] The depletion of fur-bearing populations along the most productive parts of their traditional subsistence territories also made the Nenets' yasak burden increasingly difficult to bear, leading to renewed attacks on Mangazeia in the 1640s. As receipts dropped perilously low in the 1660s, the government transferred troops and personnel out of the area. A series of Samoyed rebellions in 1662/3, 1666, 1667, 1668 and 1669 made the financial costs associated with defending this Russian position untenable, leading to the wholesale transfer of Mangazeia's garrison to Turukhansk in 1672.[401] This marks the end of this trade-dependent colony, which disappeared back into the tundra-taiga ecotone once its access to marketable ecological commodities collapsed. For the next seventy-five years, the Nenets-Samoyed lived outside of Russian control and continued to press on Western Siberia's northern settlements, successfully attacking towns and hamlets along the lower Ob until well into the first half of the eighteenth century.[402]

It is worth asking how a collection of Neolithic hunter-gatherers was able to compete militarily with the Russian state in 1700 when they had been unable to do so a hundred years earlier. It would be difficult to argue that the Russian state was less materially capable of defeating the Samoyeds in 1700 than it had been in 1600, a time when Russia's European heartland was being ravaged by the 'Time of Troubles' that ended with the elevation of the Romanov dynasty in 1613. Rather, as would happen in the northeastern corner of the continent in the next century, the depletion of the region's ecological resources – which had drawn the state into the area to begin with – diminished its ability to subsidize the costs of domestic sovereignty.[403] The state simply found itself unable any longer to 'trade away' from its EC shortfalls and it became unwilling unable to cover the costs of direct sovereign control.

Mangazeia was typical of one strategy associated with Socio-Ecological Coevolution in the Arctic, being was one of the many trade-dependent islands of colonial rule carved out of the tundra and taiga by successive resource discoveries. These colonial constructs are born out of the metropolitan society's demand for a specific product, maintained by a combination of ecological supply and social demand, and doomed by

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[400] *Ibid*: 178-9.
[401] Forsyth (1992): 46.
[402] *Ibid*: 46.
[403] Slezkine (1993): 17.

the failure of either to maintain its side of the bargain.[404] While they persist, the principles by which boom towns are administered converge with the Westphalian model of direct domestic control over a consolidated territory.[405] When their trade declines, boom towns sink back into a shadowy existence and de facto state power either withers or passes to a local proxy.[406] Over the past four centuries, boom towns have sprung up around the circumpolar basin to access the region's bonanza deposits of natural resources, becoming centres of trade-dependent colonial government in otherwise marginal ecological systems.[407] They are characterized by a shared life cycle: a short period of intense growth, followed by a window of sustained activity based on a single commodified good and, finally, a rapid decline following the resource's depletion or a collapse of demand.[408] During their lifetimes, they are islands of neo-European colonial rule, relying on their integration into metropolitan and international markets for access to ghost acreage with which to maintain their complex divisions of labour between bureaucrats, soldiers, policemen, and leaders. They rise quickly from the imperial hinterland, extract its resources, and erode back into the tundra and taiga. Being complex units with relatively large populations and sophisticated hierarchies and divisions of labour, they are vulnerable to the two varieties of social collapse described by Joseph Tainter: when the resource base upon which they depend deteriorates due to human mismanagement – as with the depletion of fur resources, or when its technological adaptations are disrupted by an environmental shift – be it social or ecological.[409]

Following its retreat from the fur lands of northern Siberia in the late seventeenth and eighteenth centuries, Russia left indigenous proxies to administer domestic sovereignty in return for their recognition of Moscow's Vattelian-Westphalian rights and banal lordship. By allowing indigenous volosts to rule themselves as semi-independent units with their own 'customary law', the state relocated itself at the hub of an imperial

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[404] Raymond Fisher, 'Mangazeia: A Boom Town of Seventeenth Century Siberia', *Russian Review* 4(1) 1944, p. 90.
[405] Armstrong (1965): 66-67; John Ruggie, 'Territoriality and Beyond: problematizing modernity in international relations', *International Organization* 47(1) 1993, p. 151.
[406] Armstrong (1965): 47.
[407] Bonanza deposits are defined by large scale, high-grade resource discoveries whose size and quality lowers the costs of their exploitation. [Lee Huskey, 'Globalization and the Economies of the North', in Lassi Heininen & Chris Southcott, *Globalization and the Circumpolar World* (Fairbanks: University of Alaska Press, 2010): 62.]
[408] *Ibid*; Chris Southcott, 'History of Globalization in the Circumpolar World' in Heininen & Southcott (2010): 52.
[409] Tainter (1988): 44. Although Tainter was referring specifically to ecological changes when referring to 'environmental shifts', this project's recognition of the interconnectedness of social and ecological contexts leads it include *both* ecological and social changes under that heading.

international system.[410] Given the importance of EC to this process, it should come as no surprise that the northern limit of agricultural productivity in Siberia covaried with the northern limit of the state's direct exercise of domestic sovereignty and therefore represents a socio-ecological ecotone between the state and imperial systems of northern Asia. As early as the seventeenth century, each of Siberia's regional capitals, with the exception of Yakutsk, was sited in one of its neo-European agricultural niches. Yakutsk – itself a classic colonial boom town – was only able maintain its status by virtue of its position at the centre of the eastern Siberian fur trade. Even so, the depletion of fur-bearing fauna in its vast hinterland led to the town's administrative eclipse by the agriculturally productive settlement of Irkutsk next to Lake Baikal in 1736, completing the southward shift of domestic sovereignty that defined the split character of Russian rule in arctic and subarctic Siberia.[411]

The extension of Russia's medieval system of kormlenie into northern Siberia via the introduction of indirect rule stands in stark contrast to events in European Russia, where the practice was in decline by the time of Yermak Timofeevich's conquest of the Khanate of Sibir's capital at Isker in 1582.[412] It would be going too far to say that kormlenie had ceased to exist in European Russia by 1581. However, the trend there was definitely away from decentralized control via imperial proxies. Throughout its neo-European territories, the Russian state was on an evolutionary path towards increasing centralization and homogenization – a trajectory from which it was deflected in northern Asia by its constrained EC in non-European arctic and subarctic ecosystems.[413] We must look to Socio-Ecological Coevolution and EC to explain these trends in divergent and convergent evolution, which resulted in a growing gap in the exercise of sovereignty between Siberia's directly-ruled, neo-European colonial south and its indirectly-ruled, non-European and imperial north. As predicted by the evolutionary patterns observed among indigenous units and systems in Chapter Four, Russian units embedded in different ecologies evolved in different directions – some towards the increasingly centralized forms of governance common in the core of the European international political system, and others towards an imperial international system in which local administration fell to subordinate, semi-autonomous collective

[410] Roudik in Stolberg (2005): 88.
[411] Fisher (1943): 116-119, 179-181; Forsyth (1992): 112.
[412] Lantzeff (1943): 23-24.
[413] Dixon (1999): 67; Lieven (2002): 239, 252.

actors. The result was the division of Siberia along socio-ecological lines, with non-European hinterlands integrated into an imperial international system via a hub-and-spoke arrangement that marked Russia out as *both* a state *and* an international system in its own right.

Indirect Rule & Sovereignty in Arctic North America

European states claiming sovereign jurisdiction over subarctic and arctic North America also utilized indirect rule and imperial relationships to mediate their low Ecological Capacity in non-European biomes. As Europe's expanding international economic system began to interact with the continent's pre-international units, proxies such as the Hudson Bay Company (HBC), Russian American Company (RAC), and Royal Greenlandic Company (KGH) took over responsibility for the administration of domestic sovereignty in their respective geographical spheres: Rupert's Land and the Canadian Northwest, Russian America, and Western Greenland.[414] They did so behalf of metropolitan states, becoming de facto – in the HBC's case, even de jure – units in direct relationships with imperial metropoles in Great Britain, Russia, and Denmark. Though this use of corporate proxies was not novel in and of itself – chartered companies such as the East India Company (EIC) having been responsible for the governance of large sections of European states' growing empires since the seventeenth century – states' ongoing need to mediate their depressed EC in arctic and subarctic ecosystems allowed these units to outlast their counterparts in other biomes.[415] Whereas the mighty EIC was largely subordinated to the British government by the 1784 India Act, the HBC remained the de facto and de jure sovereign of Rupert's Land and the Northwest Territories until the transfer of these territories to the young Dominion of Canada in 1871.[416] Even then, unlike the EIC in India, the HBC maintained an important role in the maintenance of Canada's imperial relationships across the region. Using the EC it had developed over two hundred years, the Company continued to act as an avenue by which Ottawa provided its subordinate native units – the 'effective occupiers' of the land with whom the Canadian government had signed a series of land-claim treaties – with goods and

[414]The case of the Russian American Company (RAC) is interesting in that, unlike Siberia, Russian activity in Alaska was more closely aligned to the capitalistic means of resource mobilization used by the HBC and its competitors in Rupert's Land and the Northwest. In the 1821 renegotiation of its original 1799 Charter, the RAC recognised Alaskan natives as imperial citizens – with status akin to free peasants in European Russia. [Grant (2010): 91, 120.]

[415] Buzan & Little (2000): 270.

[416] Ramakrishna Mukherjee, *The rise and fall of the East India Company: a sociological appraisal* (Berlin: VEB Deutscher Verlag der Wissenschaften, 1958): 354.

capital in return for their recognition of Canada's banal lordship and Vattelian-Westphalian rights. Like other corporate proxies in arctic North America, the HBC represented a social technology by which the 'hub' of an imperial system communicated with its 'spokes' until technological advances allowed for more direct state administration after the Second World War.[417]

The HBC's position in Britain's (after 1870, Canada's) imperial system linked indigenous units in Rupert's Land and the Northwest – the 'effective occupiers' of the non-European boreal and tundra biomes – to the metropolitan hub. Effective occupation is an important concept in international law, and deserves some explanation. Sometimes known as *uit possidetis* or the 'Principle of Effectivity', it was formalized at the Berlin Conference of 1884/5, where Europe's imperial powers settled most of their competing territorial claims in Africa. As a legal principle, effective occupation judges claims on the basis of states' abilities to administer and control lands and people. Effective occupation was the principal route by which states substantiated claims originally based on other international principles, such as the right of discovery.[418] Without it, territory might be declared inchoate and returned to the status of *terra nullius*, opening it to competing claims from other international actors.[419] Lacking widespread agricultural settlements on which to base their claims thanks to the ecological systems in which their rule was embedded, states such as Great Britain and Canada designated subarctic and arctic indigenous peoples as 'effective occupiers' in direct subjection to the imperial metropole. This was an interesting development insofar as their claims prior to European contact had been dismissed or marginalized, allowing Europeans' claims of discovery to be made on lands already inhabited by indigenous groups. Recognition of indigenous claims required a sovereignty bargain between the imperial system's metropole and its subordinate indigenous units – trading away some of the former's domestic sovereignty in return for the latter's recognition of its Vattelian-Westphalian rights, which thereby buttressed the metropole's sovereignty claims in Europe's *secondary*

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[417] Galbraith (1957): 3-4, 8; Buzan & Little (2000): 270; Arthur J. Ray, *The Canadian Fur Trade in the Industrial Age* (Toronto: University of Toronto Press, 1990): 39.
[418] Grant (2010): 20. Meanwhile, the failure of Dutch claims to Western Greenland – made on the basis of whalers' long-standing trade relations with the West Greenlandic Inuit – was largely due to the Nethlands' inability to show any 'effective occupation' of the land through settlement or conquest. [*Ibid*: 83, 402.]
[419] *Ibid*: 12.

international system, which constituted what Paul Keal refers to as a '*society of empires*'.[420]

Europeans' recognition of indigenous units as effective occupiers tended to be withheld as long as no competing claims to international legal sovereignty were put forward by other international actors.[421] Russia, for example, faced competition from maritime powers such as Britain and the Netherlands early in the fur trade era, particularly around the mouth of the Ob River, contributing to its decisions to close the northern trans-Siberian route to all foreign traffic in 1704 and devolve power onto its indigenous peripheries. Canada adopted a parallel policy of indirect rule with reference to its arctic possessions in the early twentieth century to protect against perceived threats to its claims from American, Danish and Norwegian explorers, who had established several bases in the eastern Arctic Archipelago.[422]

Though less developed than Siberia's imperial international system, the structures that supported states' sovereign claims in arctic America shared several of the former's fundamental principles. First, the states of arctic North America permitted indigenous units the widest possible degree of judicial and administrative autonomy so long as they acknowledged the imperial hub's rights and claims vis-à-vis other European actors. Until the early twentieth century, the government of Canada refused to formalize its responsibilities towards indigenous peoples, seeing little purpose in systematic attempts to restructure indigenous socio-economic and political relationships. Even when resource discoveries after 1900 made trade-dependent European settlements north of the agriculturally productive prairies possible, the state sought out the least intrusive options for extinguishing indigenous land.[423] Treaty Eleven, signed in 1911 and covering 620,000 km^2 and an estimated 3,400 individuals, was at the time the only land agreement to deal specifically with Canada's arctic peoples. (see figure 5.2)

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[420] Paul Keal, *European Conquest and the Rights of Indigenous Peoples: the moral backwardness of international society* (Cambridge: Cambridge University Press, 2003): 21.
[421] Grant (2010): 186-187.
[422] Nancy Fogelson, *Arctic Exploration & International Relations*: *1900-1932* (Fairbanks: University of Alaska Press, 1992): 111.
[423] William Morrison et al., *Treaty Research Report,Treaty 11 (1921)* (Ottawa: Treaties and Historical Research Centre, Department of Indian and Northern Affairs, 1986): 2-3.

Figure 5.2 – Native treaties in Canada, 1871-1921[424]

This formal agreement between indigenous groups and the Crown made provisions for the extinguishing of native claims along the Mackenzie Valley and Great Slave and Bear lakes (sites of newfound mining potential) in return for annual government payments to native hunters and the provision of hunting and fishing equipment, with payments depending on an individual's hierarchical position in the clan, as defined by the metropole. Thus, a clan chief received $25 per year, the headman of a family group $15, and other individuals $5.[425] The government thereby continued the process of social differentiation that had begun with the HBC's selection of trade captains and the development of a trade hierarchy incorporating home guards, middlemen, and trappers. More importantly, the treaty system formalized the relationship between indigenous 'spokes' and the imperial 'hub', according to which indigenous peoples swore themselves to respect the Crown's rights to Vattelian-Westphalian sovereignty and banal lordship in return for guarantees of protection against encroachment on their traditional practices.[426] Thus, the imperial international system of Canada converged with the practices of indirect rule that typified those in Russian Siberia, with the state intervening as little as possible in the domestic sovereignty of native units so long as

[424] DG Kerr (Ed.). *A Historical Atlas of Canada* (Toronto: Thomas Nelson & Sons Ltd., 1966): 57.
[425] *Ibid*: 18.
[426] Motyl (1999): 120-122.

its final right to exclude other actors from the region was recognized by local actors.[427] In IR terms, each represented the formal overlay of an imperial international system on top of the pre-international indigenous socio-economic systems of the region.

The effects of EC can be felt across all of the sectors described in Buzan and Little's analytical matrix. For commercial proxies in subarctic and arctic North America – including the HBC, KGH, RAC, and the Alaska Commercial Company (ACC) – the devolution of commercial power onto trade captains and indigenous Middlemen was a variation on the theme of indirect rule. The HBC's uneven distribution of EC in different regions of Rupert's Land and the Northwest had observable effects on the organization of the economic units and systems by which it incorporated these challenging biomes into Britain's – and later Canada's – arctic empire. Thus, the organization of its inland trading posts diverged from the principles common at the Bayside, where the Company used its positions at the nexus of indigenous and European trade routes to subsidize NPP shortfalls with food and materials traded from more productive biomes. This ghost acreage gave Bayside posts access to energy surpluses, allowing them to maintain relatively complex systems of functional differentiation.[428] In the boreal and tundra hinterlands of the Saskatchewan and Mackenzie basins, the potential benefits of differentiation – maintained by trade-based energy subsidization – were weighed against the costs of sustaining high-energy units in regions of low Ecological Capacity. Without efficient physical technologies with which to import energy from more productive biomes, posts' organisations became less differentiated as they moved inland, slipping from a largely functional division of labour towards a stratificatory social model in which hierarchically differentiated units carried out a similar range of tasks regardless of rank. Functional divisions of labour therefore became less complex as posts moved farther away from the communications hubs that allowed Bayside posts to mediate their ecological deficits.[429] With little to mediate their relationship to local NPP, inland posts evolved towards simpler social principles and became organized along increasingly stratificatory lines, reinforcing the link between EC and social differentiation described by the three axes of ecological productivity in Chapter Four. This was most evident in arctic America's least productive biomes, particularly those lying northwest of Fort Prince of Wales and in

[427] Kerr (1966): 21.
[428] Galbraith (1957): 8-9.
[429] Rich (1959): 123-126.

the tundra of the central Canadian Arctic – the 'blank' area lying northeast of Treaties 11, 8, 10, and 5 in figure 5.2. This tundra ecosystem remained outside the direct reach of fur traders until 1911, and was incorporated into Canada's imperial system only via the continuing linear relay trade that marked the outer limits of the HBC's – and Canadian – Ecological Capacity.[430]

As in Siberia, the ecological systems of North America had a perceptible impact on the metropole's ability to sustain units and systems in the politico-military sector. Even with its access to ghost acreage at the Bayside, the HBC was never unable to maintain a full division of labour in its politico-military interactions, relying instead on trading personnel to fill soldiers' boots. The results of this stratificatory approach to warfare were woeful. In 1686, the Chevalier de Troyes, with only thirty French veterans, emerged from the woods above the HBC post at Moose factory and captured it easily. Within weeks, posts on the Rupert and Albany rivers followed Moose Factory into French hands, leaving the HBC with only York Fort from which to carry on its trade.[431] These military failures were a consequence of coevolutionary influences resonating between the posts' social and ecological contexts, which limited the number of mouths that could be fed on local provisions and imported foodstuffs and thereby constrained units' ability to maintain specialised military personnel. In every subsequent Bayside military action, attacking forces had no difficulty dispatching amateurish defenders – be they British or French. Without adequate local NPP to support a dedicated militia, neither side was able to escape the politico-military consequences of their depressed EC.[432] In 1782, the last military engagement between European states in Hudson Bay followed the same pattern as Comte de Lap rouse sailed up to Prince of Wales Fort, by then an impressive and modern fortification reinforced by stone bastions and heavy cannon. Severely undermanned with only thirty-nine men on hand, and completely lacking in dedicated artillerymen to work the cannon, it was surrendered without resistance.[433] The same problems associated with EC contributed to Russia's decision to sell Alaska to the United States in 1867,

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[430] David Damas, *Arctic Migrants / Arctic Villagers: The Transformation of Inuit Settlement in the Central Arctic* (Toronto: McGill-Queen's University Press 2004): 19-20.
[431] Rich (1958): 213-217.
[432] This is evidenced by the fall of Fort Albany to the HBC in 1693, of York Fort by the French in 1695, its subsequent recapture by the HBC in 1696, and the second loss of York to the French in 1697. This left the HBC with only Fort Albany until all of its remaining Bayside posts were returned following the Treaty of Utrecht in 1713. [Hudson's Bay Company Committee (1934): 8-10.]
[433] Rich (1959): 84-85.

bringing a new state actor into the region.[434] Such is the cost of low EC leading to stratificatory differentiation in a warzone where, as a result, defence has historically been severely disadvantaged by the costs of sustaining functionally differentiated politico-military units in ecologically challenging biomes.

The HBC's unwillingness to allow Canadian agricultural settlement in its lands along the 49th parallel – which it rightly saw as a threat to the sustainability of the fur trade – finally contributed to pressure that forced the Company Directors in London to sell Rupert's Land and the Northwest Territory in 1870, transferring over 10 million km^2 to the three year-old Dominion of Canada.[435] With the sale, the HBC surrendered its de jure political rights in return for freedom to continue its trade in the region, freedom from special taxation, and a 1/20 share of subsequent land sales. Though the Company lost its de jure responsibility for the administration of justice and relations with the region's indigenous people, it did not surrender its position in the imperial international systems linking peripheral units of the boreal forest and tundra to the metropolitan state.[436] HBC posts remained the de facto point of contact between its new de jure political leaders in Ottawa – who continued to employ the HBC as its main conduit for northern supplies and services well into the 20th century – and the indigenous units that formed the 'spokes' of Canada's imperial international system.[437] This role actually expanded as the Company pioneered the fur trade in the Arctic Archipelago and the central Canadian Arctic in the early twentieth century. Between 1911 and 1926, it opened posts in Chesterfield Inlet, Repulse Bay, Baker Lake and Eskimo Point on the northwest coast of Hudson Bay, at Aklavik in the McKenzie River Delta, and at Lake Harbour, Pond Inlet and Arctic Bay on the coasts of Baffin Island. These laid the territorial groundwork for the reestablishment of a de facto fur monopoly in the Eastern and Western Arctic and became important centres for the areas' indigenous peoples, who acted as trappers, guides, hunters, and clients to the Company's traders. Throughout the Canadian interior, the HBC's posts remained the principal sources of food and supply – bases from which commodification and differentiation continued to spread through their associated indigenous units.[438]

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[434] Frederick Starr, *Russia's American Colony* (Durham: Duke University Press, 1987): 274, 279.
[435] Galbraith (1987): 8-23.
[436] Hudson's Bay Company Committee (1934): 36.
[437] Morrison (1986): 8; Watson (1990), pp. 102-103.
[438] Ray (1990): 159-161; Richard Vaughan, *The Arctic: A History* (London: Sutton Publishing, 2007) second edition: 130-131; Hugh Shewell, *'Enough to Keep Them Alive': indian welfare in Canada, 1873-1965* (Toronto: University of Toronto Press, 2004): 89.

The HBC's arctic posts supported and sustained the Canadian government's claims in the Canadian Arctic and the Arctic Archipelago by connecting the imperial core to its non-European peripheries. When the Northwest Mounted Police (NWMP) established their first stations at Ft. McPherson on the Mackenzie River and Fullerton Harbour on Hudson Bay in 1903, both were sited beside HBC posts on which they also relied for supplies and support. Only the NWMP post at Herschel Island in the Beaufort Sea west of the Mackenzie Delta in 1904 did not align with existing HBC establishments, being set up specifically to supervise the whaling camp established there by American sailors in the 1890s.[439] The RCMP's post at Pond Inlet (1922) was sited alongside the HBC post of the same name, whose existence had led to the nucleation of a small settlement by the time of the force's arrival. Craig Harbour (1922), at the extreme south-east corner of Ellesmere Island, was far removed from any human settlement and only remained in operation for a few years to 'fly the flag' before being shut. Subsequent RCMP posts at Pangnirtung (NE Baffin Island), Dundas Harbour (SE Devon Island), Bache Peninsula (E Ellesmere Island), and Lake Harbour (SE Baffin Island) followed similar courses. Those associated with HBC posts outlived their original garrisons, helping to form the bases for many of today's nucleated Arctic communities. Those sited away from HBC posts soon disappeared back into the tundra, their garrisons being transferred to locations better integrated with Canada's evolving imperial state.[440] As in Rupert's Land two centuries earlier, the HBC's twentieth-century commercial expansion in the Canadian Arctic presaged subsequent political inroads by its associated imperial power. State power followed in the wake of the commodification of local Inuit, whose HGBs nucleated around these sources of supply. The costs of this development only became clear with the decline of the fur trade during the 1930s and after the Second World War. Its collapse effectively denied indigenous units access to capital, cutting them off from the trading system on which they had come to rely for access to ghost acreage, ushering in an era of crisis for the indigenous 'spokes' on Canada's imperial wheel. Even then, government relief in these remote districts – a clear signal of Ottawa's jurisdiction in the Arctic Archipelago – was put in the hands of the HBC, which also ran a parallel program of

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[439] Ken Coates, *Arctic Front: defending Canada in the far north* (Toronto: Thomas Allen Publishers, 2008): 24-26, 29; Hadley, Jack, 'Whaling Off the Alaska Coast', *Bulletin of the American Geographical Society* 47(12) 1915, pp. 910, 913. The NWMP was renamed the Royal NWMP in 1904, changing again to the Royal Canadian Mounted Police (RCMP) in 1920.
[440] *Ibid*: 46-47.

relief throughout the 1930s.[441] Thus, the state's gradual penetration of the Arctic followed paths laid down by their economic vanguard. Indeed, the Canadian government was only able to replace the HBC as the main provider of goods and services in the North after the introduction of modern communications and transport technology in the second half of the twentieth century, a date that marks the beginning of an identifiable political sector in the region.[442]

As in Siberia, the international units and systems of arctic North America experienced divergent patterns Socio-Ecological Coevolution driven by the different EC they enjoyed in the region's neo-European and non-European biomes. Where neo-European conditions boosted their EC, the principles by which territories and populations were integrated into the international system converged with those of the system's European core. Where non-European ecosystems limited such settlement, states constructed imperial international systems to integrate their ecologically distinct peripheries. These systems – less developed than their older cousin in Siberia – often relied on economic proxies to connect their 'hubs' and 'spokes', lacking as they did sufficient EC to permit the formation of functionally differentiated units and processes in the political sector.

Ecological Capacity & Territoriality in the Arctic

Throughout the nineteenth and early twentieth centuries, the organization of the Arctic's states and their associated imperial systems continued to be heavily influenced by their limited Ecological Capacity. This constrained metropoles' abilities to exercise domestic and interdependence sovereignty over their ecologically constrained peripheries, opening space in which non-state actors could contest territoriality. Structures of indirect rule predominated over the sovereign state model that was fast becoming the norm among dominant units of the European and global international system, with arctic states split between their neo-European cores – characterized by hard boundaries within which states sought to exercise full sovereign control – and their non-European peripheries – where sovereignty bargains led to vaguely demarcated frontiers that resembled medieval Europe's imperial marches more than

[441] Ray (1990): 44. Shewell notes that much of this relief was returned to the Company by the sale of goods and food to the very individuals who came to collect it, stabilizing the HBC's trading empire at a time of unstable fur markets and supplies. [Shewell (2004): 81-88.]
[442] Ray (1990): 220-221; Grant (2010): 215.

the carefully drawn lines that separate territorial jurisdictions in a Westphalian international system.[443]

At a time when territoriality in Europe and its neo-European colonial extensions was becoming increasingly formalized, frontiers above the socio-ecological ecotone that bifurcates the circumpolar world remained highly permeable to competition and penetration by external actors. As indicated by the discussion of functionally differentiated politico-military units in the last section, the Arctic's imperial states had only a limited ability to stem foreign encroachment into their territory.[444] Non-state actors, such as whalers, found that the hubs of these imperial systems were often unable to enforce their claims to interdependence sovereignty. As rivers had earlier been for Russian promyshlenniks and the HBC, Arctic seas became points of penetration for non-state actors: ecologically productive pathways to peripheries' peoples and resources. Nowhere was this truer than in the rich whaling grounds around the Bering Strait. Though Russia claimed the major landmasses on either side of the North Pacific until 1867, as many as 400 American and British whalers were operating at any one time in the confined waters of the Bering Strait and the Sea of Okhotsk by mid-century. These often landed to trade with locals, ignoring Russia's de jure sovereign rights and harvesting significant resources from Chukotka and Kamchatka.[445] Their infiltration was facilitated by the imperial system by which Russia exercised its authority in its non-European biomes. Having recognized the Chukchi and Eskimos as 'peoples not completely subdued' and barred the establishment of Russian posts or settlements among them in its 1857 Legal Code, the Russian metropole accepted regional autonomy in Chukotka in return for the nominal allegiance of its native units.[446] By 1900, the thickening economic ties that bound Chukotka's people and territory to the maritime trade of the North Pacific sparked renewed Russian concern over its sovereign authority in the region, a situation made all the more worrying by the emergence of English as the peninsula's *lingua franca*. Nevertheless, the imperial government found that little could be done to stem the flow.

