

CARBON PROPERTY RIGHTS, CITIES AND CLIMATE CHANGE

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Summary:

In a time of climate change, cities are challenged by the twin demands of reduced carbon emissions and the provision of a potable water supply. Meanwhile our governance and legal frameworks are inadequately prepared for the emergent trade in carbon property rights and water property rights. Such instances are compounded when legal frameworks from developed economies are applied to developing nations, particularly those with a reliance on customary structures.

The key contribution to the body of literature is our highlighting of inappropriate reliance on legal precedent to explain emergent rights (which sees them wrongly described in a climate changed world) and the evolution of a coherent model of the constellation of carbon property relations and interests.

Key Words:

Real property rights, constellation, carbon property, carbon-constrained cities, Australia.

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I. INTRODUCTION

This paper engages with the complexity of competing demands on limited resources at the nexus of climate change and rapid global urbanisation. We argue for a relational and inclusive (rather than silo based) system of governance for property rights, obligations, and restrictions. We explain this through the unfolding property rights in carbon and water.

In a time of climate change, cities are challenged by the twin demands of reduced carbon emissions and of providing a secure clean supply of potable water. Meanwhile, our governance and legal frameworks are inadequately prepared for the emergent trade in carbon property rights and water property rights. Such instances are further compounded when legal frameworks from developed economies are applied to developing nations, particularly those with a reliance on customary structures.

The significance of this research is that we highlight the inappropriate reliance on legal precedent to explain emergent rights (which sees them wrongly described in a climate-changed world). Our conclusions are reinforced by the provision of a coherent model of carbon property relations and interests.

We present this paper in seven sections. We start by providing context, by way of an overview of the emergence of carbon-constrained cities. We then provide a comprehensive discussion on the emergence of carbon property rights, drawing on international literature whilst explaining the depth of the challenge from an Australian perspective. This leads us into the development of a rational model of property rights where we attempt to integrate ecological and social understanding with the prevailing (and competing) legal and economic influences.

Our explanation unfolds into a model that acknowledges these interests, providing the grounding to introduce a constellation of property relations and interests. We test our model in an Australian context, and offer discussion on the interplay between international law, national law and local government.

II. THE EMERGENCE OF CARBON CONSTRAINED CITIES

Urban areas are concentrations of vulnerability. Urban governments have a key role to play in building climate resilient cities (Tanner *et al.*, 2009). Cities will need to respond to a number of drivers of change in the coming decades. This includes the need to develop innovative responses to sustainability and climate change. Recognition of the urgent need to adapt our urban settlements to the likely impact of climate change is now widely recognised, as is the requirement for greenhouse gas (GHG) mitigation initiatives. A key consequence of GHG

mitigation initiatives is the movement towards more ‘carbon constrained’¹ urban environments that present both challenges of urban adaptation and opportunities for city resilience. Adaptation in this context relates to the adjustment in natural or human systems in response to actual or expected climatic changes or their effects – the goal being to moderate harm or exploit beneficial opportunities (Pittock, 2003).

Cities are profligate consumers of resources and fierce carbon polluters (JLL, 2008). Cities will be sites of significant impact, and will need to take a range of mitigation and prevention measures in order to manage their carbon footprint. Within the UK the urban concentration of Greater London, followed closely by Greater Manchester, is the biggest emitter of carbon dioxide in the UK (Planning Resource, 2007). The movement towards ‘carbon constrained’ (Garnaut, 2008) cities will have significant repercussions on how we value and price various elements of the city, as well as how we live in and use urban environments. This challenge is multifaceted.

In Australia, the government has identified that whilst Australians are experienced in dealing with climate variability human-induced climate change is likely to take us outside the range of prior experience. This will require new strategies to cope with new situations that cross over previous management thresholds (Pittock, 2003). Our cities will need to prepare, adapt, and retrofit in response to these challenges - time is of the essence and the need for adaptation is urgent (Stern, 2006; Garnaut, 2008).

