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Synthesis

Rethinking Social Contracts: Building Resilience in a Changing Climate

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ABSTRACT. Social contracts play an important role in defining the reciprocal rights, obligations, and responsibilities between states and citizens. Climate change is creating new challenges for both states and citizens, inevitably forcing a rethinking of existing and evolving social contracts. In particular, the social arrangements that enhance the well-being and security of both present and future generations are likely to undergo dramatic transformations in response to ecosystem changes, more extreme weather events, and the consequences of social–ecological changes in distant locations. The types of social contracts that evolve in the face of a changing climate will have considerable implications for adaptation policies and processes. We consider how a resilience approach can contribute to new social contracts in the face of uncertainty and change. Examples from Norway, New Zealand, and Canada show how resilience thinking provides a new way of looking at social contracts, emphasizing the dynamics, links, and complexity of coupled social–ecological systems. Resilience thinking provides valuable insights on the characteristics of a new social contract, and social contract theory provides some insights on creating resilience and human security in a warming world.

Key Words: *adaptation; climate change; New Zealand; northern Canada; Norway; resilience; social contracts.*

INTRODUCTION

There is a growing recognition that the resilience of social–ecological systems is being undermined by human activities, and there are many indications that new approaches to both understanding and managing change are needed (Folke et al. 2002, Gunderson and Holling 2002). Greenhouse-gas emissions resulting from human activities and carbon-based energy systems are contributing to potentially unprecedented environmental changes (Intergovernmental Panel on Climate Change (IPCC) 2007). These changes create challenges in terms of the protection that citizens might expect from the state. Social contracts, which have served as an important conceptual tool for managing the relationship between citizens and states in western liberal democracies, may be discussed in this context. They have been presented both as a cause of social and environmental problems, and as a possible solution (Miliband 2006, Nussbaum 2006, Pateman and Mills 2007). Given the complex and far-reaching impacts of climate change on social–ecological systems (Adger et al. 2006), it is time to discuss the potential role of social contracts as a political response to a changing climate (see Pelling and Dill 2006). Resilience thinking offers a new way of understanding complex adaptive systems and it can provide key insights into the evolution of the social contracts that underpin many systems of governance.

We consider how resilience thinking can contribute to contemporary debates about social contracts. In particular, we look at the ways that social contracts implicitly and explicitly inform governance responses to climate change. Rather than simply offering a new scholarly way to explore climate change, we examine how climate change affects the foundations of political arrangements and, in turn, how the evolution of these political arrangements exacerbates or reduces vulnerability to climate risk. In particular, we draw attention to some fundamental questions about the ways that climate change affects citizen–state relationships that have been legitimized by social contract theory. Drawing

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on examples from Norway, New Zealand, and northern Canada (three resource-dependent economies with indigenous populations and a tradition of strong liberal social contracts), we show how resilience thinking can be used as a lens to highlight important issues surrounding the evolution of contracts in a changing climate. We then point out some of the lessons that resilience thinking itself can glean from debates about social contracts, including insights on how dynamic relationships of power and interests influence social–ecological systems. One conclusion from this discussion is that some difficult questions of trade-offs among social groups and ecosystems across time and space must be debated in a more open and inclusive way. This includes attention to the rights of distant others and future generations who have been largely excluded from debates about resilience. It raises questions about resilience of what, and for whom.

We wish to be clear from the outset that we are not advocating social contracts as an inevitable or even necessarily desirable way to regulate relationships within changing social–ecological systems. We acknowledge that there are a variety of visions for alternative ways that these relationships can be managed (capability approaches, trusteeship models, and cooperative local community networks, to name a few). Drawing on our academic backgrounds from geography, political science, and applied ecology, we would like to open up a debate on the role that social contracts may play in a new and dynamic global context that will be increasingly shaped by the impacts of and responses to climate change.

SOCIAL CONTRACTS

One of the most influential political arrangements for governance has been the idea of the social contract (Kant 1959, Locke 1965, Rawls 1971, Rousseau 1973, Hobbes 1998). Social contract theory predates and implicitly informs our modern concepts of democracy. Political philosophers, from Aristotle to Hobbes, Rousseau, Locke, Kant and Rawls, have sought to identify principles that might underpin a legitimate political arrangement for government. These writers and contemporary social contract theorists have diverse visions, but generally agree that legitimate, collective governance arrangements should be informed by the consent of the people (Weale 2004). Consent is achieved through a real or ideal agreement or compact between a civil community and the state. This agreement, in turn, defines the rights and responsibilities of these groups to each other (Harsanyi 1976, Gauthier 1986, Barry 1995, Scanlon 1998, Rawls 2001, Weale 2004, Pateman and Mills 2007). This notion of government by consent is simple and powerful, and helps us understand why the ideas presented by social contract theory have continued to have an important, albeit problematic, influence in modern government (Pateman and Mills 2007).

