A law & economics approach to the study of integrated management of estuaries

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1 Introduction

At the present the European Union and a large number of member states are in the course of changing their water management policies in the direction of more integrated and sustainable management regimes (Bressers and Kuks, 2003). This transformation comes to expression in the adoption of the Integrated Coastal Zone Management initiative (ICZM)[1] and the Water Framework Directive (WFD)[2]. With the adoption of the WFD the EU intends to stimulate a more holistic and territorially integrated approach to solving water-related problems (Moss, 2004). The idea is that institutional arrangements must be developed who take knowledge of local users serious, who protects the interest and rights of local stakeholders, while at the same time having the mechanisms to adapt to new insights, knowledge or changes in the institutional context of the arrangement (Young, 2002). Such institutional arrangements must be capable of handling the dynamics of the ecosystem and maintaining system integrity and ecological resilience. In other words, the EU is switching to an ecosystem management approach.

In this process special attention must be paid to estuaries, because they are unusual cases. The problems in this type of ecosystem are much more complex than, for instance, in rivers. Managing an estuary is a complex balancing act of a mix of very different interests, stakeholders and resources. Of all the (aquatic) ecosystems, estuaries are the highest valued[3] and probably the ones most endangered by human activities (Blaber *et al.*, 2000; Edgar *et al.*, 2000). They are small, very attractive, events far upstream can have an important impact, and they concentrate materials like environmental pollutants and sediments (Branch, 1999). Estuaries are also the intersection between land, river and sea/ocean. This means that they are very attractive for settlement, industry, harbors and trading Hoare (2002). Add to this the huge biodiversity(and related food producing capacity) and recreational opportunities,

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[1]Recommendation of the European Parliament and of the Council of 30 May 2002 concerning the implementation of Integrated Coastal Zone Management in Europe (2002/413/EC)

[2]Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy

[3]In the research of Costanza *et al.* (1997) estuaries have the highest value per ha of all researched ecosystems (table 2, p. 256).

and it is not strange that large trading and cultural centers have been established in their vicinity (e.g. London near the Themes, Rotterdam, Antwerp and Gent in the estuarine area of Rhine, Maas en Schelde) (Commissie, 1994).

Some useful lessons can be learned from the fact that in the United States almost 20 years ago, the EPA already started a programme for managing the 28 most important estuaries of national significance on the basis of ecosystem management. This programme is called the 'National Estuary Programme'[4]. Given the long standing experience with ecosystem management and estuaries, the legal regimes governing these estuaries can provide useful insights as to how ecosystem management policies can be specified and institutionalized (Keiter, 1998). This can be done by analyzing existing structures and examining their performance. To that end we shall start by taking stock of the (economic) natural resources management literature and theories about legal institutions which can provide frameworks for the analysis of integrated management of estuaries.

In the current literature on natural resources management, much attention is given to the importance of institutions (see for instance Ostrom (1990); Veeman and Politylo (2003); Cortner *et al.* (1998)). This is especially the case, where the responsibility for our natural resources is looked at from a more integrated ecosystem approach or landscape perspective (Söderqvist *et al.*, 2000). Institutions are considered to provide the mechanisms by which individuals can resolve social dilemmas (Steins, 1999). They are sets of rules that people have created in order to controle/regulate the behaviour of people using a natural resource. The idea is that institutions must define and restrict access to and control over the resources, so that they can give the appropriate incentives to users and theoretically guarantee the sustainability of natural resources (Ostrom *et al.*, 1999). This way a 'tragedy of the commons' (Hardin, 1968) can be averted.

Institutions are complexes composed of 'rights' (claims, duties, privileges and exposures). These complexes of 'rights' may take various forms across different types of resources and/or different institutional contexts (Cole, 2000). In other words, institutions governing natural resources may create different legal regimes (Bromley, 1991). For optimal governance, a legal regime must constitute a nested system of powers and authorities, so that it can adapt to changing circumstances, changes in institutional contexts and new scientific insights (Dietz *et al.*, 2003).

Ensuring that people receive the right incentives often involves awarding them with property rights in natural resources (Devlin and Grafton, 1998). Property right regimes are often seen as both cause and solution for natural resource or environmental problems. Property rights induce people to behave in certain ways, and to avoid behaving in certain others(Dahlman, 1980). The idea is to alter or establish a (private) property right regimes, so that it is generating the appropriate incentives (again). Property right regimes restrict and govern access and use of natural resources. For this to happen, a relation must be established between a decision unit and one or more resources. Each decision unit will have certain interests in the management of the resources, and such interests will find expression in claims made by the decision unit. When such claims are judicially confirmed and given formal protection we say that property rights are attributed to decision units (Bromley, 1991).

Hardin (1968) already saw two solutions to restricting access and use, namely privatization and regulation. Privatization means that a decision unit must be given private ownership of its resource. One person is given absolute control over the access and nobody can legally

[4]Based on Clean Water Act Section 320

exploit it without his authorization. The other option is regulation. Regulation can either be government-regulation or self-regulation of users themselves. Both regimes will reduce or eliminate incentives to over exploitation, by (self) imposed restrictions on users and modes of use.

Both options, privatization and regulation, have been recognized and discussed extensively by legal and economic scholars. This would suggest that there is some sort of common understanding about what property rights are. But, as Cole and Grossman (2002) already noted, this is actually not the case. Economic conceptions of property rights differ significantly from legal conceptions. Almost all economic scholars discussing the alternative options of privatization and regulation fail to discern that both are property-based (Cole, 2002). Regulation cannot exist without a legal regime giving some decision units, the state or a group of (self-regulating) users, control over (some part) of a resource. The difference between the two is not the existence or non-existence of property rights, but the type of property rights regime used (Cole, 2002).

