Making Use of Paradoxes: Law, Transboundary Hydropower Dams and Beyond the Technical

Kenneth Kang[1]

Abstract

Law's regulation of transboundary hydropower dams is a field of study brimming with paradoxes. The most notable being the paradox of a hydropower dam solving one problem and creating another. From a logical perspective, such a paradox would typically be viewed as an obstacle to be avoided because it brings everything to a standstill. But from a social perspective, paradoxes are not neces- sarily negative, as managing them also potentially enlightens and transforms planning systems. The latter perspective, which brings to analysis a kind of dyna- mism, is employed in this text. In order to work out the reoccurring patterns under which law might productively make use of paradoxes, this text therefore proposes the methodological tools of exposing and building upon paradoxes. Exposing paradoxes sets out to make more visible some of the unthought limitations, self- deceptions and self-contradictions which arise in modern planning practices, while building upon paradoxes attempts to open up headways towards a more adequate conceptualisation of the solutions which law can offer. The overall intention here being to offer a Luhmannian-inspired theoretical framework which illuminates the value of social systems theory as a methodological tool for describing the com- municative challenges facing law's regulation of transboundary hydropower power dams.

Keywords Hydropower dams · Law · Niklas Luhmann · Paradoxes · Planning systems · Social systems theory

[1] China International Water Law Research Group, School of Law, Xiamen University, Xiamen, China. Email: Kenneth-kang@hotmail.com

Introduction

Imagine a situation where a lawyer uses particular distinctions[1] like lawful and unlawful, or a scientist investigating whether certain empirical findings are true or false, or an economist calculating whether or not monetary profit can be made. Now think of the time when these specialists are forced to make a decision to select A over B, despite being unable to meet a reasonable standard of rationality because they do not have full information. This we may call a paradox. In the context of transboundary hydropower regulation, paradoxes are abundant, especially as these projects tend to solve one problem but also create another. For example, think of the efficiency paradox, whereby the industrialisation of a river increases irrigation efficiency to save water, only for the saved water to be used for the expansion of the irrigation area and thus no net savings of water are made. Or think of the peak water paradox, whereby increasing water extraction upstream leads to potential environmental degradation downstream, as was the case in the Murrumbidgee basin, Australia (Sivapalan and Blöschl 2015).

From a logical perspective, such paradoxes would typically be viewed as obstacles to be avoided because they bring everything to a standstill. But from a social perspective, paradoxes are not necessarily negative, as managing them also potentially enlightens and transforms planning systems.[2] The latter perspective, which provides analysis with a kind of dynamism, is employed in this text. In order to work out the reoccurring patterns under which law might productively make use of paradoxes, this text therefore proposes the methodological tools of exposing and building upon paradoxes. Exposing paradoxes sets out to make more visible some of the unthought limitations, self-deceptions and self-contradictions which arise in modern planning practices, while building upon paradoxes attempts to open up headways towards a more adequate conceptualisation of the solutions which law can offer. The overall intention here being to offer a Luhmannian-inspired theoretical framework which illuminates the value of social systems theory as a methodological tool for describing the communicative challenges facing law's regulation of transboundary hydropower power dams.

This text first briefly explores the theoretical background to Luhmann's social systems theory, focusing in particular on the question of how paradoxes arise within the operations of social systems ('Exposing the Paradoxes of Social Systems' section). The text will then explore the communicative challenges facing law when it aspires to offer planning systems support to build upon paradoxes, that is, to look for and compare alternative ways of solving problems. This will be conceptualised by providing a brief overview of the proposed theoretical framework ('Building Upon Paradoxes Via Methodology' section), followed by the framework's main body ('Making Use of Paradoxes Via Theoretical Framework' section), with conclusions reached in the last section.

---

[1] Distinction, understood here as pointing to things that matter.

[2] Planning systems are understood here not as a system of people labelled 'planners', or of a system of state organisations called 'planning departments'. It refers to a constellation of coupled organisations which observe each other, and respond to each other, in terms of their decision-making processes.

Exposing the Paradoxes of Social Systems

How might one adequately comprehend the complex 'hydro-socio-ecological connections' (Bond 2012, p. 197) underpinning law's regulation of hydropower dams? I propose roughly two distincWt methodological approaches. The first is to employ the perspective of a participant observer, such as a jurist or a practitioner, whereby the predominate interest here is to participate in decision-making processes so as to offer planning systems' support and practical guidance. Are state X's planned measures lawful or unlawful, right or wrong, economically feasible or not, being some of the frequent questions asked. Of course, there is no doubt these advisory transactions play a crucial role in ensuring that planning systems run smoothly. But what happens when the question of paradoxes enters the equation, and the probability of being criticised for making inadequate judgements increases?

Perhaps the more pressing issue in these circumstances is to understand better the present condition, by asking the more preliminary question 'how can one improve observations', as opposed to jumping ahead and asking 'what can be done'. This is where the analytical value of the second methodological approach can be found, the systemic observer which this text proposes. What differentiates a systemic observer from a participant observer is that whereas the latter is concerned primarily with the observational question of what, the former is concerned primarily with the how; this being, namely, how and why is it that participant observers observe (or do not observe) certain problems as problems, or certain solutions as solutions? It is, in other words, concerned with working out the forces that lie behind a participant observer's ability to have reached their current assessment of the events. Of course, such cool detachment from the hurly-burly world of decision-making processes means that this type of analysis cannot itself offer any useful technical professional advice. But what it can do is offer a 'semantic reorganization of knowledge' (Luhmann 2013, p. 20) so as to reach a proper formulation of the proposed research agenda, to work out the reoccurring patterns under which law might productively make use of paradoxes.

In order to adequately address this question, it is necessary first to employ an empirically sound and logical basis with which to ground the analysis. Drawing upon the works of Niklas Luhmann's theory of society, I propose that this can be most adequately attained by focusing the analysis at the level of social systems.[3] After all, if the analysis were to account for the (roughly speaking) 7 billion individuals living on this planet, it would likely be drowned with informational overload. But if the analysis employs a fictional distinction where one finds a set of clearly differentiated and typified functional (social) systems such as law, science and the economy, then this offers a more comfortable basis for analysis. For what this enables is an exploration of how each functional system strives to do nothing more than autopoietically[4] reproduce themselves. A functional system such as the

---

[3] To the question of what is meant by social systems, Luhmann simply claims that 'there are systems' and these are empirically observable: if conversations, payments or organisations are real, then also social systems are real (Luhmann 1995, p. 12).

[4] The concept autopoiesis derives from the Greek whereby autos means 'self' and poiesis means 'production', hence the concept literally means 'self-production'.

law, for example, 'produces and connects millions of courts, lawyers, judges, clients, and cases to one another in and through an ever reproducing network of communications' (Kessler 2009, p. 102). Indeed, it is only by doing this, that the legal system[5] can build its own communicational redundancies (i.e. its routines, repetitive communications or past decisions) and thus distinguish itself from other types of communications—a prerequisite for the survival of any social system.

But why then select social systems as the basis for analysis, and not natural features such as the river basin system? This is because, from a systemic perspective, the latter does not exist as a system. Although we could, for example, describe the downhill gravitational natural flow of a river as systemic, this is not the case if we understand the preconditions to any system as having only autopoietic self-referential features. For whereas an autopoietic social system has the ability to pull itself up from its own bootstraps and establish boundaries that distinguish itself from its environment[6] (environment understood here as everything else surrounding a system and not just the natural environment), the river basin system, by contrast, cannot. What goes into a river cannot be taken out by the river itself, but if a social system is disrupted, such as the way of life of an indigenous tribe, this system can at the least protest, as was the case of the Xingu River tribal people in Brazil.

