Reinventing rules for environmental risk governance in the energy sector

Article (Accepted Version)

Reinventing Rules for Environmental Risk Governance in the Energy Sector

Abstract

The debate over expert versus laypeople participation in risk analysis has deep theoretical roots. It also has practical implications, with both camps often attempting to assign the blame for shortcomings in risk analysis to the other side's faulty approach. A fairly recent concept in risk analysis, risk governance attempts to put the strengths of each camp into productive use by making them work together toward the same goal. Yet the legal and regulatory frameworks for implementation of the non-technical context of risk governance, as well as the underlying theoretical concepts, need development. This paper attempts to elaborate on the theoretical foundations of the debate and its practical applications, and propose an agenda for future research.

Introduction

Most people regard hydraulic fracturing, a technique used to extract shale gas and oil, tight oil and gas, and other unconventional hydrocarbons, as a recent phenomenon. However, hydraulic fracturing has been known since the 1940s, while its accompanying technique, horizontal drilling, has been around since the 1920s.[1] Some environmental dangers of pumping water containing toxic chemical substances and proppants underground had become apparent in the 1990s, shortly after the technique gained traction in the industry. In March 1994, members of the Legal Environmental Assistance Fund (LEAF) submitted a petition to the U.S. Environmental Protection Agency alleging deterioration of the quality of the drinking water in their wells.[2] LEAF asked the agency to suspend their state's Underground Injection Program (UIC), arguing that it did not meet the standards set under the Safe Drinking Water Act (SDWA).[3] After the agency denied the petition, LEAF members challenged it in court.[4] It took another lawsuit for the EPA to finally release a study in 2004 on the impacts of hydraulic fracturing on drinking water–*ten years* after LEAF members filed their first petition.[5]

The story does not end there. The study focused on coal bed methane (CBM), despite the expanding application of hydraulic fracturing to the extraction of other forms of unconventional hydrocarbons.[6] The study concluded that "the injection of hydraulic fracturing fluids into CBM

wells poses little or no threat to USDWs and does not justify additional study at this time."[7] The study received a great deal of criticism from environmental groups and even its own officials, including a 30-year agency veteran.[8] In addition to several design and data flaws, the study contained a number of shortcomings outside the realm of science.[9] For example, certain chemicals were exempted from the review on the sole basis of being considered proprietary.[10] Unsurprisingly, the EPA came up with a different conclusion six years later, linking hydraulic fracturing to groundwater contamination in a study conducted in Pavillion, Wyoming in 2010.[11] Yet Congress used this incomplete, outdated, and otherwise faulty 2004 study to amend the SDWA, exempting fracking fluids (other than diesel fuel) from the purview of the statute.[12] This controversial legislation became known as the "Halliburton loophole" due to former Vice President Dick Cheney's (the legislation's alleged mastermind) ties to Halliburton, the operator that holds many patents on hydraulic fracturing.[13]

There is little doubt that the EPA botched the assessment of environmental risks in the 2004 study. Yet, as noted above, it did so not only by choosing a suspect study design, among other "technical" shortcomings. It also made a value judgment that placed the importance of proprietary information above the importance of public health. Even more troubling is that the U.S. political and legal systems failed to put a massive red flag on an activity loaded with the potential for adverse consequences nationwide. It failed to give the public a fair opportunity to accept the risks of hydraulic fracturing (and reap the benefits of shale gas and tight oil booms) or to avoid the risks at the expense of stalling hydrocarbon production.

The purpose of this example is not to speculate regarding the "real" reasons behind the Halliburton loophole or to make a political point. Rather, it is to highlight the importance of the non-technical context surrounding formal risk analysis and the impact it has on laws enacted on the basis of such risk analysis. Congruently, this paper focuses on the non-technical context of environmental risk analysis in the energy sector and the law that governs it, with an overarching goal of proposing a research agenda for legal concepts underlying such law. I start with an overview of risk theory, tailored to identifying key theoretical concepts and debates relevant to the paper's chief goal. I continue with a discussion of the non-technical context as a societal element of risk governance. I conclude with identifying the need for future research and proposing a three-item research agenda. I utilize examples from the energy sector, predominately the oil and gas industry, to illustrate my points.

I. Theoretical Perspective of Risk

Risk and Hazards, Objective and Perceived Risk: Why Risk Theory Matters

Literature on risk is plentiful. It spans across a multitude of topics and subtopics. Some of it is based on empirical knowledge, whereas some is purely theoretical. The description of theoretical concepts of risks in this section does not do justice to the effort and expertise that some social scientists put into their research and scholarship. And given the size constraints of the article, the review only covers a very small portion of the vast body of risk literature.

However, such a review is necessary because what is understood and described in the literature as a risk often reflects and influences what the decision-makers and societies at large *do* about risks. This, in turn, shapes the legal rules governing decisions about risk, including laws and regulations governing environmental risks in the energy sector. For example, the narrow understanding of risk as "probability multiplied by severity of an adverse effect" often leads to the equally limited cost-benefit analysis solution.[14] In fact, the latter is generally understood as the approach of handling environmental risk in American jurisprudence. In my seven years of studying, teaching, and practicing environmental law and consulting on environmental issues in the United States, I have never encountered a different definition or model of handling risk.

Such a conceptual difference begins with the use of the terms "risk" and "hazard" interchangeably. Even though some theorists understand risk as hazard (*i.e.* danger "related both to its probability and to the magnitude"), most mark a difference.[15] According to the International Risk Governance Council (IRGC), "hazards characterize the *inherent properties* [emphasis added] of the risk agent."[16] Risks, on the other hand, "describe the *potential effects* [emphasis added] that these hazards are likely to cause on specific targets such as buildings, ecosystems or human organisms and their related probabilities."[17] Correct "translation" of the conceptual differences between hazard and risk into the text of a statute or regulation is important as it determines *what* is regulated: adverse consequences or dangerous properties of the object or activity.

In addition, reducing an activity or event to its properties (hazardous, dangerous) may be rather limiting for gathering knowledge about the fast changing technological and geographic dimensions of energy. This is especially important for obtaining empirical data by engaging a wide range of stakeholders who are mostly familiar with adverse *effects* of an activity and not necessarily with the activity itself. Consider offshore oil and gas development as an example. Some stakeholders, indigenous communities and marine scientists, for example, are unlikely to understand the nuts and bolts of offshore oil and gas drilling. However, members of an indigenous community may be ultimately familiar with routine spills and seepages (not all oil spills are catastrophes like the Deepwater Horizon accident) because of the fishing activities in which they are engaged. Marine scientists may have something to say about the increasing acidity of the ocean.[18] No doubt, one can learn quite a bit from the industry or permitting agency about the dangers of offshore drilling, the

actors that propose and approve the hazardous activity. However, shifting the definition of risk from the activity to the effect of the activity allows gaining both a wider and deeper insight. If we classify exploratory drilling as the hazard, oil exploration becomes the source of the hazard, and oil spill becomes one of the risks (uncertain adverse consequences) of exploratory drilling. Departing from "conventional" risks associated with oil and gas development and giving consideration to climate change, climate change becomes the hazard, oil exploration its source (because of direct emissions during the exploratory activities and "ensuing" emissions from the combustion of extracted hydrocarbons), and ocean acidification becomes one of the risks.[19] As a policy outcome of such thinking, a catastrophic oil spill ceases to be the only severe risk associated with oil exploration. After all, short-term (contamination of locally caught fish) and long-term (drastic reduction of stocks due to the acidification) impacts on the world's fisheries may lead to devastating consequences.

Yet the most significant difference in conceptual understanding of risk is the difference between objective and subjective (perceived) risk. Beck points out that: "[r]isk does not mean catastrophe. Risk means the anticipation of catastrophe."[20] He concludes that risks are in the state of "becoming real" determined by the extent to which they are anticipated.[21] According to Adams, the key difference between objective and subjective risk stems from *who* anticipates the "catastrophe."[22] He cites the 1983 report by the Royal Society entitled "Risk Assessment" that put objective risk as the prerogative of "the experts" while making subjective or perceived risk the product of lay-people's anticipation of an adverse event.[23] Correspondingly, it is the objective view of risk as "the probability of an adverse future event multiplied by its magnitude" that dominates the safety literature.[24]

The subjective or perceived risk is based on how an individual understands and experiences the potential adverse effect.[25] One's individual understanding of risk may be influenced by a number of different factors such as: familiarity with the hazard, level of control over the situation, and commonality of the event.[26] Yet to what extent is subjective risk the property of "lay-people" and objective of "experts"? The following Russian joke provides an illustration of how blurry the line is between the expert and lay-people camps.