Rights, duties and powers/authority are granted on the basis of rules. In the past much research has been conducted concerning the effects of single (legal) rules. Nowadays, research concentrates on the role of (legal) rules in the wider context of, so called, 'institutional configurations' (Crawford and Ostrom, 1995) governing natural resources. For that purpose institutional theories[5] that provide frameworks for detailed analysis that can also be used as the basis of economic analysis are required. are capable to handle such detail and which can be used as the basis of a economic analysis. In this article, a legal theoretical view of regimes for governing natural resources is taken as a starting point. It is an attempt to discover the common ground on which legal and economic scholars can discuss the natural resource management issues. This will be done by presenting the 'underlying unities in legal doctrines and institutions' (Posner, 2004).

In the coming section, the Institutional Legal Theory (ILT)[6] will be briefly introduced. Then we will go deeper into the form and content of legal institutions. In the third section the forms of legal institutions are discussed. Concerning the content of these legal institutions (section four), we look into the literature on bundles of property rights. To that end, attention will be paid to the four 'fundamental legal relations' distinguished by the American legal theorist Hohfeld (1919) and the possibility of combining them with economic conceptions of property rights. The last section (five) will provide a research agenda for applying the economic analysis of legal institutions, as presented in this paper, to the management of estuaries.

2 Institutional Legal Theory

Any contemporary legal theory has a significant analytical component. Successful analysis requires that the theory is capable of describing the components of a legal system, the logical relationships between them, and the ways in which all legal phenomena and operations in the legal system can be described in the terms of these components and relations (MacCormick and Weinberger, 1992). ILT analyzes the legal order as a universe consisting of a multitude

[5]Diermeier and Krehbiel (2003) make a distinction between institutional theories and theories of institutions. They state that an institutional theory 'seeks an understanding of the relations between institutions, behaviour and outcomes' while a theory of institutions seeks 'explanation why some institutional features come into existence, and persist, while others are either non-existent or transient'.

[6]Others refer to it as the Institutional Theory of Law (ITL), see MacCormick and Weinberger (1992).

of relatively independent systems of rules (legal institutions) rather than, as was usual in traditional legal theory, concentrating on logical and other relations between single legal norms and rules (Ruiter, 1993, 2001). Legal institutions are the buildings blocks for (re-)constructing legal orders (MacCormick and Weinberger, 1992; Wessel, 1999).

But what are legal institutions? To understand this, we will first take a look at the concept of institutions. Nelson and Sampat (2001) have reviewed the literature dealing with the question how institutions affect economic performance. Their survey reveals that the concept of an 'institution' means different things to different scholars, both within economics and across social sciences. The question they raise is whether the concept has a single coherent meaning, and their answer is in the negative. Although such a unified content may be lacking, there yet appears to be general agreement on a broad conception of institutions as systems of rules that provide frameworks for social action within larger rule-governed settings. Keman (1997) has surveyed a great number of definitions of institutions used in neo-institutionalists approaches. He found the following general concept of institutions: sets of rules that occur in social reality in the form of recurrent behaviour that complies with those rules. Institutions are not only effect-producing, but are also distinct "realities that shape patterns of behaviour of individuals, groups and organizations" (Keman, 1997).

This definition of institutions is used as point of reference (Ruiter, 2001) in ILT. Legal institutions are systems of legal rules governing specific social action in the context of a comprehensive social order, which purport to meet with general acceptance. General acceptance means that they are socially taken into account as a factual situation (Ruiter, 2004).

There are three reasons for choosing ILT and its legal institutions for studying legal regimes governing estuaries. The first reason is that by describing legal regimes in terms of legal institutions they can be compared systematically (). Much researchers comparing different laws or legal regimes in different legal regimes compare them without the use of a common denominator. This means their descriptions can get distorted because they compare concepts which have they think have the same name, but in reality can have different contents. Or they compare by looking with lenses focussed by their own legal system, so their descriptions are biased towards their own legal system. By using legal institutions as his 'tertium comparatione' (van Wageningen, 2003) a researcher can stay clear of these problems when he is describing, analyzing and comparing legal regimes. The second reason is that with ILT a researcher can make detailed and systematic descriptions of legal regimes, which, combined with Hohfeldian legal relations (4.1), can be used for total cost analysis(6.1.1). The last reason for using ILT is that because of the detailed and systematically description, it is easy to detect institutional interplay. Within the field of environmental law and planning law a lot of authorities (agencies, municipalities, states, etc.) have the power to set rules. Because these rules are set on different levels of government, are set within different policy fields and bear on the same people or objects, it is not uncommon that they interact. This interaction can be beneficial, because the rules are complementary, but the rules can also conflict with each other. With ILT a researcher is able to detect the interplay, because he can show the effect rules have on the behaviour of subjects. If the rules are complementary, a researches will see that the rules restrict or enable different behavioural options. If they conflict, he will detect that one allows/denies a subject to choose a certain course of action, and the other rules won't.

3 Legal institutions

If legal institutions are socially taken to be taken into account as factual situations, their form must be such that they can actually be conceived of as particular situations. That is to say, as existent. There are three basis forms of particular situations[7]:

1. The existence of a certain entity. (There is an Eiffeltower.)
2. A certain existing entity having a certain property. (The Eiffeltower is made of steel.)
3. Certain existing entities having a certain connection. (The Eiffeltower is near the Louvre.)