Social contract theory performs diverse functions. Here, we are interested in the way that contracts legitimate and constrain government authority, and secure rights and protections for citizens in a changing climate (Boucher and Kelly 1994, Hampton 1997). Social contracts typically offer some form of mutual benefit and impose some mutual obligations or constraints. Citizens who are party to these agreements, for example, explicitly or implicitly accept obligations or responsibilities (paying taxes, voting, obeying rules and regulations, etc.) in return for benefits and protection by a state (e.g., maintaining order, fostering citizen well-being, and providing for education and health services). Social contracts also reflect a much wider principle, namely that human relationships should be regulated by agreements. Viewed as part of the Enlightenment project, much early social contract thinking evolved in a period of the expansion of the state, and the expansion of individual civil, political, and social rights (Mills 1997).

Given the roots of social contract theory, it is not surprising that many argue that existing contracts are not neutral, and have not been applied equally to all members of society (Nussbaum 2006). Social contracts have prioritized power of some over others and have served as exclusionary tools for domination (Pateman and Mills 2007). Patriarchal, racial, and imperial structures have shaped the modern world and have left a legacy in modern society (Pateman and Mills 2007). As a model of governance, the social contract has been continually contested and challenged, particularly in relation to the way that the theories of social contracts have in reality codified and legitimated men's domination of women (Pateman 1988) or the subordination of one race to another (Mills 1997). Increasingly, too, there are groups beyond the state that are included within the reach and impact of modern social contracts, and yet, that have never consented or

agreed to the contract. These nonconsenting parties are unable to exclude themselves from the negative socioeconomic or environmental effects that are caused by distant others (Bohman 2004). The reaches of power express themselves not only through economic and social domination, but also through environmental changes that threaten the basis for livelihoods, production, and a sense of place (Hayward 2008a).

There is little doubt that nature and the physical environment have been subordinated and exploited in the name of development, progress, and economic growth. Social contracts have been criticized for legitimizing the exploitation of the environment (including the accumulation of resources and property) to the benefit of colonizers, land developers, speculators, mining companies, and others (Barry and Wissenburg 2001). Since the age of territorial expansion, the state has been able to provide benefits to citizens by drawing on resources extracted through such activities, offering protection of rights of property ownership, and facilitating conditions of unsustainable growth. The rights of private-property ownership and economic growth based on resource consumption have become revered tenets in modern liberal democracies, and they are protected by social contracts (Macpherson 1973). Greater regulation and control (or even talk of such action) can threaten the processes of capital accumulation and speculative investment. This could influence economic growth and prosperity, the provision of which is a cornerstone of states' legitimating authority (Dryzek 2000, 2006). To subordinate values of private-property rights and growth to environmental objectives in a modern context would require fundamental transformations of the principles that underpin modern liberal governments (Dryzek 1996, Jackson 2009). In other words, contesting social contracts in the name of the environment requires states to revisit the very processes of economic investment that have contributed to the exploitation of resources and disregard for ecosystem services.

As social contracts have evolved, many of the benefits of contracts have accrued to the private sector. Corporations and private businesses have gradually acquired the functions of governments in the provision and care for public goods, yet without having any formal responsibilities to citizens. The changing role of the corporation within the social contract is widely evident. "Amid the broad spectrum of public goods—*public* health, *public* education, *public* lands—the emergence of the corporation as an investor, advisor, and partner has moved from the exceptional to the expected" (White 2007). This transfer of power and responsibility from governments to corporations is problematic because the rules of engagement are being rewritten as the result of the pressures of shifting expectations, rather than through an explicit and transparent debate. The relationship between governments and corporations has shifted in balance as the economy has become more globalized. "As companies scaled up their operations, capital needs expanded and government control turned from dominant to subordinate and from active to passive" (White 2007). Corporations, unlike governments, are not accountable to citizens, who have no authority to install or dismiss them if they feel aggrieved or violated (White 2007).

The notion of corporate social responsibility is emerging as an informal and voluntary clause to the social contract (Zadek 2006). Using the language of collaboration and collaborative governance, Zadek describes how the business community has become "more visible in advocating its preferred public policy solutions, and actively engaging in both their development and enactment, particularly where private delivery options exist." Zadek further notes that it has been in the interests of both business and governments to enhance the role of businesses in providing public goods, legitimizing the notion of collaborative governance. In response to the emergence and strengthening of this coalition, numerous civil-society organizations are now engaging with businesses and governments, becoming a fourth party to the social contract. White (2007) recognizes a new form of collaborative governance emerging between governments, civil-society organizations and businesses, as they each realize that global problem solving cannot be carried out by one party alone.

Part of the context of the debates about social contracts concerns globalization, neoliberal policies that lead to globalization, and the rise of civil society as a major player in participatory environmental management. Globalization processes, viewed by many as an avenue for spreading prosperity and development (Friedman 2005), have been criticized for ignoring social and environmental goals in favor of economic outcomes that are nonetheless unequally distributed both within and across nations (Bello 2004). The human consequences of these

changes and transformations have led to growing inequalities, and the gap between winners and losers appears to be widening rather than closing (Roberts and Parks 2006, Held and Kaya 2007). In many cases, the capacities of societies to manage ecosystems are evolving far more slowly than changes to the same systems (Millenium Ecosystem Assessment (MA) 2005). In times of unprecedented global environmental change and globalization, the interactions between these processes are influencing the resilience of individuals, communities, regions, and social groups (Leichenko and O'Brien 2008).