Anticipated impacts of projected climate change include increases in temperature, altered rainfall patterns, altered frequency of extreme weather events, and sea level rise (Pittock, 2003). Australia experienced the consequence of the ‘business as usual approach’ in early 2009, when several days of dangerously high heat that contributed to the deaths of at least 173 people, left hospitals swamped, electricity systems crippled, public transport out of action and two Australian cities almost completely disabled (Thompson, 2009). Extreme weather events are expected to become increasingly normal over the next century. The Australian Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the Bureau of Meteorology have projected increases in >35°C days for all Australian capital cities under business as usual/no mitigation scenarios (CSIRO & Australia Bureau of Meteorology, 2007).

Business as usual does not work in a carbon-constrained city. Many of the changes we have seen so far have been incremental. There is a need for transformative change aimed at carbon pollution reduction. Approaches to transport planning and governance within many cities have reduced urban carbon emissions through the successful development of formalized transport systems (e.g. in Bojata, Brazil).

Moving beyond carbon emission reduction, many urban governance bodies such those in the UK and China have chosen to commit to or build zero-carbon suburbs and cities (such as Dongtan) – ‘ecopolis’ with CO₂ emissions reduced to virtually nothing (Macintyre, 2006).

Critical to incremental development initiatives in carbon reduction is a growing commitment across the world to govern carbon emission within cities through the identification of reduction targets. There is an increasing reliance on the development of sufficient ‘carbon sinks’, such as

¹ A plethora of terms are used to describe the move towards a lower carbon economy. Low carbon, lower carbons, zero-carbon, carbon neutral are commonly applied across a variety of spatial scales. ‘Carbon-constrained’ is used in the recently published Garnaut Report (2008). It provides an effective umbrella and shall be utilised in this paper.

carbon sequestration forests, to mitigate carbon emissions from cities and industries. This includes the potential for urban carbon sequestration – in urban residential green spaces, large green spaces, small pocket parks, vacant lands, and residential yards, among other habitat types (Pickett *et al.*, 2008). Gendall (2008) probed into the way in which urban planning and design strategies can amplify carbon sequestration in these habitat types.

However, there is acknowledgement that for the foreseeable future carbon constrained cities will need to utilise carbon sinks beyond city limits to mitigate the carbon emissions that result from the industries that are needed to support urban populations (Holling, 1973; Holling & Sanderson, 1996). This need to sequester has resulted in the emergence of carbon property rights, which we explain in the next section.

III. THE EMERGENCE OF CARBON PROPERTY RIGHTS

Many countries have made serious international commitments to develop national policies and schemes aimed at dealing with carbon management. Such commitments are, in principle, designed to govern human use of resources to achieve what is popularly called ecological sustainability (see Berkes *et al.*, 1998; Berkes *et al.*, 2003).

Within Australia, the Rudd Federal Government committed to the Kyoto protocol upon election in 2007 and is currently developing a national Carbon Pollution Reduction Scheme (CPRS) proposed to commence in 2010, with significant impact after 2012 (Australian Government, 2008). The draft legislation highlights that ‘Tradability requires secure and clearly defined property rights and mechanisms for recording changes in ownership’ (Australian Government, 2008 p.8-1). Recording, transfer, and trade arrangements are required to provide a stable foundation for the exchange of rights in carbon between those who develop accredited CPRS carbon sinks and those who wish to use the carbon sequestered in those sinks to mitigate carbon emissions from urban areas and industry. In acknowledging the importance of carbon property rights to the mitigation of carbon impacts the CPRS draft legislation acknowledges that conflict exist between emergent property rights in carbon and the existing complexity of property rights for Indigenous lands (Australian Government, 2008 p.6-62), a point highlighted in other recent research (Boydell *et al.*, 2009 in press).

Carbon property rights are beginning to be implemented in Australia as part of land-use strategies both within rural and urban areas (Boydell *et al.*, 2009 in press). This implementation is despite irreducible legal, scientific, and political uncertainties and the multiple value orientations and concerns of many local, national and international stakeholders. The carbon property rights being implemented within these contexts are the creation one hundred to one hundred and fifty year rights, obligations and restrictions over the land.