In this Luhmannian perspective, excluding natural features such as a river from the analysis is, therefore, the only way in which a systemic observer can take a river seriously. For what this analytical positioning acknowledges is that a river remains excluded from society and hence is marginalised, and that the only way it can become relevant is if it is incorporated into social communication.[7] The same is true for individual humans, because even if a fist is secretly shaken in one's pocket, this only becomes relevant if such action is communicated. This is why Luhmann's 'world society' constitutes the horizon of all possible communications, because it is social systems that utilise communications to autopoietically reproduce themselves, rather than ecological conditions or individual humans which make society happen.[8] Ecological conditions, nevertheless, may allow for the enactment of social communication, and human individuals may contribute to communication through

---

[5] More specifically, the 'legal system' is understood here as the total sum of all communications within society that are directly related to issues of legality or illegality. It extends, for example, to government departments debating the creation of new laws and regulations, to the teaching and interpretation of legal norms in law schools, or to environmental NGOs investigating cases of transboundary water pollution with a view to possible court action. At the same time, all other systemic communications, such as politics, religion or economy and so forth, form part of the environment of the legal system, namely whatever the system is not.

[6] See Maturana and Varela (1987, pp. 46, 47).

[7] Following Luhmann, social communication means the occurrence whenever information is announced by A and understood by B. Here understood refers to the likelihood that B misunderstands the information, without understanding that it misunderstands the information. In other words, communi- cation does not refer to a substantial transfer of information from sender to receiver but, rather, it refers to the likelihood that communication emerges 'unintentionally'; see Moeller (2005, p. 217).

[8] More specifically, as Ziegert puts it explaining Luhmann's unequivocally clear and uncompromising position, this is because: 'people (individuals) think, social systems communicate; conversely, systems cannot and do not think and individuals have no control over the meaning(s) that are produced by systems' (2013, p. 324). Or, in the words of King, simplified but still in keeping with the proposition of systems theory: 'systems, not people, make society happen' (King 2009).

consciousness, but these entities will always remain part of the environment of a social system (Luhmann 2012).

This is where the paradox of social systems can be found. Since the environment (including all other systems) represents everything else surrounding a system, and since the environment is always more complex than the system, the environment therefore presents for the system an 'ungraspable unity' (Luhmann 1995, p. 209). As a consequence, the environment remains inaccessible to the system, because a system can never actually communicate with its environment, but only about its environment. Should a system proceed to communicate about its external environment, then this is always an internally constructed vision based on a system's own specific redundancies. Luhmann describes this autopoietic process as the evolutionary achievements of functional differentiation, whereby human communication achieves a certain scale and begins to branch out into separate realms (e.g. science, economics or politics). As a means for discovery rather than an end in itself, he also suggests each functional system employs a binary code with which it uses to see and interpret the world. For example, in order to function, science uses the code true/false and its derivatives, such as subjective/objective or likely/unlikely. Although actual truths change all the time, science, however, can only approach the world through these codes. It cannot use true/false/feminist, for example, or subjective/objective/subaltern unless it turns into ideology (Fuchs 1999, p. 118). Similar arguments can be made for other functional systems, such as the economic system, whereby its transactional possibilities are structured by the code payment/non-payment (i.e. wealth creation) and not social position; or the political system, which strives for independence from religion by structuring itself around the code government/opposition, so as to retain its capacity to make collectively binding decisions.

If one accepts this Luhmannian description of society, then this explains why society appears differently even though it remains the same. It explains, for example, why a banker, restricted and burdened by the demands of the economic system, might observe hydropower infrastructure investment in terms of payments, while a politician might observe this as a means to reinforce legitimacy. Nonetheless, this intense sensibility to specific questions also explains why modern society becomes a threat to itself, as it tends to give way to a recurrent stream of paradoxes or, as Luhmann puts it, that when 'one acts as society expects one to act, one acts poorly' (Luhmann 1999, cited in Alexander and Blum 2016, p. 244). For example, the paradox of enhanced economic predicaments driven by ongoing power games of political actors or the profit-oriented calculations of lobbyist, often come 'at the cost of ecological and social sustainability'.[9] Of course this is not to say that paradoxes will bring everything to a standstill, but what it does point to is that each system will have to handle and build upon paradoxes in their own particular ways, something which law seeks to facilitate, as will be explored next.

---

[9] Valentinov describes this paradox as the complexity sustainability trade-off; see Valentinov (2014).

Building Upon Paradoxes Via Methodology

The concept 'to build upon paradoxes' does not mean to try and resolve problems. After all, the core problems facing law's regulation of transboundary hydropower dams have, more or less, been resolved long ago.[10] Instead, the concept invites analysis to explore the conditions under which planning systems might look for and compare alternative ways of solving problems. For example, when observing the solutions available for flood control, a planning system may traditionally employ the formulas of efficiency from the economic system that building one large dam as opposed to several smaller dams is the most cost-effective means.[11] However, in a functional differentiated society this has to be negotiated, since each functional system offers solutions (or formulaic templates) to different problems. The formulas of risk minimisation from the system of science, for example, might diagnose that there are other functional equivalents to flood control, such as modifying land use within the flood-plain so that flood-waters can be accommodated, or by building an alternative number of smaller dams upstream with floodplain management downstream.[12] In this sense, using the above examples, if we accept that the economic system offers solutions to different problems than science, then this functional analysis offers roughly two important insights. On the one hand, it invites analysis to compare the artificiality of how problem-solution relationships are rooted in the need for the survival of each system (i.e. the exposure of paradoxes). On the other hand, it also enables analysis to gain new insights about the particular solutions being compared by planning systems (i.e. the analysis of building upon paradoxes).

To illustrate these dual processes, the proposed theoretical framework will employ a fictional scenario. Set within the context of a joint transboundary hydropower project between two nation states,[13] the overall intention here is to work out the reoccurring patterns under which law might productively expose and build upon paradoxes, that is, to make use of paradoxes. To do so, the following autopoietic processes of self-reference, paradox, indeterminacy, and stability through eigenvalues[14] will be employed.[15] Self-reference[16] explores how recurring

---

[10]   For example, Rieu-Clarke summarises six institutional linkages relvant to transboundary hydropower dams which intersect between legal regimes (2015). I explore this in more detail in the "Stability Through Eigenvalues" section.

[11]   As supported by Howe and Dixon who observe that for development banks large projects hold the promise of concrete and large-scale changes, maximising aid flow while minimising project management costs (1993).

[12]   As suggested typically by proponents of 'sustainability science'. See for example, Swart et al. (2004).

[13]   More specifically the nation state is understood in this text as a political organisational system whose function is the 'production of attributability and visibility of the collectivity' (Nassehi 2002, p. 245).

[14]   A classic illustration of an eigenvalue from auto-logic used by Teubner is: 'This sentence has ?? letters'. The number thirty-one is one eigenvalue of this sentence (2011, p. 388).

[15]   These four elements are adapted from the autopoiesis literature which Gunther Teubner proposes offers 'practical solutions to the indeterminacy problem' (2011, p. 387).

[16]   Self-reference, meaning what can be detected and processed as information at any time, depends upon the legal system's stream of accompanying redundancies (i.e. its routines, repetitive communications or past decisions).

patterns of communications within the legal system self-organise in a manner, which often burdens the law with the task of institutionalising irresolvable conflicts. Paradox explores how legal argumentation serves to subject communications to highly selective actualisations of the future. Indeterminacy explores how events, no matter what actually happens, will happen many times depending on a social system's scope of analysis. Finally, stability through eigenvalues explores the manner in which law's institutional norms offer planning systems' support and stability to continue their autopoiesis.