Climate Change and Social Contracts

The realities and potential dangerous implications of human-induced climate change add a sense of urgency to discussions and debates about social contracts. The potential for dangerous climate change has led to urgent calls for action, including the development of new types of social and political arrangements that might better enhance human well-being and enable societies at all levels, from local to global, to grapple more effectively with complex problems. Moreover, the widespread impacts of climate change, extending beyond national borders and influencing both present and future generations, raise new questions of responsibility and compensation for citizens and governments that are not formal parties to a particular social contract (Adger et al. 2006). Finally, a swell of public opinion and concern, linked in part to observed climate trends, and unusual and extreme weather events, has led to a growing sense of fear and urgency that is contributing to a demand for immediate action and that can potentially undermine the legitimacy of governments.

The ways that the social contract may be tested when disasters strike are described by Pelling and Dill (2009) and illustrated by Ignatieff (2005), writing in the aftermath of Hurricane Katrina. Ignatieff (2005) argues that the U.S. government's failure to provide its citizens with protection from natural disaster has undermined the belief in the contract that binds Americans together. "Had they [officials and engineers in charge of the levees] reasoned with any degree of political imagination, they might have started from the premise that there are some harms that a government must protect its people from, however unlikely they may turn out to be, whatever the cost." Although governments may have been initially slow to recognize the challenge of climate change, there is growing recognition that climate change may erode both the moral authority of governments and their ability to govern. Political leaders such as David Miliband and John Ashton in the United Kingdom have recently argued that the social contract should be redefined (Ashton 2006, Miliband 2006). Miliband's position is that a new "environmental contract" is needed to establish the rights and responsibilities of government, businesses, and individuals towards the environment, "because citizens, businesses and government will not act if they feel their actions are not backed up by others, or even undermined. People feel powerless in the face of threats such as climate change that require collaboration between individuals, businesses and governments" (Miliband 2006).

The creation of new institutions that can address the sense of powerlessness that people feel in an interdependent world is considered to be a great political challenge. Nonetheless, a "tweaked" social contract presented under the guise of an environmental contract will not be sufficient or effective in creating a future that is more equitable, just, and sustainable. Although the problem of climate change calls for more clearly defined rights and responsibilities, in reality, the rights and responsibilities of all parties to the social contract have not been clearly defined. Recognition of the rights and responsibilities of distant people and future generations are critical to addressing climate change, and yet these vulnerable groups have little voice in the social contracts of high-consumption fossil-fuel-based economies and societies. The rules are being written and rewritten at a fast pace by all parties, justified by the urgent need to address climate change. Carbon trading, carbon offsets, adaptation funds, clean development mechanisms, food miles, cap-and-trade policies, and other market and nonmarket mechanisms, are evolving at a pace that defies critical analysis. However, critical analysis is exactly what is needed if a new environmental contract is to be forged to address the challenges of climate change. This is more than a superficial concern, particularly because it is likely that a new environmental contract will be created in an atmosphere of urgency and fear, where dominant institutions will be advantaged and existing power relations will remain unchallenged. There is perhaps a need not just to revise the social

contract, but to rethink it altogether. Insights from resilience thinking can contribute to the formulation of principles for a new politics of social–ecological systems.

Three Resilience Lessons for Social Contracts

Resilience thinking can be considered a perspective for organizing thought and inquiry about social–ecological systems that emphasizes the capacity for renewal, reorganization, and development, where disturbance presents an opportunity for innovation (Gunderson and Holling 2002, Walker et al. 2004, Folke 2006, Walker and Salt 2006). It draws attention to the problematic way that social contracts have treated nature, either as a resource to be owned, managed, or redistributed, or as wild, anarchic, outside the world of the political, and therefore, needing to be tamed, controlled, and ordered. Nature has had little or no intrinsic value for most (but not all) social-contract theorists, and the role of ecosystem services has generally not been recognized (Dobson and Eckersley 2006). Resilience thinking suggests that approaches to climate change that favor "business as usual" are unlikely to be sustainable in the long run. Some key lessons from resilience research can inform debates about social contracts and climate change. Several of these lessons, well known in the resilience literature, but not previously applied to debates on social contracts, are discussed below. They are followed by examples from real-world applications.

Resilience thinking reminds us that environmental problems cannot be addressed in isolation of the social context.

Climate change is more than an ecological or environmental problem that can be addressed as if it were a purely scientific, technological, or managerial challenge. It is not just about what humans are doing to the environment. It is also about what humans are doing to humans, with the costs of climate change disproportionately impacting future generations, minority groups, and poorer nations (Müller 2002, Adger et al. 2006). A social or environmental contract involving the private sector can easily obscure the pathways of responsibility, giving businesses an opportunity to address CO_2 emissions, but without the responsibility for redressing injustices and inequities that exacerbate vulnerability. A social contract developed between transnational environmental NGOs and communities or groups outside of their own state can be based on very different cultural understandings and expectations of rights and responsibilities (see West 2006). A revised social contract needs to go far beyond an environmental contract. It needs to take into account the ways that climate change interacts with globalization processes, creating what Leichenko and O'Brien (2008) call double exposure, whereby interacting global-change processes increase inequities and vulnerabilities and reduce resilience.