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[443] Friedrich Kratochwil, 'Of Systems, Boundaries, and Territoriality: an inquiry into the formation of the state system', *World Politics* 39(1) 1986, pp. 35-37; Ruggie (1993), pp. 150-152.

[444] Russia's attempt to exclude British and American shipping from the territorial waters off Russian America in the *ukaz* of 1821 is a case in point. Following protestations from London and Washington and concerns from within the RAC itself, which relied on foreign shipping to make up its chronic food shortages, the *ukaz* was never implemented. [Grant (2010): 118-119.]

[445] Forsyth (1992): 262.

[446] *Ibid*: 150. Chukchi autonomy went so far that in the 1857 Legal Code of the Russian Empire, they were empowered to "pay yasak to the amount and of the quality that they themselves desire". [Slezkine (1993): 105.]

In the end, Russian claims were preserved by the absence of a rival state rather than by any actual show of sovereign control. Even after the establishment of Soviet power, it proved difficult to unseat these non-state actors from northeastern Asia, and the HBC and various American companies continued to act as sources of goods and services to local units into the 1920s.[447]

As sovereignty became fragmented at the ecological limits of states' power, so too did the frontiers that defined their territoriality. As indicated by Chukotka and Kamchatka, Arctic boundaries at the beginning of the twentieth century diverged from the model of hard territoriality developing in Europe since the end of the medieval period, resembling the *imperial marches* of medieval empires: frontiers between centres of imperial power characterised by a degree of geographical imprecision and a gradual shading of authority between one centre of power and another.[448] Given the tenuous control they exercised over distant and ecologically hostile regions, imperial cores treated their arctic frontiers with a flexibility that was completely absent in the tightly defined states systems of Europe and its neo-European colonial extensions. So long as their right to Vattelian-Westphalian sovereignty was nominally recognized by local actors and their rights to international legal sovereignty was recognized on the international stage, imperial states were willing to subcontract territorial administration – and with it domestic sovereignty – to any variety of proxies, *including those of another state's imperial system*. Such was the case in the Alaska panhandle. There, the Russian American Company (RAC) leased its rights in the area to the HBC from 1837 until the RAC's dissolution in 1867. Constrained by its limited EC in the region, the RAC – with the approval of the metropole in St. Petersburg – sacrificed its domestic authority over the panhandle in order to maintain its international-legal and Vattelian-Westphalian rights in Russian America.[449] Embedded in non-European biomes, Russian America's reliance on a single commodity – fur – made it a typical example of a trade-dependent colony. As a result, it was highly vulnerable to human-induced depletion events and dramatic environmental transformations that could disturb either the supply of, or demand for, the colony's furs.[450] When smallpox ravaged native hunters, killing a third of the Aleut hunters on whom the pelagic sea

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[447] *Ibid*: 107, 134.
[448] Brendan Smith, 'The Concept of the March in Medieval Ireland: The Case of Uriel', *Proceedings of the Royal Irish Academy. Section C: Archaeology, Celtic Studies, History, Linguistics, Literature* (88C) 1988, p. 257.
[449] Galbraith (1957): 153-155.
[450] Starr (1987): 35, 82; Tainter (1988): 44.

otter trade depended, the trade was thrown into crisis. The situation was made worse when four in ten Tlingit died in the neighbourhood of Novo-Arkhangelsk, the company's colonial capital at present-day Sitka. This posed a double socio-ecological challenge, as the Tlingit were major providers of fresh meat and fish to RAC posts during the winter – essential supplements to the supplies sent from Russia and bought from American and HBC ships.[451] With declining trade volumes and rising costs, the RAC bargained away its domestic authority over the Alaskan panhandle to the HBC, which provided Novo-Arkhangelsk with a reliable source of non-trade income and steady source of supplies in return for its trading and governance rights on the mainland south of Mt. Elias.[452] Though costly in terms of domestic sovereignty, the lease brought British recognition of Russia's Westphalian-Vattelian and international-legal rights in the region, stabilizing Russia's effective occupation of the panhandle until the sale of Russian America to the United States in 1867.

This curious arrangement was indicative of the Russian state's inability to overcome the challenges posed by the ecological systems of the North Pacific and the Beaufort Sea; a problem it shared with the other imperial systems in the circumpolar region: British, Danish, and – after 1867 and 1870 – American and Canadian. It also illustrates the constitutive role played by ecological context in framing regional international relations. Having failed to overcome its depressed EC by means of social or physical technologies, Russia was forced to accept its inability to adequately occupy, administer, and protect its American possessions.[453] Whereas Chukotka's contiguous position at the North-eastern corner of Siberia protected the legality of Russia's claims, Alaska's position on the other side of the North Pacific posed a double socio-ecological challenge. Socially, it required the Russians to develop a substantial navy and merchant marine to mediate the impact of the region's depressed ecological capacity. This did not come easily to Russia, whose path dependent evolution had adapted it to terrestrial, not maritime, processes. It therefore lacked the infrastructure to maintain a navy or merchant marine along its Pacific Coast – a problem that would become all too clear in the Russo-Japanese War of 1904-1905.[454]

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[451] James R. Gibson, 'European Dependence Upon American Natives: The Case of Russian America', *Ethnohistory* 25(4) 1978, pp. 368-370.
[452] Starr (1987): 34, 38, 81-83.
[453] Ilya Vinkovetsky, *Russian America: an overseas colony of a continental empire, 1804-1867* (Oxford: Oxford University Press, 2011): 183-184.
[454] Starr (1987): 267.

Ecologically, a major problem was posed by the productivity of the North Pacific, whose wealth of marine mammals pulled non-Russian economic units into a sensitive strategic crossroads. Once there, non-state actors deployed technological adaptations to limit Russian access to the marine ecosystems that linked its Siberian and Alaskan possessions. Meanwhile, the relatively unproductive terrestrial ecosystems of Russian America constrained attempts at permanent settlement, creating chronic problems of supply and manpower that increased Russian dependence on European rivals for communication and transport, and on indigenous peoples for furs, provisions, labour, and sex.[455] These ecological and social factors contextualize Russia's decision to sell its American colonies to the United States for US$7.2 million in 1867. Though undoubtedly influenced by political considerations emanating from Europe's secondary international system – including ongoing tensions with Britain following the Crimean War and the 'great game' in Central Asia – Russia's decision would have been highly unlikely had its socio-ecological adaptations in the North Pacific been more successful.[456] Any assessment of the sale of Alaska with reference to political factors alone would therefore be as flawed as a deterministic explanation based solely on the region's ecological conditions. In the final analysis, a middle road between social and ecological causation must be found. This path is provided by Socio-Ecological Coevolution, whose influence in the North Pacific contributed directly to the formal entry of the United States into the Arctic Basin's developing international systems.

While the march-like frontiers of the Arctic's non-European international units and systems remained contested areas of overlapping authority, those bounding neo-European biomes and their embedded colonies were being formalized through treaties that defined states' respective jurisdictions as disjoint, mutually exclusive, and fixed territories.[457] Along the southern frontier of Rupert's Land, where agricultural settlement was thought inevitable following American expansion beyond the Mississippi, the border was formalized in 1818 when the British and American governments agreed to a line following the 49th parallel of latitude from Lake of the

[455] The RAC's reliance on contracts with American and HBC suppliers for everything from food to trade goods are cases in point. E.E. Rich, *The Fur Trade and the Northwest to 1857* (Toronto: McClelland & Stewart, 1967): 277. For a discussion of the RAC's reliance on native peoples, see Gibson (1978), pp. 359, 379-380.
[456] Starr (1987): 274, 409 n.9.
[457] Ruggie (1993), p. 174.

Woods in modern Ontario to the Rocky Mountains.[458] Following the occupation of the Willamette Valley in modern Oregon by American settlers, the twenty eight year-long Anglo-American condominium in the Oregon Territory was terminated by the Treaty of 1846, which extended 49th parallel to the Pacific Coast.[459] The careful demarcation of state borders in the neo-European farmlands of the Great Plains and coastal mountains stands in stark contrast to the overlapping jurisdictions that continued to characterize Arctic frontiers. Whereas the division of Oregon led to the HBC's complete withdrawal from those portions of the Columbia River basin below the 49th parallel, the company felt no such obligation towards the northern hinterlands divided by the Treaty of St. Petersburg (1825), which defined the boundaries of Russian America and the HBC's lands between 54˚40'N and the Arctic Ocean. Indeed, the HBC maintained Fort Yukon at the confluence of the Yukon and Porcupine rivers for twenty-two years from 1847, at a point well beyond of the 141st line of longitude that marked the western boundary of British territorial claims (see Figure 5.3).[460]

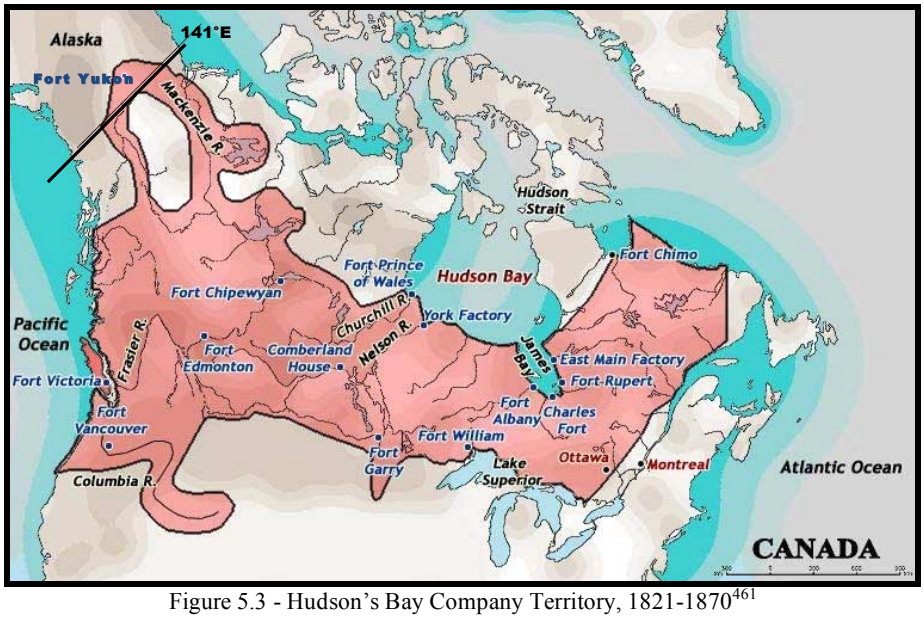

Figure 5.3 - Hudson's Bay Company Territory, 1821-1870[461]

[458] Foreign and Commonwelath Office. "Convention of Commerce between His Majesty and the United States of America. Signed at London, 20th October, 1818" *Canado-American Treaties*. Université de Montréal. October 4, 1999. [online] September 14, 2010. <http://www.lexum.umontreal.ca/ca_us/en/cus.1818.15.en.html>

[459] Foreign and Commonwelath Office. "Treaty between Her Majesty and the United States of America, for the Settlement of the Oregon Boundary. Signed at Washington, 17th July, 1846." *Canado-American Treaties*. Université de Montréal. October 4, 1999. [online] September 15, 2010. <http://www.lexum.umontreal.ca/ca_us/en/cus.1846.28.en.html>

[460] Galbraith (1987): 160-161.

[461] Natural Resources Canada. 'Hudson's Bay Company territory 1821 to 1870' [online] 2001, 'Canadiana: Exploration, the fur trade, and Hudson's Bay Company'. September 21, 2010. < http://www.canadiana.ca/hbc/_popups/PAMhbc1821-1870_e.htm > Following its merger with the Northwest Company in 1821, the British Parliament affirmed the HBC's de jure rights in Rupert's Land, the Columbia River Valley, and the Northwest. The HBC withdrew from the Columbia River valley immediately following the Treaty of 1846. The Alaskan panhandle approximately covers the blank area southeast of the 141st parallel.

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Neither imperial Russia nor the international systems of arctic and subarctic North America were able to escape the constraints imposed by the limited ecological capacities they enjoyed in non-European arctic and subarctic biomes. Their plight illustrates three ways in which the imperial states of the circumpolar world have been affected by the axes of socio-ecological productivity discussed in Chapter Four. First, it provides inductive support for Crosby's contention that European political power has been drawn towards relatively productive southern, maritime, and riverine sites. Second, it illustrates how indirect rule evolved to become a primary social technology by which metropolitan states maintained their claims over ecologically marginal regions, constructing hub-and-spoke imperial international systems that linked European and neo-European cores to their non-European peripheries. Third, it shows how trade-dependent colonial settlements were only sustainable so long as their access to ghost acreage in other biomes could be maintained. Each of these points has blocked the development of functionally differentiated units and processes in the circumpolar basin, producing a characteristic division of sovereign authority between states' southern and neo-European cores – where they exercise domestic and Vattelian-Westphalian sovereignty; their non-European northern, continental, and upland peripheries – where sovereignty bargains are struck that devolve domestic sovereignty onto local proxies and semi-autonomous imperial units; and their trade-dependent islands of colonial rule – boomtowns that temporarily converge with the principles of the metropolitan core before the collapse of trade causes them to evolve back towards the non-European hinterlands out of which they originally rose.

The frontiers that bound the resulting imperial state systems have historically been characterized by a split personality. Principles of membership and behaviour in Europe's evolving international states system were largely unable to bridge the gap between neo-European and non-European biomes, causing them to evolve along divergent pathways on either side of this socio-ecological divide. Borders and territoriality in arctic and subarctic ecosystems came to be characterised by a large degree of geographical imprecision and a gradual shading of authority between one centre of power and another, resembling the frontiers of the medieval European international system more than the mutually exclusive borders of its nineteenth and

twentieth century successor.[462] Only with the widespread introduction of modern physical and social technologies in the early to mid-twentieth century were the resulting imperial international systems dragged, at least partially, into line with the practices and principles that defined the dominant units of Europe and its neo-European colonial extensions. Even then, the region's deeply rooted socio-ecological bifurcation would defy attempts at complete erasure.

Mediating Ecological Capacity: physical and social technologies

The twentieth century has seen metropolitan states' increasing Ecological Capacities allow them to take on additional sovereign responsibilities vis-à-vis their respective imperial peripheries. Much of this increase in EC has followed the application of modern physical technologies to the problem of state power in non-European biomes. Innovations such as the airplane, icebreaker, and snowmobile have increased units' and systems' interaction capacity across Arctic landscapes. By determining how many – at what speed – ideas, goods, and people can be moved across space, interaction capacity affects units' and systems' ability to subsidize local energy deficits.[463] Trade, and with it interaction capacity, are therefore sedimented aspects of Ecological Capacity: social technologies that mediate a site's Net Primary Production. A unit embedded in a region of low NPP can have its EC boosted well above the levels one would expect by means of trade, explaining the increasing presence of trade-dependent neo-European islands in otherwise non-European landscapes. This is particularly significant for Arctic states insofar as it permits them to expand the geographical extent of their hard borders, closing the frontiers of the imperial international systems they dominate. It is also important for peripheral units in non-European imperial hinterlands, where physical technologies can boost the EC of indigenous groups living in increasingly large and differentiated settlements.

Units' EC has also been boosted by specific social technologies, including the use of involuntary labour to carve colonial archipelagos out of the taiga and tundra. The best-known example of this prior to the Second World War was the Soviet Union's use of the GULAG as a colonial vanguard, permitting the Stalinist state the state to carve out

[462] Smith (1988), p. 257.
[463] Buzan & Little (2000): 199.

large colonial settlements at relative low financial, but extraordinary high human cost. This section will discuss the importance of physical and social technologies as mediating influences on units' and systems' Ecological Capacity and, hence, their ability to sustain complex units and systems in the circumpolar North.

Physical Technologies & EC: mediating NPP

The slow growth of interaction capacity in the Arctic from the sixteenth to the twentieth centuries had a relatively small effect on the Ecological Capacity of its imperial units and systems. Drawn to familiar sites by path dependent decision-making and lacking physical technologies to permit easy communication through the Arctic's non-European ecosystems, early modern European units were 'pulled' down paths of least resistance – waterways on which they could use existing knowledge and adapt local transportation technologies, or along the steppe-forest ecotone where the best mix of agricultural conditions was found for neo-European settlement.[464] The discovery and application of steam power, internal combustion, and electricity in the late nineteenth and early twentieth centuries revolutionized humanity's ability to move ideas, goods, and people across inhospitable terrain, increasing sites' potential access to ghost acreage and permitting the development of increasingly complex units in the demanding ecological systems of the circumpolar world.

From Yermak Timofeevich's first entry into Siberia via the Tura River in 1581/2, Siberia's waterways – and Russians' path dependent decision making – helped to determine the routes by which actors explored, conquered, and occupied the land. The narrative of Russia's lunge across Siberia is awash with rivers. Both the northern and southern trans-Siberian routes (see fig. 4.7) depended on the intersecting tributaries of the Ob, Yenisei, and Lena to facilitate the West-East movement of ideas, goods, and people. It is no coincidence that all four of seventeenth and eighteenth century Siberia's razriads were based in settlements that controlled access to major river valleys: Yakutsk ruling the Lena; Yeniseysk, the Yenisei; Tomsk, the Ob; and Tobolsk, the Irtysh. With their long experience of travel on rivers west of the Urals, Russian units possessed the social and physical technologies to use Siberia's waterways to their best advantage, adopting a variety of craft to explore and exploit the continental interior. Though better suited to Russian technologies than either overland

[464] Moon (1997), pp. 874-875.

travel through the tundra and taiga or oceanic travel via the ice-choked coastal waters of the Arctic Ocean, travel on Siberia's river network was notoriously slow. A trip from Tobolsk to Yeniseysk via the southern route took three or four months, and up to seven months via the northern. A round trip from European Russia to Yakutsk and back often took between three and four years to complete.[465] However, in the absence of viable alternatives before the construction of the overland post road from Tyumen to Irkutsk along the taiga-steppe ecotone in the mid-eighteenth century, Russian units remained tied to the subcontinent's river valleys. As a result, their spatial distribution was closely entwined with these waterways: the main thoroughfares of Russia's arctic and subarctic empire.[466]

A socio-ecological explanation of this historical evolution combines consequences arising from units' and systems' ecological context, interaction capacity, and path dependence. It is worthwhile to note the dynamics by which these interrelated concepts operate. Consider their combined impact on the technological evolution of a group of fishermen living around a lake. It would be natural to assume that, because they are accustomed to a life near the water, the group would likely develop or adopt boating technology sooner than would a group of herders living on the steppes. If our boat-building fishermen then had a choice to migrate down a stream that flows out of their lake or across a mountain range that rises beside it, the path dependence generated by the interaction of their social and physical technologies with their ecological context will probably send them downstream, through familiar ecologies where their existing adaptations could be used to best effect. Similar socio-ecological effects can felt at the level of social systems. When, like the hypothetical fishermen-boat builders mentioned earlier, an international unit is presented with a set of ecologies into and across which it can transport its ideas, goods, and people, it is most likely to select ecological highways that best fit its existing technological toolkit. As discussed in Chapter Two, this path dependent behaviour results from society's tendency to maintain institutions in which its members have invested time and energy.[467] That is not to say that a society *must* select ecologies similar to the ones in which their institutions were developed. As shown by the Yakut settlers of the lower Lena, units and social systems can adapt or adopt alternative social and material

[465] See Fisher (1943): 173-177.
[466] *Ibid*: 174; Armstrong (1965): 36-37.
[467] Arthur in Arrow & Pines (1988): 10; North (1990): Ch. 3; North (1991), pp. 97-112.

technologies to deal with novel ecological challenges. However, the constraints of path dependence help to explain why units and systems in Siberia evolved as they did: with Russian populations and practices coalescing along narrow riverine corridors at Siberia's southern fringe in regions around Tobolsk, Tomsk, Krasnoyarsk, and Irkutsk, whose neo-European ecosystems closely resemble those left behind in European Russia.[468] Motivated by path dependence, Russian units and systems were predisposed to transport ideas, goods, and people to and through ecosystems in which their existing technologies provided the greatest possible returns, pushing them away from the hostile and unfamiliar worlds of the northern taiga and tundra and contributing to the socio-ecological bifurcation of northern Asia's state and imperial international systems. This combination of social and ecological factors helps to explain Alfred Crosby's thesis of ecological imperialism, which identifies neo-European ecologies as a determining pull factor in the expansion of Europe's imperial states.[469]

Since the early to mid-twentieth century, the Arctic has witnessed a gradual pattern of imperial integration stemming from the application of new material technologies to the problems posed by ecological constraints. The use of these technologies varied from state to state, helping to determine the Ecological Capacity available to each of their associated imperial international systems. Russia and the Soviet Union ran far ahead the United States, Canada, and Denmark in this regard. By 1922, Canada relied on the *CGS Arctic*, an unmodified trawler purchased from Germany in 1904, to transport its RCMP detachments to Pond Inlet and Craig Harbour. It had no appreciable icebreaking capacity, leaving detachments isolated throughout the winter except by dogsled.[470] The Russians, meanwhile, had commissioned their first metal hulled, steam-powered icebreaker, the *Yermak*, from Newcastle shipyards in 1898.[471] By 1917, its navy had four icebreaking and five ice-forcing ships, ranging from 2,600t. to 8,750t. and from 2,000 to 10,000 horsepower. These remained the backbone of the Soviet Arctic fleet until 1939.[472] With an icebreaking fleet already at hand by 1917,

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[468] Crosby (1986): 298-299.
[469] *Ibid*: 296.
[470] Grant (2010): 224. The *Arctic* was also used in Canada's Eastern Arctic Patrols between 1919 and 1922. At various times, the Canadian government also had on hand the *Stanley* and *Minto*, originally designed as ferries to Prince Edward Island and of little icebreaking value, the *Montcalm* and *J.D. Hazen*, used to break ice in the St. Lawrence River, and the *CGS Earl Grey*, sold to Russia in 1914, where she joined the Imperial, later the Soviet, icebreaking fleet. [Janice Clavell, 'The origins of Canada's first Eastern Arctic Patrol, 1919–1922', *Polar Record* 45(233) 2009, pp. 103-104; R.J. Fraser, 'Early Canadian Icebreakers', *Arctic* 16(1) 1963, pp. 4-6.]
[471] Vaughan (2007): 201. It was on the *Yermak* that Vice-Admiral Stepan Makarov reached 81˚N 28' in 1899.
[472] John McCannon, *Red Arctic: polar exploration and the myth of the North in the Soviet Union, 1932-1939* (Oxford: Oxford University Press, 1998): 37-38.

the USSR made significant headway in developing the Northern Sea Route (NSR) that connects European Russia to the Bering Strait and the Pacific. Central to the state's plans for arctic transportation after the civil war of 1917-1919, the NSR was to be a northern parallel to the trans-Siberian railway that linked European Russia to Vladivostok along Siberia's southern margin. The first transit of the NSR was completed by Adolph Nordenskjöld in the *Vega* over two seasons, from 1878-1879, followed in 1914-1915 by Boris Vil'kitskii, captaining the Russian ships *Taimir* and *Vaigach*. Through much of the 1920s, the NSR's development was hindered by competition between the many agencies and commissariats assigned to the task. Competition for resources, manpower, and authority in northern Siberia led to an unsustainable drain on the region's ecological systems, resulting in the amalgamation of the state's many northern agencies under the Main Administration of the Northern Sea Route (GUSMP) in 1932. Though the 1920s witnessed some notable successes in terms of the NSR's physical infrastructure, including the construction of port of Igarka on the lower Yenisei – later a centre of Soviet forestry – these paled in comparison with the achievements of the GUSMP.[473] The period to 1936, covering the second Five-Year Plan, saw tonnage on the NSR rise from 136,100 to 271,100, with river traffic on the Ob, Yenisei, Lena, and Kolyma climbing from 57,300 to 160,000 tons.[474] When compared with the stagnation that typified marine transport in arctic North America, the NSR's subsequent history, even the low point of having half of its shipping fleet and all but one icebreaker locked in the ice during the winter of 1937, is one of remarkable achievement. This ultimately led to the USSR's effective application of interdependence sovereignty over its Arctic coastlines, transforming its frontiers into true Westphalian border and allowing it to exclude non-state actors such as the Hudson's Bay Company, which had remained an important provider of goods and services in Chukotka throughout the 1920s.[475]

In addition to its focus on arctic shipping, the USSR put great emphasis on the development of its arctic airlift capacity, which had also been pioneered during the

[473] John McCannon, 'The Commissariat of Ice: The Main Administration of the Northern Sea Route (GUSMP) and Stalinist Exploitation of the Arctic, 1932-1939', *The Journal of Slavic Military Studies* 20(3) 2007, pp. 396, 399-401.
[474] McCannon (1998): 56.
[475] Forsyth (1992): 264.