> *An indigenous hunter comes to a shaman to inquire about tomorrow's weather. The shaman does not know. Yet instead of admitting his lack of knowledge or any kind of premonition about tomorrow's weather, he says: "It will be fine tomorrow." The encouraged hunter returns home and starts preparing for his hunting trip. The shaman is feeling bad about his less than informed advice and decides to ask a meteorologist the next morning. "Do you know what the weather is going to be like today?" – asks the shaman. "I have no idea… but wait," says the meteorologist and looks out of the window. "The weather will be fine today," says the meteorologist then. "How do you know?" asks the shaman. "Do you see that hunter leaving the village? That's how!"*[27]

Some proponents of the subjective view deny the very possibility of objective risk on the premise that as long as risk is appraised (at any time and in any shape or form) by humans, it cannot be by

definition objective.[28] On the other hand, according to Brehmer, one cannot perceive risk because there is nothing "out there" which can be called "risk" and which can be sensed."[29] Sjöberg and Boholm take a reconciliatory position and allow the coexistence of "real" and "perceived" risks.[30] Thus, Sandman's "combination of "hazard and outrage," or as Renn *et al.* describe it "a potential for harm as well as a social construction of worry," has become a more acceptable compromise in the debate.[31]

Crawford-Brown takes a similar approach and concludes that "[t]here is no way to decide which definition of risk is correct."[32] He further notes that although risk assessment can be done according to an objective standard, risk management must have a subjective element to it because managers are people and not machines.[33] He makes this observation via putting the question of subjectivity/objectivity of risk in the context of a decision-making process (risk governance). The approach appears to be especially applicable to designing legal rules governing risks. Legal theory, which forms a foundation, allows for both "subjective" and "objective" sides to work together. For example, while hearing a rate case, a regulator hears subjective "stories" of what should and should not be included in the rate base. Yet when she actually decides the case, she uses the objective standard set by the statute. Although an argument can be made that even the objective standard is prone to subjectivity, the objectivity imperative is protected by the ability of an appellant to raise the question of whether the regulator abused her discretion (*i.e.* acted subjectively).

From Environmental to Systemic Risks

Definitions of environmental risk vary depending on the source. Even the same governmental agency, the U.S. EPA, provides four different definitions.[34] Yet the exact meaning of what constitutes *environmental* risk is yet another critical element of designing legal rules for environmental risk governance, as this element sets the scope of the rule. The vast majority of the reviewed sources viewed environmental risk in light of negative consequences to the *human* and *natural environments*. Some sources, such as *Environmental Risk Assessment* published by the Scientific Committee on Problems of the Environment (SCOPE), add the medium (*i.e.* "the air, water, soil or biological food chains") through which adverse consequences to the human and natural environments arise in and/or are transmitted.[35] However, including this qualifier might limit understanding of some environmental risks common to the energy sector as not purely "environmental" but rather of a systemic kind.

The IRGC describes systemic risk as "embedded in the larger context of societal, financial and economic consequences and is at the intersection between natural events, economic, social and technological developments and policy-driven actions."[36] The earlier definition came out of the 2003 OECD report entitled "Emerging Risks in the 21st Century" (the "2003 OECD Report") that focused on the threat to the human and natural environments.[37]

Yet the concept of systemic risk was introduced long before the 2003 OECD Report. In his renowned 1987 essay in *Nature*, Slovic gives an example of systemic risks by examining the accident at the Three Mile Island nuclear power plant ("TMI") in Pennsylvania, United States. Fittingly, the concept of a systemic risk was developed in relation to energy infrastructure. Slovic describes other negative consequences besides injury, death, and property damage. Such consequences include the cost of stricter regulation (capital and operating costs), reduced operation of reactors worldwide, greater public opposition to nuclear power, investor flight, community opposition, litigation, etc. Slovic puts TMI-like accidents in the category of "unknown" and "dread" hazards capable of creating "large ripples."[38] Such ripples start from the actual victims of an accident and move to the company, industry, and other technologies.[39]

Even though Slovic did not introduce the actual term "systemic risk," his description of "ripples" accurately reflects the concept behind systemic risks. Beck, perhaps unbeknownst to him, also contributed to the emergence of the concept in *Risk Society* by highlighting the reach of modern day risks and the "boomerang effect."[40] Beck returned to the concept in his 2006 essay *Living in the world risk society.* He points to chlorofluorocarbons (CFC), the use of which caused a chain of unforeseen secondary effects that lead to climate change.[41] Wiser *et al.* differentiate unsystematic and systematic risk.[42] A systemic risk is "a risk that affects all members of a group simultaneously."[43]

Klinke and Renn define the following major characteristics of systemic risks: (1) complexity, (2) uncertainty, (3) ambiguity, and (4) ripple effects.[44] Complexity refers to the difficulty of "matching" the plethora of adverse effects with potentially affected parties and objects, as well as deciphering the casual relationships and identifying the feedback loops.[45] Uncertainty refers to the deficiencies of the evidence that ultimately weaken the cause and effect chain.[46] Ambiguity supposes the presence of various legitimate interpretations of the same data set.[47] Finally, "ripple effects" mean a possibility of secondary impacts that may be separated by time and space from the primary consequences and may extend into political, social, and economic dimensions.

As noted above, some environmental risks in the energy sector are of a systemic kind. Even a cursory examination of the Deepwater Horizon and Exxon Valdez spills confirms this point. For example, both accidents caused great economic and regulatory ripples. The former, among other things, reshaped the structure of principal regulatory agencies responsible for management, enforcement, and revenue collection in connection with oil and gas activities on the U.S. outer continental shelf.[48] The Oil Pollution Act, enacted in the aftermath of the latter accident, changed the liability regime applied to U.S. offshore oil and gas operators.[49] In the case of climate change, long term effects of ocean acidification and loss of land mass, as well as other environmental risks are only the very tip of the iceberg. Should the nations come up with a global agreement imposing *universal* global carbon controls, such an agreement will likely impact the market for many types of expensive unconventional oil as well as Arctic and deepwater oil.[50] The socio-economic impact of falling oil prices may prove to be devastating for nations heavily invested in new expensive oil, thereby "extending" environmental risks far beyond their narrow original meaning.

Socio-economic and political status of many communities located adjacent to energy infrastructure, nuclear power plants, waste sites, and mines in particular, serves as another example of the systemic nature of environmental risks arising in the energy sector. These communities disproportionately bear the environmental risks of living next to a source of the highly hazardous activity. Yet they are also exposed to economic risks such as decreasing property values and socio-political risks of having any dissenting voice suppressed by the energy company, which is usually a dominant employer in the area.[51]

Who Is in Charge: Theories of Risk Perception

My review of risk literature would have been incomplete if it did not include works on risk perception. Of course, if the notion of subjective or perceptive risk is rejected, and the definition of risk is confined to probability of an adverse consequence times its severity, no need exists for an inquiry into the theories of risk perception. However, because the end goal of this paper is to suggest an agenda for legal scholarship in the area of environmental risk governance, and legal theory is open to coexistence of subjective and objective sides of a concept, such a review is not only warranted but rather necessary.

Wildavsky and Dake identify six rival social science theories of risk perception.[52] *Knowledge theory* is based on the premise that people perceive technologies to be dangerous because they know they are dangerous.[53] *Personality theory* stems out of individual propensity to take or avoid risk.[54] The first version of the *economic theory* asserts that affluent people are more tolerant to risks stemming out of new technologies because they benefit more from them and because they are better insulated from them due to their economic status.[55] The rationale of the second version, or "post-materialist" theory is reversed – indigent people are willing to do whatever it takes (including taking more risks) to become wealthier.[56] *Political theory* explains differences of risk perception through the struggle over political interests.[57] Finally, *cultural theory* connects risk taking/avoiding to cultural biases.[58]

Yet it is the cultural and psychometric theories of risk perception, as well as another set of theories that Wildavsky and Dake failed to mention, the so-called "rational actor theories" have been at the center of the risk perception debate. The basic principle of rational action is premised on the notion that "human beings are capable of acting in a strategic fashion by linking decisions with outcomes."[59] A more sophisticated view of rational action is described as the Rational Action Paradigm (RAP).[60] RAP rests on the following assumptions: (1) all actions are individual choices; (2) people and institutions can separate means and ends; (3) people pursue goals when making choices; (4) personal satisfaction serves as the ultimate driver for making decisions; (5) people know what the consequences of their decisions will be; (6) people prefer to make preferences based on values and expected benefits; and (7) people's actions are predictable if subjective knowledge and preferences are known.[61] In terms of collective behavior, RAP presupposes that

people choose the option that is likely to result in maximum payoff, thereby maximizing their utility.[62]

The psychometric theory focuses on cognitive factors that affect people's perception of risk. The theory was born from empirical studies that targeted people's aversion and acceptance of risks, as well as the differences between the lay-person perception and the expert perception of risk.[63] Slovic (who is widely considered the father of the psychometric theory) and his colleagues concluded that the dread risk factor and the unknown risk factor dominate people's perception of risk.[64]

However, the psychometric theory, which is rooted in the field of behavioral psychology, failed to explain the differences in levels of risk perception among socio-economic and ethnic groups.[65] Cognitive factors identified by Slovic could not explain why one society is more accepting of risk than another.[66] This presented a unique opportunity for anthropologists and sociologists to make their contribution to the theory of risk perception.[67] Douglas and Wildavsky, in their 1982 book *Risk and Culture*, argue that each culture (set of shared values and supporting social institutions) emphasizes certain risks and downplays others.[68] People are creatures of social culture; thus, individual perception of risk is shaped by cultural values, views, and attitudes.[69] Douglas and Wildavsky suggested the so-called grid/group typology to describe different types of cultures.[70] Grid refers to the level of social control while group to the level of social commitment.[71] As a result, the following four cultural patterns emerge: (1) hierarchy (high grid/group); (2) egalitarianism (low grid, high group); (3) individualism (low grid/group); and (4) fatalism (high grid, low group).[72]

It would be only logical to assume that proponents of each risk perception theory disagree with each other on which theory is correct. Yet sometimes such debates take an especially contentious turn as "risk experts" defend their vocation by asserting superiority over lay people in understanding risk.[73] Potential implications of the expert versus lay-people standoff should not be underestimated as its outcome ultimately determines who is in charge of making decisions about risk.