The value of this theoretical framework, I propose, can be found in the way it emphasises the immediacy of the law's autopoiesis. In other words, how the appearance of problems also initiates processes for solutions, and how this in turn produces consequent problems/solutions. This has the advantage of enabling analysis to define problems more specifically, and in doing so subsequently enhances the number of possible solutions to practical problems which could be understood as problems outside the legal system. Indeed, although employing this four-step autopoietic process will inevitably place a degree of restlessness upon the analysis,[17] I propose this has productive value, since it presses analysis to probe further, to inquire more deeply into the intricacies of paradoxes, while simultane- ously offering methodological tools which are 'more freewheeling than liberal universalism and more systematic than poststructuralism' (Kim 2015, p. 374).

Making Use of Paradoxes Via Theoretical Framework

Self-Reference

When disbelief or suspicion is systematically suspended, a social system emerges (Luhmann 1995). When a social system organises communications so that expectations constrain a range of possibilities (i.e. science allocates truth/false values), structures are created. When structures are created, communications and complex technological sectors such as hydropower infrastructure become routinely co-ordinated with each other, to the extent that planning systems proceed on the assumption that the basic fundamentals of hydropower technology works.

The feasibility of engendering these structural presuppositions nevertheless produces a paradoxical requirement for law. On the one hand, the legal system consequently becomes burdened with the task of naturalisation: it is expected to strengthen the discourse that the operations of a hydropower dam will not cause significant harm to other riparian states (or other systems) despite legally permitted invariable changes in water flows.[18] Of course, this is in itself a paradoxical requirement, for even if planning systems implement further control mechanism,

---

[17] In the sense that the theoretical framework invites the analysis to cast new lights on social practices, but at the same time never claim a privileged standpoint from which to speak 'the truth' about particular problems and solutions.

[18] As designated in the principle of equitable utilisation which determines the right of a state to use the waters of an international watercourse. This is also reflected in the principle of limited territorial sovereignty. See e.g. Magsig (2011, p. 335).

such as the modification of rules, habits and arguments, these are still subject to the same paradoxical requirements: the duty not to cause significant harm, despite invariable changes produced by a hydropower dam's 'factory time'.[19] As a result, due to this regulatory burden of having to present the law's inconsistency as consistency,[20] paradoxes will therefore inevitably be generated, no matter how far the law succeeds in strengthening the discourses that the operations of a hydropower dam works, as opposed to it not working.

On the other hand, law also becomes burdened with the task of institutionalising policies, laws and plans. Of particular relevance is the story of how law is expected to regulate the asymmetries of switching off and switching on the operations of a hydropower dam, from uncontrollable water flows to the opportunity of controlling such flows. The asymmetry here refers to the specific character of switching off the hydropower dam, where the simple solution of withdrawing technological resources, as opposed to leaving it on, results in even more catastrophic costs including the risk of unmitigated flooding, the risks of insufficient energy supplies, or the risk of unprecedented liability issues (Hepler 2006). This is especially the case where urban development on vulnerable floodplains becomes more and more dependent upon the 'factory time' of evermore functional hydropower dams. In other words, the more planning systems depend upon technological resources to avert ecological disasters, the more society develops its own structures on the basis of this precondition—until something unexpected occurs.

Afterwards everything is different; afterwards it was human error; afterwards the environmental parlance is drawn between destroyers of the environment (the industrialists), and environmental conservationists (the supporters of ecological interests). The paradox of conflicting values can be more or less summarised in the difference of semantics. For the industrialist, the semantics of integration are typically chosen as the political solution to the conflict. The idea here is to maintain the presentation of all-inclusiveness: to ensure the realisation of the right to develop, and thus relieve society from the worry of economic stagnation, inadequate water supply and unmitigated flooding, hydropower infrastructure development is therefore a necessity. In contrast, the environmentalist employs the semantics of inclusion and exclusion: the industrialist celebrates all-inclusiveness, yet this produces mass exclusion through the displacement of peoples, water quality degradation and/or the destruction of wetlands and fishing grounds. Although this conflict of interests tends to generate protest-prone situations, it nevertheless brings out new worlds of meaning. It grants communications a certain stance or disposition towards an expectation which supposes it will be disappointed (A anticipates B will reject X, so A proposes Y). It allows communications to then decide in advance on a response whereby, however events actually turn out, it is the expectation of how the other reacts, rather than the event itself, which serves as the reference point for one's next anticipated claim or

---

[19] 'Factory time' in the sense that it is the power company which decides, based on the electricity demand, the amount of water and at which time water is to be let through the turbines or sluice gates (see Jakobsson 2002, p. 44).

[20] More specifically, this being the law's burden of having to present the high probability of conflicting legal claims, as if there were a high probability that the limits of normality have been already predetermined by law.

counter claim. It therefore offers communications more suitable forms of conflict topics and reasons as opposed to the open use of violence, which among other negative consequences, interrupts communication necessary for the self-reproduction of society (Luhmann 1995, p. 369). Indeed, if this peculiar form of determinate contradiction is true, then this is why one speaks of the need for a shared understanding to resolve the condition of absolute uncertainty.[21] One which perhaps the law is best placed to offer 'damage limitation' services (Fischer-Lescano and Teubner 2004, p. 1045), as will be explored next.

Paradox

When paradoxes are generated by very specific social systems,[22] they are inevitably re-produced, albeit in a different form within the law. But what differentiates societal paradoxes from legal paradoxes is that the latter has greater additional freedom because it cannot alter the symbol of the validity of law (Luhmann 2004, p. 305, 326). Instead, one has to conduct claims by open reference to rules and principles instead of in secret and without adequate documentation; by aiming towards coherence and consistency, instead of a selective bargaining between 'old boys'; or by an openness to revision in light of new information and accountability for choices made, instead of counting on getting away with it (Koskenniemi 1996, p. 455, 478). Viewed in this way, the law's normative aspirations serve to subject communications to highly selective actualisations of the future and, thus, at the same time suppress irrelevant communications that are counter conducive to the law's own self-perpetuation.[23]

The protest movement in the context of the planned Myanmar Myitsone Hydropower project exemplifies the point. The protest movement introduces the probe of inequality into the planning system and measures the evident inequalities. It then generates re-distribution topics calling for the halting of the planned project, so as to re-allocate water resources for the local villages, and thus less for industry and urban dwellers. But the protest movement can hardly be stylised as a struggle for the law, since the context of the planned project takes place not by unregulated seizure, but via property and contract; that is to say in conformity with the agreed law between the China Power Investment Corporation, and the Myanmese Government (see Ruo 2011). Viewed from the perspective of decision makers, failure to restore adequate legal redundancies[24] and counter such activism is therefore imperative, as this would lead to an element of immense uncertainty. It would grant the possibilities actualised

---

[21] Absolute uncertainty in the sense that any further action of subject A is blocked, because A has nothing to follow up or to relate to the past histories, current actions or future expectations of its object of study, subject B.

[22] For example, see above in footnote 9.

[23] In a previous paper entitled 'Making paradoxes invisible: International law as an autopoietic system', I have reconceptualised from a Luhmannian perspective how international law self-perpetuates itself as an autopoietic system, and how the system proceeds to make paradoxes invisible (forthcoming).

[24] For example, this could be the restoration of so-called 'stabilisation' or 'umbrella' clauses which seek to protect the commitment that was made to the foreign investor at the time of signing a contract with the relevant parties. See e.g. Rieu-Clarke (2015).

by the protest movement to become the possibilities for another movement; it would open up the law to the floodgates of litigation and deprive both the internal development of law and the functional development of the economy, of its desires for consistency and predictability; in short, it would obstruct not only all efforts to base decisions on rational calculation but, in the last instance, also undermine the claim of method and procedure to rationality.