Tsarist era.[476] In 1932, the GUSMP operated six aircraft north of the Arctic Circle, clocking up 512 flying hours. By 1936, it had 125 aircraft recording 10,900 hours. This led to increases in both passenger numbers, up from 123 in 1932 to 5,423 in 1936, and freight haulage, which rose from 1,512 lbs. in 1932 to 90,723 lbs. in 1936.[477] As with the icebreaking fleet, these developments present a stark contrast with the relatively slow development of air transport in arctic America. Apart from the contract given to Ben Eielson in 1924 to deliver priority mail in Alaska, the United States' arctic colony saw little investment in its transportation infrastructure until Japanese threats in the Second World War made such improvements necessary for the movement of men and weaponry to the Aleutian front.[478] In Canada, the HBC and the handful of mining companies operating in the Mackenzie Valley pioneered subarctic air transport, though to nowhere near the same degree as the Soviet government across the water. As opposed to Soviet planners, who sought to create *permanent* bases and settlements in the North, the Canadian government and its commercial proxies saw aircraft as a means to locate, construct, man, and supply *transient* northern mines and lumbering camps from bases in the neo-European south, reinforcing arctic America's continuing socio-ecological dynamics by making it easier for neo-European actors to access non-European ecosystems without the need to establish and maintain costly permanent settlements.[479]

These advances in arctic interaction capacity led to an extension of hard territoriality in the Arctic Basin. Whereas imperial frontiers north of 60° remained highly permeable to international actors prior to the Second World War, states' investments in ice-capable ships and air infrastructure led to increasingly defined lines of demarcation as the century progressed, shifting the frontier of actively-patrolled sovereign borders north of 60°. The Japanese invasion of the Aleutian Islands during the Second World War was particularly important in this regard, leading to the construction of the first all-weather highway from the lower 48 states to Alaska and encouraging the construction of significant military infrastructure in this long-neglected American

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[476] William Barr, 'Imperial Russia's Pioneers in Arctic Aviation', *Arctic* 38(3) 1985, pp. 222-224. The first recorded flight north of the Arctic Circle was flown by Jan Iosifovich Nagurskii in 1914 as part of a search and rescue operation around Novaya Zemlya.
[477] McCannon (1998): 56-57.
[478] Joanne Mattern, *Alaska: past and present* (New York: Rosen Publishing Group, 2011): 31. Eielson was killed during a flight to rescue personnel on an ice-bound Russian ship in 1929.
[479] Ray (1990): 188-190. See also Trevor Lloyd, 'Aviation in Arctic North America and Greenland', *Polar Record* 5(35-36) 1948.

territory.[480] It is not coincidental that further increases in the USA's interaction capacity in Alaska coincided with the need to boost American interdependence sovereignty vis-à-vis the Soviet Union across the Bering Strait after 1947. Even then, however, the difficulty of ensuring full sovereign control over this massive and distant landmass led to considerable opposition to its full incorporation into the union in 1958, with even President Eisenhower opposing its claims to statehood.[481]

Social Technologies & EC: socialist identity & the GULAG

In Siberia, indigenous peoples played a key role as proxies in Russia's imperial international system by virtue of their effective occupation of the land. Following 1917, however, the new Soviet government of the USSR began to interfere with groups' internal affairs, pushing the region's imperial structures onto evolutionary pathways towards Westphalian statehood. While Canada, the United States, and Denmark focused on maintaining indirect control over their imperial peripheries, the USSR adopted novel social technologies to bridge the ecological gap that separated its neo-European and non-European territories, seeking to construct a 'socialist identity' among indigenous units to mirror that which it sought to create among its European populations. In the 1920s, these efforts centred around northern Siberia's fourteen *kul'tbazii* (cultural bases) and numerous 'red tents' (mobile cultural bases) supported by the Committee of the North – the state body charged with the welfare of Siberia's twenty-six 'Small Peoples of the North', a designation that included all indigenous groups of less than 50,000 individuals. These centres were generally unsuccessful insofar as they failed to convince native groups that what they offered was an improvement over traditional lifestyles, whose 'simpler' social and physical technologies continued to prove themselves resilient to ecological and social crises.[482] By the mid-1930s, when the Committee of the North was taken over by GUSMP, the goal of revolutionary cultural change was replaced by new imperatives: the destruction of opposition to Soviet authority and the harnessing of indigenous productive capacity to the state's economic goals. The state took aim at two groups: the indigenous elites that had developed out of the region's three hundred year-old imperial international

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[480] Claus M. Naske & Herman Slotnick, *Alaska: a history of the 49th state* (London: University of Oklahoma Press, 1987): 126, 131-133; Claus M. Naske, *An Interpretive History of Alaskan Statehood* (Anchorage: Alaska Northwest Publishing Co., 1973): 57-59; Grant (2010): 248, 271-273.
[481] Naske & Slotnick (1987): 154; Stephen Haycox *Alaska: an American colony* (London: C. Hurst & Co., 2002): 266.
[482] McCannon (1998): 50-52.

systems, and the shamans who were at the centre of indigenous spiritual life. In a northern extension of Stalinist *dekulakization*, both groups were branded class enemies. In their efforts to mobilize native resistance to these anti-Soviet forces, native women and the poorest members of native society were encouraged to access Soviet courts, symbols, and powers in order to undermine traditional institutions. By granting women and the poorest natives special access to Soviet power, the relationship between the imperial 'hub' and its indigenous 'spokes' shifted down the social hierarchy, weakening leaders' positions vis-à-vis their fellow natives.[483] In the end, however, this did not produce the revolutionary changes that Moscow had hoped for. Rather, thanks to the influence of path dependence, the advantages that women and the dispossessed gained from their improved access to external sources of authority were turned to bolstering their positions within their clans rather than to the subversion of traditional lifestyles.[484]

Moscow's attempt to close the gap between the processes and structures that defined Siberia's imperial international system and those that defined its European and neo-European heartland proved unsustainable. Unable to justify their expense, the GUSMP abandoned cultural projects aiming at the creation of a socialist identity, focusing instead on the economic goals set by the decade's parade of Five-Year Plans.[485] With this retreat, the systems of indirect, imperial governance that Soviet power had sought to replace bubbled back up to the surface, defying the Soviets' costly, decade-long struggle against them.

More lasting change was brought about by Stalin's decision to employ the state's growing prisoner population as a colonial vanguard to boost the state's Ecological Capacity in arctic and subarctic biomes. To an extent undreamed of in Tsarist Russia, prisoners became a disposable form of social technology, used to carry out the dangerous job of accessing isolated raw materials and laying the groundwork for subsequent Russian colonization. In a process unique in the history of Arctic settlement, the prison camps of the Main Administration for Prisons (GULAG) became the main population centres of northern Siberian, involuntary colonial archipelagos carved out of the tundra and taiga. Run on an 'eat-as-you-work' basis and concerned

[483] Slezkine (1993): 230-232.
[484] *Ibid*: 235-236.
[485] McCannon (1998): 53; McCannon (2007), pp. 394-395.

mainly with the construction of infrastructure and mines, this brutal system expanded from 23,000 inmates in 1929 to half a million in 1934. By the eve of the Second World War, its population had risen to two million prisoners for whose services the GULAG acted as a central clearing house, providing labour to a wide variety of government projects.[486] Typical of these were those of the gold-rich Kolyma basin in northeastern Siberia.

Operated by *Dal'stroy*, the Main Administration for Construction in the Far North, the Kolyma camps subsidized the high costs of construction, supply, and maintenance with disposable human capital. In temperatures that regularly dropped to -45˚C in January, prisoners were clothed poorly, fed poorly, treated abominably and died in droves, making it necessary to constantly 'top up' the population.[487] Of the 16,000 prisoners who travelled to Kolyma in its first year, only half are thought to have survived. On their way to Kolyma, all prisoners passed through Magadan on the northern coast of the Sea of Okhotsk, whose port, highway, and civic infrastructure they were forced to build.[488] In 1936, Magadan boasted a free population of 15,000, rising to 70,000 by 1939, nearly all of whom were dedicated to the supply, security, and support of Dal'stroy.[489] Both Dal'stroy and the GUSMP on which it depended for supply until the late 1930s were effectively 'states within states', operating as spokes on a new imperial wheel in a region whose ecological constraints had heretofore made neo-European settlement impossible.[490] They were thus the successors of the HBC and Speranskii's indigenous volosts, operating with almost total autonomy from the imperial metropole to which they owed final allegiance and for whom they were 'effective occupiers' of the Arctic Basin.

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[486] Hill & Gaddy (2003): 84-86; McCannon (2007), p. 407.
[487] This was an issue in GULAGs across Siberia, from the Urals to Kolyma. [James Harris, 'The Growth of the Gulag: Forced Labor in the Urals Region, 1929-31' *Russian Review* 56(2) 1997, pp. 269-270.]
[488] Anne Applebaum, *Gulag: a history of the soviet camps* (London: Penguin Books, 2003): 96-101.
[489] Robert Conquest, *Kolyma: the arctic death camps* (London: MacMillan Press, 1978): 108.
[490] McCannon (1998): 38-40.

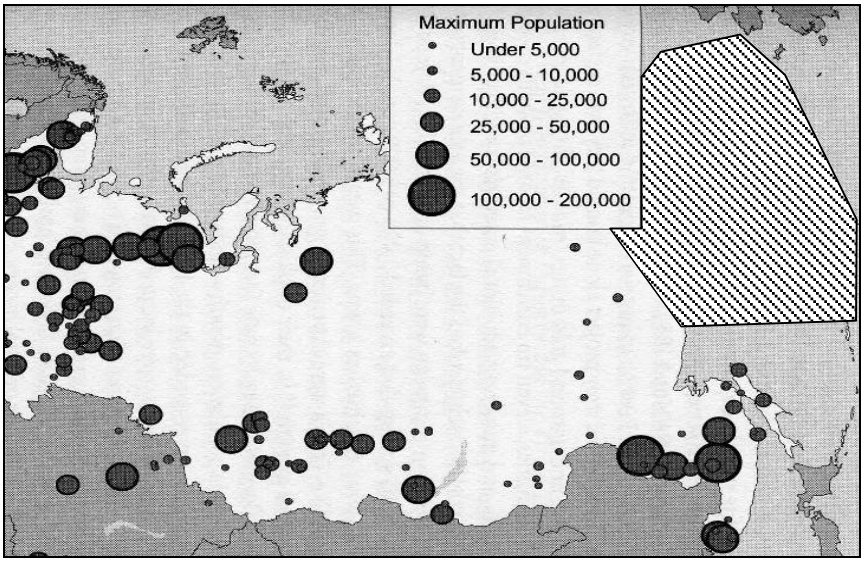

Figure 5.4 - Distribution of forced labour during the GULAG era, with Dal'stroy's region of responsibility at the height of its influence, stretching east of 140°E[491]

It is difficult to depersonalize the brutality of this system by treating it as just another form of social technology. Though beyond the scope of this project, the stories that emerged from the GULAG are disturbing in the extreme. In the cold light of history, 'social technology' may be the best description for a system that treated men and women as disposable tools, nails to be hammered and discarded. However, we would do well to take minute to consider the true costs of arctic development, which – as we will also see in Chapter Six – is often calculated in human lives and dignity as much as in rubles, dollars, and kroners.

The long-term impact of the prison camp system on the socio-ecological evolution of northern Siberia led to the growth of sizeable urban centres which, if not subsidized by the Soviet state, would not have been possible. This point is forcefully made by Hill and Gaddy and illustrated by a comparison of two maps from their work. Figure 5.4 illustrates the distribution of forced labour during the GULAG era. Figure 5.5 illustrates some of the associated urban centres remaining in modern Russia, indicating the lasting impact of Soviet penal servitude on the direction and development of permanent neo-European settlements in northeastern Siberia – already described in previous chapters as the most northerly and continental of Siberia's regions.[492] Like the HBC posts of Arctic Canada and the gold-producing towns of Alaska – including Juneau, Nome, and Fairbanks – the GULAG archipelagos described by Alexander

[491] Hill & Gaddy (2003): 85. *Dal'stroy* shading added by author.
[492] McCannon (1998): 177-178.

Solzhenitsyn were a colonial vanguard, carving out centres of neo-European settlement around which subsequent processes of nucleation took place.

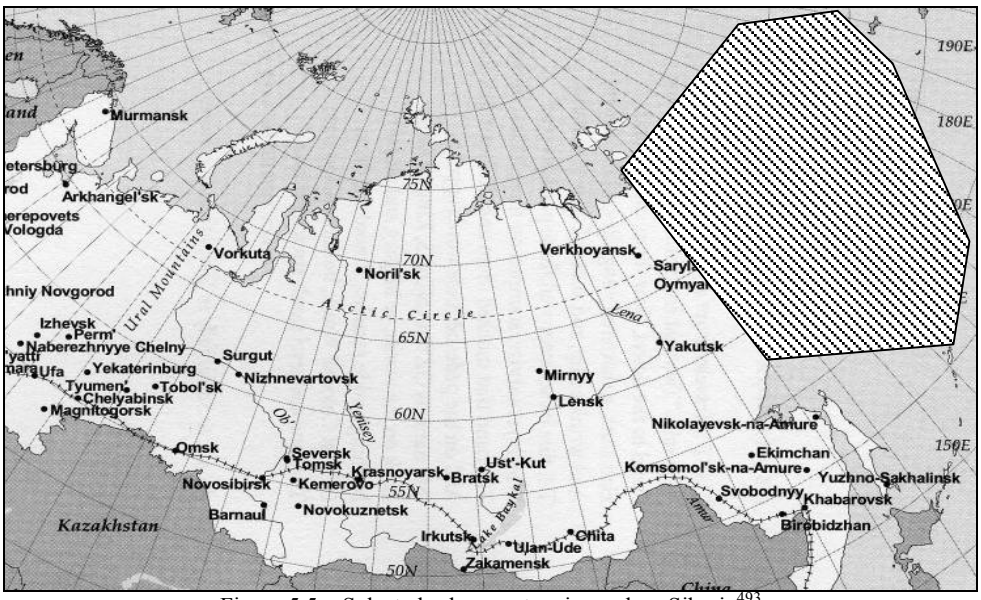

Figure 5.5 – Selected urban centres in modern Siberia[493]

Though incredibly costly in terms of human and financial capital, the GULAG experiment remains one of the most influential attempts to bridge the ecological bifurcation between the state's neo-European systems of southern Siberia and those of its non-European northern, continental uplands. It also illustrates the unsustainability of such experiments, which require constant subsidization in order balance local energy deficits. The GULAG's use of slave labour to overcome the adaptation costs associated with settlement in arctic and subarctic ecosystems is indicative of a structural division that developed between the Soviet Union and the capitalist states of North America during the Cold War era. While the Arctic's banded ecosystems continued to act as a source of convergent evolution around the rim of the circumpolar basin, political and socio-economic processes originating in Europe and its neo-European extensions after 1917 produced divergent trends on either side of the Bering Strait. These divergent trends mirrored the growing gap in the global international system between the principles of membership and behaviour that defined its capitalist and communist subsystems.

Once the divergent social pressures resulting from the Cold War were removed in 1991, Siberia's development was placed on a capital-intensive footing akin to that of North America. As a result, the gap that had separated the Asiatic and American arctic

[493] Hill (2003): frontpiece. Dal'stroy shading added by author

began to close. This spelled disaster for many of the arctic communities that had been supported by the USSR's politico-military system of resource mobilization since the 1930s. Between 1989 and 2002, the population of northern and eastern Siberia fell by an average of 14%. In the northeast – long recognized as the most non-European of the subcontinent's ecosystems – the drop was even more precipitous. Magadan, the gateway to the Kolyma, lost 53% of its population. Chukotka, at the extreme northeastern tip of Siberia, lost two-thirds of its inhabitants as Russian settlers flocked back to their preferred neo-European biomes.[494] The Soviets' arctic experiments in social technology and direct state control were expensive and unsustainable. Without a source of tradable energy with which to subsidize their high costs, large urban centres sank rapidly back into the tundra and taiga. Like Mangazeia three hundred years earlier, these boomtowns could not outlast their subsidies, leaving the units and systems of the area – who had come to rely on the state as a major provider of goods and services – either to develop new sources of energy or to evolve towards simpler principles, including the systems of indirect, imperial rule that the Soviet experiment temporarily submerged.

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Arctic states have deployed a number of physical technologies to mediate their Ecological Capacity and bridge the gap between their neo-European cores and non-European imperial peripheries. The impact of physical technology on the internal organisation of the region's dominant units has been mixed. In terms of their Vattelian-Westphalian and interdependence sovereignty, it has extended sovereign boundaries, allowing metropolitan capitals to replace imperial frontiers with Westphalian borders. In terms of domestic sovereignty, it has increased interaction between states' neo-European cores and their northern peripheries, boosting the energy allowances of the North's trade-dependent islands of colonial settlement. Other technologies have been less successful. Thankfully, the GULAG system at the heart of Stalinist development in northern Asia has become morally unjustifiable in the post-Cold War period. With the removal of the subsidies that supported its successor settlements, these have begun to sink back into the taiga and tundra from which they were carved by slaves of the state, a coevolutionary consequence of European units'

[494] *Ibid*: 119.

and systems' limited Ecological Capacity in the non-European biomes of the Arctic Basin.

Conclusion

The impact of Ecological Capacity on the evolution of the Arctic's imperial international systems has created a socio-ecological bifurcation around the circumference of the polar basin. Throughout the region, states' political and economic power clusters around European and neo-European biomes. The exercise of domestic sovereignty outside of these regions is left to subordinate indigenous and economic proxies – dependent on the metropolitan capital for economic sustenance or political legitimacy but possessing a degree of autonomy within the structure of their imperial systems. Relations between the Arctic's metropolitan capitals – Moscow, Washington, Ottawa, and Copenhagen – and the units in their northern, continental and upland hinterlands are therefore typified by a core-periphery dynamic in which units in biomes with relatively low NPP are subordinated to those enjoying higher levels of technologically mediated EC. This development began with Europe's initial entry into the region, when state actors were forced to exercise their authority through processes of indirect rule. This gave local collective actors significant de facto administrative powers in return for recognition of the metropole's sovereign rights, creating imperial international systems characterized by march-like frontiers and layered authority rather than the Westphalian model of hard territoriality and centralized sovereign control. As metropolitan actors deployed more sophisticated social and physical technologies, states found themselves better able to access and subsidize local NPP, permitting the development of denser populations and the northward extension of Westphalian principles of territoriality. These developments came at a significant cost, however, as witnessed by the precipitous decline of Siberia's colonial archipelagos – carved out of non-European biomes by forced labour and supported by state subsidies – following the collapse of the Soviet system.

This dynamic reflects the coevolutionary influence of Ecological Capacity on the international units and systems of the circumpolar basin, whose evolution since European contact reflects the ecological bifurcation of the circumpolar world. Resulting patterns of convergent evolution have led units and systems alike towards a shared set of international principles defining membership and behaviour in the

Arctic's regional international system – which itself constitutes a secondary international system generated and maintained by the imperial subsystems which inhabit it. This socio-ecological construct has proven remarkably durable, surviving even the divergent trends engendered by divisions within global international system during the Cold War. By shifting the socio-ecological structures on which the region's bifurcated processes and structures are based, GEC promises to be a more lasting force for change. As the axes of ecological productivity described in the last two chapters shift, so too will the principles by which membership and behaviour in this region systems are defined. The potential impact of these changes will be the main concern of our analysis in Chapter Six.

Chapter Six

The Socio-ecological Structure of the Contemporary Arctic International System

Chapters Four and Five have explored ways in which the Arctic's imperial international systems – and the secondary international system constituted by their interactions – have been influenced by the ecological contexts in which they are embedded.[495] Through a process of Socio-Ecological Coevolution, these interconnected international and ecological systems have generated sedimented social structures: system-wide principles of membership and behaviour that cause IR's collective actors to behave in ways that may be at odds with their internal processes. These define the Arctic as an international region distinct from the global system of which it is a part. This Chapter will explore these regional structures by reference to the ways in which its units are organized at the systems level: a very conventional definition of international structure from which some very unconventional conclusions can be drawn.[496] It finds that the Arctic is not a region of international anarchy. Neither is it a region dominated solely by modern states. Rather, it is a hybrid international system caught between competing sets of international principles. One is rooted in the region's specific international and environmental history and is best understood in terms of a set of several interacting *imperial hierarchies*, 'centred on, but not reducible to, states possessing sovereignty in the Westphalian model.'[497] The second is focused around a more conventional *state-system* constituted by the interactions of sovereign territorial units in a formally anarchic social environment.[498] The transition from one structural form to the other takes place across a socio-ecological ecotone that bisects the Arctic Basin – the defining feature of its biogeographical and international structures.

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[495] Crosby (1986): 5-7; Ernest Callenbach, *Ecology: a pocket guide* (Berkeley: University of California Press, 2008) second edition: 18.
[496] Waltz (1979): 80.
[497] Hobson & Sharman (2005), p. 71.
[498] Bull (1995): 8, 13. This definition intentionally conflates Buzan and Little's use of 'international systems' with Bull's definition of 'international societies' because, as argued throughout this project, a network of human interaction cannot exist without some degree of society emerging between its members. [James (1993), pp. 269-288.]

The Arctic international system has evolved structures that differentiate it from the wider global system of which it is a part. This makes it a distinct region within the global 'set of sets', with principles of membership and behaviour generated by the interaction of imperial international systems with and within the Arctic's bifurcated biogeographical structure. These interactions have produced a secondary state system defined by a combination of directly and indirectly ruled neo-European and non-European biomes, with isolated pockets of trade-dependent neo-European settlement scattered throughout the latter around valuable resource deposits. The Arctic Basin's biogeographical structure covaries with these *hierarchic* and *anarchic* social principles. The former – located in non-European biomes – diverge from global and European norms and are defined hub-and-spoke arrangements in which peripheral units' interactions are centred on, but not reducible to, their metropolitan cores. The latter – located in neo-European biomes and around trade-dependent colonial settlements – converge with the principles by which units and systems are organised in the global (née European) international system, particularly in terms of centralized sovereign control and hard territoriality.

This Chapter will approach the question of structure in the modern Arctic international system in two steps. First, it will describe the evolution of the modern circumpolar international system since the Second World War by reference to its organizing principles in the political and economic sectors.[499] This provides a human systems baseline against which to judge the impact of ecological transformations associated with GEC. Second, it will consider the future shape of the Arctic international system in light of anticipated changes to one of the key biogeographical structures of the region – the polar ice cap that has heretofore provided a relatively stable physical context around which the region's hybrid units, processes, and structures have evolved.

Biogeographical Determinants of International Structure

The balance between the Arctic's anarchic states system and its formally hierarchic imperial international systems has its fulcrum on a *socio-ecological ecotone* – a transitional zone that divides the region's agricultural and non-agricultural biomes and

[499] The timing of the modern era is asynchronous around the polar basin, starting earlier in Siberia (c.1930) than in the western Arctic (c.1945).

marks a shift from Westphalian to imperial forms of organisation. The ecotone metaphor is apt insofar as there is no clear point or line at which one type of system or unit is completely abandoned in favour of the other. The gradient between them varies depending on where and when one looks. It is a dynamic transition, shifting over time alongside *both* the ecological structures that have influenced its evolution *and* the social and physical technologies that give human populations the ability to mitigate the influence of their ecological contexts.

All four principles of Coevolution are in play in this socio-ecological process. First, human societies react to their ecological contexts by adapting technologies to address specific environmental challenges and opportunities. These technologies can be social or physical – GULAGs or airplanes. Second, ecosystems are altered by the social and physical technologies adopted by their embedded human populations, defining Coevolution's cyclical pattern of mutually effective social and ecological transformation. Third, the relative impact of ecology and humanity tends towards increasing human influence as our societies become more technologically sophisticated. Physical and social adaptations provide us with more powerful tools to mediate the impact of our ecological contexts, though often at the cost of higher energy requirements that must be met by subsidizing local energy deficits from the surpluses of other ecosystems. Finally, Ecology and IR react to one another's influences at varying rates, with effects radiating down each discipline's levels of analysis. This means that the planet's individual organisms and biological communities will react to human influences before the chemical and physical systems that support them.[500] Likewise, individuals will react to ecological influences more rapidly than international units, which in turn react more rapidly than the broader systems constituted by their interactions.[501] Thus, as individuals and units adapt their practices to meet ecological challenges and opportunities, the system-level social and ecological structures that constrain their behaviour remain relatively stable, contributing to the adaptive expectations discussed with reference to the constraints imposed on social evolution by path dependence.

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[500] Molles (1999): 303-304; Miller (1991): 63-65.
[501] Recall that international systems are dynamic social networks inhabited by units and constituted by their interactions. [Mann (1986): 1-5.]

Coevolution – expressed in Chapter Five in terms of Ecological Capacity (EC) – implies that the Arctic's hybrid international system has been constituted by the interactions of collective actors in the ecological context of the circumpolar basin. The impact of EC on the organizing principles of the Arctic international system has been profound. In ecological terms, the sovereign states at the heart of the Arctic's imperial international systems each possess material capacities that far exceed those of any other collective actors in the region. None of the littoral states under discussion in this project are *exclusively* or even *predominantly* Arctic in their constitution. Each straddles several biomes, with political and economic authority concentrated in southern ecosystems, beyond the taiga and tundra.[502] This gives them ready access to the ecological surpluses of neo-European biomes, allowing them to maintain complex organisations. These include functionally differentiated 'administrative, policing, and military organisations headed, and more or less well-coordinated, by an executive authority', with which they mobilize human and financial capital to directly administer and defend their territorial jurisdictions, reproducing themselves over time by a combination of coercive and capitalistic means.[503]

Historically grounded in late medieval and early modern Europe, these states' imperial expansion was heavily influenced by their socio-ecological preferences, products of their often path dependent histories. This has drawn them down particular evolutionary pathways suited to the ecological bases of their development: toward ecosystems in which agricultural producers can enjoy biogeographical conditions similar enough to those of Europe to allow for the successful cultivation of its familiar crops and livestock. These *Neo-Europes* tend to be found at temperate latitudes and include areas around the Rio Del Plata in South America, the fertile fringes of southeastern and southwestern Australia, most of New Zealand, the Cape of Good Hope, Siberia's southern belt of agricultural productivity, and a swathe of North America stretching from south of the boreal forest to the deserts of the American Southwest.[504] Though every European state's version of imperialism has been unique in its characteristics, the Russian and British examples that dominated the early modern Arctic were driven and sustained by agricultural settlement from the mother

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[502] Yvon Csonka et al., 'Societies and Cultures: change and persistence', in Susan Joy Hassol, *Arctic Human Development Report* (Akureyri: Stefansson Arctic Institute) 2004:45.
[503] Skocpol (1979): 29; Tilly (1985): 181-184; Tilly (1992): 14-15.
[504] Crosby (1986): 6-7. They can also include sites of higher elevation in the tropics, such as the Kenyan and Peruvian highlands.

country.[505] Ecosystems played at least two key roles in the expansion of their Arctic empires, as well as those of the successor states who took their places. First, they permitted the reproduction of metropolitan principles in neo-European colonies. Second, they defined the frontiers of Westphalian and imperial international principles.[506]

Unable to find neo-European ecosystems in which to base agricultural settlements, the states that expanded into the Arctic Basin were forced to abandon their preferred methods of colonization in favour of the two strategies described in Chapter Five: either carving resource-dependent colonial 'islands' out of non-European subarctic and arctic biomes, or making sovereignty bargains with semi-autonomous proxies who exercised domestic authority in return for maintaining the metropolitan state's international legal and Vattelian-Westphalian claims to the region. The first strategy has created non-contiguous extensions of metropolitan society, colonial archipelagos in a sea of trees and tundra. These have used technological adaptations – particularly trade – to mediate local energy deficits, acting as nodes of contact between imperial systems' European/neo-European cores and their non-European peripheries. The second strategy has produced imperial international systems characterized by hub-and spoke relationships between metropolitan cores and semi-autonomous units in the periphery.[507] The result has been a tripartite organisation of units, including:

1. the metropolitan state – the dominant unit of each imperial international system, based in a European or neo-European biome and possessing a high degree of Vattelian-Westphalian, interdependence, international legal, and domestic sovereignty;
2. the trade-dependent colony – a non-contiguous extension of the metropolitan state based in the non-European hinterland near a lucrative resource deposit which it exchanges for the ecological surplus of more productive biomes; and
3. the imperial periphery – a series of semi-autonomous units capable of sustained and effective occupation of non-European ecosystems, integrated into each

[505] Tom Griffiths & Libby Robin, *Ecology and Empire: environmental history of settler societies* (Edinburgh: Keele University Press, 1997): 66; Vaughn (2007): 361; Lieven (2002): 208-210.
[506] Eric Smith & Joan McCarter, *Contested Arctic: indigenous peoples, industrial states, and the circumpolar environment* (Seattle: University of Washington Press, 1997): xii.
[507] Buzan & Little: 246-247, 251; Motyl (1999): 120-121.

imperial international system via direct and unmediated relations with the metropolitan core.

Though relatively stable for the first three hundred and fifty years of European empire in the Arctic, constant changes to the social and ecological contexts in which this organisation is embedded has meant that the biogeographical structures on which the Arctic's regional international system is based have been ever-shifting, never reaching a 'steady state' of socio-ecological equilibrium. We would do well to remember the lessons of New Ecology discussed in Chapter Three. These teach us that as a population adapts to meet environmental challenges, it will necessarily alter the very environment that is affecting it. Remembering Heisenberg, it follows that neither human populations nor natural systems can achieve a final, optimal condition vis-à-vis their social or ecological contexts. Rather, both contexts and units will be constantly evolving due to their mutually constitutive relationships with the 'other side' of the socio-ecological equation.[508]

In the Arctic, this dynamic relationship has meant that the application of social and physical technologies to the requirements of the region's biogeographical structure has altered units' and systems' EC *and* the ecological contexts in which they are embedded. The Stalinist Soviet Union's use of GULAG labour as a form of disposable human capital is one particularly nasty example of this coevolutionary process in action, diverting rivers and destroying the taiga and tundra around it.[509] The application of physical technologies such as the icebreaker, the airplane, and the snowmobile has also boosted units' capacities to sustain complex organisations in relatively unproductive arctic and subarctic hinterlands. In coevolutionary terms, these physical technologies increase units' *interaction capacity* – a socially-contextualized source of explanation that can itself become a sedimented aspect of a socio-ecological system and, therefore, an important determinant of a unit's EC.[510] In the modern Arctic, physical technologies have radically improved units' and systems' abilities to move ideas, goods, and people across space. This has made the hinterland's trade-

[508] Zimmerer (1994), pp. 109-111; I. Scoones, 'New Ecology and the Social Sciences: What Prospects for a Fruitful Engagement?', *Annual Review of Anthropology* (28) 1999, pp. 481-483, 488-489.
[509] Paul Gregory & V. Lazarev, *The Economics of Forced Labor: the Soviet Gulag* (Stanford: Hoover Institution Press) 2003: especially chapters 6 & 7; Oleg Khlevniuk, *The History of the Gulag: From Collectivization to the Great Terror*, Trans. Vadim Staklo (New Haven CT: Yale University Press, 2004): 242-243, 335-337.
[510] Much as international processes can become sedimented aspects of interaction capacities, so too do interaction capacities becomes sedimented aspects of units' EC. [Buzan & Little (2000): 83.]

dependent colonial islands more sustainable by lowering the costs of interaction with the non-contiguous, productive biomes that provide the ghost acreage necessary for colonies' convergence with metropolitan structures.