The category of entities can be further divided in two, namely subjects, which can perform acts, and objects, which can be acted upon. With the aid of both distinctions, a classification of particular situations and therefore also of legal institutions can be constructed. The idea is that this classification is exhaustive, because there are subjects and objects, which can only have a limited number of relations (Wessel, 2001). The different kinds of legal institutions can be characterized as follows(Ruiter, 1997, 2001, 2004):

Legal Persons A legal person is a valid legal régime with the form of an entity that can act. Example: the European Community.

Legal Objects A legal object is a valid legal régime with the form of an entity that can serve as the object of (trans)actions. Example: a conveyable right of ownership.

Legal Qualities A legal quality is a valid legal régime with the form of a characteristic of a subject. The legal regime regulates the behavioural relation between that *particular* subject and *all other* subjects. Example: a person's legal majority.

Legal Status A legal status is a valid legal régime with the form of a characteristic of an object. The legal regime regulates the behavioural relations between *particular* subjects responsible for that object and *all others* subjects. Example: a listed historical monument.

Legal Connections A personal legal connection is a valid legal régime with the form of a connection between subjects. The legal regime regulates the behavioural relations between those *particular* subjects. Example: a personal right.

Legal Configurations A legal configuration is a valid legal régime with the form of a connection between objects. The legal regime regulates the behavioural relations between *particular* subjects with certain relations towards each of the objects. Example: an easement, that is, a legal régime with the form of a connection between a servient tenement and a dominant tenement consisting in a burden (e.g. a right of way) laid on the former for the benefit of the latter. All successive owners of the servient tenement are obligated to bear the burden and all successive owners of the dominant tenement are entitled to treat the former as thus obligated.

[7] See also Ruiter (1997).

Objective Legal Connections An objective legal connection is a valid legal régime with the form of connection between a subject and an object. The legal regime regulates the behavioural relations between a *particular* subject in the legal connection and *all other* subjects. Example: ownership of property.

4 Content of legal institutions

In the previous section we have discussed different forms of legal institutions as distinguished by ILT. However, in order to make an adequate and correct analysis of legal institutions possible, a theory must also not only take notice of different forms, but also take their contents into account (Coleman and Kraus, 1986). ILT identifies as contents of legal institutions their 'ranges of behaviour'. That is, the behavioural patterns regulated by them. To illustrate the content of 'ranges of behaviour', we will analyze property rights and the 'ranges of behaviour' regulated by them.

Property rights are systems of legal relations that 'link a person to an object against all other persons' (Bromley, 1989). Property rights are social institutions, because they, just like other institutions, structure human relations to attain certain goals. This structuring takes place in a system of relations between individuals (Hallowell, 1943). Property relations are created by human communities to mediate individual and collective behaviours regarding objects and circumstances of value to members of the community (Bromley, 1998). This means that all activities which individuals and the community are at liberty or are required to do or not to do, with reference to the object claimed as property, must be defined (Commons, 1934).

It is generally accepted now that property rights compromises complex aggregates of legal relationships made up of claims, privileges, powers and immunities (Hohfeld, 1919)[8], which can be seen as a 'bundle of rights'(Penner, 1996). This view is recognizable in the current (economic) property rights literature. Property rights are thought of as a bundle in the sense that a general description of them will allow for some kind of subdivision into 'elementary rights'. There are different conceptions of the bundles of rights. Therefore we will look into some accepted conceptualizations of these bundles. Because these property rights concepts are all of the form 'subject in relation to an object', it might be interesting to see if they also have the same content. In order to make the comparison, we turn to the rights concepts of Hohfeld (1919). His rights concepts can function as common denominators for describing and analyzing the content of the different property rights concepts. This is possible because Hohfeld has succeeded in reducing the language of the law to a few essential and fundamental legal concepts answering to the standards of simplicity, precision, and universality (Hoebel, 1968). They are fundamental because they 'express the vitally important relations of men with each other in any judicial or governmental system' Corbin (1964).

4.1 Hohfeld

Hohfeld was driven by his dissatisfaction with the indiscriminate use of the term 'right'in the legal practice of his time. Hohfeld noticed that the idea of someone's having a right

[8]These aggregates can differ between people. Hohfeld uses on p.30 the example of the difference between the fee simple owner and the easement owner;'the fee simple owner's aggregate of legal relations is far more extensive than the aggregate of the easement owner'.

X's duty towards Y	jural correlative	Y's claim on X
jural opposite		jural opposite
X's privilege[10]towards Y	jural correlative	Y's no-claim on X

Table 1: Hohfeld's first order set of legal relations

to something is really a cluster of related ideas if we may judge from common legal uses of the word 'right'. This causes much unnecessary ambiguity. Contrary to the saying that for every right there is a correlative duty, he pointed out that some rights have such correlates while others have not (Perry, 1977). His analysis of fundamental legal relations was intended to show that the term 'right' is used in four different senses. For this purpose, Hohfeld distinguishes four legal relations, which contain his eight fundamental conceptions. These conceptions constitute the 'lowest common denominators of the law' (Hohfeld, 1919).