In the context of climate change, it is not realistic to draw a hard line around the carbon-constrained city. What is becoming increasingly important is how the notion of carbon engages with the other regions of, in our research, Australia. For example, a ‘forestry right’ at Kopyje Station, a large rural landholding in regional Australia has created a one hundred and fifty year right over a freehold interest. This binding agreement uses a monoculture of eucalyptus spp. trees’ at the exclusion of ‘native vegetation’ for the purposes of sequestering carbon. The establishment of these property rights has been a topic of intense discussion and often-

contentious debate, leading to uncertainty on the economic impact on the rest of the landholding from such a covenant (source NSW Titles office and selling agents information).

The Re-Genesis Project is a partnership between Blacktown City and Liverpool Plains Shire Councils, on the urban fringe of Sydney. The scheme allows for 'large tracts of public and privately owned land to be utilised for community biodiversity plantings and carbon storage' (Re-Genesis, 2009). It aims to assist landholders to enter the carbon market by providing advice and seedlings for human induced revegetation. This local council promoted scheme requires 'carbon sequestration rights' to be registered over the land title, with a legal covenant to retain the revegetation (trees) for 100 years. However, beyond the economic uncertainty, there is a greater risk of situations like Kopyje or the 'Re-Genesis project' causing inadvertent environmental and socioeconomic harm (Noble & Scholes, 2001; UNFCCC, 2008) despite their intention to promote ecological sustainability by offsetting carbon emissions.

There is concern that land-use activities such as the monoculture plantation forestry being implemented at 'Kopyje Station, could contribute to carbon management strategies that increase the risk of catastrophic loss of forest land to fire or disease. There is increasing evidence of carbon sequestration initiatives that promote the replacement of native forest by faster growing monoculture species, despite their obvious negative environmental (monospecies / soil fertility) and socioeconomic (local income generation) impacts. The Re-Genesis project claims to avoid this through biodiversity management, and is co-funded by NSW Environmental Trust.

The way in which property rights are conceived for such projects can play a powerful role in either promoting and detracting from ecologically sustainable development and either minimize or intensifying adverse social, environmental and economic impacts.

The ability to understand and scope the emerging terrain and impact of property rights in carbon requires one to delve into a set of complex relations. These span from the way in which property rights are designed to enable global ecological sustainability, the development of carbon constrained cities through to the way in which carbon property rights are implemented in concrete situations like the 'Re- genesis project' in Sydney and 'Kopyje Station' in western New South Wales , Australia.

IV. UNDERSTANDING THE COMPLEX TERRAIN OF CARBON PROPERTY RIGHTS

Within this paper, we develop a conceptual model for property rights that can be used to engage with and map the complex landscape of contemporary property rights. Property rights research has emerged from a broad range of disciplines including archaeology (Earle, 2000), anthropology (von Benda-Beckmann *et al.*, 2006), ethics, sociology and anthropology (Sorenson, 2000; Fligstein, 2003; Swedberg, 2003), psychology, law (Arnold, 2002), geography, history, philosophy, economics, planning and business studies.

The transdisciplinary property rights model developed within this paper draws heavily on research emerging from within the disciplines of law (Arnold, 2002), sociology and anthropology (von Benda-Beckmann *et al.*, 2006). These disciplines have a strong history of interdisciplinary research into property rights. Anthropological research into property does not differ essentially from that of the sociological and has from the beginning drawn heavily on legal traditions. Similarly as Sheehan has noted "property rights research at a broader jurisprudential

level [is] indistinguishably part of the social sciences” (Sheehan, 2006, p.389). The established interdisciplinary relationship between these fields is exemplified by recent research undertaken by the legal pluralism group at the Max Planck Institute for Social Anthropology (von Benda-Beckmann *et al.*, 2006).

For more than a century the ‘bundle of rights’ identified by Henry Maine in *Ancient Law* (1861), has provided some common ground for interdisciplinary dialogue on property. There are various ways of defining the components of such bundles, for example (Schlager & Ostrom, 1992): use rights, such as the right to access the resource, withdraw from a resource, or exploit a resource for economic benefit; and control, or decision-making rights, such as the rights to management (plant a crop), exclusion (prevent others from accessing the field), and alienation (rent out, sell, or give away the rights).