The Arctic International Political System

The application of modern physical and social technologies to the non-European biomes of the circumpolar world has altered the tripartite structure of state, colony, and imperial periphery that heretofore defined the Arctic's regional international system. In the decades following the Second World War, states' increasing EC encouraged them to reverse earlier trends toward indirect rule over imperial hinterlands via local – often indigenous – proxies. Instead, the populations of the imperial hinterland were concentrated around outposts of state power such as collective farms and police stations. In the Soviet Union, the means by which this concentration was pursued followed in the well-trod, coercive pathways traced by earlier policies. This process was already underway in the 1930s through Moscow's intensive use of physical and social technologies to extend the state's reach in northern Siberia – already discussed in Chapter Five. The dekulakization of indigenous hunter-gatherer groups was the thin edge of the assimilationist wedge, which slowly drew more native units into state-managed hunting and herding kolkhozes and sovkhozes. Like other international processes before it, including the commodification of indigenous economies in subarctic North America during the eighteenth and nineteenth centuries, collectivization did not occur everywhere at once. Rather, it spread down the axes of ecological productivity that ran from South the North, from maritime to continental climates, and from river valleys and coastlines to tributary uplands. It was most successful among groups who lived in relatively productive niches that permitted sedentary and relatively differentiated organisations, such as those among the Yakut of the middle Lena.[511] It was far less successful in Siberia's marginal northern, continental, and upland biomes, where some HGBs, such as the Nenets-Samoyed and Even-Tungus, were able to maintain their nomadic lifestyles until the 1970s.[512]

Thanks to the social constraints imposed by their path dependent histories, the processes by which the imperial states on the North American Arctic tried to

[511] The impact of Coevolution on the distribution of these groups is discussed at length in Chapter Four.
[512] Forsyth (1992): 292-296, 314; Olson (1994): 160, 200-201, 225.

incorporate indigenous proxies into metropolitan institutions were dominated by capital-intensive methods. Commodified by the arrival of the fur trade in nineteenth and early twentieth centuries, the Inuit of the Canadian Arctic were actually discouraged from nucleating around trading posts and Royal Canadian Mounted Police stations before 1945. The position of the Hudson's Bay Company as Ottawa's de facto corporate proxy in the region gave it the power to unilaterally transfer native populations from location to location – a policy for which it looked to its Headquarters in London for approval rather than to the Canadian Parliament in Ottawa.[513] The HBC's economic priorities meant that it encouraged the Inuit's continued dispersal in small bands so as to increase the range of their trapping activities, maintaining 51 posts across the region by 1927. In comparison, the government maintained only seven RCMP stations in the same area.[514] This situation changed dramatically after 1945. The depletion of fragile arctic biomes by a wartime boom in fur production was disastrous for both Inuit trappers, who lacked other sources of trading capital with which to access the ghost acreage on which their commodified livelihoods increasingly relied, and for the HBC, which was financially incapable of providing welfare benefits to the entire native population of the North.[515] The advent of the airplane, the icebreaker, and the snowmobile also increased the state's capacity to directly rule its Arctic hinterlands – eventually overturning the HBC's policy of population dispersal in favour of concentrated settlements at which Canada's growing welfare state could provide centralized services to Inuit hunters.[516] The commodification of Inuit economies makes it difficult to say whether this process was driven by indigenous or state priorities.[517] Regardless, indigenous administration in Arctic Canada began to converge with the norms of the metropolitan state – a process permitted by the commodification of pre-international systems of exchange and by the state's growing capacity to maintain complex organisations in ecologically marginal biomes.[518]

Where Moscow, Washington, Ottawa, and Copenhagen had been content to use indigenous proxies as semi-autonomous 'effective occupiers' of the land in the early

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[513] Damas (2002): 29-30.
[514] *Ibid*: 27.
[515] Ray (1990): 226-228.
[516] Damas (2002):107-110; Frances Abele, 'Northern Development: Past, Present, and Future', in Frances Abele et al., *Northern Exposure: Peoples, Powers and Prospects in Canada's North* (Toronto: McGill-Queens University Press, 2009): 25-26.
[517] Yvon Csonka, 'Societies and Cultures: change and persistence', Niels Einarsson et al., *Arctic Human Development Report* (Akureyri: Stefansson Arctic Institute, 2004): 48.
[518] Vaughan (2007): 279-81.

modern era of Arctic IR, 1945 saw them begin to target groups' cultural and socio-economic distinctiveness, making them tools of state integration.[519] The indigenous peoples of Siberia, Canada, Alaska, and Greenland were shifted into state-sponsored settlements by a combination of coercive and capitalistic means, where they were exposed to assimilationist policies. Children, for example, were forced to attend residential schools where use of their language and culture was actively discouraged and the children themselves were exposed to shocking cruelty.[520] The 1950s and '60s also witnessed increasing colonization from the South as significant deposits of metals and hydrocarbons were discovered, swamping or displacing local indigenous groups in the neighbourhood of the resulting archipelagos of trade-dependent colonial settlement.[521] The same pattern of indigenous displacement occurred when and where the state saw its security – a primary politico-military resource during the Cold War – hampered by their presence. Such considerations led to the removal of Siberian Eskimos from their coastal villages in Chukotka in the early 1950s and to the removal of the Inughuit from the vicinity of Thule United States Air Force Base at Cape York, Greenland, in 1963.[522]

Even in the midst of this increasingly statist dynamic, the structural influence of indigenous groups' special status as 'effective occupiers' of the land on behalf of their metropoles lived on as a sedimented aspect of the Arctic's international system. In the summer of 1953, the Canadian government attempted to extend its effective occupation of the heretofore uninhabited Queen Elizabeth Islands in the northern Arctic Archipelago by the forced relocation of several Inuit families. As one government official said at the time, Canada was "anxious to have Canadians occupying as much of the north as possible and it appeared that in many cases the Eskimo were the only people capable of doing this."[523] Ten families were relocated from Pond Inlet (now Mittimatalik) on Baffin Island and Fort Harrison (now Inukjak) on the East coast of Hudson Bay to Resolute (now Qausuittuq) on Cornwallis Island and to Grise Fjord (now Ausuittuq) on the southern coast of Ellesmere. Unlike the

[519] Shewell (2004): 171-173
[520] Csonka (2004): 47-49; Truth and Reconciliation Commission, *TRC Interim Report* (Winnipeg: Truth and Reconciliation Commission, 2012): 4-7.
[521] Forsyth: 384; Else Broderstad et al, 'Political Systems' in Einarsson (2004): 87-88.
[522] Pamela R. Stern, *The Historical Dictionary of the Inuit* (Oxford: Scarecrow Press, 2004): 133-134; Olson (1994): 214; Grant (2010): 317-318.
[523] Alan Marcus, 'Out in the Cold: Canada's experimental Inuit relocation to Grise Fjord and Resolute Bay', *Polar Record* 27(163) 1991, p. 293.

communities from which they were removed, Resolute and Grise Fjord were located in the high arctic tundra – with desperately low NPP and up to three months of winter night. This was completely unlike the relatively productive subarctic marine ecosystems to which the migrants were accustomed. Moreover, many of those sent from Port Harrison were craftspeople rather than hunters, having recently established a successful carving industry on the shores of Hudson Bay.[524] The settlements survived due to the generosity of local RCMP detachments, a few hunters who happened to be included in the Grise Fjord party, and the presence of a military airbase near the settlement at Resolute, where Canada's 'effective occupiers' were forced to hunt for food and materials in the base's rubbish tips.[525] Ottawa's efforts in 1953 are evidence not only of its disregard for its indigenous population and ignorance of its own territory, but also of its continuing inability to mobilize sufficient EC in its imperial hinterland to integrate these units into the state-centred global international system of the metropolitan South. Only in a hinterland like the Arctic Archipelago could two tiny hamlets, composed of a few Inuit families, an HBC post, and an RCMP detachment demonstrate 'effective occupation' of over 400,000 km^2 of territory in the Queen Elizabeth Islands. When viewed from the perspective of the densely populated and intensively worked ecosystems of the neo-European south, these attempts at sovereign occupation are feeble. In the harsh ecosystems of the polar north, however, they were effective – emulating earlier 'sovereignty settlements' founded by the Russians at Novaya Zemlya with Nentsy hunters in the 1870s, and by the Danes, using Inuit, at Ittoqqortoormiit, East Greenland in 1924.[526] Each of these has since been accepted by the international community, with the Danish effort constituting a principal reason for its successful defence of its claim to the whole of Greenland at the International Court of Justice in 1933.[527] This acceptance is indicative of the Arctic's atypical status in international law and the failure of its littoral states to integrate the region completely into the structures of the global international system.[528]

Even as states used their increasing EC in the North to alter the terms of their proxy relationships with the indigenous peoples of the region – making them adjuncts to the

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[524] *Ibid*, pp. 286, 290.
[525] Grant (2010): 319-322; Marcus (1991), pp. 287-289.
[526] Semyonov (1963): 374; Vaughn (2007): 269-270.
[527] Grant (2010): 240-241.
[528] The Arctic's special status in international law will be discussed further with reference to territoriality and the United Nations Convention on the Law of the Sea (UNCLOS) later in this chapter.

region's islands of colonial settlement and thereby undermining their semi-autonomous status – they also sought to expand their colonial archipelagos. The Soviet Union, whose centrally-planned economy allowed it to allocate financial and human capital wherever it chose, created and maintained the largest of these island chains by executive fiat; their settlement policy being driven mainly by the politico-military sector.[529] When the human tragedy of the GULAG proved to be no basis for sustained colonial occupation, the Soviet state turned to central planning and direct subsidization to meet its settlement goals.[530] These sought to recreate Soviet industrial society in non-European ecological contexts, harkening back to the 'Engels Dictum' discussed in Chapter One.[531] Throughout the Soviet era, scattered arctic and subarctic settlements were founded and expanded in order to fulfil this ideological ambition. Like the GULAGs on whose bones they were built, these new archipelagos were located near significant natural resources: gold in Kolyma, nickel and platinum in Noril'sk, diamonds at Mirny, and oil and gas at Urengoi. These were far larger than similar resource colonies in Alaska, Canada, and Greenland, with permanent family habitation being preferred to the transient mining camps that predominated in the West.[532] With their populations sometimes reaching over 200,000 people, Siberia's Arctic cities depended on massive quantities of imported food and manufactures to make up their local resource shortfalls – the same kind of ghost acreage that had been the basis of the HBC's Bayside posts and imperial Russia's fur-trading boom towns.[533]

The consequences of the end of the Cold War and the collapse of the Soviet economy make it clear that the Russian state has not escaped the biogeographical constraints imposed on it by Siberia's ecological context. Despite the fact that their development was driven by central planners rather than market forces, many of Siberia's settlements fit snugly into the boom town-bonanza deposit model described in Chapter Five. It is worth reminding ourselves of the conditions in which such complex units might be forced either to revert to simpler forms of social organisation – most often by shrinking

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[529] Georgi Derluguian, 'A Tragedy Arising From Success', *Problems of Economic Transition* 49(9) 2007, p. 5.
[530] Hill & Gaddy (2003): 83; Jacob Greenberg, 'The Arctic in World Environmental History', *Vanderbilt Journal of Transnational Law* (42) 2009, pp. 1355-1356.
[531] Hill & Gaddy (2003): 88-89. The Engels Dictum asserts that, "Capitalist industry has already made itself relatively independent of the local limitations arising from the location of sources of the raw materials it needs…Society liberated from the restrictions of capitalist production can go much further still… in so far as it is conditioned on the most equal distribution possible of modern industry over the whole country." [Engels (1947)]
[532] Robert North, 'The Transport Situation in Russian Far East', in M.J. Bradshaw, *The Russian Far East and Pacific Asia: unfulfilled potential* (London: Curzon Press, 2002): 75
[533] Hill & Gaddy (2003): 99-100, 148-149.

their population in order to reduce their energy deficits – or face the risk of complete collapse. This can occur (i) when the resource base upon which they depend deteriorates due to human mismanagement, or (ii) when trade is disrupted by an environmental shift.[534] Magadan, the gateway to the mineral-rich Kolyma basin, is one such settlement. From its founding in 1929 as gateway to the Kolyma camps, its existence hinged on the ecological surpluses of other biomes to subsidize the enormous energy deficits generated by its population of over 150,000. The collapse of the Soviet system in 1991 abruptly altered Magadan's social environment – undermining the politico-economic structures that had delivered the bulk of its ghost acreage. As expected of a boom town shorn of its resource base, the city and its surrounding region shrank rapidly, losing over half of its population between 1989 and 1999. The rural population of the oblast around it shrank even more rapidly as outlying villages that relied on Magadan as a resource magnet were cut off and their populations shifted into town. This simplified the regional resource picture by consolidating the oblast's population around a developed trade hub, lowering the overall costs of supply.[535] Even so, the average food basket in Magadan cost 1,601 rubles in 2002, third in the Russian Federation only to Anadyr in Chukotka (r.2,823) and Petropavlovsk-Kamchatski (r.1,762), and well above the national average of r.955. Supplying Siberia's northern settlements remains problematic, with the costs of their upkeep totalling over half a billion dollars annually – four times the costs associated with transportation and supply in the European and neo-European core.[536]

The same boom town dynamic affected the military settlements created by the United States during the Cold War – another variation on the theme of state-subsidized colonial archipelagos. Bases such as Eielson AFB in Alaska and Thule AFB on Greenland were built as providers of a social commodity – security – and existed *despite* their ecological surroundings rather than *because* of them.[537] Around 1960, with the Cold War at its height and bombers playing a central role in the American nuclear deterrent, these self-contained urban centres were home to over to 10,000 military personnel each.[538] In the wake of 1991, both bases' went into decline. Thule,

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[534] Tainter (1988): 44.
[535] Timothy Heleniak, 'Demographic Change in the Russian Far East', in M.J. Bradshaw (2002): 142-144
[536] Hill & Gaddy (2003): 124-126.
[537] *Ibid*: 89.
[538] Naske & Slotnick (1987): 131; Greenberg (2009), pp. 1368-1369; Dan Cragg, *Guide to Military Installations*, 6th Ed. (Mechanicsburg PA: Stackpole Books, 2000): 8-9; Grant (2010): 315.

located in the high tundra of Cape York, was especially hard-hit, and is now reduced to around 600 inhabitants.[539]

Only two types of Arctic settlement have escaped this precipitous post-1991 decline: (i) islands of colonial settlement located near bonanza deposits of valuable commodities, and (ii) those inhabited by the region's indigenous groups. The persistence of these familiar units is indicative of Ecology's continuing influence on the organisation of units in the region. In Western Siberia, enormous oil and gas reserves in fields such as Samotlor and Urengoi supported the growth of trade-dependent boomtowns based on hydrocarbon extraction as early as the 1970s. Noyabyrsk and Novy Urengoi, both settlements situated in the Yamalo-Nenets autonomous region near the mouth of the Ob River, date from the discovery of the Urengoi gas field in the mid-1970s and have maintained relatively stable populations of around 100,000 each. Noril'sk, a former GULAG settlement dating from 1935, has also survived thanks to its position near another bonanza deposit – in this case one of the world's largest nickel-copper deposits. After losing a quarter of its Soviet-era population between 1989 and 2002, it has now stabilized at around 135,000 people.[540] Though still overpopulated by between 14% and 30% when compared to Alaska, the Canadian Arctic, and Kalaallit Nunaat, the population dynamics of Siberia's colonial archipelagos are gradually converging with those of the Western Arctic: turning to market-led growth around trade-dependent boom towns in lieu of experiments in direct state subsidization.[541] This ongoing reorganization of population in the arctic and subarctic Siberia has proceeded along the three axes of ecological productivity described in Chapter Four, with migrants leaving northern, continental, and upland ecosystems for sites enjoying more southerly, maritime, and riverine – i.e. neo-European – biogeographical conditions.[542] The ecological structure driving this development is essentially the same as that which drove early the bifurcation of the Arctic's imperial international systems: the presence or absence of neo-European biomes. Though the units of the twenty-first century global international system

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[539] United States Air Force. *Newcomer's Welcome Pack, Thule Air Base Greenland, Home of the 821st Air Base Group*. 2011. [online] Accessed 13 January 2012: 3. <www.peterson.af.mil/shared/media/document/AFD-100412-027.pdf>.
[540] Dmitry Bogoyavlenskiy, 'Arctic Demography', in Einarsson (2004):30-31; Vaughn (2007): 244.
[541] Elena Nuykina, *Resettlement from the Russian North: an analysis of state-induced relocation policy* (Rovaniemi: Sevenprint, 2011): 21-22 [online] accessed Jan 3, 2012 <http://www.doria.fi/bitstream/handle/10024/72513/AKreport55_electronic110808.pdf?sequence=1>; Hill & Gaddy (2003): 205-206.
[542] Heleniak in Bradshaw (2002): 142-143.

certainly possess more EC than their nineteenth and early twentieth century forbearers, they cannot escape their ecological contexts. Units, and the systems constituted by their interactions, can only mediate constraints arising from the ecosystems in which they are embedded, and even then only at considerable cost in financial and human resources.

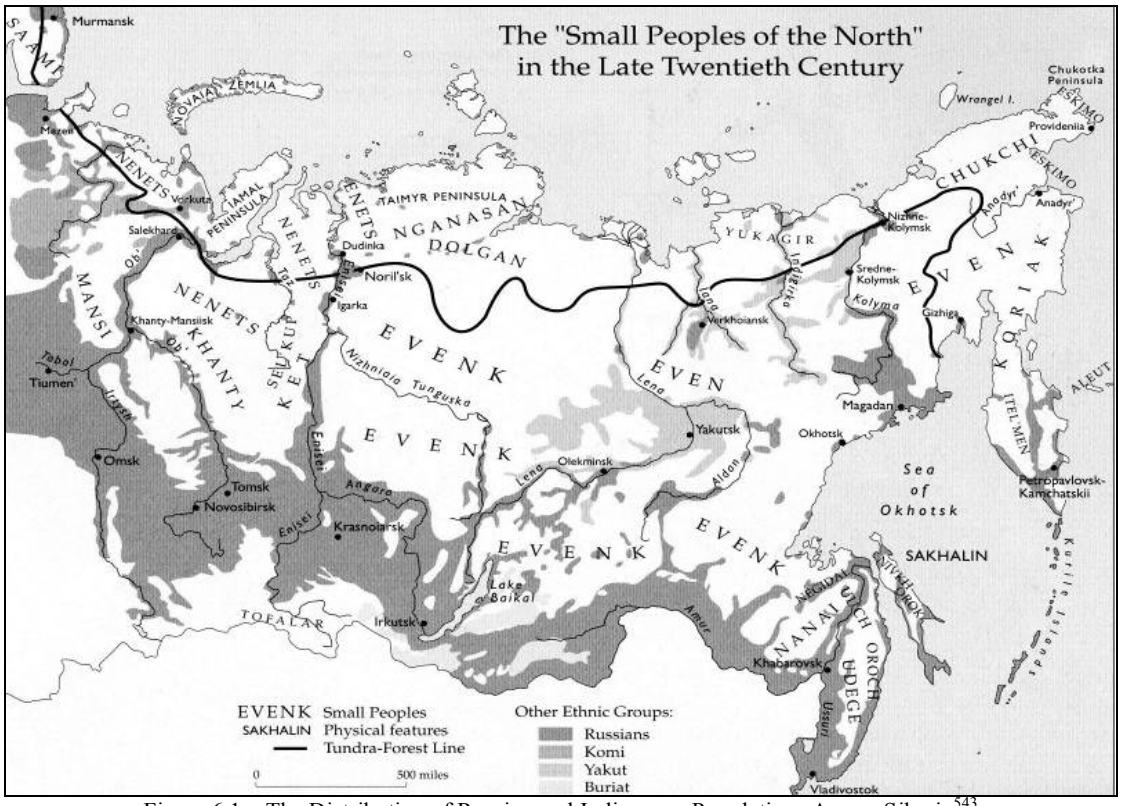

Figure 6.1 – The Distribution of Russian and Indigenous Populations Across Siberia[543]

The stability of indigenous populations in post-1991 Siberia is remarkable given the contemporaneous decline in European settlement. In Chukotka, which lost 76% of its total population between 1989 and 2003 (dropping from 148,301 to 35,300), the indigenous population actually increased by 15% from 15,903 to 18,300.[544] Although Siberia's Small Peoples of the North remain swamped by its urban European settlements, making up just over 4% of the total population, their numbers have experienced steady growth since the 1970s, standing at around 90,000 as of the 2002 census.[545] Moreover, their distribution continues to give them local majorities away from the centres of Russian settlement – an area that covers the vast majority of Siberia's landmass. (see fig. 6.1)

[543] Slezkine (1993): xvi.
[544] Csonka (2004): 52.
[545] Olson (2004): 753-757.

The survival of indigenous actors through the assimilationist period of Arctic international history that ran from 1945 and 1970 led to their eventual re-emergence as semi-autonomous actors in a hybrid international system balanced between anarchic and hierarchic structural forms. The state-building period of the Cold War certainly had a major impact on the 'system of empires' that preceded it.[546] Metropolitan states' efforts to integrate their imperial hinterlands into the neo-European mainstream concentrated indigenous groups in settled communities and radically altered their socio-economic systems, linking them more directly to those of the European and neo-European core. The effects of these changes were unexpected and contradictory. Far from deleting the differences between core and peripheral units, they recreated a new form of imperial hierarchy for the modern age: a hybrid structure in which expanded archipelagos of colonial settlement replaced isolated islands, with indigenous peoples taking a central role in defining their extent. This produced a new distribution of units to replace the early modern period's rather neat tripartite division of neo-European metropolitan states, non-contiguous and trade-dependent colonial islands, and semi-autonomous imperial proxies inhabiting non-European hinterlands. In its place arose a much messier situation in which Arctic states share the domestic and international stage with a variety of functionally differentiated sub-state and imperial units organized in structures reminiscent of earlier hub-and-spoke arrangements, with peripheral actors possessing varying degrees of domestic and international autonomy in highly asymmetric federal systems.

The first inkling of this hybrid structure arose in Alaska in 1971, with the passage of the Alaskan Native Claims Settlement Act (ANCSA). ANCSA has its roots in the discovery of significant oil and gas reserves in arctic North America in the late 1950s, which began to unravel the metropolitan state's uncontested power in the region by introducing powerful new actors into the imperial international system that it had heretofore dominated. Multinational corporations proved unlikely allies for Alaska's embattled native peoples, who had been using the 'Indian Title' provisions in the Alaskan Statehood Act of 1958 as a lever against industrial development on traditional lands.[547] Repeated attempts to settle indigenous land claims in the decade after

[546] This concept has been adapted from Paul Keal, who discusses the European international society during the time of imperial expansion as a 'society of empires'. [Keal (2003): 41-43.]
[547] Naske & Slotnick (1987): 192-198. Alaska's natives used this lever to good effect, blocking the Atomic Energy Commission's plans to use a nuclear warhead to blow a harbour into the West Coast of Cape Thompson in 1960 and

statehood floundered: caught between Alaska's indigenous hinterlands – whose inhabitants held ill-defined de jure rights to the land – and Alaska's islands of colonial development – whose inhabitants controlled the state government. While the former sought to maintain their rights to the land and gain access to the resource wealth flowing from Alaska's commodity sector, the latter opposed any step that might limit access to what they saw as an untouched resource hinterland – an economic *terra nullius*.[548] Unable to construct pipelines or wells following oil discoveries at Prudhoe Bay on Alaska's North Slope in 1968/69, oil and gas companies lobbied the federal government to cut this Gordian Knot, leading to the passage of ANCSA in 1971.[549] The same state-MNC-indigenous dynamic had much to do with the gradual devolution of sub-state power to various indigenous groups in Canada's Northwest Territories, a process that also evolved out transnational companies' need to settle land claims disputes during the Mackenzie Pipeline debate of the late 1970s.[550]

Drawn up without any direct consultation with indigenous landholders, ANCSA was intended to extinguish native claims to 90% of Alaska's 400 million acres of land.[551] It created a dual system of native governance that empowered more than 200 native villages to claim up to 40 million acres of land, and provided US$925million dollars in compensation from the federal and state governments, amounting to about two dollars and fifty cents and acre.[552] This money was distributed to indigenous villages by twelve regional corporations, a new form of indigenous-controlled sub-state actor whose internal constitutions were modelled on private-sector firms rather than public or tribal governments. (see fig. 6.2) They were to be run by local communities, and were made responsible for investing the 2% royalty indigenous groups were to receive from resource production and rents on the 103 million acres of lands conveyed to the state government by the Statehood Act of 1958.[553] ANCSA is interesting to this project insofar as it signalled a return to the asymmetrical treatment of indigenous and European units by state actors who, for the previous twenty-five years, had pursued

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the construction of a 162 meter high, 1.4 kilometer long dam at the Ramparts Canyon on the Yukon River that would have created a lake with a surface area greater than the state of New Jersey. [*Ibid*.]

[548] Stephen Haycox, *Frigid Embrace: politics, economics and the environment in Alaska* (Corvallis: Oregon State University Press, 2002): 94.

[549] Grant (2010): 358-359; Naske & Slotnick (1987): 208.

[550] Charles Emmerson, *The Future History of the Arctic* (New York: Public Affairs, 2010): 186-187.

[551] The Alaskan Federation of Natives (AFN), formed in 1966, was active as a lobby in Washington but had no formal role in the creation of ANCSA. [Naske & Slotnick (1987): 20, 205-208.]

[552] Thomas Berger, *Village Journey: the report of the Alaska Native Review Commission* (New York: Hill and Wang, 1985): 24.

