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Pathway to Reframing Environmental Law

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Abstract. This article provides a diagnostic of a major structural problem of environmental law before suggesting a way to address it. The problem is that environmental law, even *avant la lettre*, was and remains designed as a law of negative externalities: a body of laws fundamentally organized so as to minimize interference with the underlying transaction while mitigating its negative externalities. This article proposes instead to reframe environmental law not as the expression of allocative efficiency but as a means of steering socio-economic processes in directions that are more likely to avoid an irreversible change in Earth System dynamics.

Keywords: Complexity economics, transformational change, fundamental uncertainty, risk-opportunity analysis, environmental law as a technology, Anthropocene

Theorising environmental law faces two main types of challenges. The first type revolves around the necessary challenges faced by any intellectual inquiry. The second type is perhaps much more difficult: it concerns the relevance of the theoretical enterprise, at a very prosaic level – whether the theory provides a fairly accurate account of reality – but also at more complex levels – whether the theory sets a direction of travel that makes it realistic, effective and/or fair.

The decade between 2020 to 2030 is, by many accounts, critically important for our ability to set a new course on how human activity, as a force of geological proportions, is affecting the Earth System. Environmental law features prominently among the human technologies through which such new course could be achieved. In the present circumstances, the relevance of theory is a particularly pressing and important imperative and, the more pressing it is, the more difficult is to develop a theory that makes realism, effectiveness and fairness converge.

The purpose of this article is to outline not a theory of environmental law and policy but a diagnostic of what we see as the main problem and, hopefully, a realistic, effective and fair reframing of this technology. We will attempt to make one point as clearly as possible: environmental law, even *avant la lettre*, was and remains designed as a law of negative externalities, that is a body of laws fundamentally organised so as to minimise interference with the underlying transaction while mitigating its negative externalities.

This was so even before the theory of externalities emerged. Already in the 1800s, laws adopted to reduce industrial pollution and nuisance were designed to preserve production processes. From this broader vantage point, it matters little

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whether the design of the law makes them 'command-and-control' regulation or economic 'corrective' instruments. In both cases, the core of the transaction was preserved. That same situation prevails today. When modern environmental law emerged in the second half of the twentieth century, finer-grained approaches were developed within this overall framing.

By the time the 1972 Stockholm Conference on the Human Environment was convened, as environmental law and policy gained traction at both the domestic and international levels, the focus was on the competing approaches of 'regulation' or market-based instruments (taxes and later trading schemes) based on the polluter-pays principle, alongside with new versions of the old injury-based approaches (tort litigation) and some emerging information-based approaches (information gathering and monitoring, environmental impact assessments and, increasingly, public participation broadly understood). But even in their most sophisticated forms, all these approaches underpinning environmental law and policy make it, essentially, a law of negative externalities or, in other words, a law focussing on the mitigation of otherwise lawful and often encouraged production and consumption processes.

The scale and urgency of the unfolding environmental crisis has now made the critique of this hierarchy (of the economy over environmental protection) more powerful. This critique has long existed, in very different forms, some highly questionable in their radical, authoritarian and/or unrealistic leanings, but the climate crisis has made part of their message more credible and effective. Yet, the social technology we call environmental law remains structured as well as embedded in a broader legal structure (e.g., sovereign equality, economic freedoms, etc.) which sets fundamental bounds to more intrusive inroads into the transaction. To mention only climate change, it is striking that something as widely acknowledged to be harmful as emissions of greenhouse gases is unquestionably lawful and merely, indeed loosely, controlled. The reason for that is quite compelling, namely that the processes that sustain our way of life since the industrial revolution are based on technologies (associated with the use of fossil fuels) that emit greenhouse gases. Thus, the normative fairness dimension of relevance, alone, does not seem enough to prompt a legal intrusion into the core of the transaction.