Whilst some scholars (Peters, 1998, p.370) in recent decades have suggested abandoning the study of property rights altogether as a separate field of study, suggesting that it be replaced with the broader language of ‘rights’. Others have sought to develop more complex metaphors and models for understanding contemporary property rights arguing that the ‘bundle of rights’ is conceptually limited (see for example Gluckman, 1965; Arnold, 2002; von Benda-Beckmann *et al.*, 2006; Zellmer & Harder, 2007).

These critiques have sought to question the existing image of the bundle, instead presenting new metaphors and models that establish new building blocks from which to visualise, imagine, understand, and problem-solve contemporary property. These critiques share the view that visualising property through the bundle of rights is too narrowly conceived, that it brings up the image of exclusivity and separation. The bundle approach does not adequately reflect the increasing sense of interconnection and co-existence that marks contemporary property rights such as those associated with carbon (Boydell *et al.*, 2009 in press) or water (Zellmer & Harder, 2007).

These new models and metaphors promote the use of such terms as ‘interests’ and ‘relations’ rather than just rights, to promote a more fluid articulation and understanding of contemporary property.

V. TOWARDS A MODEL OF PROPERTY RIGHTS THAT ACKNOWLEDGES RELATIONALLY

Property rights are fundamentally about social relations (Gluckman, 1965; von Benda-Beckmann *et al.*, 2006). Real property rights, obligations and restrictions can be found in and change across the full range of human societies, both in time and space (Herskovits, 1940; Hoebel, 1954; Horwitz, 1977; Bell, 1998; Hann, 1998; Hunt, 1998; Neale, 1998; Emigh, 1999; Hunt, 2000).

Different societies give different answers to the question, what can be owned? The inclusion of new objects or the exclusion of old ones is a process variably shaped by political, cultural, economic, and technological factors - why some objects can be owned and others cannot depends on culture and formal law. The set of potential owners varies across societies (e.g. different societies recognize ownership by households, lineages, villages, kin groups, or other collectives). Gluckman (1965) was driven by concerns that the bundle of rights privilege western colonial powers. He developed another influential property metaphor with his concept of ‘estates of administration’, which grew out of his social anthropological fieldwork in southern

Africa in the late colonial period (early to mid 20th century). Gluckman's theorization was intended in part to create property rights that recognised indigenous relations.

More recently, Sheehan notes "property rights in most post colonial common law countries evidence cultural blindness with fundamental flaws in property *relationships*" (emphasis added Sheehan, 2006, p.379). It is important to recognise that as society's demands on real property have evolved, so have the use rights thereon (Polanyi, 1975).

Not all restraints are imposed externally through formal government regulation (Donaldson & Preston, 1995; Ziegler, 2000). The social rules that constitute property rights are neither self-evident nor self-enforcing. According to North (1990), the state is uniquely qualified to ensure compliance with all kinds of rules, including real property. There are many different—and changing—expectations towards the role of the state. As a minimum, a fundamental role of the state is to specify the property rights within its jurisdiction (North, 1990). North focuses on formal legal enforcement, but many rules are enforced informally, and some compliance occurs voluntarily.

Despite informal arrangements, the modern state within western societies has remained a primary locus of property enforcement until recently when the emergence of global markets and international treaties (e.g. Kyoto protocol and Trade-Related Aspects of Intellectual Property Rights (TRIPS)) have begun shifting the locus of enforcement to the international arena (Braithewaite & Drahos, 2000, pp.54-57).

Property rights constitute the foundation for many kinds of social inequality. Property relations govern access and control over things of value, and consequently undergird social inequality (Brudner & White, 1997). Property relations confer power (Gale & Scholz, 1994; Altonji *et al.*, 2000) and determine who controls which resources (Weber, 1981; Stiglitz, 2002).

Building on the growing awareness of the complex nature of the links that have emerged and continue to emerge between social relations and property rights the von Benda-Beckmann *et al.* (2006) have argued for the development of a more rigorous conceptual model that embraces the complex nature of property *relations*. This interpretation does not seek to comprehensively reject the bundle of rights outright, but rather offload its surplus ideological 'freight' and incorporate it into a model that can be used to map the fuller constellation of property relations. This model, which we discuss in more detail below, takes property to be a 'cover term' for how human beings regulate their *relations* to the things that they value.