Within resilience thinking, the integrated social–ecological system is often thought to be the most appropriate analytical unit for study. The term emphasizes the coupled and interdependent nature of social and ecological subsystems, and stresses that the delineation between the two is artificial and arbitrary (Berkes and Folke 1998). Much of the resilience research focuses on social and ecological subsystems together, and shows that it is the interaction of the two that provides insights about nonequilibrium processes and surprises that account for the behavior of the system as a whole (Folke 2006, Gallopin 2006, Liu et al. 2007). For example, the internationalization of the shrimp trade is a driver of coastal-habitat loss (and especially mangroves) in many parts of the world. The loss of mangroves and their buffering capacity, in turn, has made people more vulnerable to coastal disasters, as was experienced in the 2004 Asian tsunami (Adger et al. 2005). Resilience thinking, therefore, addresses more than local ecosystems and environmental problems. It also focuses on understanding how they are linked or related to the wider social context, and how they interact with other processes of change. Resilience thinking encourages innovation and transformation into new and more desirable configurations, and we believe it is time to consider what those configurations mean for social contracts. In particular, it is worth identifying for whom social contracts are desirable and why, how social contracts might be changed, and whose interests will be affected by any such changes.

Resilience thinking emphasizes that uncertainty and surprise are inherent attributes of complex systems, and that we must learn to live with them.

It is now clear that human societies are going to experience dramatic changes in the global climate

over the next decades, regardless of what measures might be taken in the coming years (Parry et al. 2008). Adaptation is no longer a matter of choice, but a question of when, what, how, and how much (Adger et al. 2007). Scenarios and projections about future climate change can be used to guide adaptation, but there will always be uncertainties and surprises, particularly because climate change is not the only change facing social–ecological systems. Economic, political, social, and cultural changes also contribute to uncertainty and complicate adaptive responses. This suggests that social contracts may need to be flexible and adaptable to new situations, including dynamic social contexts. Social contracts need to be able to handle new or changing information (e.g., about sea-level rise or ocean acidification), multiple types of knowledge, and uncertainty.

Most political systems are challenged by fast, multiple changes and stressors. Social contracts that may have been defined during times of stability should also be relevant and reflexive during times of disruption or disaster. As Pelling and Dill (2009) point out, this is when social contracts are tested. In a changing climate, social contracts should be flexible enough to meet new demands (e.g., providing protection to groups that are emerging as vulnerable to climate change, such as the elderly and disabled, and future generations). Social contracts should ensure that both the benefits and burdens of processes of change are fairly distributed among all parties to the contract. Yet distributive justice is not enough. Social contracts should also be based on agreed principles of procedural justice. That is, the process by which decisions are made must be fair, just, and inclusive. Parekh (2000), for example, has argued that complex multicultural societies require institutionalized forums to facilitate dialog between communities with widely differing values, rather than merely the assertion of a "new contract" (that is, in most cases, informed by liberal values). This calls for a different mindset where an array of possible changes is anticipated and prepared for through actions and strategies that can enhance resilience. Strategies for building resilience include: (1) learning to live with change and uncertainty, (2) nurturing diversity in its various forms, (3) combining different types of knowledge for learning, and (4) creating opportunity for self-organization and cross-scale links (Folke et al. 2003, 2005). A resilient social–ecological system fosters fairness, inclusivity and diversity, pluralism of knowledge, and social learning. Any new social or environmental contract should prioritize these characteristics as a means for responding to uncertainty and surprise.

Resilience research reminds us that change is complex, and that problems such as climate change cannot be analyzed at any one level alone.

It was previously thought that global problems required global solutions, usually through a combination of national legislation and international agreements (Mathews 1991). The 2002 World Summit on Sustainable Development represents a benchmark in terms of the recognition that this is not sufficient. All levels, including local and regional levels, need to be involved in finding the solutions to global problems (Cash et al. 2006). One way to characterize multilevel governance is the notion of institutional interplay, where institutions may interact horizontally (across the same level) and vertically (across levels of organization) (Young et al. 2008). Interconnected communities need to function effectively across all levels, and this requires both horizontal and vertical links. These links can provide for the flow of knowledge, learning, and other resources, and may facilitate more inclusive, participatory, and democratic decision making.

Multilevel governance also has implications for social contracts. Are social contracts (traditionally envisioned as contracts between unitary nation states and their citizens) sufficient in a complex, multilevel world? Social-contract theorists are wrestling with ideas about complexity as well as growing interdependence tied to global processes managed through an increasing number of international treaties and agreements, not to mention the inclusion of future generations in contract theory (Barrett 2003, Gardiner 2009). Nonetheless, contract theory still tends to distinguish between "domestic contracts" between a nation state and its citizens, and "international contracts" or agreements among states (Barrett 2003, Hoffman and Graham 2006). They generally do not consider that global interdependence may mean that rights and obligations have to be extended to others outside of the conventional spatial and temporal domains of a domestic social contract to include others in distant locations (Gardiner 2004).

The notion that processes of change occur at various levels and at various speeds is captured in resilience thinking through the concept of the "panarchy."