Hohfeld started his analysis by stating that 'rights' are used in a very broad sense, and used to denote very different concepts. Therefore he tried to limit the concept to a coherent set of concepts, or 'relations' as Hohfeld calls them, with definite and appropriate meanings. The first set of concepts is claim-duty. This means that someone (X) who has a duty, has a legal obligation towards the claim-holder (Y) to take or refrain from taking a certain course of conduct. Y's claim that X should or shouldn't do something is equivalent to X's duty towards Y to take that course of conduct like he is obliged to do. Hohfeld calls equivalent legal conceptions 'jural correlatives', which means that the existence of one necessarily implies the other. If such concepts cannot exist together in one person in respect of the same thing, he calls them 'opposites' (Kamba, 1974).

The second legal relation Hohfeld discerns is the one between 'privilege' and 'no-claim'. A 'privilege' means that X may do or do not as he chooses. In equivalent terms, a privilege means that X is not under a duty to perform some action, in contrary, he is free[9] to choose the course of conduct he wants to take. This means that Y cannot claim that X should take some course of action, therefore his positions is named 'no-claim'. But at the other end, Y may interfere with X. This is possible, because X does not have a claim against Y (because Y has no duty not to interfere).

The first order set of legal relations of Hohfeld which are discussed above, can be found in table 1.

'Power' and 'exposure' are the third Hohfeldian relation. 'Power' is the legal capacity to alter legal relations. It is one's affirmative control over a given relation as against another. These other persons are exposed to the power of the former, and have no capability to 'fend off' the changes decided upon by the person having a power they are exposed to. As far as the alterable relations are fundamental legal relations of the first order, this amounts to legal capacity of replacing existing duty-claim-relations by liberty-no-claim-relations and vice versa. However, although Hohfeld himself does not elaborate on this implication, 'power' may also be the legal capacity to alter legal relations of the second order. This amounts to the legal capacity of replacing existing power-exposure-relations by disability-immunity-relations and vice versa. Furthermore, it should be kept in mind that fundamental legal relations of the first and second orders need not be between the same persons. In many situations, X and Y have either a duty-claim-relation or a liberty-no-claim-relation, while commonly having a

[9]Of course this freedom is not unlimited. Some restrictions are set, but within these restrictions, a person is free to do whatever he wants.

X's power towards Y	jural correlative	Y's exposure[11]towards X
jural opposite		jural opposite
X's immunity for Y	jural correlative	Y's disability towards X

Table 2: Hohfeld's second order set of legal relations

power-exposure-relation or a disability-immunity-relation with Z concerning their first-order legal relation. In such tripartite relations, Z is legally (in)capable of changing an existing first-order legal relation between X and Y (Ruiter, 2003)

The fourth and last of Hohfeld's legal relations is the one between 'immunity' and 'disability'. An immunity means that X is exempted from the effect Y's power. This means that legal relations vested in X cannot be changed by the acts Y. This means that Y is under a disability so far as changing the relations X has with Y or a third party concerned.

The second order set of legal relations of Hohfeld which are discussed above, can be found in table 2.

4.2 Bundle of rights

Now we have found a way to render different definitions of property rights in the same 'language', we can turn our attention to conceptualizations leading to such different definitions. Several conceptualizations (e.g. (Honoré, 1961)[12] and (Furubotn and Pejovich, 1974)) are possible, but although it looks like they are really different, on the most important accounts they are the same(van de Griendt, 2004). The choice has been made to take the approach of Schlager and Ostrom **?**. This approach is chosen, because it is more precise and its conceptualization relates better to the total cost analysis (6.1.1).

Schlager and Ostrom (1992)Ostrom and Schlager (1996) present 'a conceptual schema for arraying property-rights regime that distinguishes among diverse bundles of rights that may be held by the users of a resource system'. They distinguish four classes of property rights holders, namely owner, proprietor, claimant and authorized user. Each position has its own associated bundle of rights. These bundles contain one or more property rights. Schlager and Ostrom discern five different property rights(p.250-251), which they define as:

access *The right to enter a defined physical property.*

withdrawal *The right to obtain the 'products' of a resource (e.g., catch fish, appropriate water, etc.).*

management *The right to regulate internal use patterns and to transform a resource by making improvements.*

exclusion *The right to determine who will have an access right, and how that right may be transferred.*

alienation *The right to sell or lease either or both of the above-mentioned collective-choice rights.* (p.250-251)

With what kind of Hohfeldian relations (3 are we dealing here? A right of access, gives the holder a privilege to enter the property and at the same time, gives others a no-claim.

[12]Both Becker (1977) and Munzer (1990) have rendered Honore's elements into Hohfeldian terms.

Schlager & Ostrom	Hohfeld
access	privilege to enter a defined physical property [13]
withdrawal	privilege to the products of an object [14]
management	power to determine usage of object
exclusion	power to determine access to object
alienation	power to transfer rights

Table 3: Property rights of Schlager & Ostrom in Hohfeldian terms

	Owner	Proprietor	Authorized Claimant	Authorized User	Authorized Entrant
Access	x	x	x	x	x
Withdrawal	x	x	x	x	
Management	x	x	x		
Exclusion	x	x			
Alienation	x				

Table 4: Bundles of rights associated with types of owners (**?**)

This means that they cannot claim that the privilege holder must take some course of action. But at the other hand, it does not mean that they must not interfere with the formers access. A situation of non-interference can only exist if the privilege is reinforced with claim rights, giving other persons then the privilege holder a duty not to interfere. A subject with withdrawal rights a liberty to obtain products produced by the resource. Others cannot claim that he should not take them. Here the same situation as with the access rights, they must be reinforced with claim rights before a situation of non-interference comes into existence. A person with management rights has a power because he has the capacity to change the relations between himself and other people wanting access or withdrawal rights. If he has not giving them 'rights', they are under a duty to not take any products. If he has used his power and given them rights, the situation and the legal relations are changed. Then the 'manager' is under a duty not to keep them from taking products, and thereby respecting their claims. This is the same for exclusion rights, the person holding them has a power. Also the right of alienation is a power, because the owner of this right may change his position to the object in relation to others, and let someone else partly or totally take over his position. For that to happen, he must change the legal relation between him and the new 'owner'. Because he has transferred some of his rights, he cannot claim anymore that the new 'owner' should refrain from taking a course of action in relation to the object. The different rights are summarized in table 3.