Deploying legal argumentation through the mediums of contract and property on the other hand can be seen as a defence against this. This is because it allows possibilities to retain a concreteness. The decision makers of A can learn from the experiences of B without A being in the situation to actualise these experiences as its own. The decision makers of A thus gain an immense increase in direct selectivity of awareness, such as the possibility for a state to transfer ownership over water property rights, by entering into a concession contract with a private company. This has the advantage of 'opening up economic possibilities in the domain of rational calculation that had hitherto been inaccessible' (Luhmann 1993, p. 65). At the same time, retaining this concreteness allows the law to observe itself as if it were 'moving forward in a seemingly purposeful way' (King and Thornhill 2003, p. 50). The task of the political system might be to fix amounts such as the level of acceptable environmental pollution, or the final amount of fresh water consumption acceptable to the public. The task of the economic systems might be then to provide the optimal distribution and usage of these amounts. And the task of the law might be to refine, regulate and continue these operations in one direction (and not the other) towards the desired goals.

Nonetheless, retaining structural concreteness in possibilities between systems also comes at the price of increasing the potentiality of risks and, hence, unreliability within society. The experiences of B may be incompatible for others, and thus B's intentions could become A's disappointment. This is exemplified if one views the paradox of scarcity as a social problem, whereby the elimination of scarcity for B through a dam's redistribution of water actually increases scarcity for A. Of course, in order to prevent catastrophic strains and breaks in public and private finance, market systems frequently disguise and distort this paradox by employing instead political and economic success stories such as the semantics of 'environmental sustainable growth', something to which law plays its part in concealing. In particular, the success stories of benefits from the river, benefits because of the river, and benefits that extend beyond the river (Sadoff and Grey 2002) are used, for example, to accomplish this social construction.

It is here, however, that the problem arises. This is because when newly acquired knowledge is deployed to establish the difference between availability decisions (i.e. the anticipated availability of water resources), and allocation decisions (i.e. the anticipated benefits derived from the river for agriculture, domestic or energy purposes etc.), such differences tend to get tangled up in a kind of 'strange loop' (Hofstadter 2007). For when one intends to operate on one level, this unexpectedly becomes the operations of another. As exemplified when allocation decisions interfere with availability decisions which then create compelling grounds for changing the pretext of availability due to the demands of allocation. Of course, this is not necessarily a bad thing, since it is indeed part of the decision-making process which allows planning systems to continue their autopoiesis and re-adapt to

changing environments. But what this 'strange loop' of tangled decision making does give rise to is the generation of perhaps another more relentless paradox: that the more law intervenes by legitimising the demands for water allocation,[25] the more unpredictability is introduced because the more likely unintended side-effects such as unanticipated droughts or floods become locatable and attributable to a decision and, thus, the more society grows to distrust hydropower technology.

Indeterminacy

When it appears to systems that the powers of laws, policies and plans have broken their promises to create a better world, cynicism inevitably emerges. This happens predominately because the structures of ecological risks do not follow the logic of cooperation but rather, so to speak, ambush cooperation by straining the doctrine of concerted action. In the context of hydropower infrastructure developments, the unintended consequence of river-bed incision and the resulting problem chains[26] occurring geographically elsewhere, exemplifies the point. Of course, no matter what actually happens, the event will happen many times depending on a system's scope of analysis. What might be understood as 'politically convenient and acceptable solutions' to ecological dangers for one system, may lead to functional disturbances in other systems (Luhmann 1989, p. 120). What might be established as the distinctions between legal and illegal within the planning system, may lead to an attribution of injustice by others, and thus trigger the communications of protest.

   If it is true that the time spans of reliable experiences and expectations in modern society are dramatically decreasing (Luhmann 1976), then this means that imposing structural constraints upon a planning system's available possibilities becomes ever more prevalent.[27] However, operationalising this structural constraint can no longer rely solely on the norm-orientated institutions and methods derived from state-oriented legal management.[28] On the contrary, the problem shifts more into the question of how to absorb external connections newly made between legal and non-legal discourses. Indeed, this preference to sensitise the law towards the rationalities of, namely, science, economics and technology,[29] is of course nothing but the

---

[25] As exemplified in most treaty agreements, whereby the law is often based on a fiction which aggregates water availability as a given.

[26] Such as when a hydropower dam releases large amounts of water in powerful surges so as to provide electricity during the day, resulting in the problem chain of riverbed scouring, and the loss of organic materials, sediment, vegetation and macroinvertebrates.

[27] This is because by imposing structural constraints upon planning systems, this enhances their overall stability, and thus paradoxically grants them greater freedom to continue their operations.

[28] This is because according to Zumbansen, these institutions have actually ceased to be the 'risk carriers' of societal evolution (2001).

[29] It should be noted that technology systems such as hydropower infrastructure are not autopoietic, since they do not perform either biotic or metabiotic autopoietic operations. Thus, this is why system theorists speak of the inability of technology systems to directly cause social change. Nonetheless, technology systems do participate in the social construction of reality by creating the conditions for social systems to change themselves (see, for instance, 'Self-Reference' section). In this sense, technology systems only 'feign the status of autopoietic systems' (Clarke 2014, p. 15) because, although they partake in the autopoiesis of social systems, they do not themselves produce autopoietic operations.

acknowledgement that cognitive-orientated functional systems[30] have increasing priority.

Nevertheless, these functional systems cannot constitute themselves as unities capable of action. A scientific publication which forms part of the scientific system cannot, after all, communicate with a corporation's financial statement which forms part of the economic system. This is why organisations are crucial, since only they can communicate with other organised social spheres (e.g. a university communicating with a corporate company). Yet in order for organisations to acquire societal relevance they must also have a functional echo (Mathias and Hilkermeier 2004, p. 192). An investment bank analysing the cost-benefit risk of investing in hydropower infrastructure exemplifies the point. On the one hand, in order for the bank to ensure its performativity and reap the predictable benefits from complying with the demands of functional systems, it must remain a product of them, and that means to be multilingual. It must therefore not limit itself to economic communications but must also conform itself to legal procedures, including the mechanisms of cooperative soft laws directly coupled[31] with the operative constraints of functional systems. These constraints may be, for instance, scientific or public health observations which irritate[32] planning practices by making their complexity (and with it indeterminacy, contingency and the pressure to select) available for the legal system to construct as soft law. The point in case being the World Commission Dam's good governance standards, a theme I shall return to later.

On the other hand, organisations are also the producers of communications, since they can make decisions about whatever they want. Investment banks can, for example, decide to treat the risks involved in displacement from hydropower developments correctly or incorrectly; in the case of the latter, for example, due to the dynamics of functional differentiation, this would result more in neglect than exploitation or suppression.[33] Indeed, the investment bank may seek to give the impression of compliance with the constraints imposed by functional differentiation, but the bank can nevertheless in their practices, via informal organised measurements, non-decisions and others, decide not to act on such issues. Due to the successful 'invisibilisation of social inequalities' as promised by functional differentiation (Philippopoulos-Mihalopoulos and Webb 2015), such decisions may not produce noise.[34] Yet if this promise is broken, then the original communications of the

---

[30] In the sense that these functional systems are geared towards permanent innovation as opposed to norm-oriented functional systems such as law and politics, which tend to rely upon finding consensus (see Kerwer 2004, pp. 201–202).

[31] Coupling in the sense that systems refer to each other and 'existentially' depend on each other but at the same time operate autonomously by remaining an environment to each other.

[32] Irritation is understood here not as annoyance, but rather as an itching calling for action.