According to Yorque et al. (2002), "[o]ne of the essential features of the panarchy is that it turns hierarchies into dynamic structures." These authors point out that individual levels have nonlinear multistable properties that can be stabilized or destabilized through critical connections between levels. The notion of "heterarchy" (a system of organization characterized by overlap, multiplicity, and no rankings or mixed rankings among elements) is relevant here (see Crumley 1995). This suggests that arrangements that include a wider group of stakeholders interacting across different levels, perhaps drawing on principles of coalition building or deliberative democracy, may better address the dynamics and complexity of climate change. In any case, this insight from the panarchy concept has tremendous implications for social or environmental contracts. The hierarchical structures that have dominated social contracts may no longer suffice, and new types of arrangements may better serve the goals of resilience and sustainability in the context of a changing climate.

The implication of these three lessons from resilience thinking is that social contracts, as we know them, may become obsolete because climate change is a global problem that does not rest in any existing contract domain. No government can offer a unilateral contract to its community to deliver protection and security, regardless of its wealth, ingenuity, technological development, or adaptive capacity. It is not possible to disconnect a country or a group of people from the complex global system, nor it is possible to "opt out" of a changing global-climate system. In imagining new kinds of social contracts, resilience thinking reminds us that we need to address social and ecological systems together, that uncertainty and surprises are inherent in our global system, and that the necessity to deal with all levels through cross-scale designs imposes new responsibilities and creates new opportunities.

Examples of Changing Social Contracts

The problems that climate change creates for social contracts can be illustrated in three states with traditionally strong social contracts. Below, we draw on examples from Norway, New Zealand, and northern Canada to show how resilience thinking might influence debates about current and future social contracts, particularly in relation to climate change. Through these cases, we also illustrate the ways that changing social contracts may affect vulnerability due to climate change.

Norway

Norway is a stable democracy characterized by egalitarianism, a strong public sector, and a culture of cooperative institutions that merge private and public interests (Østerud 2005). The Norwegian social contract is defined by high levels of institutional centralization balanced by a high level of citizen control. This is consistent with a Nordic model for government and public policy that emphasizes a strong welfare state, an egalitarian tax system, and corporatism (Christensen 2005, Hilson 2008). Nonetheless, conditions have changed over the past two decades, putting pressure on the implicit contract between the Norwegian state and its citizens (Østerud 2005). Liberal economic policies and new public management of the public sector have led to changes in the role of the state, including structural devolution of responsibilities to more autonomous agencies and state-owned enterprises, as well as partial privatization and increasing autonomy for regulatory agencies (Christensen and Lægreid 2001, Christensen 2005). These changes involve a transfer of power to institutions that are immune to voter sanctions, as well as a weakening of municipal autonomy and power (Østerud 2005, Tranvik and Selle 2005). The new public management's treatment of people as "service users rather than citizens" has implications for the social contract between the state and its citizens, particularly because it disregards the interests, values, and wishes associated with specific communities and regions (Tranvik and Selle 2005). As Selle and Østerud (2006) point out, "it is this social contract—high levels of institutional centralization balanced by high levels of citizen control—that is now being eroded."

In Norway, an already strong social contract has been strengthened by the development of oil and gas resources (a key driver of climate change). Indeed, since the 1980s, the exploitation of North Sea oil has transformed the Norwegian economy to support unprecedented levels of prosperity and living standards (Hilson 2008). Norway's oil wealth, much of which is invested abroad, reached NOK 1000 billion (U.S.$160 billion) in 2004 (Listhaug 2005). Importantly, there are some tensions between the Norwegian policy to invest revenues from oil and gas production into a

petroleum fund intended to meet future welfare expenses when oil resources are exhausted, and voters' expectations of immediate benefits from oil wealth (a situation that has contributed to political distrust) (Listhaug 2005). The contradictions between energy security and climate security are most evident in the Arctic, where the petroleum industry is expanding oil and gas production, at the same time that the impacts of climate change are becoming increasingly evident (Kristoffersen 2009).

Lessons from resilience thinking can inform the debate about Norwegian social contracts within the context of climate change. Norway has traditionally prioritized egalitarian policies (Østerud 2005). The emergence of a new lower class composed of immigrants working in low-paid jobs, those underemployed, or those unemployed and receiving welfare benefits, coincides with changes in the structure of civil society and the nature of collective movements. Because climate change will result in winners and losers, new social contracts should prioritize equity amongst these new groups (Østerud 2005, Tranvik and Selle 2005, O'Brien and Leichenko 2006). Yet equity issues related to climate change extend beyond the physical borders of Norway, to places where Norwegians have strong social, cultural, economic, political, and humanitarian links. Resilience thinking suggests that extending the social contract to distant populations and to future generations may be necessary to address egalitarian concerns among Norwegians.

