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RESEARCH AGENDA

My scholarship focuses on questions of resource management, as reflected in the fields of property, energy, natural resources, environmental, and land use law. My research examines the diverse set of rules and institutions that govern access to resources.

My work has two principle strands. The first relates to property, a field which is fundamentally concerned with the control of resources in our world. My analysis is mostly analytical and explanatory, aiming to untangle the costs, benefits and implications of our existing systems of resource management, while also unearthing the conceptual and intellectual roots of these systems. The second strand of my scholarship studies questions of resource control as applied to energy and natural resources. My focus in this strand is more normative and constructive: it identifies alternatives to existing institutions and policies, in order to better answer the challenges of modern resource management. In my doctoral dissertation and the articles that followed from it, I honed in specifically on wind energy management. In both strands, my work proceeds from the assumption that different resources present materially distinct social and legal challenges. I thus aim first to understand the particular challenges presented by each resource, and then to investigate whether and how general systems should be differentiated to respond to those particular challenges.

In the following paragraphs, first, I underscore my current contributions to property theory. I then describe my contributions to date in the fields of energy law and natural resources. I conclude by discussing three future projects, all of which continue to explore various aspects of resource management.

CONTRIBUTIONS TO PROPERTY THEORY

In *Rethinking Original Ownership*, [66 U. TORONTO L.J. 515 \(2016\)](#), I tackled the initial allocation of entitlements as a key aspect of resource control. Existing property scholarship identifies two main rules for assigning original ownership, “first possession” and “accession,” and positions them one against another. This article challenged the conventional binary division and the dominance of either first possession or accession as “pure” allocation principles, arguing instead that the ownership of new resources is often allocated through hybrid mechanisms that combine the two. Hybrid rules for allocating property in new resources have significant implications for policy-makers when deciding how to allocate newly-created or newly-exploited resources, such as intellectual property rights, unconventional reserves of oil and gas retrieved through hydrofracking technology, or kinetic energy extracted from the wind.

In my job-talk, *Horizontal Property*, I argue that a mismatch between the spatial dimension of a particular resource and the spatial dimension of the regime employed to control it, for example a vertical regime for a horizontal resource, is costly since it increases both the number and the complexity of the interactions among users. Shifting to a regime that is in harmony with the resource can decrease those interaction costs. This conceptual analysis shows why the spatial dimension of property matters, more so than current scholarship appreciates.

Every property regime controls a certain physical three-dimensional space. The property entitlement in land, for example, extends beyond the crust of the earth to a vertical three-dimensional column, below and above the ground. Yet property is not limited to vertical columns of control. Other property regimes assert control over three-dimensional spaces on the horizontal axis. I call these “horizontal property” regimes. Such regimes include the control of subway tunnels, pipelines, radio waves, and even navigable airways through which airplanes fly horizontally across the earth. The resources which we seek to control likewise occupy a certain three-dimensional space. A piece of land, for instance, interacts primarily vertically with the airspace immediately above it and the ground directly below. An airstream, in contrast, flows horizontally, parallel to the surface of the earth.

The claim is that, all things being equal, a vertical property regime is best suited for a vertical resource and a horizontal regime is likewise best fit for a horizontal resource. Yet sometimes the physical space occupied by the resource and the spatial domain of the regime are misaligned, for instance when a vertical regime is applied to a horizontal resource. I call this a “structural mismatch.” Such mismatches are costly, because they increase the interactions incurred by users seeking to employ or enjoy the resource. Consider, for example, how difficult it is to control an oil field through multiple vertical landownerships, or the hurdles one would face if seeking to manage the navigable airways through the same vertical silos of control. The spatial dimension of the regime simply does not match the spatial dimension of the resource.

Structural mismatches have in some cases been resolved or partially mitigated, although in an ad hoc manner. The Article provides a framework for systematically analyzing the spatial problems that underlie such mismatches and the circumstances in which they arise, an analysis which is otherwise lacking from the discourse. Mapping out the geometry of property also allows us to see how seemingly disconnected problems of resource control are in fact rooted in the same issue of spatial misalignment. Issues of aggregation (for instance, the need to seek authorizations to fly across numerous plots of land) and problems of overuse (for instance, over-drilling in oil and gas) essentially stem from the same problem of spatial mismatch. Understanding the interplay between horizontal and vertical regimes is also increasingly significant for policy-makers given the prevalence of spatial misalignments and their relevance to ongoing property debates, from new advances such as drone flights, hydrofracking drilling and wind energy, to the use of groundwater in times of drought, shifting land uses, and rapid urbanization, all of which constantly interact both vertically and horizontally.

CONTRIBUTIONS TO ENERGY AND NATURAL RESOURCES

My first Article in this strand of scholarship, *Gone with the Wind? The Potential Tragedy of the Common Wind*, [28 UCLA J. ENVTL. L. & POL'Y 435 \(2010\)](#), argued that the uncontrolled extraction of wind presents a problem of externalities. Although people often think of wind as an inexhaustible resource simply because it is renewable, I emphasized that wind is in fact competitive in the sense that its extraction by one means less energy is available to others. Each user gains from harvesting the kinetic energy within the wind yet does not account for the effects of the extraction on her surroundings. Thus I contended, first, that wind is in fact a common pool resource, which may be subject to problems of overuse or underinvestment if not managed appropriately, and second, that property rights in wind are one way to address these management dilemmas.