[33] This is because, according to Luhmann, exploitation and suppression are forms of violence more reminiscent of stratified societies where there is a clear dual distinction between the aristocracy and common people (1997, p. 74). As exemplified when the US Agency for International Development funded the redesign for steeply sloped concrete sides on the Mahaweli irrigation project in Sri Lanka, making it as a result impossible for the indigenous local population to continue their customary uses such as bathing, laundry or the watering of domestic animals (Groenfeldt 2013, p. 136).

[34] As the well-known proverb states 'pas d'intérêt, pas d'action' (no interest, no action).

investment bank may produce follow-on communications, and thus become part of the self-reproduction of protest communications; in particular, advocacy organisations.

The existence of advocacy organisations is, however, a precarious one. If one views their radicalisation not as a 'condition of emergence' but as a condition 'of continuation' (Luhmann 1995, p. 401), system-environment theoretical insight can offer roughly two modes of self-reproduction. On the one hand, they may become lost in pure self-referentiality. In order to survive, advocacy organisations must presuppose another side against which they can protest, and therefore cannot themselves be or become this other side. For example, the International Rivers advocacy organisation initiated the 'Stop Dam Greenwashing' campaign, discrediting the dam-building industries' efforts of justifying development on the general discourse of greenhouse gas reduction, climate change mitigation and clean energy (Imhof and Lanza 2010). The result, however, was that in order for such advocacy organisations to enter the list of 'defenders of nature',[35] they must therefore resist collaboration with the industry so as to avoid being accused of 'supping' with the devil (Wilson 2002). But such advocacy organisations cannot survive on this oppositional difference alone. They must also radicalise demands, heighten sensibilities, and attempt to attain a position that offers only limited room for consensus. They must not only discredit existing 'unsustainable' practices in the hydropower industry, but must also scrutinise the very raison d'être to build dams—'infrastructure for who'? (International Rivers 2012). They must leap from topic to topic so as to generate new protest issues from 'new topics when old ones have run their course' (Luhmann 1993, pp. 136–137). The alternative would after all see their dispersion, and the general left-behind residuum of protest from which, given more favourable opportunities, new movements might form, with other topics structurally biased towards assuring the continued existence of other social systems.

On the other hand, advocacy organisations may become absorbed by their environments. This is because when issues are incorporated into conventional politics, they no longer trigger protest communications, but rather contribute to the construction of a particular societal reality. For example, when the (advocacy) organisation World Wildlife Fund (WWF) employ the symbolism of alternative hydropower sustainability norms and practices, these values and vocabularies are also shared by the industries which they criticise.[36] Consequently, any diagnosis of societal problems and suggestions for remedial strategies can hardly be said to challenge the leading self-descriptions[37] employed by the industry, but rather it will tend to legitimise their actions and thus assist them in their claim for credibility. In other words, it will grant the industry an apology so that they can 'market

---

[35] Incidentally, in order to enter this list, advocacy organisations must also downplay the risk involved in refusing to develop hydropower infrastructure, such as the risk of flooding, lack of sufficient energy, or economic decline.

[36] As supported by Eichert who, drawing upon empirical research, observes that there is a collaborative and consensus-oriented approach established between WWF and the hydropower sustainability assessment forum (2014, pp. 193–197).

[37] Self-description, meaning here the established difference between the industries' own particular routines, repetitive communications or past decisions, and their environments (namely all other systemic communications).

themselves on the basis of such euphemistic semantics' (Moeller 2005, p. 117), and thus assist them to do what they would have probably done anyway. Of course, such (advocacy) organisations must never admit their self-foundational paradox, that they must present themselves as adopting an external neutral point of view, despite the fact that their communications will always remain a system within a functionally differentiated society. As exemplified when the WWF organisation speaks the language of neutrality—dams are 'both a blessing and a curse' (WWF 2004, p. 3)—but at the same time couples itself with the operative demands of the economic system whereby voluntary standards promoting efficiency are prioritised over binding standards promoting legal stability.[38] What one finds as a consequence is that the industries' adoption of sustainability norms and practices will therefore tend to produce only a limited equalising effect, for what actually is empowered is more or less a bold propagation of concrete economic interests.

Viewed in this way, the more influential an advocacy organisation is as a regulatory agent, the more it must be satisfied with compromises, and therefore the less revolutionary its policies can be. Whereas the more revolutionary an advocacy organisation is, the more difficult it will be to occupy those administrative positions in which the main lines of policy are being set. Either way, there is no guarantee that either movement knows more about the problems of modern society, 'or judge them more accurately than any other system of society' (Luhmann 1998, p. 865). The only guarantee is that when a conflict of interest does arise as a conflict of legally accepted interests (such as over the law of restitution), they are inevitably reproduced not just between two opposing groups, amongst whom the law is then divided; instead, they are made up of an opposition between two representations of law, two incompatible conceptions of right and wrong, of which neither can be reconciled within the concrete case at issue. Nevertheless, this does not imply that one has to lose heart and surrender to an 'anything goes' (Luhmann 2000, p. 131). The question is only how might society depend on the support offered by the law's institutional norms (eigenvalues), and how might this support enhance the overall stability within society.

Stability Through Eigenvalues

Eigenvalues offer systems stability. For the law, legal eigenvalues are neither desirable normative end points, nor do they offer guarantees against societal risks and dangers. Rather, they symbolise various institutional norms and principles which the law proclaims as legally valid, and thus indisputable. In doing so, this self-validated unity (i.e. realness of legality) enables the law to perform its function within society, which is to take measures against conflict formations. The six institutional norms which Rieu-Clarke proposes in the context of transboundary hydropower infrastructure development exemplifies this, for what they enable is for planning systems to communicate that particular 'legitimate' goals have been

---

[38] As supported by Eichert who suggests that WWF's rationale for backing an initial 'voluntary approach to sustainable industry performance' was due to the 'belief that the dam industry is not ready to adopt or accept any binding standards' (Eichert 2014, p. 194).

implemented to address particular problems which have been identified. If, for instance, 'the obligation to prevent transboundary harm', to conduct a 'Transboundary Environmental Impact Assessment', to conduct 'stakeholder consultations', to ensure 'equity and the right to water', to balance between 'environmental protection' and 'investor protection', to implement 'institutional co-ordination' (Rieu-Clarke 2015) are all enforced by law, then in principle this enables planning systems to legitimise all of the side effects of their actions. Of course, whether other systems can tolerate these side effects will remain an open question; something to which law aids by deploying its greatest weapon of epistemological distance—'the subterfuge of abstraction' (Philippopoulos-Mihalopoulos 2013, p. 22, 27).

Therein lies the pragmatic value of legal eigenvalues. They offer planning systems stability precisely because they are vague and underdetermining. They secure their status as legally binding principles with society-wide validity, precisely because their vagueness allows recipients to make something out of them according to one's own particular priorities. As a result, this increases the likelihood that conflicting claims therewith can start to look like interactions, and eventually might even be seen as intended, consensus-oriented communications. Furthermore, once this occurs, one then tends to bind oneself before knowing whether others will agree, thus clarifying presumable obligations even if the specific planning content remains undecided. The legal requirement that all states must conduct a transboundary environmental impact assessment exemplifies this point. Everyone agrees on its necessity but, with regards to actual content, it is to the discretion of states to decide.[39] Undeniably such style of declaratory politics leaves much to be desired. Yet what is attained from the law's strategy of 'sounding out' the capacity for consensus is that it is an operation which can always be carried further (Luhmann 1995, p. 233). It nurtures a type of situational dependency, whereby specialised expert systems can offer more measured margins of security for diagnosing the possibility of risk itself and thus bring many more possibilities into the discussion, which paradoxically means making the future even more unpredictable (Ciampi 2013, p. 251).