Resilience thinking also draws attention to the importance of recognizing multilevel governance of social–ecological systems to support adaptation to climate change. This may involve some changes to the rights and responsibilities associated with current social contracts. In northern Norway, indigenous Saami reindeer herders have been given considerable autonomy through international conventions, as well as within the Norwegian constitution and human-rights law. Nonetheless, reindeer herding is highly regulated, and governed by national legislation that imposes a production-oriented agricultural model on traditional herding systems, while at the same time blaming reindeer herders for managing their herds irresponsibly (Tyler et al. 2007). Reinert et al. (2009) consider the implications of this for climate-change adaptation:

"The ability to self-organize according to their traditional knowledge is an important factor in strengthening reindeer herders' resilience to changes. ...Institutional settings where reindeer pastoralists' traditional organization is restricted—as in Norway—represent a serious institutional constraint on adaptation."

This example also highlights the importance of the local context of Saami reindeer herders, as well as the need to combine different types of knowledge to build a resilient social–ecological system. Although the Norwegian social contract currently focuses on autonomy and rights, it fails to recognize the factors and knowledge that underlie the livelihoods of Saami reindeer herders, such as the importance of maintaining diversity in reindeer herds (Tyler et al. 2007). The state-assumed responsibility for regulating reindeer production undermines the resilience of reindeer pastoralists by insisting on the use of equilibrium-based management tools such as carrying capacity. This is similarly true in fishing communities, where government control of fisheries has had a negative effect on local livelihoods. Jentoft (2003) argues that "...a social contract for the fishery cannot be imposed from the top down. Instead, we must build on democratic principles, where all affected stakeholders must be allowed to voice their concerns." Within the context of a changing climate, social contracts must recognize the interests, values, and knowledge systems of local communities.

New Zealand

As a small, developed island state, New Zealand faces numerous threats from climate change, including an increased risk of drought in eastern areas, increased erosion and flooding in highly populated coastal regions, increased storm events, and significant loss of biodiversity (Hennessy et al. 2007). The severity of these threats is underscored by a reliance on wealth generated from agriculture, forestry, fishing, and tourism that relies heavily on ecosystem services (Fitzharris 2007). Climate threats have increased against a background of significant restructuring of New Zealand's social contract. New Zealanders in the past have taken pride in a "cradle to grave" social contract that, through a variety of legislative initiatives after 1938, was boasted to provide security against "predictable" risks of poverty, unemployment, sickness, and age (Maharey 2000). However, in the 1980s and 1990s, a radical overhaul of the social contract occurred, informed by principles of new public management and neoliberalism (Castles

1996). The removal of trade barriers, the rapid corporatization and privatization of state departments, and the introduction of stringently targeted welfare benefits has increased the vulnerability of some to climatic changes.

During the reform period of the 1980s and 1990s, a review of national planning devolved decision making to lower levels of government. The accompanying restructuring and privatization of government departments into smaller policy and research agencies aimed to introduce an element of market competition in the provision of planning and policy advice, including meteorological services (Steiner et. al. 1997). However, critics argue that these reforms also eroded institutional memory, breaking down linkages of cooperation and trust between public organizations with experience in addressing complex environmental problems (Memon and Glesson 1995, Lewis 2004).

After planning reform, local governments were left with few legislative tools to regulate for desirable land use, mitigate greenhouse-gas emissions, or encourage adaptation to climate change. For example, the recent and rapid conversion of large areas of New Zealand from lower-intensity sheep grazing to higher-intensity dairy grazing (in response to the growth in export-earning potential) has increased demand for irrigation at a time of threatened water insecurity. Local governments have expressed frustration over their inability to effectively manage these dairy conversions (Barnett and Pauling 2005). Similarly, without effective national legislation, local authorities are sometimes unable to prevent significant coastal subdivision, and consequently face costly legal battles to implement coastal-adaptation plans (Hayward 2008b). These experiences illustrate the limitations on government's ability to protect citizens from climate threats if those actions are perceived to conflict with, or undermine, goals of economic development, even when that development may exacerbate climate vulnerability (Dryzek 1996).

New Zealand's social contract was also weakened by other policy changes. For example, rapid and wide-scale privatization of government departments, together with labor-market deregulation, "decimated employment in whole areas of the economy and regions of the country" (Castles 1996). These changes, in combination with the historical legacy of colonization, disproportionately impacted rural indigenous Maori who bore the brunt of reductions in social services and growth in unemployment (Sullivan 2006). Rural Maori have limited adaptive capacity given their dependence on climate-sensitive resources such as local water and food supplies (Fitzharris 2007). Although some *iwi* (tribes) with established infrastructure at the time of reform were able to take up new opportunities to exercise greater self-determination, other communities never fully recovered from these changes and continue to face a higher likehood of unemployment and poverty than non-Maori (Sullivan 2006). In other words, they face a double threat of climate change and neoliberalism (see Leichenko and O'Brien 2008).