The argument postulated by von Benda Beckmann *et al.* is that all human societies have a property system comprising three elements:

- > the social units (individuals, groups lineages, corporations, states) that can hold property rights and obligations;
- > the construction of valuables as property objects;
- > the different sets of rights and obligations social units can have with respect to such objects' (ibid., 15).

They contest that property is too significant for the functioning and reproduction of social systems to be confined to the domain of economy, pointing out that property regimes 'cannot easily be captured in one-dimensional political, economic or legal models' (ibid., 2). In place of these one-dimensional models, von Benda-Beckmann *et al.* put forward a model that

distinguishes four layers. The most general consists in the norms and values of a cultural tradition – the ideological layer. The second layer consists of political and legal regulations, which is typically privileged in economic and legal models. Layer three consists of the social relations of property, for example particular land use and the way that these may be tied to particular forms of kinship, and the implications for different forms of social inequality. Finally, at the layer of ‘practices’ the actors may reinforce the patterns of the other layers or they may initiate changes.

In its systematic rigour, this framework is an advancement on the loose notion of embeddedness: real property must be analysed at all four layers. Concentrating on legal categories, or to draw a simple contrast between economic norms and practice, is inadequate and distorting. To accompany their constellation of property *relations* model, von Benda-Beckmann *et al.* offer a systematic reinterpretation of the metaphor of the ‘bundle of rights’ (ibid., 15–22). Their constellation can be usefully deployed in several quite different ways:

- > as a way to express the totality of property rights and obligations;
- > with regard to the rights that together constitute a ‘master category bundle’, such as private ownership;
- > with regard to particular property objects, such as land; and,
- > with regard to the different valuable resources held by one and the same person or social unit.

VI. TOWARDS A MODEL OF PROPERTY RIGHTS THAT ACKNOWLEDGES INTERESTS

Whilst von Benda-Beckmann *et al.* (2006) sought to incorporate the ‘bundle of rights’ into their constellations of property relations arguing that it was possible to offload its surplus ideological ‘freight’, other recent critiques of the bundle of rights from law (Arnold, 2002; Zellmer & Harder, 2007) have argued for its complete replacement. Drawing on the types of ecological arguments discussed above Arnold (at p.281, 283) argues that the ‘bundle of rights’ is unable to address two of the essential principles that underline such a consciousness:

- > the interconnectedness of people and their physical environment, and
- > the importance of the unique characteristic of each object.

In the face of these seemingly insurmountable problems with the bundle of rights, some legal scholars have called for the formulation of a metaphor – ‘web of interest’ - for property that address the “concepts of interconnection, ‘thingness’ (object-regard), and the uniqueness of the object of property” (Arnold, 2002, p. 283, see also Zellmer and Harder 2007). Considering property through a web of interest suggests a more heterogeneous approach to the management of real property, intended to capture a wide range of relationships between people, and between people and property. Within the context of the web of interest, “the thing [such as water] considered property is placed at the centre [of a concentric web] and relationships with the thing form the internal strands of the web and the surrounding framework” (Zellmer & Harder, 2007). In devising this broad-based metaphor for property, scholars are clear to point out that “it must encompass all aspects of property, not merely those that involve the natural environment” (Arnold 2002, p.283).

Old conceptions of property are no longer relevant to the carbon property relations and interests of the contemporary carbon constrained city. In the context of “new property”, carbon property rights are the first right relating to the commodification of the ‘right’ to pollute the environment. Conceiving this right accurately will have implications on the future institutional arrangements of governments.

Within these institutional arrangements, and the need for adaptation, there is a collision occurring between climate change and property law. As the climate changes, we are moving into a period of new institutional and governance arrangements that adapt the ideological notion of decarbonisation – the missing link of preserving the environment without considering biodiversity. In managing the public interest, planning law can define what biodiversity is so that it goes back to the ideological level to give solidity to what we mean by biodiversity (Planning law as property rights).