Empirical evidence suggests that people tend to violate rather than follow the rules of rational action.[74] This significant crack in RAP's empirical foundation serves as the root of criticism for RAP-based individual choice theories. The main criticism of RAP as the basis for collective choice stems from the rejection of extending its assumptions from the individual to collective level.[75] And according to Renn *et al.*, RAP proponents have treated empirically sound challenges on both individual and collective levels as nuisance while unable to adequately respond to them.[76]

Critics of the psychometric theory cite problems with empirical support as one of its weaknesses.[77] Sjöberg conducted a study similar to the foundational nuclear waste study conducted by Slovic *et al.* but came up with different results.[78] In addition, Sjöberg, Gregory, and Mendelsohn had problems with understanding qualitative characteristics employed by the psychometric theory.[79] Finally, Gregory and Mendelsohn explained risk professionals' opposition to the theory by citing difficulties with incorporating it in risk management practices.[80]

Similarly to the opponents of the psychometric theory, critics of the cultural theory focus their claims on the lack of adequate empirical support. Oltedal *et al.* cite Sjöberg, Boholm, and Raynes and note, "the empirical support for this theory has been surprisingly meagre."[81] According to Boholm, the problem with the empirical support comes from the structural flaw of the theory – although the theory rejects personality as a basis for explanation of individual behavior, it is "clearly is related to personality as an explanatory concept."[82] Another explanation of the "meagre" empirical support is the problem with the "instrument" used to measure culture.[83] According to Sjöberg, even though the World View scales developed by Dake and Wildavsky showed promising results in the United States, empirical studies in Europe failed to replicate the success.[84] Yet even more reliable scales would have resulted in only marginal improvement.[85] Rippl responded to the criticism of cultural theory of risk perception in her study concluding that: "a theoretically conforming measurement of cultural biases is possible."[86]

Perhaps the most pronounced shortcoming of the mutual critique of risk perception theories is the lack of practical context. In fact, the vast majority of authors use the terms "risk analysis," "risk assessment," and "risk management" interchangeably. This may not matter on a deeply theoretical level, but varying the context in which a theory is applied is likely to lead to different conclusions regarding the validity of the theory. Crawford-Brown highlights the importance of the context by pointing out the differences between risk analysis and risk assessment:

> *Risk analysis may be thought of as the process by which the basic building blocks of the concept of risk are determined and then built back into a more complex understanding of risk; in short, risk analysis includes analysis of the concept of risk and of the ways in which risk is determined. Risk assessment is the more technical field, striving to place numerical values onto the concepts revealed by risk analysis.*[87]

Thus, it is hardly legitimate to criticize the psychometric and cultural theories on the basis that the qualitative categories they use do not fit the rigorous quantitative rubric of highly technical risk assessment. Similarly, it is as questionable to judge a risk assessment model created by several scientists exclusively through the lenses of cognitive factors or in view of cultural biases.

The problem with the lack of appropriate context becomes even more apparent if the world's population is divided into experts and lay-people. According to Paul Slovic, "[w]hereas technologically sophisticated analysts employ risk assessment to evaluate hazards, the majority of citizens rely on intuitive risk judgments, typically called "risk perceptions."[88] And, as noted above, this division ultimately leads to the debate over *who* should be in charge of risk in society.[89] Yet if we are to put this debate in the context of a multi-phase decision-making process about risk, it will transform into a more nuanced dialogue about which *phase* of the process should be dominated by experts and which by lay-people.

Another lack-of-context problem that hinders literature on risk perception theories is the preoccupation with measuring risks. For example, consider the reoccurring statement that experts rate risks lower than lay people.[90] This statement presumes that risks must be rated. What about

identifying them or communicating them first? After all, one cannot assess something one does not know about. Then perhaps the debate should become more about who is to identify the risks and who is to rate them. The "measurement imperative," and the ensuing obsession with calculating risk, is puzzling, as even economists recognize non-calculable forms of contingency. According to Keynes, for certain matters, there is "no scientific basis on which to form any calculable probability whatever. We simply do not know."[91]

Based on the above review of theoretical risks concepts, it is reasonable to conclude that a great deal of divergence exists among scholars regarding the exact meaning of risk in general and environmental risk in particular. The same is true about the theories of risk perception; as Renn *et al.* note, "[u]ntil we have a unified social theory for risk, we are forced to live with a patchwork of different concepts." [92] Moreover, these concepts have already made their way into policy and law. For example, Section 15 of the Norwegian Health Safety and Environmental Framework Regulations mandate that: "A sound health, safety and environment culture that includes all phases and activity areas shall be encouraged through continuous work to reduce risk and improve health, safety and the environment."[93] The Petroleum Safety Authority's guidelines further explain that: "there is a clear understanding in the organisation that culture is not an individual quality, but something that is developed in the interaction between people and given framework conditions."[94] Here, the regulator not only recognizes cultural origins of risk perception, it actually mandates culture-centric approach to risk analysis. Thus, it is wise to put the theoretical divide aside and focus on matching the right theory with the corresponding problem.

II. From Risk Theory to Risk Governance

Risk Governance as a Framework for Comprehensive Risk Analysis

According to Beck, "[m]odern society has become a risk society in the sense that it is increasingly occupied with debating, preventing and managing risks that it itself has produced."[95] Assuming that this statement is true, modern society is not suffering from shortage of risk discourse or "risk proofing." [96] The more technical side of risk process, risk assessment has not been stagnant either. As Crawford-Brown points out, risk assessment has evolved and become more proactive, "helping in the design of society rather than simply responding to problems in previous designs." [97]

Yet as the Haliburton loophole example shows, it is not sufficient to only have an opportunity to discuss a risk-related energy issue and to conduct a formal risk assessment. A more comprehensive solution is needed – a framework featuring not only a solid risk assessment and management component but also transparency, accountability, and legitimacy as key principles for making risk-

centric decisions. One of such frameworks that combine risk analysis and decision-making[98] is the risk governance framework employed by the IRGC (the "IRGC Framework"). [99]

The IRGC Framework is holistic, flexible, accepting, and evolving. It is based on a review of existing risk literature with the input of practitioners and academics, including social scientists.[100] It does not favor a single dogmatic theory of risk or risk governance. Because it incorporates the objective and subjective view of risk, it allows evaluation and analysis of existing risk governance systems from both angles. It has been used to evaluate existing risk governance systems.[101] Finally, it targets systemic risks.[102]

The IRGC Framework gives equal importance to "conventional" elements of risk governance, such as risk assessment and risk management, and to its societal context.[103] The contextual aspects are further grouped into two categories. The first group includes the structure and relationships among the different actors "dealing with risks," their perception of risks, and adverse consequences posed by the risks.[104] The second group encompasses the style, culture, capacity, and imperatives of the entities and institutions involved in the risk governance process.[105] The first group is integrated with the "conventional" elements of the risk process while the second group forms a set of basic conditions for every risk-related decision.[106] The IRGC Framework is inspired by the symbiosis of the "factual" (objective) and "socio-cultural" (subjective) dimensions of risks; is premised on the involvement of all stakeholders.[107] The risk process under the IRGC Framework consists of five phases: pre-assessment, appraisal (scientific risk assessment and concern assessment), characterization and evaluation, management, and communication.[108] The IRGC Framework has been utilized to assess policies in several areas of the energy sector. These assessments include a study on risk governance of critical infrastructure in the energy sector,[109] bioenergy policies,[110] and issues surrounding carbon capture and sequestration.[111]

Another example of an institution that has done a tremendous job supporting the development the concept of risk governance is the National Research Council (NRC).[112] Studies conducted in connection with risks arising in the energy sector, especially in connection with nuclear energy, have provided great insights into constructing principles of effective and legitimate risk governance.[113] Among these insights are divergence in characterization of risks by experts and the general public; risk perception as a "human factor" in the operation of highly complex technology; and the importance of transparency and clarity in the flow of information about risk for productive public participation.[114] NRC should also be commended for supporting research directed at supplementing scientific analysis of risk with knowledge received from "interested and affected parties."[115] Several studies conducted by aforementioned Slovic, Gregory, as well as McDaniels, Gould, Dietz, and Stern brought a qualitative dimension to risk analysis.[116] As a result, an increasing number of researchers and policy-makers are rejecting the one-sided view of risk as probability multiplied by magnitude.[117]