Of course, it is not always necessary 'to risk the glance into paradoxicality' (Luhmann 1990b, p. 133, 137). This being in particular the problem of over- complex planning systems, whereby too many cogs end up hampering the system and each cog becoming less visible (Luhmann 1990a). Instead, it is sufficient to create a politics of time, whereby the pace and mobility of world markets and other functional processes are slowed down to the rhythm of political decision-making (Jessop 2012, p. 212). Take for example downstream state A, whose national policy goals are for the development of enhanced flood control and electricity supply so as support its burgeoning economy. After various risk assessments state A concludes that the optimum location to build the hydropower dam is not within its own territorial jurisdiction, but rather within the territory of upstream state B. To enable

---

[39] As exemplified in the Pulp Mills Case between Argentina and Uruguay, whereby the International Court of Justice (ICJ) suggested that general international law imposes a requirement upon states to conduct a transboundary environmental impact assessment, but it is 'for each state to determine in its domestic legislation or in the authorization process for the project, the specific content of the environmental impact assessment required in each case' (see International Court of Justice 2010, para, 205).

these plans state A offers 'side-payments' (Dinar 2006) to state B so as to compensate it for the collateral effects incurred for building the hydropower project upstream. Due to their histories of acceptance (i.e. developers arguing for example not against the plan itself, but against the features of this or that plan), a treaty is therefore agreed between them, and thus 'islands of predictability', or 'guideposts of reliability' are created (Arendt 1958, p. 244).

In the rear-view mirror of a planning system's historical hindsight, such agreement may look curiously like progress.[40] For what it exemplifies is how, on the one hand, the law facilitates the transformation of political problems into a problem about costs. This is because side-payments here perform the task of motivating the acceptance of propositions and, thus, dramatically increasing the capacity for states to express preferences. On the other hand, such agreement also exemplifies how responsibility is redistributed, because what it recognises is that both states are now jointly responsible for the development. Of course, negotiating treaties with side-payment provisions may 'ratchet up' new problems (Barret 2003, p. 357), such as the administration of disappointments. This is typically the case if downstream state A becomes more and more reliant upon the services of upstream state B not only to construct but also eventually regulate the operations of the hydropower dam. For what this means is that state B now acquires the possibility to extract even larger side-payments from state A, by using the threat to withdraw its services as a means to coerce state A to do what state B wants, and thus impose a 'victim pays' regime (Dinar 2006, p. 419). It is the anticipation of these circumstances that explains why some downstream states tend to resist joint-development hydropower projects with their riparian upstream neighbours, as exemplified in the Euphrates River with Turkey, Syria and Iraq.[41]

Nevertheless, this does not necessarily mean the realpolitik of sovereign states will always prevail. Where bilateral agreements between states fail to institutionalise conflicts,[42] specific organisational systems, such as joint management mechanisms, tend to fulfil this role. What is interesting here is that the tensions within these organisations will routinely emerge from the conflicting requirements of different functional systems. As evident when decision makers are frequently confronted with the choice of pursuing either the path advocated by the International Commission on Large Dams (ICOLD) and its close couplings with the economic system, or the World Commission on Dams (WCD) governance standards and its close couplings with the system of science.[43] Inevitably such generation of soft law norms will

---

[40] For example, this is exemplified in the 1961 Columbia River Treaty between the US and Canada which is often cited as a 'success' story in terms of transboundary flood control and hydrogeneration cooperation. See e.g. Firuz (2012, p. 191).

[41] As observed by Zeitoun et al. who points out that '(w)ith no basin-wide management occurring', the Euphrates River has seen 'independent development', with the result that 'each riparian state is aimed at maximum economic benefit—and generating considerable ecological and social impacts' (Zeitoun et al. 2013, p. 336).

[42] This is because after long diplomatic negotiations, treaty agreements often have barely any substance left. As supported by the empirical observation whereby two thirds of the world's 263 international river basins, plus transboundary aquifer systems, lack any type of cooperative management framework (UN-Water 2008).

[43] As suggested by Scheumann, who observes that the WCD good governance standards made public in 2000, confronted with the ICOLD standards because of its anti-developmental stance (2008, p. 62).

radically widen the structural disposition of hydropower regulation from that of a mere interstate dispute to that of a collision between the rationalities of namely limitationality in science, and efficiency in economics. Yet this clash of rationalities, this 'social space of instability and constant confrontation' (Pribáñ 2001), promoted to an extent by law's absurdly simplified legal rules—constraint of rule-making—is not necessarily a functional error.

On the contrary, it is the very space where 'legitimisation' takes place (2001). It is the very space where systems 'transcends geopolitical boundaries'[44] and hence, 'like customary international law, fills the global plenum' (D'Amato 2009, p. 898). Above all, it is the very space where systems learn to organise themselves, understand themselves, and indeed withdraw their inherent centrifugal tendencies[45] so as to maintain compatibility with their given environments. To facilitate these processes it may therefore be necessary for the law to remain content with the eigenvalues of: tacit consensus, so as to make it seem that no problem exists at all (and thus avoid the dilemma of absolute uncertainty); procedure, so as to make it possible to refuse substantive solutions; and equity, so as to make it possible to break through the legal autopoiesis of regimes involved in collisions, and replace their transcending ideals of universality and univocality with instead the 'emergency imaginaries'[46] of diversity and ambiguity.

Conclusion

One might feel disappointed with the apparent emptiness of this theoretical framework. Indeed, its self-imposed restraints regarding whether certain blueprints for action produce morally good or morally bad results, or whether they result in progress or regression, might well seem rather anti-climactic and radically incomplete for those seeking answers to social problems. Its abysmal failure to offer any sort of direct guidance on where solutions to global problems might be found provokes the very reasonable question: so what then is the value of this framework? I propose that the value of a Luhmannian-inspired theoretical framework lies in its ability to enlighten society, not by slumbering over the potentialities of rationality and its traditional optimistic ways of thought,[47] but by bringing to our attention the limits of rationality in a society of function systems. In this sense, the claims of this framework are very modest, for it cannot advise states

---

[44] In the sense that communications do not respect borders.

[45] Centrifugal tendencies, in the sense that every system desires to expand and encompass as much of its environment (and thus other social systems) as possible. For example, consider when scientific data is forced continuously to communicate politically and not scientifically, with the result that it becomes unlikely for science to be able to continue its autopoiesis.

[46] More specifically, this being the way in which the emergency imaginary of the future 'invites law to speculate about deeds not yet committed, to undo its forms of defuturization and to derogate its fundamental guarantees' (Opitz and Tellmann 2014, p. 17).

[47] This being, for example, what Allmendinger describes as rationalist models of planning which are driven by the assumption of a guidance centre capable of implementing pre-established goals through purposeful planning and 'social engineering' (2002).

or actors on whether or not their practices for developing hydropower infrastructure are on the right track. But what it can do, however, is make observations which can enable them to better understand where they are, why the oppositional claims are presumptuous and, above all, to offer a more controlled means for creating ideas by resisting the temptation to get carried away with politically informed excitement, such as when a treaty professes to incorporate the inter-connectedness of ecohydrologic units.[48]

The four elements of self-reference, paradox, indeterminacy and stability through eigenvalues are proposed to exemplify these methodological tools. Beginning with self-reference, the analysis here explores how the law is forced to stabilise and manage paradoxes, despite the fact that the law itself does not possess at its disposal much power or influence. Indeed, the law can only ever offer damage limitation services since it has '(n)o arbitrariness of the power sovereign, no generous distribution of monetary resources, no precise prediction of future events, no dark oracle, no mystic revelation' (Teubner 2009, p. 21). Instead, law's operations always end up joining the traditions of environmental parlances drawn between the industrialist, and the supporters of ecological interests.