The implementation and agreement by countries to international carbon property regimes is having significant impact at all levels of urban planning and governance. The fact that carbon sequestration within these regimes will be mostly in land, primarily in plantations, and soil, via freestanding carbon property rights means a significant raft of planning and development controls focused on governing land based rights will need to be examined. Garnaut (2008), amongst others, noted that urban planning is one of a number of ‘market failures’ that will need to be addressed in the structural adjustment process of creating carbon constrained cities. For example, he identifies that radical changes in transport use in Australian cities are unlikely in the short or even medium term without substantial government intervention. As the Commission for Architecture and the Built Environment in London recently noted:

The majority of ... carbon emissions come from ... use of shared infrastructure ... Reducing emissions is therefore not just about ... design and management of individual buildings ... but planning and designing for sustainability at the scale of neighbourhoods, cities and regions (CABE, 2007, p.3).

In Australia, the implementation of the Kyoto protocol does not only have impact through the development of a national emission trading scheme - the proposed Carbon Pollution Reduction Scheme (CPRS) – that has been designed to complement it, but is also triggering a complex set of governance issues. International law ordinarily operates within a milieu focussed on the “unfettered freedom of states” (Birnie & Boyle, 1992, p.1), however some constraints such as those against torture and human rights generally have been developed since the UN came into existence. More recently, it has become accepted that the freedom of states must also be constrained if the global environment is to be protected because activities within the jurisdiction of nation states can impact the environment of other states and jurisdictions. In conceiving international environmental law, issues of sovereignty, and in particular state responsibility arise, leading to an impact on municipal (state) laws and of course the state judicature. Hence, governance issues are emerging in Australia that require, for the first time, an integration of International, and Federal law, further integrated with ‘regional (State)’ level planning legislation down through to delegated planning controls developed by local councils. At a local government level, relevant Development Control Plans have to be modified so that they are consistent with the International carbon pollution reduction regime.

This is somewhat rare in Australia, as it is uncommon that an internationally generated issue has been integrated through all governmental levels. Arguably only the recognition of native title in

1992 by the Australian High Court in *Mabo & Ors v State of Queensland* (1992) 175 CLR 1. (Mabo No. 2) was a similar internationally generated issue resulting firstly from the 1975 decision of the International Court of Justice (Advisory Opinion on Western Sahara [1975] ICJR), which overturned the notion of *terra nullius*, and secondly the ratification on 30 September 1975 by Australia of the *International Convention on the Elimination of All Forms of Racial Discrimination*.

As a result of this rare drilling-down through governmental levels, the State of New South Wales is attempting to understand how a carbon offset under the CPRS can be supported by a land-based carbon property right. Existing planning (e.g. local environmental planning instruments) and development controls appear to be wholly inadequate to provide protection for these rights in vegetation and / or soil. This is an important governance issue currently being considered by the NSW Legislative Council Standing Committee on State Development in its Inquiry into the NSW Planning Framework. It is unclear how planning legislation, such as in this example the NSW Environmental Planning and Assessment Act 1979, will need to be amended to respond to such issues. It is the view of organisations such as the Australian Property Institute that significant amendments will be necessary to existing urban and non-urban land use controls, which must be complementary to the developing international trading regime.

The Kyoto Protocol, as an international agreement, provides the international property law from our perspective. As a catalyst for a global emissions trading arrangement, Kyoto is the guiding instrument for the carbon-constrained city. Kyoto has created an economic structure embedded within property law. Any enterprise is constrained by the impact of Kyoto. It brings into both general and property economics the far reaching influence of environmental economics, most especially within the developed world (with its greater carbon footprint).

Within Arnold's (2002) web of interest, a key concern becomes how the expansion of influence of State property law through the creation of new property objects that either support or compete with claims of overlapping interests in property. Because property rights are derived from social relationships and institutions, changes in property regimes have implications for the entire social and ecological fabric.

Formalisation of property rights in law has historically led to a fracturing of the web of overlapping interests, creating individualised ownership in resources. In many cases, this has been due to an imposition of western-style concepts of "ownership" as exclusive rights. Transferability is regarded by many economists and policymakers as necessary to allow the property to serve as collateral for credit (a key consideration in the CPRS), to provide users with incentives to care for a resource (so that they can profit from increases in its value), or to transfer the resource to other "higher value" uses. However, transferability requires severing the other's claims on the resource, because additional claimants cause complications, increasing the transaction costs or reducing the certainty of transfers.