Another body of research that should be commended for developing the concept of risk governance is studies on risk communication. After all, results of the most sophisticated quantitative risk assessment will have little chance of becoming part of a policy solution if they are not clearly transmitted and translated to policy-makers. Similarly, a policy that involves a group of risks will

not enjoy support of the general public, if voters, taxpayers, consumers, and citizens are left in the dark about potential adverse consequences of the policy. Obtaining legitimacy of risk-laden decision through public participation; timing of risk communication; the role of "boundary" organizations in bridging the gap between "generators" and "recipients" of risk; and the dangers of overemphasizing the benefits and downplaying the risks – these studies are as important for the overall success of risk governance as the research on quantitative risk assessment methods.[118]

However, the set of principles of risk governance proposed by Stern on the basis of the research supported by the NRC is even more relevant to the overarching goal of this article. These principles include:

> 1. Invest in science to understand the technology, its interactions with its users, and the ways in which its use can pose risks to things people value. . . .
>
> 2. Ensure meaningful participation of the interested and affected parties in both scientific and governance matters. . . .
>
> 3. Integrate scientific analysis and broadly based deliberation. . . .
>
> 4. Higher-level actors should facilitate participation by lower-level actors. . . .
>
> 5. Engage and connect a variety of institutional forms. . . .
>
> 6. Establish independent monitoring, accountable to the interested and affected parties. . . .
>
> 7. Plan for institutional adaptation and change. . . .[119]

Even though these principles are not limited to energy technologies, they are nonetheless highly applicable to them. Stern illustrates this applicability by proposing a governance regime for risks related to unconventional oil and gas production.[120]

The examples reviewed above are by no means intended to provide a complete overview of risk governance research. However, they represent the depth and the quality of ideas behind merging the conventional risk analysis methods with the societal context into a comprehensive framework for making decisions about risk.

Making Room for Societal Element of Risk Governance

I suspect that some readers may question the veracity of this subsection's title. After all, and as noted above on several occasions, the expert versus laypeople debate is premised on the notion that lay people (i.e. society at large) see risks differently than risk experts. Beck, for example, sees an increased supervision and control over risk experts as the prime solution for settling the debate.[121] The notion that laypeople and experts cooperate during a decision-making process, via,

for example, hybrid forms, is a fairly new.[122] Thus, the element of risk governance when a broad range of stakeholders plays the greatest role in the process is likely the one that needs the most help getting incorporated into the pertinent legal and regulatory framework.

As noted above, preliminary stages of risk governance, which the IRGC Framework combined in a stage called risk pre-assessment, are focused on obtaining a broad picture of the risk.[123] However, risk pre-assessment does not end after a technology or activity is "handed over" to risk appraisal and management. The technology or activity often "returns" to pre-assessment, thereby forming a feedback loop.[124] Correspondingly, risk pre-assessment is the most appropriate phase of risk governance participation of a broad range of stakeholders.

The chief purpose of pre-assessment is "to capture both the variety of issues that stakeholders and society may associate with a certain risk as well as existing indicators, routines, and conventions that may prematurely narrow down, or act as a filter for, what is going to be addressed as risk."[125] What is seen as a risk by one group of actors may not be seen as such by another.[126] Pre-assessment is comprised of two non-sequential sub-phases: (1) framing risks and defining relevant issues, and (2) inventorying institutional and organizational capacity.[127] Correspondingly, the first sub-phase aims to identify, frame (identify dimensions), discover the extent to which the risks at issue can be identified, as well as to determine the imminence and existing risk indicators. The second sub-phase seeks to identify pertinent institutions, stakeholders, scientific methods, as well as to identify their *de jure* and *de facto* role and place in risk pre-assessment.

Inclusion of *all* involved stakeholder groups representing government, industry, academia, and civil society[128] during pre-assessment has critical importance for risk framing and inventorying relevant institutional and organizational capacity.[129] Stern warns of the dangers of allowing industry to dominate the risk governance process: "It is plausible that when decisions are made entirely by private actors, a technology may be developed in ways that yield greater societal risks and fewer societal benefits than under a regime in which public interests have some of the decision authority."[130]

Ironically, as the recent decision by the Court of Appeals for the Ninth Circuit in *Native Village of Point Hope v. Jewell* shows, stakeholder exclusion may backfire for industry, if the legal system provides mechanisms to challenge such a decision.[131] A coalition of indigenous communities and environmental organizations challenged the environmental impact assessment conducted for the Lease Sale 193 in the Chukchi Sea. The plaintiffs argued that the Department of the Interior's (DOI) finding of "no significant impact on the human and natural environment" was erroneous. The agency disregarded the concerns about the impacts of a potential oil spill voiced by a number of groups, including the plaintiffs during the comment period. After a protracted legal battle and a supplemental environmental impact statement, the court ultimately agreed with the petitioners and invalidated the environmental impact statement and thereby the result of the lease sale. According to the court's decision, the agency grossly underestimated the size of potential oil and gas exploration and extraction, and, therefore the risks associated with such activities.[132] In response to the court's ruling, Shell cancelled its drilling campaign in the U.S. Arctic offshore in

2014.[133] It is worth mentioning that Shell spent well over $4.5 billion on its offshore campaign in Alaska.[134]

As Owens, *et al.* note, "[d]ifficulties arise when a particular problem framing is *presumed* in appraisal, though it is actually (or potentially) controversial.[135] Environmental risks associated with the energy sector raise a host of not only complex issues but also very controversial ones. For example, the debate over the future of oil and gas development off the Lofoten Islands in Norway has almost brought the Norwegian government to a standstill.[136] On the Russian side of the Barents region, thirty Greenpeace activists protesting Arctic oil production by attempting to board the Prirazlomnaya oil production platform were arrested by Russian law enforcement officials and charged with piracy.[137] In fact one would be hard pressed to find an energy sector-related activity, technology, or issue that is free of controversy. From coal-fired power plants spewing GHG to relatively benign wind turbines, energy remains a, if not the most, hotly contested area.

The concept of bringing all relevant actors into the decision-making process is known in literature as inclusive risk governance.[138] Because it diversifies the typology of actors involved in risk governance, it puts yet another dent in the self-created supremacy pedestal of "risk experts." It is premised on the notion that the topical knowledge and values that relevant stakeholders (and not risk experts) possess and stand for are necessary for making equitable, efficient, effective, and socially acceptable decisions about risk.[139] Yet inclusive risk governance does not go as far as some risk expert critics. Unlike Beck, for example, who asserts that expert systems failed to manage risk, inclusive risk governance carves out a technical role of managing risk pursuant to the knowledge and values provided by all relevant actors.[140] According to Engelen *et al*. and Rauschmayer *et al*., the interaction among these four main stakeholder groups can lead to "adequate representation of pluralism of perspectives, knowledge, claims, and values."[141] Finally, inclusive discourse about risk is required by virtue as competing views should be at least considered before the decision is made.[142]

Sovacool seconds the benefits of such "[s]uch 'inclusive' or 'participatory'" approaches in the introductory article of this issue.[143] He highlights the overall value of broad participation in risk governance for the health of society at large, as well as for identifying ethical and moral concerns that may have more bearing on public acceptance of risks than their probability and severity. He also points out the economic benefits of avoiding post-decision public controversies and challenges, as highlighted in the Alaskan example above.

The broader (in geographic scale and substantive scope) and more controversial the issue is, the harder it is to reach what Renn and Schweizer call "closure" (*i.e.* joint statement or agreement).[144] Owens *et al.* point at the same problem with "deliberative and inclusive processes" as they appear "difficult, expensive, time consuming, and (to discomfort of decisionmakers) potentially inconclusive."[145] Owens *et al.* further suggest that the choice between or the role of the technical and deliberate models should be made based on the context.[146] Given the complex and nonconsensual nature of the environmental risks at issue, as well as the overarching purpose of risk pre-assessment, deliberative and inclusive participation appear to be not only appropriate but necessary.[147]

It is fitting to finish this section with ideas that push the boundaries of risk governance. In *Acting in an Uncertain World*, Callon, Lascoumes, and Barthe do just that. They ultimately call for invention of "new modalities of democracy that can pick up the challenge of the sciences and technologies."[148] "*Democratization of democracy,*" the ultimate goal set by Callon *et al*. spells out, loud and clear, the importance of legitimacy and responsibility when dealing with risk, or as they call it, "people's control of their destiny."[149] The way Callon *et al*. arrive at their ultimate conclusion is as intellectually stimulating as the conclusion itself. They build on the critique of the preeminence of the expert knowledge by, among other things, pointing out that "there's always someone more specialist."[150] Perhaps the most refreshing part of their work is the criticism of half-measures such as consultation and representation, as well as the call for *measured action*[151]. Callon *et al*. vision of risk-conscious and risk-responsible government and society represents an inspirational goal for inclusive, legitimate, and effective risk governance.