This is exemplified in paradox. The analysis here explores how the law not only attempts to resolve conflicts but also anticipates and even promotes them. It attempts to resolve conflicts by countering activism through the restoration of legal argumentative redundancies. It imagines as completed in the future the consequential actions of failed restored redundancies, and uses this selective legal reconstruction to further reinforce legal redundancies. It therefore has the potential to promote conflict, because as long as the law keeps some residual authority to intervene in social disputes the question will always be: to what extent has this intervention been used consistently and in a sensitive fashion?

Thus, with the infinite return of paradox, indeterminacy arises. The analysis here explores why legal development should not be understood as progress solely in the sense of an increasingly better realisation of rationalities derived from state practices. Nor should it be seen as a steadily increasing eradication of deviant behaviour. On the contrary, legal development ought to be seen as the ability for law to simultaneously absorb structural changes newly made by the cognitive-orientated rationalities of namely science, economics and technology. This of course is not because the couplings between world politics and law have weakened. Rather, it is because the community of states is much narrower than the community of relevant actors and activities whose societal relevance remains largely dependent on the functional echoes of these cognate systems. However, the problem that arises when the law aligns itself with the mechanisms of cooperative soft laws directly coupled with the operative constraints of these systems is that the law begins to lose its

---

[48] This is not to say that implementing such a treaty is a futile attempt which should be given up. But what this text reminds us of is that this is an event in politics, and that it has first and foremost political effects—not environmental ones. As exemplified when the term 'basin' treaty was employed as the scope for environmental protection in the 1995 Mekong River Treaty, with the first and foremost effects being that political communications often translated this instead as a watercourse, which is a smaller spatial unit of jurisdiction than a basin (Sneddon and Fox 2006).

normativity: it risks being swamped by their logics, leading to the potential corruption of the law's systemic code.

Therein lies the value of stability through eigenvalues. The analysis here explores how legal eigenvalues not only serve to regulate paradoxes, but also participate in societies' construction of reality. On the one hand, they facilitate regulation by employing institutional norms such as accountability, joint-mechanisms, equitable utilisation and so forth. These operations serve the function of communicating within society that problems are recognised, and that only through a process of constant renegotiation, whereby conflict is postponed so as to replace the freezing effect of truth-seeking consensus with the pliability of the spaces of ignorance, can a 'politics of understanding' be found (Philippopoulos-Mihalopoulos 2006, p. 141). On the other hand, legal eigenvalues also participate in societies' construction of reality. Although such institutional norms may seem to 'say nothing by saying too much' (Holmes 2011, p. 127), they nevertheless productively fictionalise conflicts. They enable the failure of planning systems and their inherent 'co-evolution of unsustainability'[49] to be recast into action and decisiveness. They enable planning systems then to maintain the impression of order, progress and controllability within a world where communications essentially have an innate tendency to generate the opposite of what was originally intended. Does this 'self-illusioning symbolism' (Luhmann 1998, p. 766), this presentation of the compassionate society, the good friendly neighbour, the optimistic slogans of win–win co-operation etc., create the recipe for social catastrophe? Not necessarily. If one accepts that it is better to pretend that planning systems are reliable and that success is possible, as opposed to the alternative of absolute uncertainty, then this presentation serves a useful purpose. It is so because it cushions planning systems from the structural risks which arise as a consequence of the irresolvability of paradoxes, and this is necessary as it enables planning systems to continue their unending search for new knowledge, new doubts, and better insights when managing the paradoxes of hydropower regulation. For this reason, I submit, to make use of paradoxes is therefore not to relentlessly expose or pathetically avoid paradoxes but, rather, it requires a kind of 'stoic' attitude of staying on the job and doing the formulations (Luhmann 1982, p. 137), while at the same time recognising paradoxically that the most ingenious way of becoming foolish is by a system.

---

[49] For example, once a dam is built and its reservoir is formed, the region that is served will be developed. In other words, it will be filled with cities, roads, car parks and houses. However, this urban development lowers the water table due to water extraction and urban runoff and, consequently, it will lower the river level even further. Eventually, such growth imperative spurred on by developers and politicians will mean that the new human populace will at some point in time run out of water. By then, the new human populace may even demand another dam. Using this example, it becomes evident why Luhmann speaks quite correctly of the 'co-evolution of unsustainability', as opposed to the sustainable co-evolution of social systems (1998, pp. 568–569).

References

Alexander, David, and Véronique Blum. 2016. Ecological economics: A Luhmannian analysis of integrated reporting. Ecological Economics 129: 241–251.

Allmendinger, Philip. 2002. Planning theory. Basingstoke: Palgrave.

Arendt, Hannah. 1958. The human condition. Chicago: University of Chicago Press.

Barret, Scott. 2003. Environment and statecraft: The strategy of environmental treaty-making. Oxford: Oxford University Press.

Bond, Patrick. 2012. The right to the city and the eco-social communing of water: Discursive and political lessons from South Africa. In The right to water: Politics, governance, and social struggles, ed. Farhana Sultana, and Alex Loftus, 190–205. New York: Earthscan.

Ciampi, Marina. 2013. 'Water divide' in the global risk society. International Review of Sociology 23 (1): 243–260.

Clarke, Bruce. 2014. Systems, media, narrative: From the trace to the telepathic imaginary. In Neocybernetics and narrative, ed. Gary Wolfe. Minneapolis, MN: University of Minnesota Press.

D'Amato, Anthony. 2009. Softness in international law: A self-serving quest for new legal materials: A reply to Jean d'Aspremont. European Journal of International Law 20 (3): 1057–1093.

Dinar, Shlomi. 2006. Assessing side-payment and cost-sharing patterns in international water agreements: The geographic and economic connection. Political Geography 25 (4): 412–437.

Eichert, Sara. 2014. NGOs as strategic actors in the promotion of sustainable dam development. In Evolution of dam policies: Evidence from the big hydropower states, ed. Waltina Scheumann, and Oliver Hensengerth, 173–200. Berlin: Springer.

Firuz, Paul A. 2012. Looking forward: The Columbia river treaty. Washington Journal of Environmental Law and Policy 2 (1): 170–192.

Fischer-Lescano, Andreas, and Gunther Teubner. 2004. Regime-collisions: The vain search for legal unity in the fragmentation of globlal law. Michigan Journal of International Law 25 (4): 999–1046.

Fuchs, Stephan. 1999. Niklas Luhmann. Sociological Theory 17 (1): 117–119.

Groenfeldt, David. 2013. Water ethics: A values approach to solving the water crisis. Oxon: Routledge.

Hepler, Thomas E. 2006. Overview of proposed USSD guidelines on dam decommissioning: Bureau of reclamation, in the role of dams in the 21st century. http://geotechpedia.com/Publication/Show/2806/OVERVIEW-OF-PROPOSED-USSD-GUIDELINES–ON-DAM-DECOMMISSIONING. Accessed 28 March 2017.

Hofstadter, Douglas. 2007. I am a strange loop. New York: Basic Books.

Holmes, Pablo. 2011. Rhetoric of legal fragmentation and its discontents. Evolutionary dilemmas in the constitutional semantics of global law. Utrecht Law Review 7: 113.

Howe, Charles W., and John A. Dixon. 1993. Inefficiencies in water project design and operation in the third world: An economic perspective. Water Resources Research 29 (7): 1889–1894.

Imhof, Aviva, and Guy Lanza. 2010. Greenwashing hydropower: The problems with big dams. World Watch Magazine 23 (1): 8–17.

International Court of Justice. 2010. Case concerning pulp mills on the river Uruguay (Argentina/Uruguay). Judgment of 20 April 2010, ICJ reports 2010. http://www.icj-cij.org/docket/files/135/15877.pdf. Accessed 26 Feb 2017.