The New Zealand case illustrates the importance of understanding the dynamic social and political context in which climate change is occurring. It is important to point out that the neoliberal revisions of New Zealand's social contract are contested at multiple levels. At the local and national level, Maori have continually asserted their rights for self-governance of natural resources under the Treaty of Waitangi, an agreement signed between Maori and the British Crown in 1840 (Sullivan 2006). The Waitangi Commission, which hears historic claims, has the potential to become an arena for airing grievances of climate justice for Maori (New Zealand Herald 2008). Maori have also pressed the New Zealand government to sign the United Nations Declaration of Rights of Indigenous Peoples and acknowledge the impact of climate change on indigenous communities (Mutu 2009). Finally, there are some calls to reframe New Zealand's social contract in a globalized context. Nongovernmental organizations have lobbied the government to accommodate potential environmental migrants from low-lying Pacific atolls affected by sea-level rise and extreme-weather events (Mortreaux and Barnett 2008). Although these calls may miss the point that many indigenous communities wish to adapt in places they love, and that have a unique ability to support their complex social–ecological systems (Hayward 2008a, Mortreaux and Barnett 2008), these calls reflect a growing awareness of the obligations between citizens, within, and across national borders.

Canada

Communities in northern Canada are seeing many changes due to climatic changes, and there is evidence of the development of coping responses (Nuttall et al. 2005). At the same time, it is also clear

that climate change (compounded by other changes such as Arctic ecosystem contamination, extensive social and cultural changes, and economic hardship) has been eroding the resilience of Arctic social–ecological systems and leaving residents increasingly vulnerable (Smit et al. 2008). Part of this vulnerability is related to the fact that, in an ironic misapplication of social contracts, indigenous peoples in Canada were historically treated paternalistically, as wards of the state, leading to a loss of self-reliance, and an increasing dependence on the state. The application of social contracts to Canadian northern indigenous people is ambiguous. On the one hand, the state appears to have accepted its responsibility for protecting them from the effects of climate change and other impacts. On the other hand, the state has pursued policies (e.g., assimilation policies of the past and development policies of recent decades) that signal that people are merely "in the way" of some higher state goals (Blaser et al. 2004). One can hardly speak of a social contract in the sense of mutual agreement between these people and the state. In fact, many of the northern indigenous groups never consented to a social contract, and have continually disputed the control that the central government exercises over their lands and resources.

However, since the 1970s, this Canadian social contract has experienced major changes. More specifically, governance has arguably become less paternalistic with regard to indigenous groups, decreasing the relationship of dependency and providing more autonomy. Much of this change has been related to the recognition of land claims and the settlement of indigenous rights across northern Canada. However, emerging local and regional decision making in northern Canada has created further implications for social contracts. Communities empowered by newly recognized indigenous rights have been able to build their own capacities, find new partners, and make new kinds of links. Land-claims agreements, and the co-management bodies created under these agreements, have been instrumental in this. For example, in the case of the problem with persistent organic pollutants (POPs) discovered in the Arctic in the 1980s, indigenous people were able to get representation on technical committees in 1989, force the government to address human health concerns, and help identify research priorities (Berkes et al. 2001). Particularly important in this process has been the ability of indigenous representatives to get the government to address local priorities and values, and to establish indigenous knowledge as a mechanism by which participatory approaches could be implemented. A contributing factor has been the development of a wide range of methods and options in which indigenous environmental knowledge could be captured and communicated to different audiences (Bonny and Berkes 2008).

The POPs problem demonstrates that with global issues such as climate change, community institutions such as hunter–trapper committees need to work with regional organizations, national organizations, and international bodies (such as the Arctic Council in this case). Horizontal links serve important functions, such as knowledge exchange among communities, and coordination. Vertical links make it possible for local voices to be heard in national and international fora. Governance systems that facilitate horizontal and vertical links build resilience in social–ecological systems because they provide the potential for a tighter coupling of monitoring and response, so that decisions are not made by centralized agencies with little knowledge of the local area.

The creation of governance systems with multilevel links, supporting partnerships and boundary organizations (such as the co-management bodies under land-claims agreements), is a major challenge in international environmental governance (Young et al. 2008). Such a fundamental shift from the usual top-down approach to governance helps achieve equity and fairness, and responds to the need for building resilience. It enables even small local groups to have their voices heard or to reach international fora (Berkes 2007). A relevant feature of this change of governance in northern Canada (as with some of the other areas in the northern circumpolar region) is that vertical links are established not just with state institutions, but also at regional and global levels. Communities are not waiting for the state to redefine the social contract. They are increasingly engaged in a struggle to define the terms themselves in ways that cannot be ignored in political debates.

As the northern Canada case shows, communities empowered by indigenous rights and able to build their own capacities, have been able to communicate across scales. Community institutions such as Inuit hunter–trapper committees have been working with regional, national, and international organizations to make their voices heard. Such multilevel governance and overlapping multiple jurisdictions

create space for inclusive deliberation and knowledge exchange so that decisions are not made by central agencies with little knowledge of local realities. They are important for bringing science and local knowledge together to solve problems related to climate change through the co-production of knowledge (Jasanoff 2004).

Implications for Resilience Thinking

We have considered how resilience scholarship can contribute to contemporary debates about the role of social contracts in responding to climate change, what social contracts need to address, and what they might look like. We now reflect on how some of these considerations can contribute to the development of resilience thinking. The scholarship on social contracts draws attention to the ways that rights and responsibilities legitimized through social contracts can influence both humans and the environment. One of the key lessons is that the capacity to adapt to shocks and stressors associated with climate change is largely a function of the social component of the integrated system, a component that includes values, interests, power, and politics as much as the economic, social, and technological factors traditionally linked to adaptive capacity.