III. Sketching Out the Agenda for Future Research

Before I begin making suggestions regarding the research agenda, it is worthwhile to note why law is important for advancing the concept of environmental risk governance in the energy sector. After all, despite its relative novelty, the concept of risk governance has made significant strides. First, regardless of one's stance on the degree of government intervention in the energy sector, governments should and often do have essential roles in dealing with environmental risks. Congruently, if a government holds itself as one of "laws and not men," the legal and regulatory regime must serve as the starting point and the foundation for risk governance.[152] Second, as I elaborate in this section, law is critical for "activating" the societal element of risk governance because it serves as a principal regulator of societal relations. However, law is a very conservative area, often reacting to a societal change rather than anticipating it. I do not necessarily mean this as criticism – sometimes society needs stability as much as it needs progress. Rather, I would like to underscore the inert nature of law and the importance of legal scholarship for bridging the gap between the social reality and the rules that govern it. And, as the Halliburton loophole example shows us, the need for new rules is apparent, but the current legal and regulatory regime fails to meet it.

It would be a severe understatement to say that there is no research targeting the legal aspect of risk governance. There are entire academic journals devoted to law and risk. *Law, Probability & Risk* and *European Journal of Risk Regulation* serve as prime examples.[153] However, both publications predominately cover topics representing the quantitative side of risk research, which often translates into a discussion of rules of formal risk assessment. In the case of *Law, Probability & Risk*, such preference is made by design as the journal's description identifies it as having the chief objective "to cover issues in law, which have a scientific element, with an emphasis on statistical and probabilistic issues and the assessment of risk."[154] Yet the bulk of the research on

risk regulation, according to MacGillivray, has focused on preventing errors arising out mis-fears of laypeople rooted in so-called cognitive heuristics.[155] Correspondingly, a significant amount of legal literature was devoted to elaborating on this point of view.[156]

Some and perhaps many will disagree with the position that "governments can do better" than make decisions based on the fears of their citizens.[157] However, the opposition to this view should not diminish the importance and the quality of the scholarship *connecting* law and the idea of preeminence of expert risk analysis to. "Seinstein and his travelers," as well as many others, deserve much of the credit for locating and developing the space for the theory of risk in law.[158] Exemplified by *Laws of Fear: Beyond the Precautionary Principle*, this body of literature can serve as a methodological inspiration for doing the same for the idea of inclusive risk governance.[159]

Where do we start? As in many other disciplines, with selecting and developing an appropriate *theoretical framework*. Because law as an area of scholarly study has existed since ancient Greece and Rome, and possibly even earlier times, it is as rich in theoretical concepts as any academic discipline. Picking the right concept or, if needed, allowing for theoretical pluralism will go a long way in finding the right legal counterpart or explanation for a risk governance concept, model, or objective. Similarly to defining risk, this process starts with addressing the most fundamental question, what is law, or more precisely, what constitutes a legal and regulatory regime.

This term is often used interchangeably with the terms "legal regime" and "regulatory regime" in legal literature.[160] Black's Law Dictionary, which is widely used throughout the English-speaking world, defines "regime" as "[a] system of rules, regulations, or government."[161] This definition is consistent with Roberts' view of law in the eyes of most lawyers and laypeople.[162] It is also in line with legal normativism which stresses a formalistic approach to law.[163] Based on this definition, there are two aspects of the regime at issue: (1) institutional (legal rules) and (2) organizational (government agencies). Remarkably, Eisner offers a non-legal definition of a regulatory regime that confirms this duality: "[t]he regulatory regime is marked by the 'configuration of policies and institutions' structuring relations between social interests, state and economic actors in the economy."[164] However, Eisner's definition does not necessarily limit the scope of the institutional aspect to formal institutions and the organization aspect to government actors. This approach is in line with legal positivism, a theory that views law as "a social construction."[165]

Given the degree of proliferation of rules that may not have the effect of law during risk analysis, it may be appropriate to follow the positivist view of law to locate the social "habitat" of risk analysis.[166] This view does not assess preeminence of primary rules (rules that impose obligations)[167] over secondary rules (rules that supplement primary rules).[168] Finally, it encompasses so-called "other rules of behavior," thereby validating the importance of culture in making risk-centric decisions. This in turn validates the theoretical acceptance of the cultural theory of risk.[169] The last point is especially important because it provides a theoretical explanation of the role of regulatory culture on policy outcomes. Eisner describes how the direction of U.S. environmental policy changed based on the dominance of a certain profession among the government workforce.[170] For example, deregulation in the 1980s was driven by the economists (who strive for efficiency), yet the American society at large did not support it.[171]

Yet legal positivism may not suit everyone should we turn to envisaging legal foundations of risk governance. Conventional legal positivists reject merit as the basis of law.[172] Following this logic, legal rule for risk governance do not necessarily have to promote common good, be just, and protect human rights. This approach may contradict some emerging concepts, such as inclusive risk governance which is based on inclusion of a wide range of stakeholders. Thus, whereas one legal theory may be suitable for locating risk governance elements among existing laws, regulations, and industry standards, another legal theory is necessary to construct new rules.

Of course, selecting the right definition of legal and regulatory regime is only the beginning of placing on solid legal ground the societal element of environmental risk governance in the energy sector. The related set of considerations comes from the *technical or methodological side* of law. This side perhaps most accurately represents what most lawyers do – use laws and regulations as tools for furthering or defending their clients' interests. This toolbox is not set in stone. Laws and regulations are often amended and government agencies change their enforcement policies. Yet the agenda for the proposed research should start with rules already in place for the following two reasons. First, the solution may already be known or available through a developed legal concept or a current statute or regulation. Second, it may be more practical and expeditious to utilize what is already in place. Stern, for example, illustrates the design principles of risk governance by proposing an independent Commission on the Development of U.S. Shale Gas and Oil Resources. Even though the administrative body (the commission) is a new body, it is created within the existing legal and regulatory framework. Stern explains the advantages of his proposal as follows: "The fact that the Commission would lack any legal authority would reduce its formal power, but has the practical advantage of making it implementable without changes in laws and regulations."[173]

Questions about the ways and extent to which the societal element of risk governance is and should be reflected in the law, as well as the timing of the corresponding phases, comprise the core of the technical and methodological inquires. The systemic nature of many environmental risks arising in the energy sector also poses an intra-disciplinary question about what areas of law would need to collaborate on solving a risk governance problem. Going back to the Norwegian and Russian offshore oil and gas example, risk pre-assessment starts (or should start) when the development of general oil and gas development policy[174] regarding a certain region (Norway, Russia) begins. It continues (or should continue) along the opening of areas (Norway) or "bestowing the right" to carry out a certain activity in relation to oil and gas (Russia). It is followed by a regional environmental assessment (EA) (Russia) or regional, and sometimes sectoral, strategic environmental assessments (SEAs) (Norway). It should end after a project-specific EA is completed (Norway, Russia), and a production license is issued. Correspondingly, the need for risk pre-assessment is at its highest during the policy-making process and it tapers down toward an individual project development. Although closely intertwined with the "operating practices" component (*e.g.* an operator needs to obtain a drilling permit before commencing exploratory drilling), this *ex ante* process is centered on the government's principal decision to allow exploration or extraction. Therefore, the governance of operational risks related to day-to-day oil

and gas activities is better left predominately to more conventional phases because the principal decision to proceed with the risk-laden activity has been made.

Consider the following examples from the Norwegian and Russian legal and regulatory systems governing risk pre-assessment of offshore oil and gas activities. In Norway, Act No. 72 of 29 November 1996 Relating to Petroleum Activities, as amended (the "Petroleum Act"), and Regulations to the Petroleum Act, set forth by Royal Decree 27 June 1997 (the "Petroleum Regulations"), play the biggest role in risk pre-assessment. Petroleum policy is made by the Storting (Parliament), and the Ministry of Foreign Affairs dictates Norway's Arctic policy (with a report to Storting).[175] Opening of new areas is preceded by an assessment of environmental, economic, and social impacts, including climate change considerations.[176] Once prepared, the impact assessment is open for public consultation for three months. Upon completion of the public consultation process, Storting makes the decision whether to open areas for petroleum activities.[177] In order to be awarded a license, an operator must prepare a plan for development and operation (PDO) and an individual (project-specific) EA.[178] In addition to the regional EA (REA), conducted as part of opening areas for petroleum activities, a project must comply with an Integrated Management Plan that covers all sectors that operate offshore. Because the policy-making and opening of new areas for oil and gas activities is a parliamentary process that is open to public debate, and because of the opportunity to engage stakeholders under two SEA frameworks and one site-specific EA, the Norwegian legal system benefits from the presence of currently working societal elements of risk governance.