VII. TOWARDS A CONSTELLATION OF CARBON PROPERTY RELATIONS AND INTERESTS

Building on the 'constellation of property relations' (von Benda-Beckmann *et al.*, 2006) and 'the web of interests' (Arnold, 2002; Zellmer & Harder, 2007) we offer a hybrid model for the

analysis of property rights in the carbon-constrained city, known as *constellations of property relations and interests* (see Figure 1).

This hybrid model is aimed at taking in the depth of property *relations* proposed in the model put forward by the von Benda-Beckmann *et al.* (2006). On the left-hand side of the model, we incorporate all four layers into our modelling of property relations and abandon the seductive reductionism of the standard neo-liberal model that has hitherto privileged economic or legal relations. At the same time, we stress that this is a general framework for studying complex real property rights, rather than a specific theory.

In adopting this model, we point out that we will disappoint those looking to identify general rules of causality: sometimes the legal form may remain constant while massive changes proceed at the layer of concrete social relationships. In short, change proceeds at differential rates at the different layers. In developing a model for property rights at various relational levels, we argue that codified laws of property can be considered as but one mechanism through which objects and land relate behaviourally to people's use, enjoyment, allocation, and transfer.

Our hybrid model is aimed at taking in the breath of *interests*, as opposed to just rights, that surround any single property object (Arnold, 2002; Zellmer & Harder, 2007). This model is a work in progress, part of a broader ongoing project that seeks to develop models and tools that can be used to map the complex terrain of contemporary property rights.

This hybrid model provides a powerful framework for the analysis of the emerging terrain and impact of property relations and interests in carbon. On the right-hand side of the model, there is a complete mirror of the Ideological/Legal/Economic/Concrete/Implementation components, which is the property legal side. As we highlighted above, International Law does not usually impact right down to the local level of Local Environmental Plans or Development Control Plans. From a property rights perspective, the exciting notion of carbon property rights at the interface of the carbon-constrained city (from a property theory perspective) the integration of International Law through National Law (Municipal Law) through to Local (State) Government legislation is unprecedented. This is unique in an Australian context, as we have never had a property rights situation where international agreements drive through all of the legislative levels.

Climate change and related IPCC / Kyoto agreements are international and thus ideological. However, whatever happens on the major global scale environmentally, will have social / political / economic consequences. These are not so much policies, or drivers, but rather the consequences that will be different in every country and every region.

Our model demonstrates the interaction of the relationships, activities, and law, from the international level to local domestic laws, particularly around carbon property rights. What industry used to do, in the natural course of industry, was to emit carbon. From Kyoto at an international level, through to national and local legislation, a rights structure has been created – you now need a property right to emit carbon. GHG polluters buy certificates under a mandatory scheme from the government as a right to emit carbon, or buy carbon credits from someone who sequesters carbon.

Towards a constellation of carbon property relations and interests at a plurality of registers (Australia)