[553] Haycox, *Frigid Embrace* (2002): 98-99.

assimilationist goals. By providing Alaska natives with independent financial capacities, ANCSA allowed Alaska's indigenous-controlled regional corporations to become key financial contributors to several transnational non-governmental organisations – particularly the Inuit Circumpolar Conference (ICC), a transnational non-governmental organisation that represents the interests of Inuit and Eskimo people from Siberia to the Denmark Strait.[554] Although one of ANCSA's purposes was to commodify Alaska's native people – a move intended to integrate its imperial hinterlands into the colonial archipelagos that dotted the region at the time of its signing – it set the stage for a general pattern of sovereign devolution that would gain pace with the end of the Cold War and eventually lead to the asymmetrical federalism that typifies the structure of new hybrid imperial systems in the Russian Federation, the United States, Canada, and Kalaallit Nunaat-Denmark.[555]

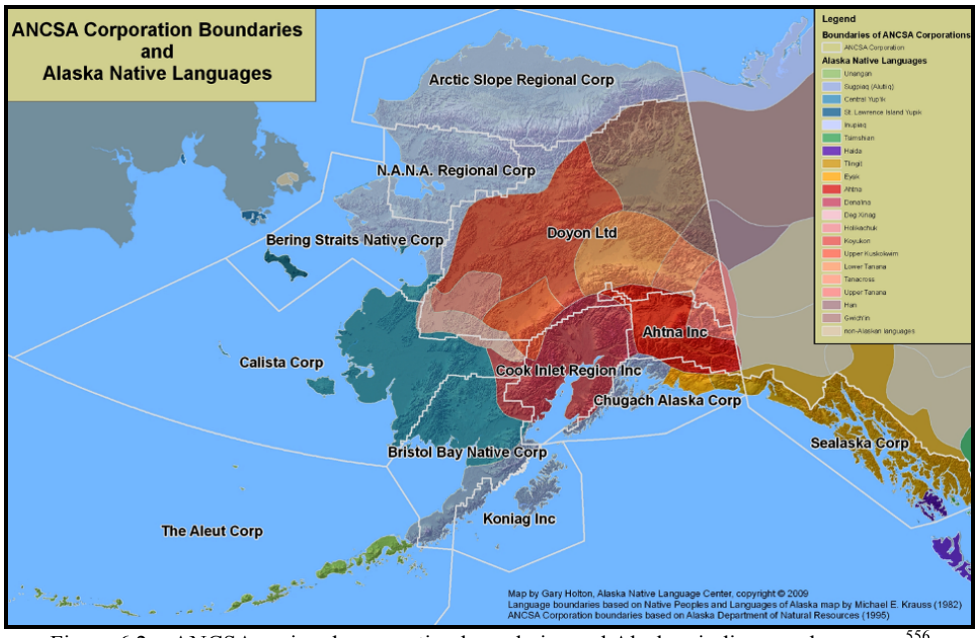

Figure 6.2 – ANCSA regional corporation boundaries and Alaskan indigenous languages[556]

A key feature of this asymmetric federalism is that its hierarchically and functionally differentiated units are neither ethnically nor territorially defined. Modern Alaska retains a dual structure for indigenous governance based on the financial capacities of its regional corporations and the domestic autonomy of its native villages. These indigenous units, in turn, operate alongside the public government of Alaska, to whose legislature they elect representatives, but from whose decisions they possess

[554] Grant (2010): 368-372.
[555] Else Broderstad (2004): 87-88; Csonka (2004): 48-49.
[556] Gary Holton, *ANCSA Corporation Boundaries and Alaska Native Languages*, Alaska Native Language Centre, 2009 [online map]. Accessed September 1, 2011. <http://fairbanks-alaska.com/images/ancsa.png>.

significant independence.[557] This multi-layered system of governance puts villages and corporations alike into direct, unmediated relationship with the metropole in Washington and is reminiscent of the proxy relationship between Canadian First Nations and the Crown. Like the treaties that extinguished native title across swathes of Canada, ANCSA was intended to help assimilate Alaska's imperial hinterlands into the metropolitan state. Instead, it became a tool with which the indigenous people of the imperial hinterland have gained control of their domestic sovereignty, becoming an instrument of indigenous autonomy as much as a means of imperial integration.[558] Such tension is only possible in a system that is at once based on the interaction of sovereign states in an anarchic states-system *and* the presence of underlying imperial hierarchies in which functionally differentiated units divide sovereignty among their overlapping domestic jurisdictions. It signalled a return to the imperial international systems by which arctic states had previously ruled their Arctic peripheries, granting significant autonomy to local 'effective occupiers' of the land in return for the latter's recognition of the metropole's right to Vattelian-Westphalian sovereignty and banal lordship.

The Arctic's indirectly ruled imperial hierarchies and its experiences of state power are products of the coevolutionary processes that link human populations to the ecological systems in which we are embedded. Without the region's specific environmental history, which stretches back much farther than the scope of this project, its hybrid international system – a secondary international system in the Wightian sense of the term – could not have developed as it did. Over the past four hundred years, the interaction of European actors with and within the Arctic Basin's ecological context has produced a hybrid international system in which Arctic states sit at the centre of asymmetric confederations in which peripheral units are granted different rights depending on their position in the social and ecological structures of the region.[559] Home Rule on Greenland became law on May 1st, 1979, giving the residents of the island – regardless of ethnicity – considerable rights to domestic sovereignty while retaining Copenhagen's exclusive control over foreign affairs, defence, citizenship, and banking. This de jure ban on international action did not stop Greenland from

[557] Broderstad (2004): 95.
[558] Grant (2010): 416.
[559] In terms of international law, this might be perceived as a combination of jus solis (rights conferred by location) and jus sanguinis (rights conferred by blood). One cannot explain the special rights conferred on sub-state units in the Arctic without reference to both. [Broderstad (2004):93-95.]

pressing Copenhagen to negotiate the island's exit from the European Community in 1985 over disputed EC fishing quotas.[560] Using the threat of secession as a lever against the metropolitan state – a threat supported by the island's history of colonial rule and precedents in international law relating to the independence of post-colonial polities – the Home Rule government effectively realigned its regional focus from Europe to North America.[561] This process was facilitated by the ICC whose socio-cultural importance to the 88% of Greenlanders who identify themselves as Inuit had an direct impact on the island's international realignment away from its European metropole and towards its socio-cultural cousins in North America.[562]

In Canada, several layers of public and indigenous government have been established that represent the Arctic's imperial hinterlands, its indigenous Arctic populations, and its islands of colonial settlement. Geographically, the largest public government in Canada is Nunavut, a territory established in 1999 following over three decades of negotiations with Ottawa. It covers 2.1 million square kilometers and has a population of 27,000 spread over 25 incorporated communities. 85% of its population is Inuit, though its government is designed to represent all of its ethnic communities. Like ANCSA, the Nunavut Agreement saw the Inuit extinguish their claims to the majority of the territory's land (82%) in return for a cash settlement of CAN$1.15billion, co-management rights over resource decisions, and enduring resource royalties.[563] These royalties do not flow to the territorial government, which remains dependent on Ottawa for its operating budget and has no direct claim on land or resources.[564] Instead, they accrue to a private Inuit corporation on the Alaskan model: Nunavut Tunngavik Ltd.[565] This dual system of public and indigenous governance highlights the complex and overlapping nature of the region's modified imperial relationships, with multiple layers of overlapping authority operating in direct relationship to the metropolitan core rather than via the clear (if contested) hierarchies of local, provincial, and federal administrations that dominate southern Canada.[566] Earlier

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[560] Nigel Bankes, 'Legal Systems' in Einarsson (2004): 102-103; Lisa Lyck & Jorgen Taagholt, 'Greenland – Its Economy and Resources', *Arctic* 40(1) 1987, p. 52.
[561] Sheldon Kamieniecki & Margaret Granzier, 'Eco-cultural Security and Indigenous Self-Determination: moving toward a new conception of sovereignty', in Karen Litfin, *The Greening of Sovereignty in World Politics* (Cambridge MA: MIT Press, 1998): 258-259.
[562] Grant (2010): 395; Bogoyavlenskiy (2004):: 29.
[563] Vaughn (2007): 292; Richard Caulfield, 'Resource Governance', in Einarsson (2004): 130.
[564] Bankes (2004): 115.
[565] Nila Aarsæther et al, 'Community Viability' in Einarsson (2004): 143.
[566] Broderstad (2004): 93-95.

agreements in Northern Quebec, the Northwest Territories, and the Yukon established similar dual structures of indigenous governance. In these small-scale predecessors to the Nunavut Agreement, the co-management of resources between indigenous and public governments have given the Inuvialuit, Dene, and Innu peoples newfound financial levers to go with the de jure domestic autonomy guaranteed by their unmediated treaty relationship to the Crown.[567] Territorial governments, meanwhile, possess few rights vis-à-vis the federal government. Only the Yukon had any rights to publicly owned resources, with decreasing powers as one moves to the Northwest Territories (now focused around the Mackenzie River watershed), Nunavut and, finally, Nunavik on the Ungava peninsula. Thus, sub-state units' positions in Canada's asymmetric federal hierarchy (an imperial structure in all but name) evolve differently along the three axes of ecological productivity described in chapters Four and Five, with the unitary power of public government increasing as one moves from the barren lands of Nunavik and Nunavut into the increasingly productive biomes of the Mackenzie and Yukon rivers.[568] Moreover, though indigenous groups possess guaranteed rights to self-government, the region's territorial governments enjoy no such powers – their decisions being subject to overrule by the Department of Aboriginal and Northern Affairs and the federal parliament in Ottawa.[569] Each of these relationships is indicative of the core-periphery distribution of power that links the various actors that inhabit Canada's asymmetric federal system - itself a product of the biogeographical structures that have led Canada to adopt policies that repackage nineteenth and early twentieth century systems of indirect, imperial rule for the modern age.

In the Russian Arctic, indigenous peoples lack the absolute demographic majorities that they enjoy in much of Alaska, Canada, and Kalaallit Nunaat, making up 90,000 of the region's almost 2 million inhabitants. This has left them with far fewer levers with which to regain the autonomy they lost to the state in the Soviet period. As a result, the return to indirect rule following 1991 empowered territorial public governments rather than the 'Small Peoples of the North', shifting proxy authority to representatives of the various sub-state units whose primary concern was for the development of

[567] *Ibid*: 81. At the same time, they are indicative of the continuing gap between the industrial resource extraction industries of the Arctic's trade-dependent colonial islands and the neotraditional economies of the imperial hinterland. This gap will be discussed further in the next section.
[568] Bankes (2004): 113.
[569] Broderstad (2004): 91; Bankes (2004): 109, 112.

Siberia's colonial islands rather than for the return of control over land, culture, and resources to the indigenous inhabitants of Siberia's non-European hinterlands.[570] Nevertheless, thanks to international developments in other parts of the Arctic Basin, Russia's Small Peoples of the North have been able to mobilize transnational support for their positions via their membership in the Russian Association of Indigenous Peoples of the North (RAIPON), a permanent participant in the Arctic Council and a working partner of the other indigenous NGOs in the region – the ICC, the Aleut International Organisation, the Arctic Athabaskan Council, Gwich'in Council International, and the Saami Council. This transnational support has allowed indigenous groups in Russia to access the political and financial resources of more empowered indigenous units in Alaska, Canada, and Kalaallit Nunaat, boosting their ability to effectively lobby their public governments to grant – or uphold – their limited rights to self-government. In 2000, these efforts resulted in passage of laws "On General Principles of Organizing Communities of Indigenous Minority Peoples of the North, Siberia, and the Far East of the Russian Federation". These recast Tsarist-era *obshchinas* – communes dating from the emancipation of Russia's serfs in the nineteenth century – as tools of indigenous autonomy, allowing them to petition the federal state directly for access to 'territories of traditional use'. Though often ignored by regional sub-state actors answering to Russia's islands of colonial rule, this gave indigenous people a 'direct line' to the metropolitan core of Russia's asymmetric federal system – a potentially powerful tool in the pursuit of land rights and self-government.[571] The recentralization of state power by Vladimir Putin since 2000 has made this unmediated, imperial relationship all the more important as increasing decision-making power flows back to the metropolitan core at the expense of the territorial governments who most often ignore indigenous units' rights.

The re-emergence of indigenous groups as semi-autonomous actors within asymmetric federal structures is mirrored in their growing role on the international stage. The status of the ICC, Saami Council, RAIPON, Aleut International Association, Arctic Athabaskan Council, and Gwich'in Council International as permanent participants in the Arctic Council – the premiere intergovernmental organisation responsible for

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[570] Broderstad (2004): 92-94. The Small Peoples of the North, a category developed in the 1920s, include any indigenous group of less than 50,000 people who petition the central government for special status as a protected nationality within the Russian Federation. [Slezkine (1993): 1; Forsyth (1992): 244-245.]
[571] Bankes (2004): 108-109, 112.

coordinating political, economic, environmental, and socio-cultural activities across the polar basin – is unique in the international community.[572] Their demographic majorities outside the Arctic's main cities gives them considerable influence over government policies on topics dealing with their traditional concerns – particularly where their rights to traditional land use are supported by domestic and international law, including questions of pollution, resource management, and cultural rights.[573] This influence does not extend to the military sphere, which cannot be discussed at Arctic Council meetings – a tension in the Council's mandate that reflects its dual role in Arctic IR.[574] For the region's imperial states, it is a means of ensuring their control over regional cooperation. For indigenous participants, it is a forum to air grievances and suggest solutions directly to federal governments – bypassing the intermediary, sub-state actors who normally mediate federal relationships.[575] Once again, this tension illustrates the two faces of the Arctic international system – one looking to the sovereign state model that dominates global IR, the other to a regional model of hierarchical imperial relationships – that are products of the region's bifurcated biogeographical structure.

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The hybrid structure of the Arctic's international political system reflects two competing sets of principles: one similar to the anarchic European states-system described by classical English School writers, the other resembling a secondary state system (or system of empires) in which international relationships are clustered around, but not reducible to, those of their metropolitan hubs. This hybrid organisation has been generated by the interaction of the region's constituent units and its bifurcated biogeographical structure, which have produced sedimented principles of membership and behaviour that define the boundaries of its regional international system. In the early modern era, these principles recognized three varieties of unit: the metropolitan states that formed the core of each imperial system, the non-contiguous colonial islands that acted as resource providers to the core, and the semi-

[572] Lassi Heininen, 'Circumpolar International Relations and Geopolitics', in Einarsson (2004): 209-210.
[573] Bankes (2004): 103-106.
[574] Arctic Council, *Declaration on the Establishment of the Arctic Council*, Ministerial Meeting of the Arctic Council, Ottawa, September 19 1996 [online]. Accessed April 14, 2009. <http://www.arctic-council.org/index.php/en/about/documents/category/4-founding-documents?download=118:the-ottawa-declaration>.
[575] Heininen (2004): 214.

autonomous indigenous and corporate units who inhabited and effectively occupied the imperial hinterland. Since 1945, states' use of modern social and physical technologies has injected principles reminiscent of the global international system into this imperial hierarchy, creating a hybrid structure that falls somewhere between state-centric and imperial forms of organisation. No longer content to rely on semi-autonomous imperial units to maintain their sovereign claims on the international stage, states have gone to considerable effort to assimilate the Arctic's imperial hinterlands into metropolitan society. They have done so by moving populations from their hitherto isolated hinterlands into new colonial archipelagos, each in direct contact with the metropolitan core. States' abilities to achieve their assimilationist goals have been constrained by the deep biogeographical structures that split the Arctic Basin into its constituent neo-European and non-European biomes. Whereas the assimilation of the former is now all but complete, states' limited EC in the latter, and the high energy demands of activities in the political sector, have left the region's move towards global principles of membership and behaviour in limbo – stuck between the imperial organisation of its past and the Westphalian organisation of the wider international system.

The Arctic International Economic System

Whereas the second half of the twentieth century has seen states take an increasingly direct hand in the political sector of the Arctic international system, its economic structure continues to reflect earlier patterns of colonial-indigenous bifurcation. The large-scale resource industries at the heart of the modern Arctic economy have allowed the region's early modern colonial archipelagos to integrate closely into the global marketplace. This has often left indigenous peripheries cut off from the financial flows that fuel large-scale resource extraction. Whereas globalization has bolstered indigenous groups' political claims to self-determination and autonomy in the circumpolar international system, its effects on the region's economic system have been mixed. Instead of undercutting the biogeographical bifurcation that separates the region's neo-European and non-European biomes, the economic sector has seen this ecologically-generated gap reinforced.[576] In place of the tripartite division of state, colony, and hinterland, the Arctic now supports a simpler distinction between *colonial*

[576] Southcott in Heininen & Southcott (2010): 24.

and *neotraditional* economic units – the former describing the region's resource settlements, and the latter the nucleated indigenous archipelagos that now dot its imperial hinterlands.

The Arctic is an increasingly important source of natural resources for the world market. In 2003, its industrial enclaves had a combined GDP of $224 billion, equivalent to Malaysia. This includes production of 10.5% of the world's oil, 25.5% of its natural gas, 25% of its gem-quality diamonds, 20% of its industrial diamonds, and over ten percent of its nickel, cobalt, palladium, apatite, and platinum. In the previous year, arctic flora and fauna contributed 10% of the world's fish production, 5.3% of its crustaceans, and almost 5% of its timber products.[577] These levels, though impressive, are unevenly distributed across the region. They are concentrated around relatively few bonanza resource deposits, whose size allows economies of scale to lower the cost of their exploitation. In 2003, 75% of the Arctic's total GDP came from Russia and Alaska, the most heavily colonized territories in the region.[578] Of this total, oil and gas revenues accounted for half and a quarter of each jurisdiction's contribution to regional GDP, with only public administration and military spending in Alaska reaching comparable levels.[579]

This regional focus on the large-scale extraction of natural resources means that the Arctic economy is reliant on external economic actors for financing and marketing.[580] Its most productive industries tend to focus on single-resource operations organised along monopolistic lines, often in close partnership with the metropolitan state in a Fordist model of economic development.[581] Because these operations rely almost entirely on goods and services imported from ghost acreage to the South, the region's main economic drivers are extremely vulnerable to price and demand shocks in southern economies. On its industrial archipelagos, economic structures describe a *colonial economy* in which people do not produce what they consume, consume only small amounts of what they produce, and rely on absentee capital to overcome the high costs of energy extraction in harsh and remote ecosystems.[582] Around these islands of

[577] Huskey in Heininen & Southcott (2010): 59-60, 69-71.
[578] Riabova in Heininen & Southcott (2010): 123.
[579] Solveig Glomsrod & Iulie Aslaksen (Eds.), *The Economy of the North 2008* (Oslo: Statistics Norway, 2009): 25, 38, 61. Government spending in Alaska remains below 20% of the state's gross domestic product.
[580] Gerard Duhaime, 'Economic Systems', in Einarsson (2004): 70-71.
[581] Southcott in Heininen & Southcott (2010): 51-52.
[582] Haycox, *Frigid Embrace* (2002): x.

colonial production and consumption stretch the *neotraditional economies* of the indigenous archipelagos that now dot the hinterland. In these, subsistence activities remain a primary feature of people's lives, providing much of the food and many of the materials they use. Indeed, food from the land is one of the few import substitutions possible in the circumpolar North, with annual harvests amounting to around 120kg of meat per person in Canada, 185kg per person in Alaska, and 125kg in Kalaallit Nunaat.[583] These economies share many aspects of their pre-modern forbearers, with a heavy emphasis on reciprocity and kinship to spread the risks and costs of Arctic life.[584] This is not a simple reversion to earlier socio-economic forms. Rather, indigenous units have reactivated aspects of past technologies, reimagining them in such a way as to make them useful in new conditions.[585]

This neotraditional economic system has been made possible by modern technology. The snowmobile has greatly expanded the range of subsistence lifestyles by allowing rapid journeys of more than 400km over ice and snow. This mobility permits hunters to live a more settled existence, using their machines for daily 'commutes' to hunting sites and trap lines. As high value goods, snowmobiles require several thousand dollars' worth of capital. Those with paying jobs are most likely to have access to sufficient funds, though they are least likely to have enough time to take full advantage of the technology. The underemployed, meanwhile, have more time for subsistence pursuits but may lack the capital needed to buy or maintain their machines.[586] Among the Dolgan of Siberia's Taimyr Peninsula, the near total collapse of the cash economy and a widespread return to subsistence pursuits after 1991 has simultaneously made snowmobiles more desirable as hunting tools and more difficult to purchase.[587] The state enterprise that organized hunters in the region, *Taimyrskii*, provided its members with hunting tools before the fall of the USSR. Since 1991, the state's capacity to equip Dolgan hunters has been severely restricted by the end of subsidies and the region's poor integration with metropolitan and international markets for their products. As a result, the fuel allowance per hunter has been reduced from one ton a

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[583] Gerard Duhaime, 'Economic and Social Conditions of Arctic Regions', in Solveig Glomsrod, *The Economy of the North* (Oslo: Statistics Norway, 2008): 74, 78.
[584] John Ziker, 'Kinship and Exchange among the Dolgan and Nganasan of Northern Siberia', *Research in Economic Anthropology* (19) 1998, pp. 228-229; Richard Condon et al, 'The Best Part of Life: Subsistence, Hunting, Ethnicity, and Economic Adaptation Among Young Adult Inuit Males', *Arctic* 48(1) 1995, pp. 41-42.
[585] Csonka (2004): 50; Lyck & Taagholt (1987), pp. 58-59.
[586] Condon (1995), pp. 35, 38
[587] John P. Ziker, 'Survival Economy and Core-Periphery Dynamics in the Taimyr Autonomous Region, Russia', *Anthropology of Eastern Europe Review* 17(2) 1999, pp. 67-68.

year, enough to cover all regular needs, to barely 170 litres in 1997, enough to travel only 500km. Meanwhile, the average cost of a Russian snowmobile has increased from five months' salary in 1991 to 50 months' salary in 1997.[588] The snowmobile economy therefore incentivized a return to traditional patterns of sharing in order to spread the burden of purchase and ownership even as the technology itself allowed greater numbers of indigenous people to live in relatively dense settlements near local transportation hubs. Such a return to a neotraditional mode of production has become the rule throughout the Russian Arctic in the wake of 1991.[589]

The reason for these two very different developmental pathways – one colonial, one neotraditional – has been the economic decoupling of the Arctic's scattered industrial enclaves from the hinterlands that surround them. As a result, the latter tend to be poorer than generalized regional statistics indicate, with higher levels of dependency and lower quality public services. Though the Arctic's indigenous people have experienced considerable improvements in their political status since 1970, these have not led to a sufficient reallocation of material resources to bring their standard of living into line with their metropolitan cores.[590] The majority of the profits of resource extraction flow to European and neo-European financiers and consumers, leaping directly from industrial archipelagos to metropoles with little impact on intervening lands and peoples.[591] Only a small percentage flows back to indigenous people through royalties and employment. Thus, outside of the Khanty-Mansiiskiy and Nenets Autonomous Okugs – the primary oil producing regions of Western Siberia – life expectancy is twelve years lower than the Russian average, while rates of alcoholism, tuberculosis, hepatitis, and respiratory infections are between 1.5 and 2 times higher. In Greenland, the average Inuit in 1998 lived for 64 years, as compared to 76 years for a Dane living on the same island. In rural Alaska, labour force participation rates in 1998 were 55% for men and 48% for women, as compared to national averages of 74% and 57%. Among the indigenous people of Arctic Canada, social indicators show the gross inequalities in standards of living between core and periphery, with substance abuse levels up to twenty-four times higher than in southern

[588] Ziker (1998), pp. 199, 210.
[589] Ziker (1999), pp. 70-71.
[590] Oran Young et al., 'A Human Development Agenda for the Arctic', in Einarsson (2004): 231-232.
[591] Huskey (2010): 64. This is particularly true of arctic Siberia, which lacks the sub-state governance structures that have evolved in Alaska, Canada, and Greenland.

populations, compounded by an ongoing housing crisis in northern communities.[592] As one travels down the axes of ecological productivity, from the Yukon to the Northwest Territories to Nunavut, life expectancy drops, while self-harming behaviour and food insecurity rise.[593] These disturbing statistics are indicative of the deep structural rifts that continue to separate the economic conditions of the Arctic's industrial and neotraditional archipelagos.

While the profits of resource extraction tend to flow out of the region, the costs associated with it remain behind, as the environmental damage done in the name of resource extraction is borne by local producers. The nickel-producing enclave at Noril'sk once again provides an interesting case in point. Since its construction by GULAG labour in the 1930s, it has become one of the most polluted cities in the world, destroying vast stretches of grazing land around its open pit mines and smelters, displacing Dolgan pastoralists and hunters even as its population of over 100,000 puts added pressure on local food supplies.[594] Officials responsible for the grazing land of the neighbouring Taimyr Autonomous Okrug estimate that the city's industrial combines released 24 million tons of pollutants into the tundra and Pyasina River in 1995 after production had already declined from its Soviet-era peaks.[595] This combination of socio-ecological pressures has compounded Dolgan subsistence problems: constricting the territory available for their herding and hunting while simultaneously reducing the number of alternative energy sources (fish, forest products) available to offset those losses.[596]

The asymmetrical relationship between the Arctic's internationalized colonial enclaves and local producers indicates the transnational impact of the region's bifurcated biogeographical structure on its international systems.[597] Whereas the Arctic's colonial economies are necessarily international, linked to world markets and capital, its neotraditional economies remain local, with limited exposure to global markets and high levels of dependence on state support. In the latter, sustainability is a matter of

[592] Riabova in Heininen & Southcott (2010): 126-127; United Nations, 'UN expert concerned at poor living conditions of Canada's indigenous people', United Nations News Centre December 20 2011 [online]. Accessed January 4 2012. < http://www.un.org/apps/news/story.asp?NewsID=40804&Cr=indegenous&Cr1=>.
[593] C. Furgal & T.D. Prouse, 'Northern Canada', in D.S. Lemmen et al., *From Impacts to Adaptation: Canada in a Changing Climate 2007* (Ottawa: Government of Canada, 2008): 66.
[594] Forsyth (1992): 402-403.
[595] Ziker (1999), p. 64.
[596] Stolberg (2005): 213; Ziker (1998), p. 228.
[597] Southcott in Heininen & Southcott(2010): 24.

predictable state funding and reliable access to subsistence resources. The transfer of the state's redistributive power to the local level has therefore been a primary goal of its indigenous groups.[598] In colonial economies, the state cooperates with absentee capital: international financiers who cover the high start-up, maintenance, and transportation costs associated with doing business in the Arctic. These powerful but distant economic actors have become indispensable partners of metropolitan states, reminiscent of the great commercial imperial proxies of an earlier age. Driven by their financial priorities to extract profit from the Arctic's commodified resources, firms increasingly oppose efforts to empower local governments – indigenous or public – who may increase taxes and regulatory controls.[599] The result has been an economic model based on planned and monopolistic development in which companies are given sole rights to specific economic resources and regions – producing goods for southern consumption and making profits for southern owners, with relatively few benefits accruing to local inhabitants.[600]

These political and economic structures have produced an international political economy featuring two largely decoupled economic systems, each incentivizing a different political outcome. For those in the local economy, strong local governments with powers of taxation and regulation are the best means to protect neotraditional lifestyles by stabilizing the state transfers on which they rely for trade and imports. In the region's colonial enclaves, absentee capital tends to oppose these very measures, which negatively impact profitability while accruing few benefits to southern investors. This leaves the region with an international economic system strongly reminiscent of its early-modern, imperial predecessor: split between neo-European, trade-dependent colonial islands, and semi-autonomous but subordinate indigenous peripheries.

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The economic structure of the modern arctic international system differs from its political counterpart insofar as it continues to reflect patterns of colonial-indigenous and socio-ecological bifurcation. Politically, the region is now inhabited by a

[598] Caulfield (2004): 123-124,134.
[599] Huskey in Heininen & Southcott (2010): 64; Duhaime in Glomsrod (2008): 21-22; Haycox (2002): 145-148.
[600] Southcott in Heininen & Southcott (2010): 47, 51-52.

collection of territorially and ethnically defined imperial units holding a variety of domestic and international positions vis-à-vis their metropolitan capitals. In fact, thanks to their ability to mobilise international and domestic recognition of their special standing, indigenous units often hold superior positions in the region's asymmetric federal hierarchies. The same is not true of its economic system. In this lower-energy sector, large-scale resource industries have allowed the colonial archipelagos of the region's early modern period to integrate closely into the global marketplace. This has left indigenous archipelagos separated from the financial flows that fuel large-scale resource extraction at the region's many bonanza deposits of oil, gas, minerals, and other natural commodities, leaving them to capture what they can from neotraditional economies that combine subsistence hunting and herding with a mixture of capital transfers from the state and wage labour in government offices or nearby industrial enterprises. Thus, whereas globalization has bolstered indigenous groups' claims to self-determination and autonomy in the circumpolar political system, its effects on the region's economic system has been altogether different: reinforcing the dependence of former imperial hinterlands on the states and firms from whom their newfound political autonomy was meant to free them. Instead of complicating and undercutting the biogeographical bifurcation that separates the region's neo-European and non-European biomes, the second half of the twentieth century has seen this gap reinforced in the economic sector.[601] Thus, in place of the division of neo-European and non-European units that described the imperial hierarchies of the early modern Arctic, the region's international economic system now supports distinction between *colonial* and *neotraditional* economic actors.