Federal Laws of the Russian Federation "On the Continental Shelf," "On Environmental Review," and "On Subsoil Resources" are the primary statutes that govern risk pre-assessment. These statutes are accompanied by a myriad of often conflicting "sub-statutory acts" (regulations) promulgated in their furtherance. Arctic and oil and gas policy-making is the prerogative of the executive branch. Although the public is encouraged to participate in the discussion of national energy strategy, I have not been able to trace the effect of public comments. The Government of the Russian Federation[179] "bestows the right" to oil and gas deposits.[180] The Federal Agency for Mineral Resources (Rosnedra) issues a license that essentially formalizes the Government's decision. An opportunity for an inclusive risk pre-assessment arises during the first stage of EA, the "Impact Assessment on the Surrounding Environment." (OVOS) This is when the proponent of the activity notifies the public and conducts public hearings. The OVOS appears to be the only opportunity to engage stakeholders because the second stage of EA, the "State Environmental Review," is done exclusively by the Federal Service for Oversight of Natural Resources (Rosprirodnazor). Remarkably, the capacity for participation set by the statute ("On Environmental Review") actually goes up because no action can be taken without conducting an EA. Thus, any deviation from the approved plan of activities requires an additional EA and the public has an opportunity to "chime in," even if the need for public participation is of low importance. Therefore, even though the Russian legal system appears to have some societal elements of risk governance, they remain largely dormant.

Both systems do not identify the reviewed mechanisms as belonging to risk governance. However, in the case of Norway, they carry out , and in the case of Russia, intend to carry out the objective of

obtaining a broad picture of risk while ensuring the legitimacy of the risk-bearing decision. This example leads to a legitimate question about whether such mechanisms should be specifically designated as risk pre-assessment. This question, along with many others, belongs on the proposed research agenda.

Stern, while noting the overall benefit of using the existing laws and regulations for the expedient deployment of the proposed Commission on the Development of U.S. Shale Gas and Oil ultimately emphasizes the need for *new* legal tools of risk governance:

> Knowledge is insufficient to define a best governance regime in advance, but it seems evident that any future governance regime would have to evolve from current governance arrangements and would likely include a mix of existing governance institutions (e.g., laws and regulatory authorities at various governmental levels, insurance industry practices, oil and gas industry standards of practice, and the tort system); evolved versions of these institutions; and new institutions and organizations developed to perform functions for which existing entities are seen as insufficiently well suited. In short, a governance regime that effectively implements all the design principles would have to be developed over time and to involve multiple institutions performing in concert.[181]

Time will tell what these tools and concepts will look like. Creating them may be a daunting task, but it is a necessary one. Many signs indicate that the expert versus laypeople conflict is fading away. It is time to sign a peace agreement and invent the rules where both parties work side by side.

Conclusion

Modern society cannot function without laws. In 2005, the U.S. legal system, regarded as one on of the most developed and robust in the world, allowed an SDWA exemption become law despite the botched risk analysis. It mis-fired not because of the dreaded impact of citizenry mis-fears on risk analysis. Quite the contrary, it failed because the system was not attuned to recognize such concerns as directly relating to the soundness and integrity of risk analysis.

Will a similar problem surface in the energy sector again? Most definitely. In fact, such hindrances emerge all the time. One of the ways to address the problem is to stop treating risk analysis as belonging to the perfect vacuum of a computer model. Spoiling the quest for impeccable set of rules for technical risk assessment with often erratic and unpredictable journey to charter a map of risk governance may be a bitter pill to swallow for risk experts. And it is hard blame them for clinging to what they know best, especially when what they know is logical, scientifically certain, and methodologically sound. However, risks do not reside in computer models and science labs.

Moreover, environmental risks arising in the energy sector are not limited to the natural and human environment and to energy infrastructure, oil rig workers, and energy company executives. They spread throughout the society and traverse the global economy in many ways. Certainly, the head of an Inupiat family can relate to the importance of increasing domestic oil supply for the U.S. energy security and the general welfare of the state of Alaska. However, she is far more concerned by the fact that in the case of an oil spill, a significant portion of her family's food supply may vanish.[182]

What does this example mean for calculating risks of drilling off the shores of Point Hope, Alaska? Should we trust an expert who has never been there but is otherwise quite competent tracking ice movement in the Arctic Ocean? Or should we rely on the opinion of an Inupiat hunter whose people relied on their knowledge of ice conditions to survive for a millennium in extremely harsh inhospitable conditions? Should the cost benefit analysis conducted by a DOI official who lives in a Washington D.C. suburb and gets all his groceries at a local supermarket trump concerns of an Inupiat mother who points in direction of the Chukchi Sea when asked where most of her family's food comes from? Are there legal mechanisms for the Point Hope community to question the results of the cost benefit analysis?

As the *Native Village of Point Hope v. Jewell* example shows, such mechanisms exist. These mechanisms are premised on legal rules that traditionally have not been viewed as those of defining risk governance. Understanding these rules as such and building on them will require selecting an appropriate legal theory. Different theories may be needed for the analysis of the existing rules and for creating new ones. However, the theoretical knowledge will be hardly enough – legal scholars must have a deep understanding of the applicable laws and regulations, their intended goals, and their practical effect. Lastly, new rules for governing potential negative environmental consequences of power plants, transmission lines, and oil and gas installations will need to be developed. Perhaps, the innovation will consist of simply designating the existing rules as governing the societal aspect of risk. Perhaps, some forgotten principles will be given a new life. What is clear is the need for such research to which legal scholars can and should contribute.

Endnotes

[1] Samuel C. Stephens, *Poison Under Pressure: The EPA's New Hydraulic Fracturing Study And The Case For Rational Regulation*, 43 Cumberland Law Review, 63, (2012-2013) [hereinafter Stephens].
[2] Stephens at 77.
[3] *Id.*
[4] *Id* at 77-78.
[5] *Id.* at 78.
[6] *Id.* at 78-79.
[7] U.S. ENVIRONMENTAL PROTECTION AGENCY, EVALUATION OF IMPACTS TO UNDERGROUND SOURCES OF DRINKING WATER BY HYDRAULIC FRACTURING OF COALBED METHANE RESERVOIRS, FINAL ES-1 (Jun. 2004), *available at* http://fracfocus.org/sites/default/files/publications/evaluation_of_impacts_to_underground_sources_of_drinking_water_by_hydraulic_fracturing_of_coalbed_methane_reservoirs.pdf
[8] Stephens at 79.
[9] For example, the underground water was actually never tested as the determination was made based on the literature review.
[10] *Id.* at 79.
[11] *Id.* at 81-82.
[12] *Id.* 80-81.
[13] William J. Brady & James P. Crannell, *Hydraulic Fracturing Regulation In The United States: The Laissez-Faire Approach Of The Federal Government And Varying State Regulations,* 14 Vermont Journal of Environmental Law, 39, 45, Fall, 2012.
[14] *See e.g.* JOHN MARTIN GILLROY ET AL., A PRIMER FOR LAW & POLICY DESIGN: UNDERSTANDING THE USE OF PRINCIPLE & ARGUMENT IN ENVIRONMENTAL & NATURAL RESOURCE LAW 346-354 (2008).
[15] ANNE V. WHYTE & IAN BURTON EDS. ENVIRONMENTAL RISK ASSESSMENT 1 (1980) [hereinafter Whyte & Burton].
[16] IRGC, RISK GOVERNANCE: TOWARDS AND INTEGRATIVE APPROACH, WHITE PAPER 19 (SEP. 2005) [hereinafter IRGC 2005].
[17] *Id.*
[18] Margaret Cappa, *Ocean acidification could cause loss of biodiversity in Barents Sea*, BARENTS OBSERVER (May 18, 2010), *available at* http://barentsobserver.com/en/sections/business/ocean-acidification-could-cause-loss-biodiversity-barents-sea.
[19] *See* Roman Sidortsov, *Measuring our Investment in the Carbon Status Quo: Case Study of New Oil Development in the Russian Arctic*, at 624-629 13 VT. J. ENVTL. L. 613 (2012) [hereinafter Sidortsov].
[20] Ulrich Beck, *Living in the World Risk Society, Economy and Society*, Vol. 35 No. 3, Aug. 2006 at 330. [hereinafter Beck 2006]
[21] *Id.*
[22] JOHN ADAMS, RISK 8 (2005) [hereinafter Adams].
[23] *Id.*
[24] Adams at 69.
[25] SIGVE OLTEDAL *ET AL*. EXPLAINING RISK PERCEPTION AN EVALUATION OF CULTURAL THEORY 11 (2004) [hereinafter Oltedal *et al*.].
[26] *Id.*
[27] Jokes aside, I am familiar with several accounts when indigenous people were much more knowledgeable about potential hazards, and, as a result much more effective at managing risks arising from them.
[28] Beck 2006 at 333.
[29] Oltedal *et al*. at 11.
[30] *Id.*
[31] RENN *ET AL.,* THE RATIONAL ACTOR PARADIGM IN RISK THEORIES: ANALYSIS AND CRITIQUE, WORKING PAPER, SOCIAL CONTEXTS AND RESPONSES TO RISK 1, *available at* http://www.kent.ac.uk/scarr/events/finalpapers/renn.pdf [hereinafter Renn *et al.*]