The social-contract literature underscores the understanding that adaptation is not a predetermined outcome that arises deterministically from biophysical considerations. It depends on human agency, including the role of individuals, collective movements, leaders, and institutions, and it often involves political struggle. There is no doubt that political decisions affect the collective capacity to manage resilience. Carpenter (personal communication, 19 January 2009) provides an illustration of this idea. "In social–ecological systems, forward-looking decisions by people are needed for adaptation or transformation. Should we adapt to sea-level rise by building sea walls, or transform to a society that mitigates climate change and thereby decreases the rise in sea level?" It is clear that not every adaptation is beneficial to all social groups and ecosystems, and that some responses to climate change may increase the vulnerability of others, both in the present and the future. Transformations of social–ecological systems can create both winners and losers, and addressing power relationships and political alliances cannot be considered outside the topic of resilience. A resilience theory that more successfully engages with social–ecological systems has to accommodate human agency, be more sensitive to power relationships, and deal with equity issues, among both present and future generations. Transformations are never politically neutral, and problems such as climate change are unlikely to be resolved without much wider dialog, debate, and political struggle.

CONCLUSIONS: SOCIAL CONTRACTS AND RESILIENCE THINKING

There is a growing movement to contest and revise the social contract in favor of new environmental contracts. Nonetheless, there is the danger that new environmental contracts will reinforce the power structures and economic relations that have contributed to the growth in greenhouse-gas emissions, and the increased vulnerability of individuals and communities to the consequences of environmental transformation and changes. An environmental contract that focuses on climate change as the problem, ignoring the underlying social, economic, and political factors that both justify and encourage the subordination of the environment to economic and political interests and goals is unlikely to change anything. Instead, climate change needs to be seen as a symptom of particular development pathways and interpretations of relationships between nature and society that have been prioritized over numerous alternatives (Forsyth 2003).

Social contracts derived from the Age of Enlightenment cannot be simply "tweaked" without attention to their wider implications for social–ecological systems, particularly within the context of climate change. Meaningful change that takes into account the new challenges posed by climate change may require deep structural transformations of existing and evolving social contracts. Given the imperfect nature of social contracts and the complexity of climate change, redefining the social contract is not a process that will occur inevitably, gracefully, or spontaneously. One danger is that transformations of social contracts will be deferred until after environmental thresholds have been crossed, and surprises have occurred (see Pelling and Dill 2009). To avoid this scenario, it is important to prioritize adaptive management and social learning and include lessons from resilience thinking, at the same time as it is necessary to address the power imbalances that are embedded in

social–ecological systems and extend resilience theory to better accommodate human agency. The resilience of social–ecological systems may require that all voices be heard in the process of imagining a new social contract, with attention to interconnectedness, uncertainty, and surprise.

Any type of new social contract is likely to include what could be called a larger conceptualization of "we." Such a conceptualization addresses the global nature of climate change and the wide reach of globalization, that together extend responsibilities to others (people, species, and ecosystems) beyond traditional national borders. For example, this may involve addressing the issue of people displaced because of greater environmental variability and extreme weather events related to climate change, such as victims of drought, floods, and increased frequency of hurricanes and cyclones. In New Zealand, this might include responsibilities to Pacific islanders displaced by sea-level rise on some low-lying atolls. In the Canadian Arctic, where food security in Inuit communities is becoming an issue as unsafe sea ice disrupts the hunting economy, this could include a responsibility to conserve the ecosystem services that communities depend on for their well-being and security. In Norway, this may introduce responsibilities to future generations whose well-being may depend more on the environmental legacy of previous generations than on an economic legacy.

Social contracts may need to be time sensitive, explicitly considering debts to the past as well as obligations to future citizens. Some kind of mechanism, such as a tribunal system or ethical guidelines, may be needed to resolve temporal dilemmas. There is a strong case for creating deliberative spaces to hear grievances by those who claim that past action (or inaction) of others has created current injustice. Interventions targeting the most vulnerable groups in society can be effective in reducing the net overall social impact of shocks and stresses (Turner et al. 2003), and social contracts will have value to the extent that they provide accountability mechanisms to protect and empower vulnerable groups. However, there may be a much wider role for social contracts, in that they can be used as a means of promoting and protecting human security. This is not only about the well-being of individuals and communities and their capacity to respond to threats, but also about the interactions and connectivity among people across spatial and temporal scales (O'Brien and Leichenko 2007).

What is special about climate change is that it demonstrates the scale and complexity of interactions between humans and the environment. It creates challenges for protection that citizens might expect from the state. Addressing the threat of dangerous climate change requires new thinking, in terms of ecology, human organization, and governance, including a fundamental rethinking of how states and citizens interact with each other. In a globalized, densely interconnected world, even quite small and seemingly defined groups of stakeholders can have profound and unanticipated effects on distant others and on future generations. Social contracts can benefit from insights from resilience scholarship, just as resilience thinking can be strengthened through greater attention to interpretations of rights and responsibilities, including the role of power, politics, and human agency as means of continually renegotiating social contracts that both create and respond to change.

Responses to this article can be read online at:
http://www.ecologyandsociety.org/vol14/iss2/art12/responses/

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