International Rivers. 2012. Infrastructure for whom? A critique of the infrastructure strategies of the Group of 20 and the World Bank. International rivers. https://www.internationalrivers.org/sites/default/files/attached-files/infrastructure_for_whom_report.pdf. Accessed 16 Oct 2016.

Jakobsson, Eva. 2002. Industrialization of rivers: A water system approach to hydropower development. Knowledge, Technology, & Policy 14 (4): 41–56.

Jessop, Bob. 2012. Obstacles to a world state in the shadow of the world market. Cooperation and Conflict 47 (2): 200–219.

Kerwer, Dieter. 2004. Governance in a world society: The perspective of systems theory. In Observing international relations: Niklas Luhmann and world politics, ed. M. Albert, and L. Hilkermeier, 196–207. London: Routledge.

Kessler, Oliver. 2009. Toward a sociology of the international? International relations between anarchy and world society. International Political Sociology 3 (1): 87–108.

Kim, Joohyung. 2015. The social and the political in Luhmann. Contemporary Political Theory 14 (4): 355–376.

King, Michael. 2009. Systems, not people, make society happen. Wilmington, DC: Holcombe Publishing.

King, Michael, and Chris Thornhill. 2003. Niklas Luhmann's theory of politics and law. Basingstoke, UK: Palgrave Macmillan.

Koskenniemi, Martti. 1996. The place of law in collective security. Michigan Journal of International Law 17.

Luhmann, Niklas. 1976. The future cannot begin: Temporal structures in modern society. Social Research 43 (1): 130–152.

Luhmann, Niklas. 1982. The world society as a social system. International Journal of General Systems 8 (3): 131–138.

Luhmann, Niklas. 1989. Ecological communication. Chicago, IL: University of Chicago Press.

Luhmann, Niklas. 1990a. Political theory in the welfare state. Berlin: Walter de Gruyter.

Luhmann, Niklas. 1990b. Sthenography. Stanford Literature Review 7: 137.

Luhmann, Niklas. 1993. Risk: A sociological theory. Trans. R. Barret. New York: Aldine de Gruyter.

Luhmann, Niklas. 1995. Social systems. Trans. John Bednarz, and Dirk Baecker. Stanford, California: Stanford University Press.

Luhmann, Niklas. 1997. Globalization or world society: How to conceive of modern society? International review of sociology 7 (1): 67–79.

Luhmann, Niklas. 1998. Die Gesellschaft der Gesellschaft: The Society of Society. Frankfurt am Main: Suhrkamp.

Luhmann, Niklas. 1999. Politique et complexité. Paris: CERF.

Luhmann, Niklas. 2000. Organisation und entscheidung [organization and decision]. Opladen: Westdeutscher Verlag.

Luhmann, Niklas. 2004. Law as a social system. Oxford: Oxford University Press.

Luhmann, Niklas. 2012. Theory of society (Volume 1). Trans. Rhodes Barret. Cultural memory in the present. Stanford: Stanford University Press.

Luhmann, Niklas. 2013. A sociological theory of law 2. Routledge: Aufl. Glasshouse Books.

Magsig, Bjorn-Oliver. 2011. Overcoming state-centrism in international water law: Regional common concern as the normative foundation of water security. Goettingen Journal of International Law 3: 317.

Mathias, Albert, and Lena Hilkermeier. ed. 2004. Organizations in/and world society: A theoretical prolegomenon. In Observing international relations. Niklas Luhmann and world politics. London: Routledge.

Maturana, Humberto R., and Francisco J. Varela. 1987. The tree of knowledge: The biological roots of human understanding. Boston: New Science Library/Shambhala Publications.

Moeller, Hans-Georg. 2005. Luhmann explained: From souls to systems. Chicago, IL: Open Court Publishing.

Nassehi, Armin. 2002. Politik des staates oder politik der gesellschaft? Kollektivität als problemformel des politischen. In Theorie der politik, ed. K.U. Hellmann, and R. Schmalz-Bruns. Frankfurt am Main: Suhrkamp.

Opitz, Sven, and Ute Tellmann. 2014. Future emergencies: Temporal politics in law and economy. Theory, Culture & Society 32 (2): 107–129.

Philippopoulos-Mihalopoulos, Andreas. 2006. Absent environments: Theorising environmental law and the city. London: Routledge-Cavendish.

Philippopoulos-Mihalopoulos, Andreas. 2013. Critical autopoiesis and the materiality of law. International Journal for the Semiotics of Law: 13.

Philippopoulos-Mihalopoulos, Andreas, and Tom E. Webb. 2015. Vulnerable bodies, vulnerable systems. International Journal of Law in Context 11 (4): 444–461.

Pribáñ, Jiri. 2001. Legitimation between the noise of politics and the order of law. In Law's new boundaries: The consequences of legal autopoiesis, ed. J. Pribáñ, and D. Nelken. Aldershot: Dartmouth Ashgate.

Rieu-Clarke, Alistair. 2015. Transboundary hydropower projects seen through the lens of three international legal regimes—foreign investment, environmental protection and human rights. International Journal of Water Governance 3 (1): 27–48.

Ruo, Liao. 2011. Lessons from the Irrawaddy. China dialogue. https://www.chinadialogue.net/article/show/single/en/4574-Lessons-from-the-Irrawaddy. Accessed 16 October 2016.

Sadoff, Claudia, and David Grey. 2002. Beyond the river: The benefit of cooperation on international rivers. Water Policy 4: 389–493.

Scheumann, Waltina. 2008. How global norms for large dams reach decision-makers. In Water politics and development cooperation: Local power plays and global governance, ed. Waltina Scheumann, Susanne Neubert, and Martin Kipping, 55–80. Berlin: Springer.

Sivapalan, Murugesu, and Günter Blöschl. 2015. Time scale interactions and the coevolution of humans and water. Water Resources Research 51 (9): 6988–7022.

Sneddon, Chris, and Coleen Fox. 2006. Rethinking transboundary waters: A critical hydropolitics of the Mekong basin. Political Geography 25 (2): 181–202.

Swart, R.J., P. Raskin, and J. Robinson. 2004. The problem of the future: Sustainability science and scenario analysis. Global Environmental Change 14 (2): 137–146.

Teubner, Gunther. 2009. Self-subversive justice: Contingency or transcendence formula of law? The Modern Law Review 72 (1): 1–23.

Teubner, Gunther. 2011. And god laughed: Indeterminacy, self-reference and paradox in law. German Law Journal 12 (1): 376–406.

UN-Water. 2008. Transboundary waters: Sharing benefits, sharing responsibilities. UN-Water Thematic Paper.

Valentinov, Vladislav. 2014. The complexity-sustainability trade-off in Niklas Luhmann's social systems theory. Systems Research and Behavioral Science 31 (1): 14–22.

Wilson, Jessica. 2002. The sponsorship scam. In Battling big business: Countering greenwash front groups and other forms of corporate bullying, ed. Lorenzo R. Scupoli, 44–52. Monroe: Common Courage Press.

World Wildlife Fund. 2004. Rivers at risk: Dams and the future of freshwater ecosystems. WWF Dams Initiative.

Zeitoun, Mark, Marisa Goulden, and David Tickner. 2013. Current and future challenges facing transboundary river basin management. Wiley Interdisciplinary Reviews: Climate Change 4 (5): 331–349.

Ziegert, Klaus A. 2013. Review: Observing law through systems theory by Richard Nobles and David Schiff. Journal of Law and Society 40 (2): 321–325.

Zumbansen, Peer. 2001. Die vergangene zukunft des völkerrechts. Kritische Justiz 34 (1): 46–69.