[32] *See* DOUGLAS J. CRAWFORD-BROWN RISK-BASED ENVIRONMENTAL DECISIONS: METHODS AND CULTURE 4 – 12 (1999) [hereinafter Crawford-Brown].
[33]Crawford-Brown at 13.
[34] U.S. ENVIRONMENTAL PROTECTION AGENCY, TERMS & ACRONYMS, ENVIRONMENTAL RISK http://ofmpub.epa.gov/sor_internet/registry/termreg/searchandretrieve/termsandacronyms/search.do;jsessionid=vnhTRwzX5tTN161GGyTTGkw2vtGGJzYTqK3jJJhlpwbT3hQJsKg0!410100326 (last visited December 30, 2013).
[35] Whyte & Burton at 1, 3.
[36] IRGC, AN INTRODUCTION TO IRGC RISK GOVERNANCE FRAMEWORK 4 (2008) [hereinafter IRGC 2008].
[37] *See* OECD, EMERGING RISKS IN THE 21ST CENTURY: AN AGENDA FOR ACTION 29-62 (2003) [hereinafter OECD 2003].
[38] Paul Slovic, *Perception of Risk*, SCIENCE, Vol. 236, Issue 4799 Apr. 17, 1987 at 284 [hereinafter Slovic 1987].
[39] *Id.*
[40] ULRICH BECK RISK SOCIETY: TOWARD A NEW MODERNITY 31-39 (1992) [hereinafter Beck 1992].
[41] Beck 2006 at 330.
[42] The difference between systematic and systemic is generally semantic. Wiser *et al., Comparing the risk profiles of renewable and natural gas-fired electricity contracts,* RENEWABLE AND SUSTAINABLE ENERGY REVIEWS 8 (2004) 335-363, at 339 [hereinafter Wiser *et al.*].
[43] *Id.*
[44] Andreas Klinke & Ortwin Renn, *Systemic Risks as Challenge for Policy Making in Risk Governance*, FORUM: QUALITATIVE SOCIAL RESEARCH, Vol. 7, No. 1, Art. 33 Jan. 2006 at 3 [hereinafter Klinke & Renn].
[45] *Id.*
[46] *Id.*
[47] *Id.*
[48] Betsy Baker & Roman Sidortsov, *The Legal and Regulatory Regime for Offshore Hydrocarbon Resources in the U.S. Arctic*, *in* Energy Law in the 21st Century: Views from the U.S. and Russia, American Bar Association, Section of Environment, Energy and Resources, *available at:* http://www.americanbar.org/groups/environment_energy_resources.html
[49] These accidents resulted in exploration and extraction moratoria as well as serious legislative and regulatory changes. *See* NATIONAL COMMISSION ON THE BP DEEPWATER HORIZON OIL SPILL AND OFFSHORE DRILLING DEEP WATER: THE GULF OIL DISASTER AND THE FUTURE OF OFFSHORE DRILLING REPORT TO THE PRESIDENT XI (JAN. 2011); FRED BOSSELMAN, ET AL., ENERGY, ECONOMICS AND THE ENVIRONMENT 336 - 340 (3rd ed. 2010).
[50] Sidortsov at 640-641.
[51] BENJAMIN SOVACOOL, R OMAN SIDORTSOV, AND BENJAMIN JONES ENERGY SECURITY, EQUALITY, AND JUSTICE 151 (ROUTLEGE, 2013).
[52] Aaron Wildavsky &Karl Dake, *Theories of Risk Perception: Who Fears What and Why?,* DAEDALUS, Vol. 119, No. 4, Risk (Fall, 1990) 44-60 at 42 – 44 [hereinafter Wildavsky & Dake].
[53] Wildavsky & Dake at 42
[54] *Id.*
[55] *Id.* at 43
[56] *Id.*
[57] *Id.*
[58] Wildavsky & Dake at 42 - 44
[59] Renn *et al.* at 4.
[60] *Id*.
[61] *Id.* at 5.
[62] *Id.*
[63] Slovic 1987 at 281.
[64] *Id.*
[65] Susanne Rippl, *Cultural Theory and Risk Perception: a Proposal for a Better measurement*, JOURNAL OF RISK RESEARCH 5 (2), 147-165 (2002) at 148-149 [hereinafter Rippl].
[66] *Id.*
[67] Aaron Wildavsky &Karl Dake, *Theories of Risk Perception: Who Fears What and Why?,* DAEDALUS, Vol. 119, No. 4, Risk (Fall, 1990) 44-60 at 42 – 44 [hereinafter Wildavsky & Dake].

[68] MARY DOUGLAS & AARON WILDAVSKY, RISK AND CULTURE: AN ESSAY ON THE SELECTION OF TECHNOLOGICAL AND ENVIRONMENTAL DANGERS 15 (1982) [hereinafter Douglas & Wildavsky].
[69] Rippl at 149.
[70] *Id*.
[71] *Id.*
[72] *Id.*
[73] Renn *et al*. at 2.
[74] *Id.* at 8.
[75] *Id.* at 11.
[76] *Id.* at 8.
[77] Lennart Sjoberg, *The Allegedly Simple Structure of Experts' Risk Perception: An Urban Legend in Risk Research*, SCIENCE, TECHNOLOGY, & HUMAN VALUES, Vol.27 No.4, Autumn 2002 443-459 at 443 [hereinafter Sjoberg 2002].
[78] *Id.*
[79] Sjoberg 2002 at 443; Robin Gregory & Robert Mendelsohn, *Perceived Risk, Dread, and Benefits*, RISK ANALYSIS, Vol. 13, No. 3, 1993 at 259 [hereinafter Gregory & Mendelsohn].
[80] Gregory & Mendelsohn at 259.
[81] Oltedal *et al*. at 5.
[82] *Id.* at 6.
[83] *Id.*
[84] Lennart Sjoberg, *World Views, Political Attitudes and Risk Perception* at 138 9 RISK: HEALTH, SAFETY & ENVIRONMENT 137 Spring 1998 [hereinafter Sjoberg 1998]
[85] *Id.*
[86] Rippl at 161-162.
[87] Crawford-Brown at 4.
[88] Slovic 1987 at 285.
[89] Renn *et al.* at 2.
[90] *See e.g.* Sjoberg 2002 at 446–447. In his critique of Slovic's study, Sjöberg mailed questionnaires that contained 20 predefined hazards. But it was Sjöberg and his colleagues (who are considered risk experts) who identified the hazards. *Id.* at 449
[91] John Maynard Keynes, *The General Theory of Employment, The Quarterly Journal of Economics*, Feb. 1937 at 114.
[92] Renn *et al.* at 21.
[93] Petroleum Safety Authority Norway, Regulation Relating to Health, Safety and the Environment in the Petroleum Activities and at Certain Onshore Facilities, *available at* http://www.ptil.no/framework-hse/category403.html#_Toc357595242
[94] Petroleum Safety Authority Norway, Guidelines Regarding the Framework Regulations, *available at* http://www.ptil.no/framework/category408.html#p15.
[95] Beck 2006 at 332.
[96] *Id.* at 333
[97] Crawford-Brown at 23.
[98] Marjolein B.A. van Asselt & Ortwin Renn, *Risk Governance*, Journal of Risk Research Vol. 14, No. 4, April 2011, 431–449 at 432 [hereinafter Asselt & Renn].
[99] Pursuant to the IRGC's web-site, "The International Risk Governance Council (IRGC) is a non-profit and independent foundation whose purpose is to help improve the understanding and governance of systemic risks that have impacts on human health and safety, on the environment, on the economy and on society at large." IRGC, ABOUT IRGC, http://www.irgc.org/about/ (last visited December 30, 2013).
[100] Among them are Mary Douglas, Ulrich Beck, Aaron Wildavsky. *See* IRGC 2005 at 24, 75.
[101] *See e.g.* AEA, STUDY ON RISK GOVERNANCE OF EUROPEAN CRITICAL INFRASTRUCTURE IN THE ICT AND ENERGY SECTOR, FINAL REPORT TO EUROPEAN COMMISSION (SEP. 2009) [hereinafter AEA].
[102] IRGC 2008 at 6.
[103] IRGC 2005 at 11. (SEP. 2005).
[104] *Id.*