GEC and Socio-Ecological Coevolution: see ice?

The structures that constrain actor behaviour in the contemporary Arctic international system mark the culmination of a 400-year process of Socio-Ecological Coevolution, illustrating the dynamic bond between human societies and the ecological systems in which they are embedded. Despite advances in physical and social technology that have mediated the impact of Arctic ecology, its international units, processes, and structures remain constrained by their ecological contexts. The slow transformation of these contexts over human lifespans has made them durable sources of stability for

[601] *Ibid*: 24.

their embedded international systems. Throughout the depletion events associated with successive waves of resource extraction, the pandemics associated with imported pathogens, and the pollution associated with industrial activity, the biogeographical structure of the region has remained relatively stable – divided between non-European biomes and the neo-European southern, maritime, and riverine ecosystems. This biogeographical structure has been a constant feature of the region since long before the late sixteenth century, shaping the units that inhabit it, the ways in which they relate to one another, and the structures that cause them to behave in ways that may be at odds with their internal processes. While the region's dominant states have lately attempted to bring these units, processes, and structures into line with global norms, the Arctic's bifurcated ecology has caused the international system they constitute to remain regionally distinct – defined by principles of international membership and behaviour that describe an atypical hybrid system, including aspects of anarchic *and* hierarchic structure. Global Environmental Change (GEC) promises to overturn aspects of this historically generated socio-ecological structure. By altering the ecological context the circumpolar world, GEC may succeed where social and physical technologies have failed – redrawing the fundamental bases of region's international system.

Climate change is instigating a new chapter in the story of the Arctic by radically redrawing the contours of its ecology. GEC is a product of the third principle of coevolution, in which the consequences of human action resonate down from individual to systemic levels of analysis. The earliest consequences of Europeans' arrival in the Arctic basin were felt at the level of individual organisms and ecological populations – the depletion of Siberia's sable and the spread of European pathogens being two examples. Humanity's increasing technological sophistication has since seen ecological effects resonate down to the communities that inhabit different ecological sites and the chemical and physical systems that support them. GEC results from these deeper effects, altering the composition and nature of the abiotic systems on which all Arctic ecology has heretofore rested.[602] The potential impacts of these transformations are too many and varied to summarize here. Instead, this Chapter will

[602] Henry Huntington & Gunther Weller, 'An Introduction to the Arctic Climate Impact Assessment', in Hassol et al. (2005): 3-6.

conclude by looking at how a central aspect of this transformation – reduced sea ice cover in the Arctic Ocean – may affect the socio-ecological bases of circumpolar IR.

Over the past fifty years, the Arctic has witnessed the most widespread warming on the planet, with surface temperature rising by as much as 5°C.[603] This has had a major impact on the sea ice that caps the polar ocean and helps to regulate global temperatures. The ice cap itself experiences an annual cycle of expansion and contraction from a winter maximum that covers the entire polar basin and Siberian shelf between Alaska and Kamchatka to a summer minimum that typically opens the coastlines of the Bering Strait, Baffin Bay, Kara Sea and Beaufort Sea. (see fig. 6.3)

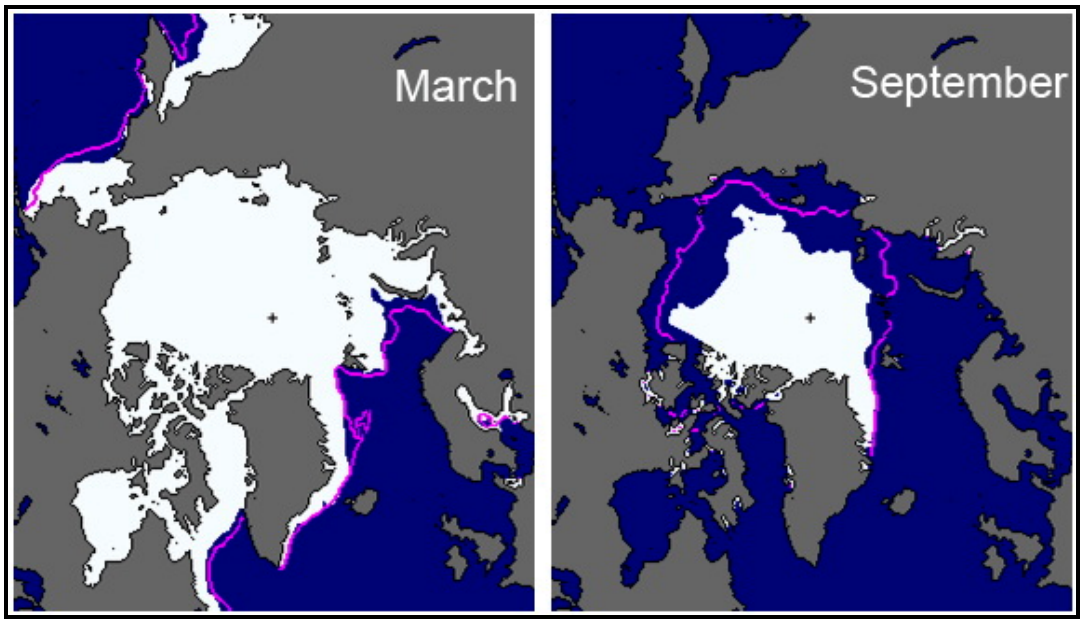

Figure 6.3 – Sea Ice conditions in March and September 2011, with the mean distribution for 1979-2000 indicated by the magenta line.[604]

Overall, summer sea ice cover has decreased by an average of 3% per decade over the last 20 years, with more than a 7% drop in multiyear ice over the same time span. This means that even as the total area covered by ice shrinks, the average thickness of the ice that remains drops even more rapidly, making the ice pack increasingly vulnerable to summer melting. Apart from the dramatic feedback effects this may have on the global climatic system, this is having immediate impacts on the secondary state system of the circumpolar basin.[605]

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[603] Anisimov et al. in Parry et al. (2007): 656.
[604] D. Perovich et al., 'Sea Ice', *Arctic Report Card: update for 2011*November 9, 2011 [online] accessed Feb. 10, 2012 <http://www.arctic. noaa.gov/reportcard/sea_ice.html.>
[605] Harald Loeng et al., 'Marine Systems', in Hassol et al. (2005): 457

These impacts will be particularly acute in respect to states' territoriality as defined by the United Nations Convention on the Law of the Sea (UNCLOS). Signed in 1982, UNCLOS came into force in 1994, and includes all arctic littoral states except the United States of America.[606] Its arctic provisions were born during the Cold War, when military confrontation between the United States and Soviet Union led to significant upgrades in states' capacity to monitor and enforce their international boundaries in the region. Submarine transits of the Northwest Passage (NWP) through the Canadian Arctic Archipelago by the United States, the Soviet Union, and Great Britain – together with a small but growing number of commercial transits by private foreign vessels – convinced Ottawa of the need for multilateral assurances of its sovereignty.[607] This search for international legal recognition is now reaching its apogee with the extension of sovereign borders to the Pole under the terms of UNCLOS, replacing the imperial frontiers that have heretofore demarcated territoriality among the imperial international systems of the High Arctic.[608] Taking advantage of technical advances in bathymetry, UNCLOS designates states' rights to a 200-nautical mile Exclusive Economic Zone (EEZ), with rights over the use and exploitation of subsurface mineral deposits – a boundary that can be extended to the limits of a state's continental shelf.[609] Metropolitan states have therefore used a combination of social technologies, like UNCLOS, and material technologies, including bathymetry and satellite imaging, to replace the graded frontiers of their imperial marches with the firmly demarcated borders that define Westphalian territoriality in the global international system.

UNCLOS remains the only major piece international legislation to explicitly acknowledge ecology's central role in international affairs. Article 234 alters the treaty's provisions based on the presence of land fast sea ice, allowing arctic states greater control over pollution and navigation in their region's challenging ecological conditions. It asserts that 'Coastal states have the right to adopt and enforce non-discriminatory laws and regulations for the prevention, reduction and control of marine pollution from vessels in ice-covered areas within the limits of the Exclusive

[606] Ken Coates (2008): 162-164.
[607] Grant (2010): 296, 331-332.
[608] Kratochwil (1986): 35-37; Ruggie (1993): 150-152.
[609] Lassi Heininen, 'Circumpolar International Relations and Cooperation' in Heininen & Southcott (2010): 268. In the current race among littoral states to define the limits of their continental shelves, particularly ownership of the Lomonosov Ridge, transportation and bathymetric technology will play a decisive role in determining the extent of states' sovereign territory.

Economic Zone.'[610] It is worth pausing to consider just how unusual this proviso is. Most international law, be it concerned with individual or collective actors, decontextualises the subjects and objects of its provisions, claiming that rights and responsibilities exist independently of where, when, or by whom they are called forth. This penchant for the anthropocentrism, which alienates individual and collective actors from their ecological contexts in order to grant them international rights or responsibilities, lies at the very heart of International Relations as both diplomatic practice and academic discipline. Thanks to its recognition of ecological context, UNCLOS has already provided for some of the consequences of climate change in the Arctic. If sea ice continues to diminish, waterways once protected by Article 234 will revert to the rules assigned to coastal states in the rest of the world.[611] This will have particular impact for Canada and Russia, whose Northwest Passage (NWP) and Northern Sea Route (NSR) currently fall under 234's special exemptions. If, as predicted by the Arctic Climate Impact Assessment, earlier melting and later freeze-up leads to steady reductions in sea ice, the multilateral means by which Canada in particular has sought to bolster its sovereignty claims over the NWP will be severely diminished as it loses the right to legislate the conditions under which shipping may use the straits linking the Beaufort Sea and the Atlantic.[612] (see fig. 6.4) Stripped of the protection afforded by the sovereignty bargain implicit in UNCLOS, arctic states will need to reinforce their material capability to monitor and dominate their seascapes, a process already underway in Denmark, Russia, and the United States in the late 1990s through the design and construction of new ice-capable ships to patrol their jurisdictions. Possessing the least ice capable fleet of the littoral states Canada is in a particularly vulnerable position with regard to the effects of climate change on its position in international law.[613] Having long relied on its own version of "General Winter" to protect its Arctic hinterlands, Ottawa will need to invest heavily in the tools of sovereignty if it is to maintain *de facto* control over its Arctic waterways. Though it has made noises in that direction through a variety of government announcements, funding and results remain elusive.

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[610] United Nations. *United Nations Convention on the Law of the Sea*, Globelaw [online]. Accessed November 10 2010 <http://www.globelaw.com/ LawSea/ls82_4.htm#article_234_ice_covered_ areas>.
[611] Anisimov et al. in Parry et al. (2007): 676.
[612] Loeng (2005): 519; Grant (2010): 368.
[613] *Ibid*: 415, 442-445.

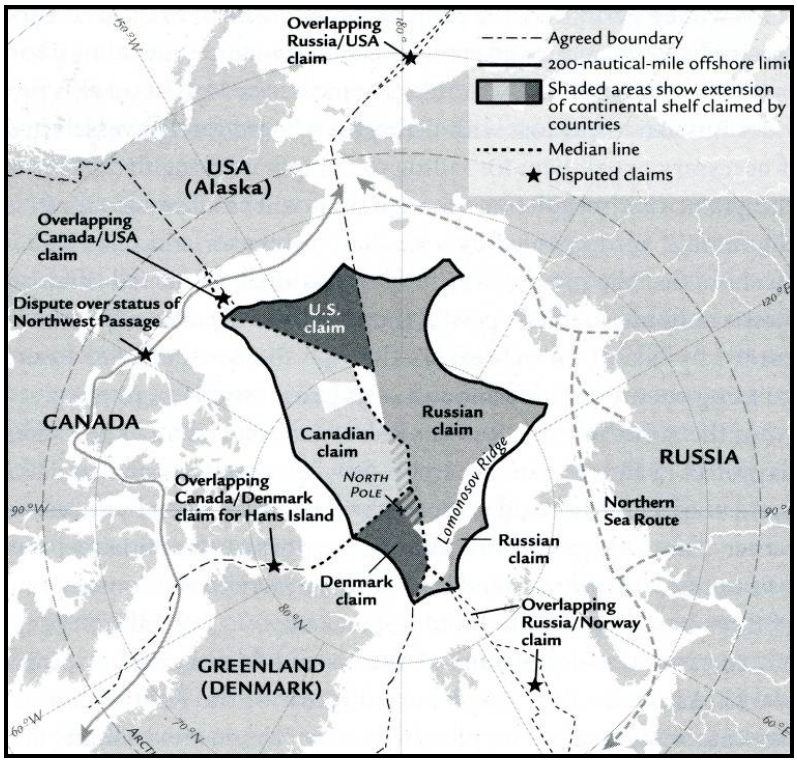

Figure 6.4 – Map showing the 200-mile EEZ claims of the Arctic Basin and potential overlaps between states' claims to their continental shelves, including the paths of the NWP and Northern Sea Route.[614]

The impact of climate change on the Law of the Sea is indicative of a wider transformation to the circumpolar international system that may follow hard on the heels of melting sea ice: the emergence of the Arctic as a region of significant politico-military interaction. Until recently, the Arctic Ocean has acted as an ecological *insulator*, marking a zone of weak interaction "where larger regional security dynamics stand back to back."[615] The Arctic itself has rarely been an object of contention in military relations. Rather, its strategic position as a crossroads between the Eastern and Western blocs made it a *conduit* for military force.[616] Its role in the Cold War was largely limited to its air- and sea-space: the former being the preferred route for adversaries' bombers and missiles, the latter being the natural hiding and hunting grounds for their ballistic missile and hunter-killer submarines. Kenneth Eyre has said of the immediate post-1945 period that 'neither the United States nor Canada looked to the North as a *place* to be protected because of some intrinsic value. Rather

[614] *Ibid*: 453
[615] Barry Buzan & Ole Waever, *Regions and Powers: the structure of international security* (Cambridge: Cambridge University Press, 2003): 40-44. Although politico-military interactions will undoubtedly increase in the Arctic, this is not enough to label it a 'Regional Security Complex' (RSC). Because, in Buzan and Waever's reading, regions are mutually exclusive in their memberships, states can only belong to one RSC at a time, (*Ibid:* 48-49, 80-81.) This leaves the Arctic's main security concerns divided between those of the Post-Soviet, North American, and European RSCs – the main regional blocs to which the region's metropolitan states belong. (*Ibid: xvi [map]).*
[616] Heininen (2004): 218-219.

it was seen as a *direction,* as an exposed flank.'[617] Though the threats that emanated from across the Arctic Ocean were very real, the land and sea ice of the region remained lightly patrolled and defended. In Canada, this patrolling has been done mainly through indigenous auxiliaries such as the Canadian Rangers – a paramilitary militia composed primarily of Inuit volunteers equipped and supported by the Department of National Defence – rather than by permanently stationed regular troops whose maintenance would be costly and whose value in defending the region's vast, unpopulated landscapes would be negligible.[618] The harkens back to the difficulties of maintaining politico-military units and systems in arctic and subarctic biomes, discussed with reference to the HBC's Bayside posts and the problems of defending Russian America in Chapter Five.

As the Arctic's rapidly shrinking ice cover opens transportation and communications routes to more conventional naval and land operations, climate change is bound to have a very significant impact on the future shape of Arctic security. By removing the ecological insulator that has divided the littoral states of the circumpolar basin, it will effectively shorten the distances between them and therefore increase their security interactions. If 'distance matters', then the shrinking polar cap promises to revolutionize states' ability to project military power into (rather than simply over and under) the Arctic.[619] Moreover, it will present arctic states with a shared set of ecological threats, from melting permafrost to increased commercial shipping and potential environmental disasters. The Arctic's position as an emerging hydrocarbon producer will present Arctic states with significant challenges in terms of environmental security.[620] It should come as no surprise that the region's littoral states are scrambling to clarify their borders and tighten their control over territories and sea-space. Even Canada and Denmark, whose relationship in other security regions is completely amicable, have gone to great lengths to generate scientific support their rival claims to Hans Island, a 1.3km^2 knob of rock in the middle of the Kennedy Channel at 80°N.[621] When considered in conjunction with the socio-ecological

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[617] Kenneth Eyre, 'Forty Years of Military Activity in the Canadian North, 1947-87', *Arctic* 40(4) 1987, p. 294.
[618] Coates (2008): 103-107; P. Whitney Lackenbauer, 'The Canadian Rangers: a "postmodern" militia that works', *Canadian Military Journal* 6(4) 2007, pp. 49-59.
[619] Buzan & Waever (2003): xvi, 466.
[620] Huskey in Heininen & Southcott (2010): 60; Donald L. Gautier, et al., 'Assessment of Undiscovered Oil and Gas in the Arctic', *Science* 324(1175) 2007, p. 1178.
[621] Grant (2010): 455-456; The Globe and Mail,*"In the Arctic, Canada Willing to Fight to the True North Free"* [online]. Accessed 25 Jan. 2011. <http://www.theglobeandmail.com/news/politics/in-the-arctic-canada-willing-to-fight-to-keep-the-true-north-free/article1881683/>.

processes at play in circumpolar basin, it seems likely that metropolitan states are on course to play an ever-more significant role in the region over the coming decades, as providers of security, as partners with international firms in the exploitation of resources, and as twenty-first century metropoles to the Arctic's resource hinterlands.

Shrinking sea ice is not the only anticipated consequence of GEC in the Arctic. The northward march of terrestrial climate zones, rising sea levels, and melting permafrost are among many other potential sources of socio-ecological change for the region's international systems.[622] Coevolution as presented and applied in this project is a tool with which to assess the impact of these interconnected ecological transformations on the Arctic's international units and systems – a baseline understanding of which has been the main goal of the past three chapters. With this baseline understanding established, future projects can spend less time in intellectual ground clearing and more in the application of an existing model to the empirical realities of GEC in the Arctic Basin.

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The future evolution of the Arctic international system is going to be heavily impacted by ecological changes brought on by anthropogenic climate change. The purpose of this project is to establish tools and baselines from which such future research can begin. However, it is impossible to resist a looking at some of the impacts likely to result from one of the many ecological changes on the way in the region. Shrinking sea ice is probably the most widely-known of these impacts, being regularly reported in the news and photographed by satellites and documentary makers alike. Its impacts on the structures of circumpolar IR will be varied. In general, a reduction in sea ice will accelerate trends that have heretofore been driven by units' application of technology – removing climatic insulators that have heretofore constrained systemic interaction between imperial systems in the polar basin. It will certainly force them to increase their efforts to exercise domestic and interdependence sovereignty in the region as the Arctic Ocean becomes increasingly accessible as a resource provider and,

[622] John Walsh et al., 'Cryosphere and Hydrology', in Hassol et al. (2005): 209-220, 230-236; Terry Callaghan et al., 'Arctic Tundra and Polar Desert Ecosystems', in Hassol et al. (2005): 287-314; Christensen et al. in Solomon et al. (2007): 903-906; Paul Lemke, Jiawen Ren et al. 'Observations, Changes in Snow, Ice and Frozen Ground', in Solomon et al. (2007): 369-373.

in time, a transportation corridor. At the same time, although GEC promises to redraw many of the Arctic's fundamental ecological truths, it is unlikely that the region will become a site for sustained and large-scale settlement in the near future. This means that states will likely continue to rely on indigenous sub-state actors to occupy significant portions of the Arctic landscape as semi-autonomous units in highly asymmetric federal systems. Thus, the region will continue to be defined by its hybrid international structures, whose evolution continues to be shaped by the interactions of its units with and within the ecological context of the circumpolar world.

Conclusion

The structures that constrain actor behaviour in the international system of the circumpolar world are both socially and ecologically constituted. They are neither stable nor homogenous across space. Like the biological populations described by Ecology, human units are constantly affecting and being affected by the ecological contexts in which they are embedded – generating an ongoing process of Socio-Ecological Coevolution in which neither actor nor context ever reaches a stable equilibrium. This has led to the evolution a hybrid international system in the Arctic Basin, defined by principles of membership and behaviour typical of both an anarchic states system and an imperial hierarchy. This Frankenstein's monster is made up of a functionally and hierarchically differentiated set of imperial international systems whose international relationships are centred on, but are certainly not reducible to, the metropolitan cores of their asymmetric federations. The result is a collection of territorially and ethnically defined archipelagos of settlement, each in direct relationship to their post-imperial capital and possessing different levels of autonomy domestically *and* on the international stage. The political economy of the system is simpler, closer to the old imperial hierarchy out of which contemporary international systems have evolved. This is divided between colonial and imperial economies – the former largely metropolitan, the latter largely indigenous in it constitution. The colonial economies do not consume what they produce or produce what they consume, relying instead on ghost acreage in more productive biomes for their sustainability. The imperial economies of the hinterland, on the other hand, have evolved *neotraditional* modes of production that combine subsistence with limited amounts of wage labour and government transfers – leaving them dependent on state support for their economic stability. Thus, whereas the former tend to eschew state regulation, the

latter have actively pursued governing power in order to control their economic destiny.

This structure has evolved in a relatively stable, transnational ecological context and reflects the deep biogeographical bifurcation that splits the region into neo- and non-European biomes. It is at the ecotones between these worlds – connected by the states that straddle them – and in the ecosystems most affected by climate change that these international units, processes, and structures will undergo their greatest crises and transformations. This includes the borders of the Arctic ice pack, where frozen sea gives way to open water. The northward march of this oceanic ecotone promises to rewrite many of the interactive processes that define the arctic region, boosting imperial systems' interaction and ecological capacities. This has already accelerated the attempts of metropolitan states to complete the transformation of their imperial frontiers into Westphalian borders, a process signified by their claims to seabed and maritime rights under UNCLOS. It will likely also accelerate their politico-military interactions in the region, with effects that may see the polar basin become a seat of increasing military confrontation. This seems unlikely in the near future given the continuing difficulty of operating in the High Arctic ecosystems that border the basin's most contested areas. In the longer term, however, and given the uncertainties implicit in climate modelling, it is entirely possible that anthropogenic climate change and the positive ecological feedback mechanisms it may trigger could accelerate much faster than currently predicted. Further investigations of the effects of GEC on the units, processes, and structures of international systems in the Arctic will undoubtedly generate firmer conclusions, investigations for which Socio-Ecological Coevolution and the international system baselines developed over the past three chapters have been designed and carried out.

Chapter Seven

Conclusions: Coevolution in the Arctic, Imperial Systems, Regionalism, and Saharan-Sahelian Africa

This project is a response to a recognised need in the social and natural sciences to develop 'standardised baseline human system data…; integrated multidisciplinary studies; [and]… regionally specific human vulnerability studies' relating to the effects of anthropocentric climate change in the circumpolar Arctic.[623] It is a need that International Relations – with its multidisciplinary interest in human systems, sectoral interactions, and regional studies – should be well placed to address. Unfortunately it is a need to which IR's current analytical approaches are unsuited, requiring the development of a new theoretical toolkit with which to assess the influence of planetary ecology on the evolution of the Arctic's international systems. The preceding chapters have pursued this goal by integrating the central tenets of Environmental History into Buzan and Little's world historical approach to the study of international systems, producing an analytical matrix capable of tracing the impact of Socio-Ecological Coevolution on the international and ecological systems of the polar basin. After reviewing the reasons and framework behind the project, this concluding chapter will look at the implications of our socio-ecological analysis for the circumpolar world, revisit the difficult question of arctic states as evolving imperial systems, consider Ecology's utility as a framework for regional studies in IR, and reflect on the applicability – and limitations – of Coevolution to international systems analysis in other parts of the world.

Over the past forty years, Ecology's understanding of the planetary ecosphere has increased in leaps and bounds, allowing it to describe the ongoing transformation of ecological systems with growing precision. The four increasingly detailed and authoritative IPCC Assessment Reports produced since 1990, culminating in the most recent report in 2007, are good indicators of its progress.[624] Over the same period, IR has developed an increasingly nuanced understanding of the human systems that

[623] Anisimov et al. in Parry et al. (2007): 677.
[624] Solomon et al. (2007); Parry et al. (2007); B. Metz et al. (Eds.) *Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge: Cambridge University Press, 2007).

describe our relationships at the international scale. From Liberal Institutionalism and Realism to Constructivism and the English School to Critical Theory and International Political Economy, IR now possesses a plurality of approaches to its subject matter.[625] Divided by the levels of analysis and sectors of interaction they describe, these approaches describe different aspects of the 'set of sets' that constitutes the global international system. They also share a deep-seated anthropocentric worldview. This ontological assumption divides humanity from the natural world, advocating the primacy of human agency and social structure in shaping and constraining the evolution of international units and systems.[626] As discussed at the beginning of this project, IR's anthropocentric turn in the second half of the twentieth century was an understandable reaction to the deterministic and pseudoscientific monocausal geopolitical theories of the early twentieth century, particularly those popular in Nazi Germany before and during the Second World War.[627] This ontological decision, however, has come at a cost. At a time when our discipline is beginning to grapple with the impact of GEC on international units, processes, and structures, anthropocentrism has stripped it of the capacity to account for the mutually constitutive historical relationships that bind human systems to the ecological contexts in which they are embedded. This is a major failing in an age of anthropogenic climate change, when understanding this relationship in terms of its impact on international units and systems is becoming increasingly important.

The preceding chapters have been an attempt to address IR's anthropocentric blind spot. Like other ontological choices, anthropocentrism presents a viewer with a specific impression of reality, emphasizing and masking different aspects of the world. For Buzan and Little, Bull and Watson, Tally and Wendt, the evolution of international systems is best understood by reference to their social (i.e. human) context.[628] As a result, their analyses focus on socially-endogenous sources of stability and change. Theirs are among IR's most successful descriptions of systemic evolution, and are far too valuable to jettison in favour of a revolutionary, ecocentric alternative. Instead, I have proposed an approach aimed at improving IR's ability to fold basic ecological concepts into existing narratives; concepts such as the coevolutionary relationships that

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[625] Halliday (1994): 23-46; Buzan & Little (2000): 36-47.
[626] Martin Coward, 'Against anthropocentrism: the destruction of the built environment as a distinct form of political violence', *Review of International Studies* (32:3) 2007, pp. 420-421
[627] Buzan & Little (2000): 59; Chapman (2010): 2; Flint (2006): 20-23.
[628] See Bull & Watson (1984); Tilly (1992); Wendt (1999); Watson (2009).

bind human populations to the biological, chemical, and physical systems in which they are embedded. Chapters Two and Three trace this middle path between social and environmental determinism. Building down from the two-dimensional analytical matrix developed by Buzan and Little for their study of socially constituted international systems in world history, I propose the construction of a third axis along which to disaggregate and study systemic evolution in socio-ecological terms. This highlights the *context* in which our objects of study are embedded, bringing Ecology in from the cold by opening a conceptual space in which to integrate socio-ecological relationships into existing IR analysis. The framework constructed in Chapter Three therefore encases IR's social narratives within a wider and older set of socio-ecological relationships, giving students and practitioners the option and ability to integrate ecological factors into their work.