How these property rights can enable us in making distinctions among the different categories of property right holders, is shown in table 4.

Individuals holding only access rights are called 'Authorized Entrants' by Ostrom & Schlager. An example is the tourist who has bought a ticket for visiting a national park. If individuals also hold withdrawal rights, they are called 'authorized users'. If specified in the rules, these access and withdrawal rights could be temporarily (lease) or permanently (sale, granted or assigned) transferred to others. An example is persons holding a permit or individual transferable quotas. The rights of access and the rights of withdrawal are determined by the persons holding the management and exclusion rights. 'Authorized Claimants' have, next to

their access and withdrawal rights, management rights. This means that they may devise a set of withdrawal rules, with which they can determine and coordinate the usage of the resource. An example would be a group of fishers together determining the fishing rules for their joint property. Authorized claimants cannot determine who has access to the resource. People who have this extra exclusion right are called 'Proprietors'. Proprietors decided who may have access to the resource, how it may be utilized, but they may not sell it. An example would be a committee governing the usage of a resource, which is not authorized to sell the property. The right of alienation is only reserved for 'Owners'. Owners have the complete bundle of rights.

The Ostrom-Schlager conceptualization is based on and applied to single-use and local-community level institutional arrangements, mostly local fishery or lobster communities (see their examples in their 1992 paper). For our purpose, the analysis of multi-level and multi-use CPR, the conceptualization must be adapted to accommodate for the positions of governmental (the state and its agencies) and non-governmental organizations (NGO's). Therefore we would like to propose two other types of owners, namely the trustee and the steward. Both are not self-interested, but goal oriented and are in a principal-agent relation towards this goal set by others. This means that they do not act on their own behalf, but on the behalf of others. This is quite different from the 'owners' of Schlager and Ostrom who all act in their own best interest. The 'trustee' is an agent of the beneficiaries (in case of the government, the 'people', this can be the current population, but it can also contain future generations) and tries to act in their best interest. A trustee is not acting on his behalf, but serving a 'higher purpose'. To do this, he needs a bundle of rights that contain at least management rights, exclusion rights and alienation rights. By selling, leasing or granting access and withdrawal to others, he can generate money for the development/improvement and management of the resource. If it is in the best interest of the beneficiaries to sell the property, he can do that. With the money he generates, he can buy other property. It is not necessary for the trustee to have access rights. If he can grant others access to the property, he can do that in such a way that the end result would be the same as if he would have had access himself. If the trustee wants to actively improve his property, then it would be logical that he also has access rights. A good example would be a municipality which is developing and improving pastures into building lots, which can be sold separately. With selling the building lots, the municipality is generating money for funding services delivered to its citizens and at the same time, it is attracting firms and generating jobs. In this selling process, they do not have to sell the property to the highest bidder, but they can choose other bidders who's bid fits better in the ideas and/or spatial plans of the municipality.

The steward is an agent acting on behalf of (some group of) owners, trying to achieve the management goals set by these owners. A good example would be a forest service agency managing the forest owned by the government. For their task of maintenance, preservation and improvement of the State forests, they would need some tools in the form of access rights, management rights and exclusion rights. With the access right they can enter the property and fulfil their management tasks. The products which are generated by the improving the property, can be sold separately. For this the steward does not need withdrawal rights, because the products are only indirectly generated. They are a sort of profitable waste generated by the maintenance activities. To keep the property in the right condition, it is necessary that a steward can set access and withdrawal rights for others. By defining these right, he is in control of the usage and therefore the condition of the resource and the stream of benefits generated by the property. With this control he is able to reach his management goals.

	Owner	Trustee	Proprietor	Steward	Authorized Claimant	Authorized User	Authorized Entrant
Access	x	(x)	x	x	x	x	x
Withdrawal	x		x		x	x	
Management	x	x	x	x	x		
Exclusion	x	x	x	x			
Alienation	x	x					

Table 5: Adapted version of table 'Bundles of rights associated with types of owners'

5 Property rights and collective action

In the property rights theory the main focus is not so much on the different owner positions, but more on the conventional fourfold distinction of property right regimes, namely (Cole, 2002):

State property Individuals have a *duty* to observe use/access rules determined by a controlling/managing agency. Agencies have a *power* to determine use/access rules.

Private property Individuals have a *privilege (reinforced with claim rights)* to undertake socially acceptable uses, and have a *duty* to refrain from socially unacceptable uses. Others (called 'nonowners') have a *duty* not to prevent socially acceptable uses, and have a *claim* that only socially acceptable uses will occur.

Common property The management group (the 'owners') has a *power* to exclude nonmembers, and nonmembers have a *duty* to abide by such exclusion. Individual members of the management group (the 'co-owners') have both *powers* and *claims-duties* with respect to the use rates and maintenance of the object owned.

Nonproperty There is no defined group of users or 'owners' and the benefit stream is available to anyone. Individuals have both a *privilege* and a *no claim* with respect to use rates and maintenance of the asset. The asset is an 'open-access resource'.