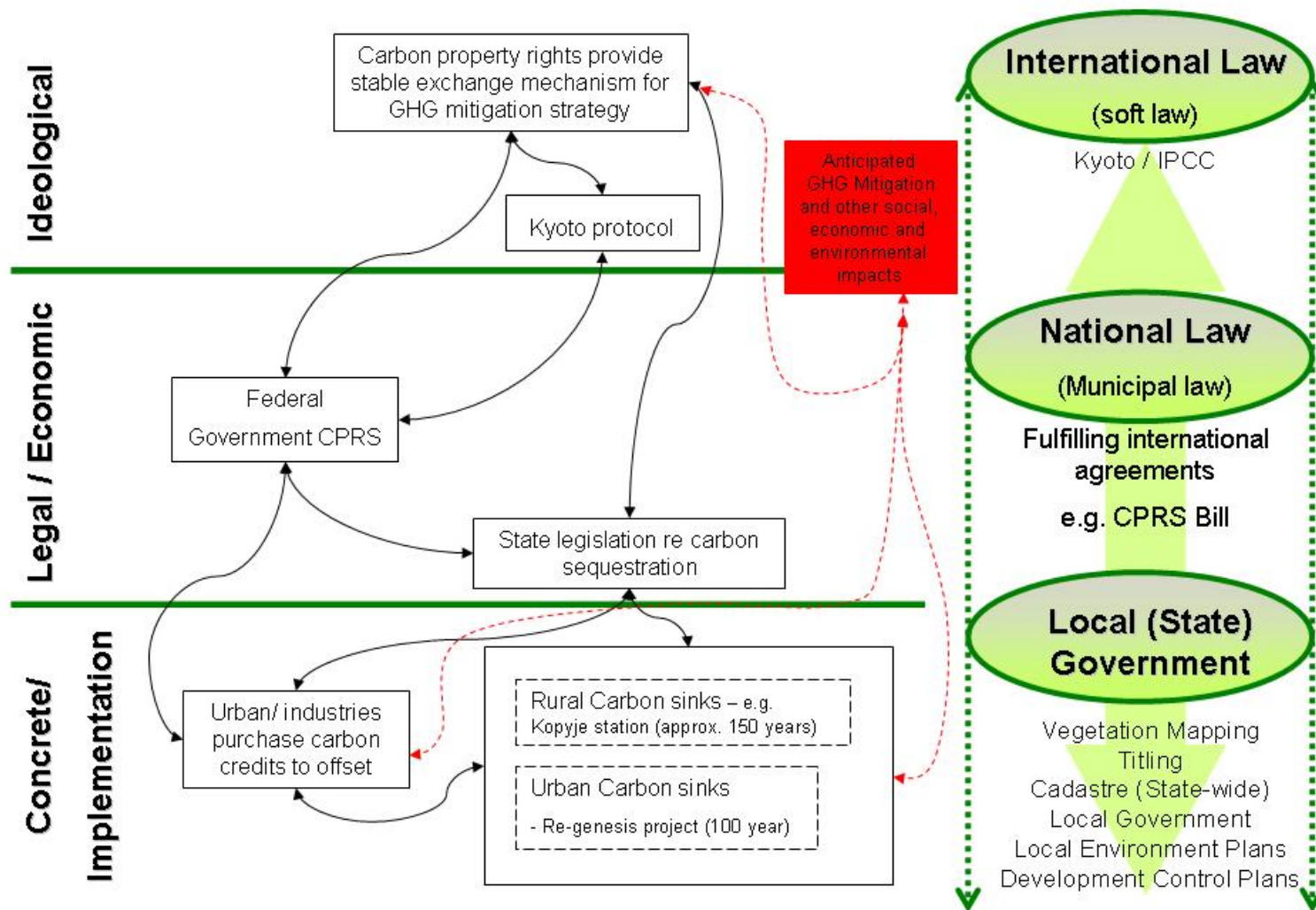


Figure 1: Towards a constellation of carbon property relations and interests. Source: authors

With the sequestration, where carbon sinks are associated with land, you have fee simple ownership and other interests in land; you have government rights to everything in the soil and below the land, now we have a new component – carbon property rights, that have to be integrated into the schema. The difference with carbon property rights is that you cannot touch, feel, or take them away – they are not fungible. Whilst the owner of land can sell the subsidiary right in carbon sequestration in, for example, trees, the owner takes on the responsibility and restriction to ensure that their activities do not impact on the loss or diminishment of that carbon right.

Our model represents a major shift in property law. It is very much a transdisciplinary function. Spatial information is critical to carbon property rights. What we have not been able to do thus far is articulate how all the push-pull factors influence each other. The next stage of our *constellations of property relations and interests*’ collaboration is to take the model from two-dimensions to three (or four-dimensions, if we include time). One of the fundamental problems, from a property theory perspective, is that few people fully understand what a carbon property right really is. Trees have a level of fixity and they are owned by someone else, as the living carbon is still owned by the landowner. It is difficult for many stakeholders to come to grips with what is being acquired and the resultant impact on the carbon-constrained city.

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