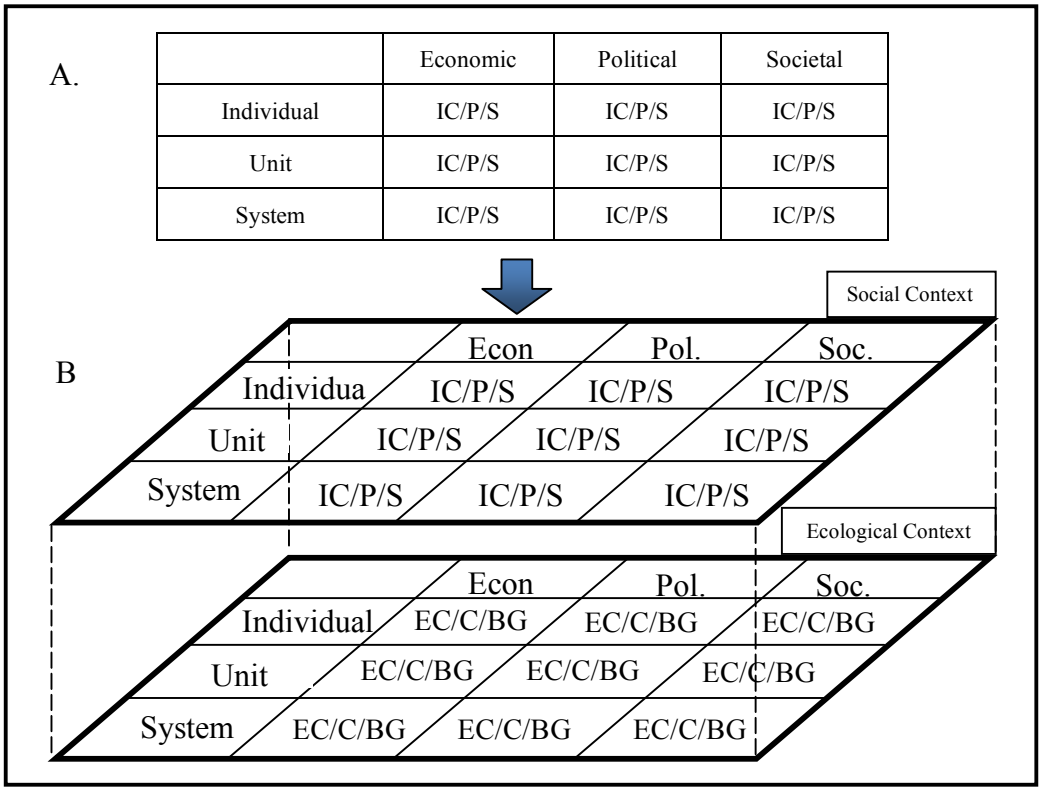

Figure 7.1 – Embedding Buzan and Little's socially constituted analytical matrix [A] in its ecologically context, generates a three-dimensional matrix [B], transforming interaction capacity (IC), social process (P), and social structure (S) into their socio-ecological counterparts [ecological capacity (EC), coevolutionary process (C), and biogeographical structure (BG)]. [629]

Figure 7.1 illustrates the effects of this move, which transforms the three sources of explanation by which Buzan and Little trace the social constitution of international systems in world history. Thanks to their new ecological context, interaction capacity,

[629] Adapted from Buzan & Little: 77. Note that the subunit and subsystem levels continue to exist between the levels of analysis listed in both matrices.

(interactive) process, and (social) structure are recast as ecological capacity, coevolutionary process, and biogeographical structure: alternative sources of international behaviour whose influence has fundamentally affected the evolution of international systems around the world.

Chapters Four to Six apply this analytical toolkit to analyse the evolution of international units, processes, and structures in Siberia and arctic North America – a region of the planet currently experiencing rapid and large-scale anthropogenic changes to its ecology. As argued by the IPCC, it is imperative that we understand the likely impact of these changes on human systems if we are to successfully adapt to them.[630] The taiga, tundra, and oceanic biomes that constitute the Arctic are experiencing the most powerful warming trends on the planet, with localized temperature increases of up to 5°C above the 1979-2000 average.[631] These promise to radically alter the ecological contexts in which international units, processes, and structures are embedded. Understanding the likely impact of GEC on circumpolar IR therefore requires that we understand the coevolutionary relationship between the region's international and ecological systems. This study finds that the evolution of the contemporary international system in the 270° arc extending westward from the Denmark Strait to the Ural Mountains has been driven by tensions arising from the overlay of largely European units, processes, and structures – with their origins in the temperate and productive ecosystems of Northwestern Eurasia – on pre-international, indigenous antecedents – which evolved locally in the thoroughly non-European biomes of the taiga and tundra. The interaction of these ill-fitted units, systems, and contexts has produced convergent and divergent evolutionary dynamics that have helped to constitute the Arctic's hybrid international system, which resembles *both* a set of imperial hierarchies *and* an anarchic states-system.

Ecological Analysis: GEC and International Systems

This project's 450-year historical investigation of Socio-Ecological Coevolution in the circumpolar Arctic identifies several compelling evolutionary dynamics. These

[630] Anisimov et al. in Parry et al. (2007): 655.
[631] Martin Sommerkorn & Susan Hassol, eds. *Arctic Climate Feedbacks: global implications*, (Oslo: WWF International Arctic Programme) 2009: 10; Anisimov et al. in Parry et al. (2007): 656.

include a direct correlation between a site's ecological productivity and the principles that define its international units and systems; a refined understanding of the relationship between physical and social context in shaping the adaptations pursued by international units, processes, and structures; and a potentially generalizable explanation of the role of biogeographical structure in shaping the political and economic networks that help constitute the global international system. It has also thrown up a potential stumbling block, however. As implied by the fourth principle of Coevolution, socio-ecological effects are most visible where ecological factors are at their most influential: in extreme ecosystems and in regions inhabited by relatively undifferentiated and technologically unsophisticated social groups. This may limit Socio-Ecological Coevolution's effectiveness when used to analyse technologically sophisticated units and systems in relatively temperate biomes, limiting its reach to a few relatively extreme ecological settings. This section will look at each of these points in turn.

Ecological Capacity & International Systems

First, there appears to be a direct correlation between international units' and systems' Ecological Capacity (EC) and their ability to maintain dense populations and/or hierarchically and functionally differentiated organisations. When considered from the perspective of Ecology, this link is neither surprising nor controversial. Humanity and its various geographical and social subgroupings constitute a number of biological populations – groups of individuals of a single species inhabiting a specific area. We are one species among the ~8 million that are thought to inhabit the planet, each of which can be subdivided into subordinate populations on the basis of location and/or behaviour.[632] The collective actors whose inside-outside distinctions define the international as a spatial scale align well with this ecological definition of man in the world, with the overarching international system being constituted by a collection of overlapping and interacting human populations that together form a global 'set of sets'.[633] In Ecology, a population's defining characteristics, including the number of individuals who compose it (its *abundance*), are affected by two categories of factor: (i) variations in the population's physical environment, and (ii) behavioural adaptations undertaken to address those environmental challenges and opportunities.[634]

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[632] C. Mora et al., 'How Many Species Are There on Earth and in the Ocean?' *PLoS Biology* 9(8) 2011, p. 2.
[633] Braudel (1982): 458-499; Chaudhuri (1990): 430-431.
[634] Molles (1999): 164, 221-224.

These twin influences have been picked up by various members of the academy beyond Ecology and Environmental History. These include environmental archaeologists, whose goal is 'the study of the past environments of man' in order to determine the relationship between cultures and ecologies.[635] Anthropology was another early adopter of coupled environmental and behavioural change as an explanatory device to explain the human past, generating the subfields of environmental anthropology, cultural ecology, and human ecology.[636] Ecological analyses in the social sciences are now being transformed by 'New Ecology', discussed in Chapter Three, which denies the existence of stable equilibria in the natural world. Though quickly accepted in the natural sciences, New Ecology has been slower in taking root in on the social side of the scientific divide, where many disciplines continue to view the natural world as a static or slowly depleting backdrop against which human drama plays out.[637] The need to move beyond homeostatic renderings of ecological reality in IR has therefore been a driving motivation behind the dynamic coevolutionary framework adopted in chapters Two and Three.

Returning to our original point, EC is defined by the combined impact of local ecological productivity, measured in terms of NPP, and the physical and social technologies available for its use and subsidization. This combination of social and ecological factors affects the levels of social complexity that any ecologically embedded unit or system can maintain in a given physical environment, impacting its population size, social hierarchies, and functional divisions of labour.[638] The key point here is that units' and systems' defining characteristics – the principles of membership and behaviour that describe their constitutions – cannot be fully understood without reference to the ecological *and* the social contexts in which they evolve. When combined with mankind's perceptible impact on the planet's ecological systems, this double movement captures our constitutive relationship with the natural world in which we live and of which we are a part, avoiding the monocausal determinism that plagued previous attempts to integrate environmental factors with descriptions of

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[635] J.G. Evans, *An Introduction to Environmental Archaeology* (Ithaca: Cornell University Press, 1978); Butzer (1982): 5; Karl Butzer & Georgina Endfield, 'Critical Perspectives on Historical Collapse', *PNAS* 109(10) 2012, p. 3628.
[636] J.W. Bennett, *The Ecological Transition: Cultural Anthropology and Human Adaptation* (New York: Pergamon, 1976): Ch. 3; Amos H. Hawley, *Human Ecology: a theoretical essay* (Chicago: University of Chicago Press, 1986): 1-4.
[637] Scoones (1999): 481-486. See also Norgaard (1994); Zimmerer (1994).
[638] Tainter (1988): 37-38; Simmons (1997): 17; Tainter (2006), p. 92; Tainter (2011), pp. 89-90.

human behaviour. Likewise, it undoes the damage inflicted on the historical record by anthropocentrism. There is, in reality, no ecological veil of ignorance behind which international units and systems develop before stepping, fully grown, into the world. As historically constituted entities, units' and systems' defining principles of membership and behaviour evolve in response to pressures emanating from both sides of the socio-ecological equation. As a result, their development cannot be properly understood without reference to both contexts. Though potentially useful as simplifying tools, neither social nor ecological determinism can produce an accurate mapping of international evolution at the unit- or systems-level insofar as each reflects only one half of the total environment that drives our adaptations.

Ecological Capacity is therefore a useful tool precisely because it incorporates a combination of ecological and social factors to describe a unit's or system's ability to sustain complexity in a given ecological milieu. As the preceding chapters have shown, the imperial states that today inhabit and help to define the hybrid international system of the Arctic Basin have evolved higher levels of hierarchical and functional differentiation alongside their growing EC. Each began as an imperial international system in its own right, incorporating thinly dispersed and largely autonomous indigenous populations into the Russian, British, Danish, and later American and Canadian empires through hub-and-spoke systems of indirect rule. Such indirectly ruled territories were common features of Europe's hierarchic imperial systems, which frequently used indigenous and corporate proxies to administer domestic sovereignty over far-flung imperial territories in which the state's limited EC made direct rule through bureaucratic or military occupation unsustainable.[639] Only when rapid increases to EC were made possible by revolutionary leaps in material technology in the early- and mid-twentieth century were the Arctic's metropoles able to tighten and formalize their holds on their non-European hinterlands, redrawing their imperial frontiers as clearly demarcated borders and transforming their imperial systems of indirect rule into asymmetric federations with qualities reminiscent of the ideal Westphalian state.

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[639] Herfried Münkler, *Empires: the logic of world domination from Ancient Rome to the United States* (Cambridge: Polity, 2007): 22-28; Motyl (1999):118-120, 124-130; Lieven (2002): 29-30.

Convergent & Divergent Patterns of Coevolution

A second finding of the preceding chapters is that Coevolution can provide a refined understanding of the relationship between social and ecological factors in the evolution of international social systems. As has already been argued, the complexity of international units and systems will generally covary alongside (i) the productivity of the biomes in which they are embedded and (ii) the technological complexity they are able to bring to bear to mobilize or supplement local energy resources. In the circumpolar Arctic, this has meant that population sizes, hierarchies, and divisions of labour have tended to increase along the three axes of increasing ecological productivity first described in Chapter Four. These run from North to South, from continental to maritime climates, and from tributary uplands to mature river valleys and coastlines. For the imperial systems of the circumpolar basin, the presence of these axes within their boundaries has created a source of divergent evolution, driving the development of different principles of membership and behaviour across the neo-European and non-European biomes they straddle. As a result, the inside-outside distinctions that define the Arctic's imperial states are cut across by a transnational socio-ecological bifurcation that traces the northern limits of both neo-European ecological conditions and neo-European settlement. This pattern is interrupted by trade-dependent neo-European islands and archipelagos – boom towns that use commodities from bonanza deposits of natural resources to sustain themselves in spite of their natural surroundings.

The different principles of membership and behaviour that exist on either side of the Arctic Basin's socio-ecological bifurcation mark a transition from Westphalian (neo-European) to imperial (non-European) international structures, with the latter describing relations between metropolitan states – in the sociological sense intended by Theda Skocpol[640] – and the peoples and territories of their subordinate non-European biomes. In all of these imperial systems, these structures are the product of Socio-Ecological Coevolution. By constituting a region-wide and relatively stable set of biomes in and across which the Arctic's imperial states have had to expand, the biogeographical structure of the circumpolar basin has contributed to their convergent evolution around the principles of membership and behaviour associated with a hybrid imperial-anarchic secondary states system. At the same time, socialization – a

[640] Skocpol (1979): 29.

socially-contextualized IR concept that explains the dynamics by which international units emulate one another's successful adaptations – has played a homogenizing role: encouraging imperial systems to adapt and adopt one another's successful strategies of imperial integration.[641] These range from Tsarist Russia's emulation of the HBC in Russian Alaska to the Canadian Inuit learning from and expanding on the land claims agreements won by Alaskan natives in ANCSA and the Greenlandic Inuit in the Home Rule Bill. Together, these ecological and social factors have produced a set of parallel adaptations among the units and systems of the circumpolar North, combining to split the Arctic's imperial systems along socio-ecological ecotones that describe the limits of their metropoles' neo-European political and economic systems.[642]

Biogeographical Structure & the Global International System

Third, there is reason to suspect that biogeographical structures in other regions of the world can have similar effects to those of the Arctic: creating socio-ecological bifurcations that cut across units' and systems' boundaries to affect their defining principles of membership and behaviour. When viewed in this light, the bands and pockets that describe the planet's biomes take on new meaning, threatening the homogeneity of the units they divide and putting otherwise disparate units on convergent evolutionary pathways. (See figure 7.2)

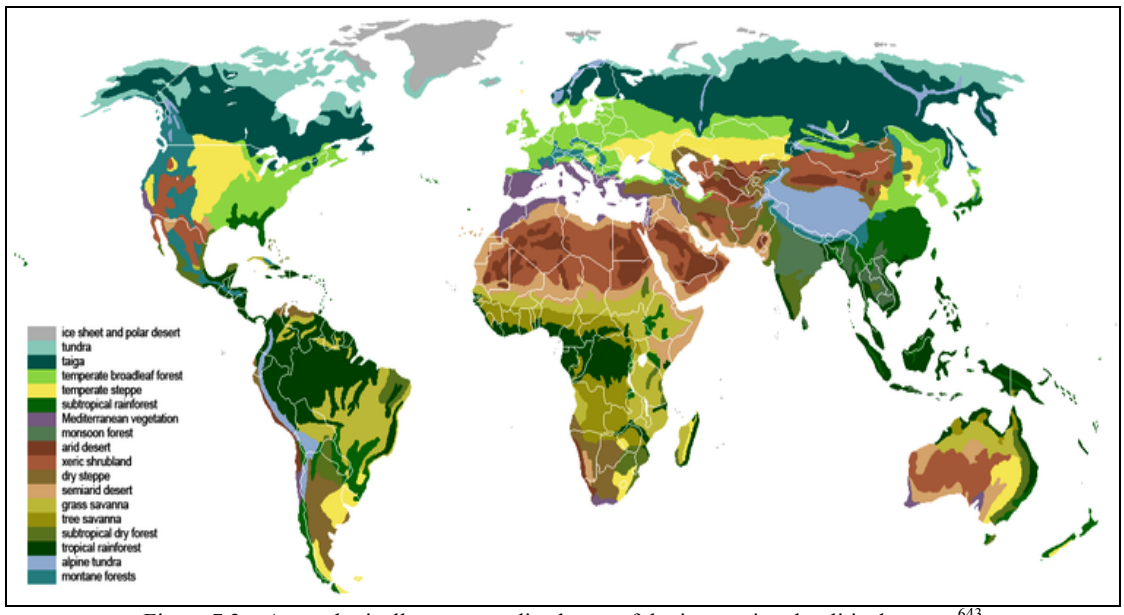

Figure 7.2 – An ecologically contextualized map of the international political system[643]

[641] Halliday (1994): 102, 122-123.
[642] Tilly (1985): 181-184; Crosby (1986): 5-7; Tilly (1992): 14-15.
[643] Ville Koistinen, "The Main Biomes in The World" *Wikimedia Commons: Vegetation.png*. 2007. [online] Accessed November 2, 2011. <http://commons.wikimedia.org/wiki/File:Vegetation.png.>

Most of the global system's dominant political units – states – straddle more than one biome. Indeed, the only states to enjoy relatively homogenous biogeographical structures at this broad spatial scale are those of western and northern Europe. It is interesting to note that it was in this relatively homogenous and temperate ecoregion that the global international system's dominant principles have their origins. States located elsewhere, including those of the Arctic Basin, have had to adapt to the biogeographical conditions in which they are embedded. The Arctic's experiences of Socio-Ecological Coevolution may therefore hold clues to the effects of biogeographical structure in other regions of the globe.

As we have seen over the past three chapters, the Arctic's bifurcated biogeographical structure has encouraged the construction of imperial international systems centred Moscow, Washington, Ottawa and Copenhagen. These systems have subordinated semi-autonomous units located in peripheral arctic and subarctic biomes to their European and neo-European metropoles via 'hub and spoke' imperial systems in which subordinate actors' international relations have become dependent on, but still not wholly reducible to, those of the core.[644] Thanks to the mediating influence of modern physical technologies and their metropoles' access to significant neo-European ghost acreage, the Arctic's hybrid state-systems have been able to take on increasingly Westphalian characteristics over the past century, with imperial frontiers slowly transforming into clearly demarcated state borders. However, even the powerful metropolitan states that inhabit the region – Russia, the United States, Canada, and Denmark – have been unable to fully escape the constraints imposed by their physical environments. Thus, rather than the classic state structures associated with the exercise of Westphalian sovereignty and typical of their European and neo-European territories, capitals' arctic and subarctic peripheries remain integrated by means of highly asymmetric federations. These higher-energy variants of the hub and spoke model represent a reimagining of imperial systems for the twenty-first century, with arctic hinterlands continuing to occupy the most subordinate positions in their respective federations. This has left the polar region balanced between imperial and Westphalian international units, processes, and structures, encompassing both

[644] Motyl (1999): 120-122; Münkler (2005): 4-8.

hierarchic and anarchic organising principles. Could the same hold true for other, similarly structured regions of the globe?

As illustrated in Figure 7.2, most of the units and regions of the post-colonial world vary from Europe's ecologically homogenous ideal. Instead of occupying relatively homogenous and temperate physical environments, they straddle ecological bifurcations that split them between two or more major biomes. Faced with these transnational biogeographical structures, states must adapt their social technologies to address the challenges and opportunities of their different ecological contexts. Alongside socialisation, shared ecological contexts may lead to the evolution of similar units, processes, and structures among initially dissimilar actors.[645] In socio-ecological terms, there appears to be a marked correlation between the neo-European biomes of the planet and significant concentrations of political and economic power. Limiting ourselves to true 'neo-Europes' – temperate broadleaf forests, temperate steppes, regions of Mediterranean vegetation and montagne forests – produces an interesting image of the core of the global international system that incorporates Old Europe, a large section of North America, northeast China and Korea, central and northern Japan, the Rio del Plata, coastal sections of the Mediterranean basin, and segments of South Africa, Australia and New Zealand. The addition of subtropical rainforests – which support important non-European food crops such as rice – expands the range of 'core' biomes to include the remainder of eastern China and southern Japan, along with parts of southeast Asia and southeast Brazil. Thanks to the application of sophisticated physical technology – such as in India's 'Green Revolution' – arguments can be made for the addition of still more biomes to the list, particularly monsoon forests. This leaves us with a map of neo-Europes that covers a significant portion of the globe, accounting for approximately a third of the planet's landmass.[646] At the global scale, there is a definite correlation between the presence of such biomes and a region's position in or near the core of the international system. This is not because productive ecosystems make for productive people – the sort of monocausal determinism against which IR turned in 1945. Rather, it is a function of the Coevolution of human societies and their physical environments. In this historical process, human societies have adapted their physical and social technologies to the

[645] Halliday (1994): 102, 122-123.
[646] Stuart Chapin III, Pamela Matson & Mark Vitousek, *Principles of Terrestrial Ecosystem Ecology* (London: Springer, 2011) second edition: 178.

ecological conditions of their immediate surroundings, permitting the development of complex units and systems in biomes capable of supporting large populations, hierarchies, and divisions of labour. The transnational distribution of these biomes has since contributed to successful processes of socialisation by enabling the spread of productive units, processes, and structures. The resulting large-scale distribution of socio-ecological cores and peripheries is a consequence of the coevolutionary process first identified by Alfred Crosby in relation to Europe's imperial age.[647]

It is worth considering how GEC may alter this situation. Remembering Joseph Tainter, the rise and fall of social complexity in the historical record has been affected by the introduction of new technologies, by resource exhaustion, and by large-scale environmental changes. These can bring new biomes into play, exhaust the productivity of those already producing, and radically alter the utility of existing technological adaptations, affecting the sustainability of embedded units and systems.[648] Sophisticated physical and social technologies have permitted post-colonial states to bridge some of the socio-ecological gaps that divide them by wringing more energy from once-marginal ecosystems or allowing processes like trade to subsidize their energy deficits. Until the advent of anthropogenic climate change, however, few technological fixes have altered the transnational biogeographical structures on which these gaps are based.[649] As result, divergent evolutionary pressures have continued to emanate from units' bifurcated ecological contexts, constraining the ability of the non-European world to emulate Europe's international units, processes, and structures. As climate change shifts the ecological fault lines of the Arctic Basin northward, it will likely ease integration between the non-European periphery and the neo-European core by transforming the biogeographical structure of the former to more closely resemble that of the latter.[650] Elsewhere, as we shall see in our discussion of Saharan-Sahelian Africa, the future is much less certain and climate change may actually deepen the biogeographical bifurcations that split some of the

[647] Crosby (1986): 304-308.
[648] Tainter (1988): 44.
[649] One region whose biogeographical structure has certainly been transformed by human land use is Amazonia, where the clearing of closed rainforest is converting large areas into open forest and savanna. It is interesting to note that this is essentially the same terraforming process as was used by early hominids to clear brush, forest, and jungle in the savanna of East Africa. [Simmons (1996): 39-41] The sustainability of both transformations has relied on continued human use or the evolution of other plant and animal species whose behaviour is such that they maintain the new structures through their interactions. [Peter Little, 'Rethinking Interdisciplinary Paradigms & the Political Ecology of Pastoralism in East Africa' in *African Savannas: Global Narratives & Local Knowledge of Environmental Change* (London: Heinemann, 2003): 163-165.]
[650] Christensen et al. in Solomon et al. (2007): 903-906.

world's post-colonial states and the systems they inhabit. Until more detailed work is done to integrate regional ecological models into the coevolutionary framework presented in this project, such hypotheses remain tentative in the extreme. However, they present an interesting opportunity for future research into the global and regional distribution of core-periphery dynamics in the international system that may complement and enrich IR's existing anthropocentric narratives.

Limitations and Caveats

Though it promises to enrich IR's existing understanding of international units, processes, and systems, Coevolution is not a panacea. The approach as it is currently constructed has been designed to deal with the international units and systems of the circumpolar Arctic: one of the most extreme ecological regions on the globe. As the four principles of Coevolution imply, the impact of ecology on social systems will be most visible when ecological constraints on social evolution are considerable and/or when embedded human societies lack sophisticated social and physical technology with which to access and supplement local energy resources. Coevolution is therefore best suited to analyse regions that share the Arctic's dramatic ecological divisions. This does not mean that only units and systems in the polar basin can be considered. Rather, the regions best suited to the current approach straddle two or more distinctive ecological regimes. As indicated in the previous section, Coevolution predicts that international systems – be they hierarchic or anarchic, regional or global – will likely see units in relatively neo-European biomes dominate others through some combination of indirect rule and direct hegemonic control. Thanks to its current focus on discontinuities in regional ecological structures, Coevolution has less to say about homogenously structured biogeographical spaces beyond predicting the presence of a much more homogenously distributed sets of organizing principles among their embedded international units and systems. This in itself is an interesting conclusion insofar as the global international system, and the principles of membership and behaviour that define and bound it, originated in just such a region of the world. However, given the heterogeneous makeup of the ecosphere and this author's still-rudimentary grasp of its functions within a coevolutionary narrative of international systems history, such hypotheses remain purely speculative and require further study.

Similar difficulties arise when Coevolution is applied to highly complex units and systems, whose relationship with their ecological context is mediated by sophisticated

social and/or physical technology. This technological sophistication may allow them to mediate many of the limitations imposed by their ecological surroundings, leaving the ecological side of the socio-ecological equation effectively buried until such time as *either* the units/systems involved collapse back to a less sophisticated technological condition *or* their ecological context transforms so as to drastically reduce the utility of existing technological adaptations. Although history is littered with examples of (and with books about) civilizations that have undergone some form of technological 'collapse', reducing their absolute level of social and material complexity, it seems an unlikely prospect in the short- to medium-term.[651] A more likely danger is that some large-scale ecological transformation driven by anthropogenic climate change may alter the utility of existing adaptations. As experts around the world admit, the impact of the present warming trends on the planet's many ecosystems and climate regimes is impossible to predict with absolute certainty. The more disturbing near-term possibilities range from a dramatic intensification of flood and drought regimes that undermine existing agricultural processes, to a sea level rise of over two meters that puts low-lying coastal units at risk, to abrupt and large-scale changes to climate patterns that could disturb the ecological structures on which oceanic fisheries and terrestrial agricultural production rely.[652] However, even such radical transformations of the physical environment may not undermine the technological foundations of the units and systems at the core of contemporary IR, whose complexity – though costly – may allow them to escape significant harm.

Hierarchic and Anarchic International Systems

One of the difficulties faced by this project has been the fact that the states of the circumpolar Arctic, whose borders are meant to define the 'international' as a scale and IR as a discipline, do not conform to the principles of membership and behaviour that define sovereign statehood in the core of the global international system. As such, I have had to make a relatively complicated argument that each of the states of the circumpolar world possesses the qualities of *both* a sovereign state *and* a hierarchic international system. Russia, the United States, Canada, and Kalaallit-

[651] Tainter (1995), p. 399; Tainter (2006), p. 92, See also Diamond (2005); Chew (2006); Tainter (1988); Butzer & Endfield (2012).
[652] Robert Nicholls & Anny Cazenave, 'Sea-Level Rise and Its Impact on Coastal Zones', *Science* (328), pp. 517-520; Robert Nicholls et al., 'Sea-Level Rise and its Possible Impacts Given a 'Beyond 4°C World' in the Twenty-Frist Century', *Philosophical Transactions of the Royal Society* (369) 2011, pp. 166-168; Kevin Trenberth 'Changes in precipitation with climate change', *Climate Research* (47) 2011, pp. 123–138; Alley et al. (2003), pp. 2007-2009.