Most economists would say that resources should be regulated by assigning one of these property right regimes. These regimes are ideal-types (Demsetz, 1967), however. In reality, many natural resources are managed in a way that combines aspects of different property right regimes (Devlin and Grafton, 1998), because resources are not used for one purpose. Why should a user merely use a forest for collecting wood, if he can also let his cows graze there (Edwards and Steins, 1998)? The result is that resources are subjected to, sometimes conflicting, multiple-uses for which different regimes are in place (Steins, 1999).

To manage such potential resource use conflicts, one must choose the right mixes of private, community and state property rights to address environmental problems. Together they can constitute successful institutional arrangements which are able to address the problems associated with the use of CPR's. An example of an interesting mix of private and state rights provides conservation/land trusts (Cole, 2002) that are increasingly important in the preservation of valued habitats in many countries (Devlin and Grafton, 1998). This brings us to the point that rather than considering a property right regime, it is more interesting to look at (legal) persons property rights are assigned to.[15] These legal persons can be or-

[15]Dales (1968) already wrote that the four types of property right regimes reflect ideological issues than that they constitute real distinctions.

ganizations/institutional arrangements (associations, communities, trusts) who, by vesting authority in them, can overcome coordination failures inherent in the exploitation of these multi-use, multi-actor, multi-level CPR's and economize on total (transaction) costs (Grafton, 2000). Coordination can be very interesting if there is the matter of economies of size, scale and scope for information gathering, monitoring, enforcement, etc. Especially when there is a public good aspect to a CPR, the costs of overcoming free rider problems can be very high, requiring some form of coordination across users, owners, beneficiaries, NGO's and other concerned parties. An overarching institutional arrangement, creating a single legal regime, can also be very helpful when CPR's are jointly used in a number of different jurisdictions and where individuals users cannot enforce property rights and contracts across these jurisdictions(Grafton, 2000). There are different types of legal regimes capable of coordinating behaviour or making decisions for the collective. These legal regimes can also be described as personified legal institutions. An overview of the basic types can be found in the following section (5.1).

5.1 Personification of legal institutions and property right regimes

The source of property rights is not important, important are the incentives it gives to the decision units. Decision units can operate under different property right regimes (Bromley, 1991). To determine the effect of the incentives, we have to know who can decide, which options he can choose from, how he takes his decisions, how costly this is and to what extent externalities occur. In all cases, the decision unit is called 'the owner'. In most legal traditions, individual ownership is seen as exemplary, despite the fact that most property is owned jointly (Holderness, 2003). Although the central contrast drawn is generally between state and private property or ownership, we should bear in mind that through the ages property has been attributed to a large class of heterogeneous entities (Alchian and Demsetz, 1973). To classify these entities/decision units, we look at the legal subjects distinguished by ILT. Legal subjects manifest themselves in four basic forms. The first form is the physical person. In addition there are three more categories of legal subjects: legal institutions playing the role of a subject in order to enable a certain social group to act as a single agent (Ruiter, 2001). Legal personality is a 'legal status' of a legal institution which it acquires by a process of personification. Ruiter characterizes this:

> Instead of making one comprehensive arrangement about exclusion and/or usage, between all the owners, this legal connection is personified. By doing this the mutual relation between all the owners is changed into one between each owner and the legal person, with the form of an association. The legal status 'legal personality' has the purport that objects having it will be socially treated as persons (Ruiter, 2004)

ILT distinguishes three categories of personified legal institutions, namely:

- associations
- corporations
- foundations

The different categories can be characterized as follows[16]:

[16]Based on the work of van Wageningen (2003) and Ruiter (2004)

Association An association is a personified alliance, based on a long-term multilateral contractual relation ('legal connection') between subjects, with the status of a legal subject. Decision-making within an alliance is fundamentally governed by the requirement of mutual contractual agreement. This means that any new decision takes the form of contract renewal. Furthermore, contractual relations only regard parties to the contract. As a consequence, no subject in the alliance can conclude contracts with third parties on behalf of the others. These restrictions can be lifted by personifying the alliance, which is achieved by making the following adjustments:

1. Contractual consensus is abandoned in favour of collective decision-making processes, whose results no longer have to confirm to the individual wills of all participants.

2. The abandonment is accompanied by the construction of a generalized will which is ascribed to the alliance itself. Hereby the alliance gains legal personality and is transformed in an association. After this transformation, it is treated like as a natural person, has a capacity for rights, is capable of performing legal acts and responsible for behaviour flowing from its will.

3. At the same time, the original contractual legal relations between participants in the alliance are replaced by a bundle of legal relations between the association and members. The membership means that the former participants are entitled to participate and vote in collective decisions. This membership is the last remnant of the original contract.

When a subject ends its membership, the association can still function normally. Even when all the original members have gone, the association persists.

Corporation At the root of the 'corporation' lies an institutional form belonging to the basic category of 'objective legal relation', which will be termed partnership. This means that a corporation is a personified partnership. A corporation is present, when two or more subjects have joint ownership of one or more objects and/or capital goods. Decision-making in a partnership is governed by the principle of agreement between partners concerning the management and disposal of the common property. The partnership is restricted in similar ways as the alliance. These restrictions can likewise be lifted by personifying the partnership. This is achieved by making the following adjustments:

1. Joint ownership of property by partners is abandoned in favour of ownership by the corporation while partners are transformed into shareholders, that is, holders of rights to certain proportions of the economic value of the corporation's property (capital) entitling them to corresponding proportions of the corporation's profits.