My second energy-related Article, *Winds of Change: Drawing on Water Law Doctrines to Establish Wind Law*, [23 N.Y.U. ENVTL. L.J. 434 \(2015\)](#), analyzed the extent to which property rights in wind have developed in the United States. My original, empirical research of developments in state and federal law indicated that few jurisdictions have recognized formal property rights in wind. However, there is a prevailing assumption in the wind energy industry that landowners own the right to extract kinetic energy from the wind over their land. Based on that understanding, the Article then analyzed various ways to control wind resources by drawing on analogous water regimes.

My next project in this field, *Trading Airborne Energy (work-in-progress)*, makes a novel proposal for controlling wind resources: establishing “wind markets” to address the externalities associated with wind energy production. The idea of creating a market for trading wind rights can be thought of as similar, but opposite to, pollution trading regimes: instead of trading rights to emit into the airstream, one trades the right to extract energy from the airstream. My proposal for wind markets thus draws on the experience gained in implementing other Coasean-inspired environmental markets such as emissions trading, water markets, and fishing quota markets. The Article sketches out some of the key issues in establishing wind markets, and at the same time also holds the promise of broader insights into the ways that markets for natural resources can be structured, and their interaction with energy markets generally.

DIRECTIONS FOR FUTURE RESEARCH

Contracts Shaping Property

My first project will draw on private law theory to analyze the relationship between property and contracts. A rich body of scholarship is devoted to the question of when shifts in property, or more generally management structures, occur. Much less attention has been paid, however, to the mechanisms by which such shifts come about. This project contributes to the latter by showing that one way in which property can be articulated or formulated is through contracts. It will do so by examining a specific example within energy law. “Wind leasing” is the practice by which landowners lease out the right to harvest the winds above their lands. While there is hardly any formal recognition of property in wind by state institutions, the prevalent (private) practice of wind leasing allows developers to harness the winds, and gives the landowners (at least de facto) exclusive control over the extraction of wind. This, I propose, presents an intriguing insight into the way contracts are employed to create or articulate property. This insight also calls into question the longstanding distinction between *in rem* and *in personam* rights. This Article will show, that despite their *in personam* nature, contracts can sometimes be used to create an *in rem* effect, one that at least in practice amounts to property. Private law tools thus interact with broader energy policy as insights into the property-contract interplay are applicable beyond the context of energy law.

Emergent Property Rights in Elusive Resources

In a second project, which follows from my job-talk, I plan to study the explanatory aspect of spatial misalignments. I am interested in the question of why do structural mismatches persist, despite the inefficiencies that are inherent in their existence. In particular, there seems to be something “sticky” about vertical conceptions of landownership, that tend to prevail even in the face of apparent inefficiencies with regards to controlling horizontal resources. I hypothesize

this has to do with the formation of “focal points” that are necessary to create property rights, and the role land plays as such focal points.

The role of land as a focal point is especially central with regards to de facto or “spontaneous” property rights, and particularly with regards to goods that are invisible to the naked eye such as radio waves or groundwater. I posit that the invisibility and elusiveness of these resources makes it very difficult to form a focal point that is necessary to sustain informal rights. And thus, either informal rights in such goods are less likely to emerge or a proxy of some sort must be used to help create the focal point. A typical example would be entitlements in groundwater attaching, historically, by default to landownership. Studying the connection between resource attributes and de facto rights in this way will begin to unpack the explanatory aspect of spatial misalignment in property, while at the same time contribute to the inquiry regarding the nexus between attributes of resources and formation of rights therein. It could also suggest how policy-makers could expect property to attach to such resources or how they might craft such rights.

Cumulative Agenda-Setting in Energy Policy

In an era where energy production is no longer solely in the domain of centralized utilities, individuals play a growing role in shaping energy policy and resource management. I call this “cumulative agenda-setting.” I plan to study the mechanisms of cumulative agenda-setting by looking particularly at “solar rights” – the rights to access solar energy necessary to generate electricity. These are increasingly important not only for large-scale production but also, recently, due to the rapid rise in distributed generation. Rather than producing energy in one place and shipping it to another, distributed generation means electricity is produced in the same location where it is consumed. In the U.S., this pertains mostly to production through photovoltaic (PV) solar panels. Importantly, due to the rise of distributed generation and increasingly affordable roof-top solar panels or “smart-grid” systems, private parties are now able to participate in the electricity field in avenues that were previously unavailable to them. Through their choices (which are themselves affected by a range of incentives, including net metering policies and land use restrictions), individuals are shaping our energy reality.

Using the example of solar rights, this project will seek to map out the mechanisms by which cumulative agenda-setting occurs, and underscore its significance for policy-making. Analyzing solar rights in particular nicely echoes and dovetails with my work on wind energy, and could benefit from the comparisons or synergies. Aside from serving as an avenue for studying cumulative agenda-setting, building a solid understanding of the existing state of solar rights will also enable me to examine the extent to which such rights need to evolve to better accommodate the recent developments and facilitate future growth. Moreover, studying solar rights also holds significant implications for land use and planning, since one’s right to solar access may entail placing limitations on others’ ability to develop in the urban or residential settings where users are clustered together. Understanding these rights and restrictions is therefore key for urban planning and land use in our times.