Nunaat/Denmark have evolved out of imperial international systems in which metropolitan capitals – in Moscow and St. Petersburg, Washington, London and Ottawa, and Copenhagen – have acted as 'hubs' around which various non-European polities have been organised in a hierarchic system. Each of these has since evolved toward, but not achieved, a form of sovereign statehood that resembles the global international system's Westphalian ideals. They have done so by reconstituting themselves as asymmetric federations in which the central government possesses an increasing degree of control over relatively well-demarcated borders and a varying degree of control over the local political and economic affairs of its non-European peripheries. This situation has been made more complex by the fact that every Arctic state expresses the classical characteristics of sovereign statehood over portions of their territory that are ecologically neo-European. In these regions, 'hard' territoriality and sovereign control conform closely to global principles of membership and behaviour. In their non-European ecosystems, however, these characteristics have been liable to break down and be replaced by much more permeable forms of territoriality and constrained forms of sovereignty, resulting in the hybrid units and systems described in Chapter Six.[653]

If the principles of sovereignty and territoriality used by ecologically bifurcated states to organize their power are not homogenously spread over the biomes and ecotones they straddle, how should they and the systems constituted by their interactions be characterized? Throughout this project, regular references have been made to asymmetric core-periphery relationships in the hybrid international political and economic systems of the circumpolar world. These have been described in imperial terms, harkening back to Michael Doyle's definition of empire as 'a system of political interaction between two political entities, one of which, the dominant metropole, exerts political control over the internal and external policy – the effective sovereignty – of the other, the subordinate periphery.'[654] A useful expansion of this definition is provided by David Lake, who refers to *informal empires* as combining 'both security and economic hierarchy, with the subordinate polity ceding some, but not all authority to the dominant state in both arenas.'[655] Lake's definition is particularly useful insofar as it expands the range of sectors to which imperial relationships can be applied and

[653] Haycox, *Alaska: An American Colony* (2002): 156; Mote (1998): 2-5; Grant (2010): ch.13; Münkler (2005): 5-6.
[654] Doyle (1986): 12.
[655] David Lake, *Hierarchy in International Relations* (Ithaca: Cornell University Press) 2009: 58.

opens space in which substate actors, such as the Regional Native Corporations of Alaska or the Home Rule Government of Kalaallit-Nunaat, might be considered semi-autonomous imperial actors on the international stage. It is also reminiscent of the imperial hierarchies described in Chapter Six, in which international relationships are 'centred on, but certainly not reducible to, states possessing sovereignty in the Westphalian model.'[656] Though often masked under the title of 'states', informal imperial systems continue to exist in parts of the world where 'sub-state' imperial peripheries possess (i) an international legal personality, and (ii) nominally independent governments. Even harder to locate than these informal imperial systems are formal empires, whose peripheral sub-state units possess neither 'international legal personality nor a nominally independent government' and 'ultimate authority is vested in the imperial centre', giving them a very state-like appearance.[657] The existence, however imperfect, of the obshchina in the Russian federation, of constitutional guarantees of tribal sovereignty in the United States, of direct treaty relations between first nations and the Crown in Canada, and of devolved territorial governance in Kalaallit Nunaat are evidence of these informal and formal imperial arrangements in the circumpolar North. Herfried Münkler sums up the difficulty of identifying imperial orders in a formally statist international system when he explains that,

> Since the whole habitable surface of the Earth has been organized in the form of states… imperial structures are superimposed on the state order, but they no longer replace it. This sometimes makes it difficult to identify an empire. Whoever thinks of imperiality as simply an alternative to statehood will come to the conclusion that no empires exist today. Whoever, on the contrary, proceeds from the superimposition of imperial structures on the state order will encounter structures of power and influence not identical to those of the state.[658]

It is these non-state and imperial structures, conditioned by coevolutionary processes and the biogeographical structures of the planetary ecosphere, which define the Arctic international system as a hybrid of hierarchic and anarchic orders.

As ever, Martin Wight can shed considerable light on this confusing hybrid of units and systems. In his discussion of different forms of state systems, he recognizes that some systems can be *suzerain* in the sense that a metropolitan core acts as 'the sole

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[656] Hobson & Sharman (2005), p. 71.
[657] Lake (2009): 57-58.
[658] Münkler (2005): 6.

source of legitimate authority, conferring status on the rest and exacting tribute or other marks of deference.'[659] As examples, he points to Imperial China and, more importantly for our purposes, the British Raj in India, which 'asserted an authority over the 600-odd native princes which was so effective that the Raj appears an extreme example of what we are discussing.'[660] British and, later, Canadian rule over the first nations of the taiga and tundra followed a similar course insofar as the treaty relations between them recognized indigenous groups' nominal autonomy and bounded them as collective actors while at the same time subjugating them to the executive branch of government in return for specific privileges and payments. In Tsarist and modern Russia, much the same is true with reference to the Small Peoples of the North, as it is with the Native Americans of Alaska. Each group is involved in different state-centred *suzerain state systems* that, taken together, constitute the *secondary states-system* of the circumpolar world.[661]

An ecological analysis of international units and systems therefore helps to explain why international systems in the Arctic can be so difficult to identify as *either* sovereign *or* imperial, *either* anarchic *or* hierarchic. One answer lies in the fact that the units and systems being described are never ecologically homogenous. As indicated by our discussion of New Ecology in Chapter Three, homogeneity does not exist at any spatial scale in the Earth's natural systems. Because the international units and systems under investigation in this project straddle ecological gradients between biomes, the social principles by which they are bounded and organized will vary across space and time. Thanks to the influence of Socio-Ecological Coevolution on their historical development, international systems' organizing principles will tend to mirror the ecological systems in which they are embedded. States, non-state actors, process, and structures in the Arctic Basin are socio-ecological constructs, products of the interaction of human populations with and within the region's bifurcated biogeographical structure.

Returning to Figure 7.2, international units and systems straddle transnational ecotones that cut across their neat, socially constituted boundaries. Thanks to the coevolution of

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[659] Wight (1977): 23-24.
[660] *Ibid*.
[661] It is interesting to note that Wight equates empires, suzerain state systems, and federations as similar structures of governance and organisation. [*Ibid*: 23-25.]

human populations and the biological, chemical, and physical systems in which they are embedded, these transnational divisions mark transitional zones that divide human populations' ecological and social contexts. They are socio-ecological ecotones and indicators of a global pattern of *ecological imperialism*: a process in which ecologically productive sites and biomes attract the most complex units and systems and thereby affect the shape and character of international units and systems.[662] Thanks to their denser populations and their more developed hierarchies and divisions of labour, these complex actors are able to mobilize significant financial and human capital to reproduce themselves and subordinate the populations of less productive biomes.[663] This combination of Charles Tilly's theory of state development, Joseph Tainter's theory of social complexity, and Alfred Crosby's theory of Europe's ecologically-driven imperial expansion adds to our understanding of *how* and *why* the modern international system of the circumpolar North remains stubbornly caught between states and empires, units and systems, anarchy and hierarchy.

Ecology & Regionalism

The preceding socio-ecological analysis has been closely related to the idea of regions: territorial sub-sets within the global international system which differ from dominant norms in terms of the principles of membership and behaviour that define their boundaries and interactions.[664] In his classic rendering of regions, David Grigg associates regional identification with classification – the process of 'grouping objects into classes on the basis of properties or relationships they have in common.'[665] This can be accomplished on the basis of *differentiating characteristics*: properties that separate a 'class' from a larger universe of individuals. If properly selected, a class's differentiating characteristics should covary with other properties that identify it as a population distinct from the larger whole. If these 'accessory characteristics' mirror the divisions produced by the differentiating characteristic, they help to solidify the class's claim to a distinct regional identify. IR has utilized many differentiating characteristics as bases for its regional divisions. Martin Wight's oft-quoted statement that we 'must assume that a states-system will not come into being without a degree of

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[662] Crosby (1986): 5-7.
[663] Tilly (1985): 181-184; Tainter (1988): 37-38; Tilly (1992) 14-15.
[664] Barry Buzan, 'How Regions were Made, and the Legacies for World Politics: An English School Reconnaissance', in *International Relations Theory and Regional Transformation*, Ed. T. Paul (Cambridge: Cambridge University Press) 2012: 22; Keskitalo (2007), pp. 187-188.
[665] Grigg (1965), p. 466.

cultural unity among its members' provides a socio-cultural basis for regional identification without reference to ecology or non-human factors.[666] Buzan bases his division of the world on a different – if still anthropocentric – set of characteristics centred on the heterogeneous principles of behaviour and membership that are present, absent, or expressed differently at the regional level.[667] These include the particular varieties of unit expressed at a spatial scale below that of the international system, foreshadowing this project's conclusion that the Arctic is a region defined – at least in part – by its resident imperial states: units whose evolution has been fundamentally affected by the physical contexts in which they have developed.

As it has developed, this project has used ecological structures as primary differentiating characteristics to identify the Arctic region. The fact that these covary with the principles of membership and behaviour that define international units and systems strengthens the project's claim that Ecology can serve as a useful organizing device in the study of IR. In methodological terms, this project has employed the biogeographical structure of the ecosphere as the primary differentiating principle on which to base its regional mapping. Instead of building its 'class' from a universe of autonomous individuals, however, it has begun with a single category that shares a set of common characteristics – the global international system. It has then separated out a subset of that totality (the regional Arctic international system) on the basis of its chosen differentiating characteristic (its biogeographical structure). The result is what Grigg calls a 'logical division'.[668]

Relying on non-human characteristics to divide the world into regions carries with it the ever-present risk of falling back into monocausal environmental determinism. Were I to adopt the homeostatic vision of Ecology present in most attempts to integrate the subject into IR, this charge would probably stick. However, informed by the dynamism of New Ecology, Coevolution maintains that the biogeographical structure of the Earth is itself the product, at least in part, of human influence. Thus, the use of biogeographical features to describe groups of human actors should not fall victim to this particular bugbear so long as the region's accessory characteristics are social and are observed to correspond to the ecological divisions adopted by the analyst.

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[666] Wight (1977): 33.
[667] Buzan (2012): 37.
[668] Grigg (1965), pp. 466-469.

Ecology provides a number of interesting perspectives on the construction and identification of regional subsystems. One of the fundamental conclusions of this project has been that *where* IR happens affects *how* it happens. That is to say, actors' ecological contexts affect the ways in which they organize themselves and their interactions. There is a clear link here to the process of regionalization, which necessarily includes an element of geographical continuity. As Buzan argues, 'Regions are not just any subsystem of states in an international system, but a specific type of subsystem defined by geographical clustering.'[669] The importance given to clustering is mirrored in ecological population dynamics, where both individuals and populations will adopt 'clumped' distributions at medium to large spatial scales, attracted either by other actors or by a common resource. In coevolutionary terms, this means that units embedded in similar ecological contexts will converge around a shared set of behaviours and/or mutually attractive environmental factors. To ecologists, this clumping is driven mainly by behaviour, in which individuals and populations attract, repel, or ignore one another. The more attraction exists, the tighter the resultant clumping. Behaviours are reinforced or dampened by environmental factors, such as the presence or shortage of a locally available resource.[670] Translated back into the language of IR, regions (understood as clustered collective actors) can be formed through different forms of social interaction, with Alexander Wendt's troika of enemies, rivals and friends being a particularly promising typology.[671] This leaves us with a picture of regional social systems ranging from power political to cooperative to convergence, each corresponding to one of Wendt's broad categories of interaction.[672] In each case, endogenous social factors can be amplified or dampened by the ecological contexts in which they take place. For example, mutually hostile human populations sharing a resource-poor site are likely to clash over access to the resources in question, while friendly populations may cooperate in order to make more efficient use of shortfalls or trade local ecological surpluses to subsidize each other's energy shortfalls in less productive ecosystems. These interactions – based as they are on a combination of social and ecological factors – combine over time to produce increasingly distinct international regions.

[669] Buzan (2012): 22
[670] Molles (1999): 169-170.
[671] Wendt (1999): 259.
[672] Buzan (2004): 159-160.

Given this project's discussion of the convergent evolution of Arctic units, processes, and systems, the use of ecosystems and biomes as a differentiating characteristic on which to base a logical division of regional international systems appears promising. Contrary to the tenets of anthropocentrism, humanity and ecology do not exist in isolation from one another. Rather, they covary over time and space thanks to the influence (i) of ecological context on the principles by which international systems are organised, and (ii) of human technology on the ecosystems in which we are embedded. The Arctic provides just one examples of how socio-ecological covariance leads to the identification of contiguous biomes and sites as discrete regional systems. Its ecological composition has generated successive waves of pre-international, early-modern, and modern international units and systems that are remarkably similar in terms of the principles of membership and behaviour by which they organise themselves and their interactions. In each era, the distribution of Ecological Capacity among units and systems has produced clumped spatial organizations typical of biological populations at large spatial scales.[673] Given the relationship between population dynamics and ecological context discussed earlier in this Chapter, this socio-ecological covariance should not be surprising. Indeed, from an ecological perspective, it would be surprising only if it were absent.

Does this mean that Ecology provides a metastructure capable of explaining regional processes around the world? Yes and no. It isn't ecology itself, but rather the ways in which humanity interacts with ecology that describes discrete international regions. Though a pedantic distinction, it is an important one. Claiming that ecology alone can determine human population dynamics – of which our international relations are one variety – would be to ignore the fundamental importance of endogenous (social) factors in determining human behaviour. Claiming the existence of socially constructed regions without paying attention to the ecological similarities that bind their human populations together falls into a similarly deterministic trap by ignoring the importance of exogenous (ecological) factors in constraining and encouraging human behaviour. Ecology is most useful when it is harnessed to the power of social analysis, and vice versa. Though ecosystems and biomes can provide an interesting starting point from which to investigate social covariance, they should never be

[673] Molles (1999): 169- 170, 172-175.

assumed to be constitutive of international regions in their own right. For this reason, it may be that Socio-Ecological Coevolution – by combining influences from our social and ecological contexts – is better able to describe the various, overlapping subsystems of the global 'set of sets' than most of the monocausal differentiating characteristics currently in use.

Saharan Africa: a comparative case for IR & GEC

Coevolution helps to explain the persistence of many of the asymmetric relationships that continue to describe interactions *within* and *between* the units and regions of the global international system. The Saharan-Sahelian belt of Africa provides a compelling case in point that is both fundamentally different and broadly comparable to that of the circumpolar Arctic. If we identify the Saharan-Sahelian belt as a distinct region, we must do so on the basis of its social *and* ecological contexts. As in the Arctic, these contexts covary in such a way as to produce principles of membership and behaviour that differ from those of the global system of which the Saharan-Sahelian region is a part. The short discussion that follows is not enough to determine whether any global principles are entirely present or absent in this geographically contiguous and socio-ecologically bounded subsystem. However, it is possible to observe how some of the central organizing principles of the global system are expressed differently at this particular regional level.

As illustrated in figure 7.3, the domination of less productive biomes by their more productive neighbours is a common feature across much of the Saharan belt that stretches from the Atlantic coast to the Red Sea. As in the Arctic, the states of the region are not *exclusively* Saharan in their biogeographical constitution. In each, desert hinterlands are ruled from the relatively productive Sahel, forest, and Mediterranean biomes that border them. Though the axes of ecological productivity that describe the region's biogeographical structure will necessarily differ from those of the Arctic Basin, the relationship between centralized state power and systems of indirect rule in relatively marginal ecosystems remains constant. Much of this has to do with the region's international history, which constructed its states in the image of the imperial systems that first demarcated their territorial frontiers on world maps

following the Berlin Conference of 1884/5.[674] Across the heart of the continent, state power is concentrated along the relatively productive shoreline – as in Mauritania and in the states of North Africa – or in sub-Saharan states' more ecologically productive southern biomes – as in Mali, Niger, and Chad. Khartoum's location at the confluence of the White and Blue Nile may also be indicative of Coevolution's ability to explain international units and systems in terms of the biogeographical structures they reflect – mirroring the third axes of Arctic NPP in that locates the most productive ecological sites at riverine and coastal locations.

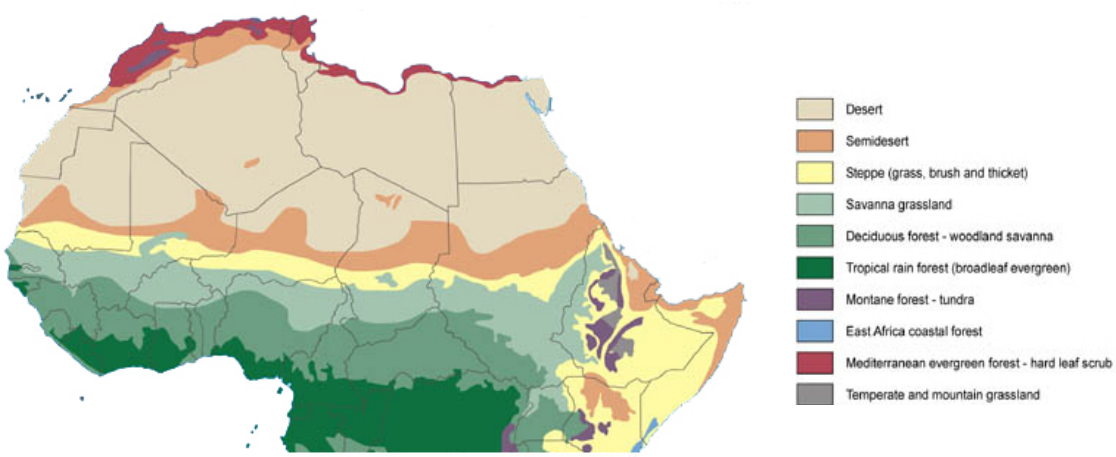

Figure 7.3 – Major biomes and political boundaries in North Africa[675]

As in the Arctic, the principles by which Saharan Africa's international units and structures are organised are not *determined* by the ecological systems in which they are embedded. Rather, their development has been affected by their conjoined social and ecological contexts, each contributing to the evolution of the region's international units and systems. For example, it would be foolishly simplistic to assert that the separation of South Sudan from the remainder of the Sudanese Republic was caused by the areas' different ecological structures. Influences from ethnicity to religion to oil revenues have each played their part, amplified and dampened by the bifurcated ecologies in which different actors are embedded.[676] However, when one extends the

[674] Mahmood Mamdani, 'Beyond Settler and Native as Political Identities: Overcoming the Political Legacy of Colonialism', *Comparative Studies in Society and History* (43) 2001, pp. 654-655; Jeffrey Herbst, *States and Power in Africa: Comparative Lessons in Authority and Control* (Princeton: Princeton University Press, 2000): 71-76. See also Mahmood Mamdani, *Citizen and Subject: contemporary Africa and the legacy of late colonialism* (Princeton: Princeton University Press, 1996).

[675] 'North African Vegetation Region Map', IUCN/SSG Cat Specialist Group – Cheetah Conservation Compendium, Maps: North African Region [online]. Accessed October 15 2011 <http://www.catsg.org/cheetah/07_map-centre/7_4_North-African-region/basic-maps/north_african_region_vegetation.jpg>.

[676] See Alex Cobham, 'Causes of conflict in Sudan: Testing the Black Book', *The European Journal of Development Research* 17(3) 2005, pp. 462-480. For a cautionary article about the dangers of neo-Malthusian environmental determinism in locating the causes of the Sudanese civil war, see Harry Verhoeven, 'Climate Change, Conflict and Development in Sudan: global neo-Malthusian narratives and local power struggles', *Development & Change* 42(3) 2011, pp. 679-707.

depth of their historical analysis to account for the ethnic and religious divisions of the region, ecology's role becomes less deterministic and much more compelling. As in the Arctic, the evolution of pre-international and international units and systems has been influenced by the distribution of EC amongst its actors and the biogeographical structures that constrain their actions. It is a coevolutionary rather than a deterministic relationship: one in which units, processes, and systems interact with and within their ecological contexts, with effects on both sides of the socio-ecological equation radiating down the levels of analysis from individuals to the wider systems constituted by their interactions. It is also a relationship increasingly mediated by the modern social and physical technologies that African state, sub-state, and non-state actors have at their disposal.

Unlike the Arctic Basin, whose ecological productivity is constrained by its low temperatures and low levels of Photosynthetically Active Radiation, the Sahara has a surplus of both. Its NPP is mainly limited by aridity.[677] This ecological characteristic means that the impact of climate change on the region's units and systems will be very different from those in the circumpolar North. Increasing precipitation gradients will likely see more rainfall in the wet tropics and less in the dry subtropics – home to the majority of the planet's major deserts and semi-desert grasslands.[678] Even where climate models predict increasing precipitation, simultaneous increases in temperature are likely boost evapotranspiration rates, leading to drier soil horizons. Combined with trends in human land use that lead to soil degradation, GEC is therefore likely to contribute to desertification along the northern and southern margins of the Sahara, driving Sahelian and forest biomes before it.[679] Instead of expanding the biomes in which neo-European units and systems are based, as it may do by warming and wetting large regions of the circumpolar world, GEC in Africa is likely contract the ecological range in which units and processes associated with the global (née European) international system can be sustainably maintained. This will put pressure on the financial and human capital available to Saharan states as they attempt to maintain their population sizes, hierarchies, and divisions of labour, endangering the sustainability of complex units and systems in the region. GEC may thus encourage

[677] Molles (1999): 26-29; Dickinson & Murphy (1998): 125-126.
[678] Christensen et al. in Solomon et al. (2007): 868.
[679] Robert Balling, 'Interactions of desertification and climate in Africa', in Pak Low, *Climate Change and Africa* (Cambridge: Cambridge University Press, 2005): 46-47.

states to reintroduce forms of imperial or indirect rule, whose the lower energy requirements have shown themselves to be well-suited to the constrained NPP of other extreme environmental systems around the world.

Socio-Ecological Coevolution, as currently constructed, is an approach that relies on the presence of significant ecological gradients whose presence will be mirrored in the units, processes and structures that constitute an international system. While this description leaves many regions of the world in play – including Amazonia, Arabia, the Tibetan Plateau and Taklimakan Desert, Southwestern Africa, and large swathes of Central and South Asia – it also excludes some of the core regions of the current international system. This exclusion, however, may be instructive in and of itself. Looking back one last time at figure 7.2, it is telling that many of the dominant units and regions in the global international system are embedded in the planet's most productive ecological contexts. Where GEC serves to extend the range of these productive ecosystems, as it may in the circumpolar North, embedded units and systems may find themselves better positioned within the international social systems of which they are a part. Such will certainly not be the case for those units and regional systems whose ecological contexts are degraded by GEC, resulting in much higher costs to maintain the population densities and levels of technological sophistication to which they have become accustomed.

Conclusion

The global climate is not a static backdrop against which human dramas play out. It is dynamic context influencing – and influenced by – the human populations that inhabit it. Understanding this coevolutionary relationship, integrating it into IR analyses of regional international systems, and using the resulting toolkit to develop socio-ecological baselines for future research into the impact of GEC on the circumpolar world have been the main goals of this project. Each step has required that we question the anthropocentric assumptions that unite IR's otherwise disparate schools of thought. The approach advocated in the preceding chapters is not intended to replace anthropocentrism with some other form of monocausal determinism. It has cleaved to a middle path described by Socio-Ecological Coevolution – the mutually constitutive process that describes the interaction of international and ecological units and systems over time. Informed by developments in IR, Ecology and History, Coevolution

asserts that humans have always affected, and been affected by the biological, chemical, and physical systems in which we are embedded. Though the influence of our ecological context can be mitigated by social and physical technologies, the complexity of the planetary ecosphere and of our relationship to it has ensured that we cannot completely escape its grasp.

The preceding chapters have generated several compelling conclusions with potentially important implications for our discipline. First, there appears to be a direct correlation between the complexity of international units and systems – a term that describes their population size and level of hierarchical and functional differentiation – and their Ecological Capacity of a given ecological context. This has effectively stalled the development of highly differentiated state units in the circumpolar North, whose imperial international systems were constrained by extremely low EC until the mid-twentieth century. The arrival of modern communications and transport technology following the Second World War set off a period of punctuated evolution, in which technological changes led to a flurry of new institutional forms.[680] In Russia, the United States, Canada, and Denmark alike, technological advancement has led to the creation of units and systems that combine low-energy imperial hierarchies with relatively high-energy state characteristics. The presence of these two forms of international unit and system marks the Arctic off as a *secondary states-system* in the Wightian sense, or a 'set of sets' to use Braudel's and Chaudhuri's description.[681] This hierarchic-anarchic hybrid has evolved out of the region's specific ecological and social history, and cannot be ascribed to either anthropogenic or environmental causation. It is the product of the system's coevolutionary history.

Second, Coevolution implies a link between the biogeographical structure of the planet and the distribution of dominant and subordinate actors in its embedded international systems. This has interesting implications for IR. It helps to explain why so many states around the world fail to conform to the principles of membership and behaviour – including centralised sovereign control and hard territoriality – that dominate the global system's European and neo-European core. States that straddle two or more major biomes may not be able to sustain the social technologies needed to establish

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[680] Hendrik Spruyt, *The Sovereign State and its Competitors* (Princeton: Princeton University Press, 1994): 25.
[681] Wight (1977): 24; Braudel (1981): 459; Chaudhuri (1990): 431.

Westphalian characteristics across their territories, relying instead on sovereignty bargains with sub-state, non-state, or foreign state actors to buttress their claims on the international stage.[682] The Arctic, with its distinctive banded set of transnational maritime, tundra, and taiga biomes, has seen its dominant states adopt a variety of institutional forms to deal with this socio-ecological reality, from the highly uneven resource-driven expansion of state influence in parts of Siberian Russia to the Native Corporations and village administrations of Alaska, to the partially devolved territorial governments of Canada, to the economically dependent but increasingly autonomous Home Rule Government of Kalaallit-Nunaat. Though these institutional forms vary, the hybrid imperial states involved are linked by several transnational social and ecological factors. These include their need to maintain international claims to effective sovereignty over their Arctic territories, their imperial relationships to the indigenous peoples who effectively occupy the majority of the arctic and subarctic territory in question, and the bifurcated ecological structures of the circumpolar basin. Given the ecological changes predicted in recent scientific reports from the IPCC and the Arctic Council, it is likely that some of these imperial projects will prove more successful than others, setting off the second phase of punctuated evolution: a period in which these imperial states are likely to undergo a period of selection in which they compete with their synchronic counterparts.[683] The most successful forms are then likely to become socialized around the region, returning the polar basin to the relatively homogenous institutional condition in which it existed before innovations of the modern era set off a period of institutional variation.

Finally, it is possible that regional studies of Arctic international systems may have wider applicability in similarly structured socio-ecological contexts. The Saharan-Sahelian example discussed earlier in this Chapter is a promising first step in this direction, though substantial research across the social and natural sciences is needed to flesh out its rather tentative hypotheses. For now, the most compelling arguments have to do with the likely impact of GEC on regional international systems. Where climate change shifts ecological systems into more productive gears, it is likely that both units and systems will converge increasingly with the global norms of hard territoriality and sovereign control – leading to a period of potential instability in

[682] Litfin (1998): 10-11; Krasner (1999):12-13, 20.
[683] Spruyt (1994): 25.

regions like the Arctic where borders have historically been loosely defined and enforced. Regions in which GEC lowers ecological productivity will likely diverge from these same principles of membership and behaviour, adapting them to better address their immediate socio-ecological environments. This may mean a return to indirect rule and informal, imperial systems throughout much of the post-colonial world – often masked under the label of asymmetric federalism and typified by increasingly porous borders and decentralized sovereign control over both territory and people.

Understanding the planet's ecological systems is certainly not the job of International Relations. However, understanding how these systems relate to international units, processes, and structures should be. For inspiration, our discipline need look no farther than Ecology and Environmental History, which have already done much of the groundwork needed to support a new analytical framework. With its increasingly nuanced and pluralist approach to the study of human phenomena at the international scale, our discipline is uniquely well-placed to address the impacts of climate change on international systems. As suggested by the theoretical toolkit developed for this project, ecological analyses of international systems will be best served by cleaving as closely as possible to the strengths of existing approaches. That developed by Buzan and Little to study the social constitution of international systems in world history is a promising starting point for future endeavours, particularly for students and practitioners who tend towards qualitative analysis. Other IR theories may generate alternative starting points from which our understanding of Ecology as a factor in the evolution of international systems can develop. What is important is not that we choose one framework of analysis or another, but that we as a discipline recognize the need and value of integrating our growing understanding of the ecological and international systems in which we are embedded.

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