2. The principle of unanimous agreement between partners is abandoned in favour of collective decision making by a general meeting of shareholders.

3. The idea of an original objective relation between joint owners and their common property is replaced by that of a bundle of personal legal relations between the corporation and its shareholders entitling them to vote in the general meeting.

4. A corporation is treated on a par with physical persons (capacity for rights), is capable of performing legal acts (legal capacity), and is responsible for behaviour flowing from the will ascribed to it (legal liability).

Name NEP	Name coordinating organ(s)	Institutional form
Albemarle-Pamlico Sounds	Coordination Council	Alliance
Buzzards Bay	Buzzards Bay Action Committee	Alliance[17]
Casco Bay	Office of Casco Bay + Impl. Committee	Alliance
Corpus Christi Bay	Estuary Council	Alliance
Delaware Inland Bays	Delaware Center for the Inland Bays	Alliance [18]
Puget Sound	Puget Sound Action Team	Alliance
Tillamook Bay	Performance partnership	Alliance
Tampa Bay	Interlocal Agreement	Alliance
Narragansett Bay	Narragansett Bay Estuary Program (NBEP)[19]	Foundation
Delaware Estuary	Delaware River Basin Commission (DRBC)[20]	Association/Foundation[21]
San Francisco Estuary	Executive Council/SFBRWQCB[22]	?[23]

Table 6: Institutional forms of National Estuary Programs

Foundation The institutional form at the basis of the 'foundation' is the fund. Funds belong to the basic form of 'objective legal connections'. A fund is someone's ownership of a collection of assets that is devoted to a particular objective. Personification of a fund is achieved by making the following adjustments:

1. The position and objective-oriented will of the owner are replaced by the objective-oriented ownership by the foundation.
2. The objective of the fund is ascribed the status of a will, providing the fund with a capacity for rights, as well as full legal capacity, while rendering it legally liable.
3. The foundation has neither members nor shareholders.

The raison d'être of a foundation is its formal objective, which substitutes for the original will of the owner.

5.1.1 Coordinating NEP organizations

The NEP of the EPA provides funds and technical assistance for States to develop a Comprehensive Conservation and Management Plan (CCMP). This CCMP is required to address three management areas: water and sediment quality; living resources; and, land use and water resources. Where appropriate, it can also address other problems. The goal of the CCMP is to improve the management of water quality and living resources in an estuary. Individual estuary programs are given a great deal of flexibility in determining how their plans will be implemented (Imperial *et al.*, 2000). As reference for looking at relevant legal (personified) institutions, we have looked at the institutional forms of some of the coordinating organizations implementing the NEP (table 6). This overview shows us that most of the NEP are based on the 'alliance' form, but not all. Especially the CCMP of NEPs which were among the first to be implemented have an association or foundation as institutional form. It would be interesting to see if these individual NEP perform more or less efficiently as the others.

6 Research agenda

The former chapters showed the capabilities of ILT for analyzing legal regimes for integrated management of estuaries. These legal regimes are based on the ecosystem management approach. Ecosystem approaches to management often look beyond specific jurisdictions and

focus on broad spatial scales (Brody *et al.*, 2004). To be able to design a legal regime for integrated management of estuaries, it is necessary to make a comparative assessment of the performance of real legal regimes (Cole, 2002). This way we can try to determine the circumstances in which one or the other legal regimes is more optimal/suited for integrated governance of estuaries. For optimality we would like to look at the adaptive efficiency of the legal regimes. This means that the legal regime determining the ownership and governance arrangements, should minimizing the sum of organization costs and transaction costs (Sun, 2002). Institutionalism is particularly well suited for comparative research (Diermeier and Krehbiel, 2003). For comparing legal regimes, it must be possible to analyze them without reference to the legal system (common, civil, etc.) in which the legal regime is 'located'. By using ILT a researcher can compare with ease, without any 'translation' problems (ILT is already applied in different fields, for instance international organisations (Wessel, 1999), universities (van Wageningen, 2003) and municipalities (Ruiter, 1995)). This is possible, because ILT is a legal meta-language, which enables the comparison of legal regimes with the help of the common denominator(s)it presents (van Wageningen, 2003). The legal institutions of ILT are this denominator which enable a researcher to name all 'building blocks' which legal regimes are made out of (Wessel, 1999). All legal regimes can be rendered in the same basic forms with the same terms for their content (range of behaviour). This is the basis a researcher needs for the comparison of legal regimes which are part of other legal systems and/or several different jurisdictions. But how to determine the efficiency of these legal regimes?

6.1 Analysis of legal regimes

Different property regimes are used for managing natural resources. Each type (private, public, common or open access) has proven to be successful in some instances, but none of them in all cases. So, which property rights regime must be selected in which situation? Each property rights regime has associated with it a particular structure of costs. These costs are not expected to be the same for each type of property regime (Bromley, 1991). So which then is the best one? Cole (2002, p.131) says:

> The 'best' property regime for environmental protection is that which achieves society's exogenously set environmental protection goals at the lowest total cost, defined as the sum of exclusion and coordination costs given the environmental amenities targeted and their ecological circumstances, economies or diseconomies of scale, technological capabilities, and institutional and organizational constraints.

The best legal regime would be the one with the highest cost-effectiveness. This is the legal regime which given a set of aims, achieves them at the least-total-cost(Rose, 1991). But what are the costs we are talking about and what are the effects?