[105] *Id.*
[106] *Id.*
[107] *Id.* at 12.
[108] IRGC 2008 at 5.
[109] *See generally*, AEA.
[110] *See generally,* IRGC, GOVERNING THE RISKS AND OPPORTUNITIES OF BIOENERGY (2007).
[111] *See generally*, IRGC, REGULATION OF CARBON CAPTURE AND STORAGE (2008).
[112] Paul C. Stern, *Design Principles for Governing Risks from Emerging Technologies*, forthcoming in XXX at 1. [hereinafter, Stern] Note that the NRC's Committee on the Human Dimensions of Global Change has been renamed to the Board on Environmental Change and Society.
[113] *Id.* at 2.
[114] *Id.* at 2 - 3.
[115] *Id.* at 3.
[116] *Id.* at 3-4.
[117] *Id.* at 4.
[118] *Id.* at 5.
[119] *Id.* at 9-12.
[120] *Id* at 12-15.
[121] MICHEL CALLON ET AL, AN ESSAY ON TECHNICAL DEMOCRACY 226-227 (2011) [hereinafter Callon].
[122] *See* Callon, et. al. 153-190.
[123] For the purposes of this article I will refer to preliminary stages of risk governance as risk pre-assessment.
[124] IRGC 2008 at 8.
[125] IRGC 2005 at 13.
[126] *Id.*
[127] *Id.*
[128] IRGC 2008 at 4.
[129] *Id.* Also *See* Douglas & Wildavsky at 7 (emphasizing the dangers of overreliance on risk perception by a single group of actors).
[130] Stern at 1.
[131] Native Village of Point Hole et al. v. Jewell, 740 F.3d 489, 492 C.A.9 (Alaska), 2014.
[132] *Id.*
[133] Matt Smith, *Shell's Arctic Dreams Postponed Another Year*, CNN, Jan. 30, http://edition.cnn.com/2014/01/30/us/shell-arctic/.
[134] Henry Fountain, *Breakaway Oil Rig, Filled With Fuel, Runs Aground*, NY TIMES, Jan. 1, 2013, http://www.nytimes.com/2013/01/02/business/energy-environment/shell-oil-rig-runs-aground-in-alaska.html?_r=0&adxnnl=1&ref=shellroyaldutchplc&adxnnlx=1370261036-fvLh/Mjf4rbFT0hDSbif8A

[135] Susan Owens *et al., New Agendas for Appraisal: Reflections on Theory, Practice, and Research*, at 1946, ENVIRONMENT AND PLANNING A Vol. 36 2004.
[136] Mikael Holter, *Statoil: Lofoten Exploration Ban Hurts Effort to Ease Norway's Oil Decline, WORLD OIL, Oct. 1, 2013*, http://www.worldoil.com/Statoil_Lofoten_exploration_ban_hurts_effort_to_ease_Norways_oil_decline.html
[137] The Russian authorities eventually dropped the piracy charges and released the protesters under the amnesty law. *Russia Drops First Greenpeace Arctic 30 Case*, BBC, Dec. 24, 2013, http://www.bbc.co.uk/news/world-europe-25504016
[138] Ortwin Renn & Pia-Johanna Schweizer, *Inclusive Risk Governance: Concepts and Application to Environmental Policy Making*, at 174 ENV. POL. GOV. 19, 174–185 (2009) [hereinafter Renn & Schweizer].
[139] *Id.*
[140] *Id.* Beck 2006 at 337.
[141] Renn & Schweizer at 175.
[142] Crawford-Brown at 35.
[143] Sovacool, BK. "What Are We Talking About? Analyzing Fifteen Years of Energy Scholarship and Proposing a Social Science Research Agenda," Energy Research and Social Science 1(1) at 22 (in press, 2014).

[144] *Id.*
[145] Owens *et al.* at 1950.
[146] *Id.* at 1951.
[147] *Id.*
[148] Callon et al. at 11.
[149] *Id.* It is important to note that Callon et al. draw a distinction between a risk and an uncertainty. *Id.* at 19 I do not subscribe to this point of view in relation to the risks discussed in this article. Categorization of certain risks as systemic implies a high degree of uncertainty among other properties.
[150] Callon et al. at 71.
[151] Callon et al. at 11.
[152] For a discussion of how various phases of risk governance are shaped by legal and regulatory regime, see the Clean Air Act example that Crawford-Brown uses to describe regulation of a single medium through which the risk is transmitted. Crawford-Brown at 27.
[153] *See eg.* European Journal of Risk Regulation, Issue 4/2013, Table of Contents, http://www.lexxion.de/en/zeitschriften/fachzeitschriften-englisch/ejrr/current-issue.html (last visited January 15, 2014); Law, Probability & Risk, About the Journal, http://www.oxfordjournals.org/our_journals/lawprj/about.html (last visited January 15, 2014).
[154] Law, Probability & Risk, About the Journal, http://www.oxfordjournals.org/our_journals/lawprj/about.html (last visited January 15, 2014).
[155] Brian H. MacGillivray, Heuristics Structure and Pervade Formal Risk Assessment, 1 Risk Analysis (2013).
[156] MacGillivray at 2.
[157] *Id.*
[158] *Id.*
[159] SEE GENERALLY, CASS SUNSTEIN, LAWS OF FEAR: BEYOND THE PRECAUTIONARY PRINCIPLE (2005).
[160] *See e.g., Erika Lennon, A Tale of Two Poles: A Comparative Look at the Legal Regimes in the Arctic and the Antarctic,* 8 Sustainable Dev. L. & Pol'y 32 (2008); Lee Clark, Canada's Oversight of Arctic Shipping: The Need for Reform, 33 Tul. Mar. L.J. 79 at 81 (2008); and, Tare C. Brisibe, State Sovereignty and Aeronautical Public Correspondence by Satellite, 69 J. Air L. & Com. 649 at 653 (2004).
[161] BLACK'S LAW DICTIONARY (9TH ED. 2009).
[162] SIMON ROBERTS ORDER AND DISPUTE AN INTRODUCTION TO LEGAL ANTHROPOLOGY 18 (1979) [hereinafter Roberts].
[163] George E. Glos, *The Normative Theory of Law*, 11 WM. & MARY L. REV. 15, at 151 (1969).
[164] MARC ALLEN EISNER, REGULATORY POLITICS IN TRANSITION 1 (2ND ED. 2000) [hereinafter Eisner].
[165] STANFORD ENCYCLOPEDIA OF PHILOSOPHY, LEGAL POSITIVISM, http://plato.stanford.edu/entries/legal-positivism/ (last visited December 30, 2013) [hereinafter LEGAL POSITIVISM].
[166] Some technical and procedural rules serve as examples of rules not having an effect of law.
[167] H.L. A. HART THE CONCEPT OF LAW 84 (2ND ED. 1994) [hereinafter Hart].
[168] Such rules aid in recognition of primary rules, alteration of primary rules, and, in the context of, adjudication, determine when primary rules can be broken. Hart at 224 Correspondingly, a "dead" constitutional provision is not considered automatically superior to an inter-agency order that is strictly observed by the regulated parties.
[169] One of the definitions of culture is a as "a [s]et[ ]of values, beliefs and behaviours." Oltedal *et al.* at 9.
[170] Eisner at 11.
[171] *Id.* at 173.
[172] Legal Positivism.
[173] Stern at 13.
[174] *See e.g.* THE STRATEGY OF EXPLORATION AND DEVELOPMENT OF CONTINENTAL SHELF'S OIL AND GAS POTENTIAL IN THE RUSSIAN FEDERATION FOR THE PERIOD UNTIL 2020 (2006).
[175] *See e.g.* NORWEGIAN MINISTRY OF FOREIGN AFFAIRS, THE HIGH NORTH: VISIONS AND STRATEGIES, REPORT TO THE STORTING (WHITE PAPER) (2011-2012).
[176] METTE KARINE GRAVDAHL AGERUP, ASSISTANT DIRECTOR GENERAL, NORWEGIAN MINISTRY OF PETROLEUM AND ENERGY, PETROLEUM LAW SPRING 2012: INTRODUCTION AND ACCESS TO RESOURCES 6 (2012).
[177] *Id.*

[178] Courtney Fidler & Bram Noble, *Advancing Strategic Environmental Assessment in the Offshore Oil and Gas Sector: Lessons from Norway, Canada, and the United Kingdom*, ENVIRONMENTAL IMPACT ASSESSMENT REVIEW 34 (2012) 12–21 at 13 [hereinafter Fidler & Noble].
[179] The Government of the Russian Federation or Pravitel'stvo Rossijskoj Federatsii operates as "kind of mega-agency that coordinates and directs all the federal agencies not under the control of the President." Betsy Baker *et al.*, *Arctic Offshore Oil and Gas Guidelines in Greenland and the Russian Federation*, Arctic Offshore Oil and Gas Guidelines White Paper No. 5, at 39, (Feb. 2011), *available at* http://www.vermontlaw.edu/Documents/IEE/20110215_IEEBakerWP5.pdf.
[180] *Id.* at 52.
[181] Stern at 13.
[182] U.S. GEOLOGICAL SURVEY, AN EVALUATION OF THE SCIENCE NEEDS TO INFORM DECISIONS ON OUTER CONTINENTAL SHELF ENERGY DEVELOPMENT IN THE CHUKCHI AND BEAUFORT SEAS, ALASKA, CIRCULAR 1370 74-77 (2011).