6.1.1 Total cost analysis

What we are looking for are the costs associated with the institutional arrangement used for conducting activities in relation to the ecosystem at hand. In other words, the cost of running this system, 'transaction costs'[24]. These costs are related to the form and content of the property rights established by the institutional arrangement. By looking at these forms

[24]I agree with Cheung (1998) that it would be better to have called them institution costs

and contents, we can observe the level of transaction costs, by using the theory of Smith (2002). For determining the total level of costs, Smith argues that it is important to answer two questions. The first is: What collection of attributes is treated as a unit for describing permitted or forbidden activities?

Natural resources which are subject of a property rights regime, can be seen as a bundle of valuable attributes, of which each individually is costly to measure. Therefore the property rights on these attributes are also costly to define and enforce. However, not all methods are as costly. Because of these issues, people setting up a system of property rights will try to economize on measurement costs. They do this by using a more or less rough 'proxy' for describing the property. Objects can then be treated as a whole or divided into spatial or time or functional slices. This way a trade-off can be made between the costs and benefits of a more precise 'proxy'. This 'proxy' is the unit to which a range of behaviour can be attached. When rough 'proxies' like borders are used, a large class of activities will be bundled and not defined separately. When such a proxy is used, we are looking at an exclusion right. This exclusion right is not absolute, because there will always be rules who will permit (right of way) or not forbid (enjoying the scenery) activities of others. But we speak of exclusion, because such a large and indefinite class of uses is bunched together under a single owner control, that it looks like that access to the resource without permission of the owner is denied. The single owner will function as a gatekeeper. He is responsible for the decisions about and the monitoring of specific activities with regard to the resource. He can control these activities by regulating the access to the resource. For this he has to make 'exclusion costs'. They are the costs of drawing and enforcing boundaries to restrict access to and use of the resource to the owner(s) of the property (Cole, 2002). These exclusion rights are used when the group of duty holders is large, and the simplicity of the rough proxy reduces the processing costs, which would otherwise be very high.

At the opposite, the people setting up a property regime can also set governance rules. Governance rules are rules which pick out uses and users in more detail. These rules can be supplied by norms, contracts and regulation. This means they can be set by the government or a group of users who close a mutual contract, determining usage of their joint property. Governance costs are costs of negotiating these arrangements, coordinating decisions and monitoring and enforcing the rules set by the arrangement. It is very hard to separate the effects of the different uses and coordinate the activities of the different users. When a lot of users are using the resource at the same time, it is very hard to determine the effect of a single individual by only (being able) to look at the total output. The more specified the rules, the more effort it will take to communicate these rules to all users and for them to remember them and act accordingly. So more precision of rules lead to higher monitoring and enforcement costs.

Exclusion and governance differ in the proxies selected and are opposites of each other. But that does not mean that when setting up a property regimes you have to choose for either one. They are poles of a continuum, with hybrid solutions in between. For instance, exclusion rights can be used to deny access to a large group of people, only leaving a small group of users to be controlled by governance rules. So it shows that it might be more interesting in some cases to use a mix of both exclusion rights and governance rules. Which proxy ultimately gets selected depends on the total costs. When a rough proxy is used, the marginal cost of exclusion is low but increases rapidly with higher levels of precision. But the marginal cost of

governance rules may be higher than for exclusion rules at the same initial level of precision[25], but may increase less rapidly.

For determining the level of costs it is not necessary to make an accurate calculation. As long as by comparing different levels of transaction cost of different legal regimes an estimate can be made about the relative order of magnitude (Furubotn and Richter, 1991), then the transaction costs are measurable at the margin and hypothesis can be tested (Cheung, 1998). For determining the level of precision, we will look at the level of specification. Rights are precise or specified to the extent that they protect attributes by preventing a range of unauthorized actions. The level of specification will be somewhere between the level of total specification and total absence of specification. Total specification means that for every use of every attribute every potential Hohfeldian relation is specified between every pair of members of the society. Total absence of specification is a situation where no rules are set and no property rights are assigned. We are talking then about total anarchy or open access regimes. To determine the level of precision of a proxy, we will observe if it is possible to distinguish more attributes of each other and if it is possible to measure the level of the individual attributes. Smith explains it with the following example:

> For example, a fence around Blackacre allows one to distinguish situations in which person A is or is not physically present on Blackacre. This is a reasonable proxy for whether A is stealing crops, but it is a very rough one; in particular, the rule overgenerates in the sense that all states of affairs in which A is physically on Blackacre but not stealing are lumped with those in which A is present and stealing. The proxy measurement by fencing and monitoring crossings is very cheap, and, as long as there is little need for A to be present on Blackacre, the approximate nature of the proxy is not a problem. Now if A being on Blackacre becomes valuable enough, say because A is a laborer helping harvest, then the original proxy will not be enough. What is needed is a proxy that will (again) pick out situations in which A is not present on Blackacre (protecting a wide range of attributes most of the time) but will break up the case in which A is present on the land into subcases. For example, one could further distinguish those subcases in which A is present on the land without containers. The new, more precise rule will allow A in but only if A does not bring any containers with him and allows his pockets to be searched. This conditional permission relies on a combination of the fence and a rule of no containers. It requires more monitoring, but it is also more precise.(p.S473-S474)

The data needed for such an analysis can be gathered with the analysis proposed in this paper. By using this method, a comparison between legal regimes and their relative total cost levels can be made.

[25]This is because so much uses are authorized, it is very hard to monitor all users, which will lead to a lot of costs of unmeasured uses. This is much harder then just keeping everybody from using the property

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