What then maybe enough? We hope to answer this question by moving from the diagnostic to the therapeutic aspects. More specifically, we will discuss an understanding of how the very transactions can be made to change so that the core transaction protected by legal organisation is no longer an economically useful process with a potentially negative environmental footprint, but one that, by its very nature, does not require intrusion into its core. Such understanding exists,[1] but it is not yet reflected in environmental law. Indeed, environmental law remains the law of negative externalities and the most it is expected to do is to be 'efficient'. At the root of the problem of environmental law as a technology lies an inaccurate framing based on allocative 'efficiency'. As long as this framing remains, the very opportunities, including economic ones, of moving away from the processes that may cause an irreversible (in a human timescale) change in the dynamics of the Earth System will simply remain outside of our radar.

In this contribution, we briefly flesh out this overall point. We first describe the framing of environmental law as the law of negative externalities, even before the theory of externalities was developed (I). Then we discuss some strands of the normative – legal – critique against the prioritisation of economic processes over environmental protection (II). Finally, we discuss an alternative theoretical basis for environmental law as a technology that abandons the framing of allocative efficiency and focuses on steering socio-economic processes in directions that are more likely to avoid an irreversible change in Earth System dynamics (III).

1. A Persistent Mis-Framing

It may seem odd and largely unintuitive to consider that the crude regulations aimed to tame industrial pollution in the nineteenth century have anything to do with the sophisticated market mechanisms still advocated by environmental economists in 2020 as the most 'efficient' policy interventions to tackle negative externalities, from air pollution to fisheries depletion or wetland degradation, to climate change. Yet, they both aim to address the same conundrum: how to 'optimise' utility by pursuing the underlying economic activity while reducing its negative side effects. It is an optimisation problem. Whereas the utility of

reducing negative side effects may change over time, for example, as a result of the higher importance attached by the population to an environment of a certain quality, the policy issue remains one of optimisation.

Similarly, while the techniques used over time (e.g. market mechanisms rather than the crude regulation of the nineteenth century) may purport to come closer to the 'optimum' allocation, the overall problem is framed as one of optimisation. That is fundamentally inaccurate, at least for the scale of transformation required to defuse the Earth-shaping impact of humans on the environment, but before showing why it is important to further clarify the old, yet still prevailing, framing.

If the vantage point that we have used in the preceding paragraph may appear excessively broad, a deep dive into the granularity of historical processes may assuage those justified concerns. A strand of French historiography on industrial pollution, based both on prefectural archives (conseils d'hygiène et de salubrité) as well as on judicial and industrial archives shows that the French administration was highly accommodating with industrial polluters, even after the enactment of the 1810 *Décret sur les établissements classes.*[2]

J.-B. Fressoz recounts the specific case of soda ash plant established in 1854 in Salindres (Gard), in France, which for almost twenty years operated without regulatory control on the basis of voluntary compensatory payments made to the surrounding landowners, until in 1871, a flood of judicial actions, prompted the administration to send inspectors.[3] Fressoz shows that such informal practices, characterised by private horizontal arrangements, sometimes formalised in contracts and/or leading to private actions, only led to regulatory intervention on a case-by-case basis and, more importantly, this 'pay to pollute' approach was deliberate since the inception of the 1810 Decree. He concludes that, despite the purported novelty of the polluter-pays principle in the early 1970s, presented by reference to the terminology of 'negative externalities' as 'market failures' to be corrected by market mechanisms, the basic approach remains that of paying to pollute[4] or, in the terminology we use here, to preserve the transaction's core while mitigating its negative side effects or externalities. A converging account is provided by historians who study the case law of mid nineteenth century England. Brenner shows that nuisance law was applied differently to individuals and factories and hardly applied at all to quasi-public (chartered) enterprises and that, in all events, there was no systematic prosecution of public nuisances.[5] Dingle observes that, even after the 1863 Alkali Act brought manufacturers of soda ash and potash (together called alkali) under State oversight, mainly to protect the property of large landowners,[6] the regulator soon became captured and prosecutions of alkali manufacturers were rare.[7]

The focus on only two countries and, even more specifically, on the alkali industry, however important it may have been for the glass, paper, soap and textile industries, may now seem too granular. Between the 'macro' view offered earlier and this 'micro' account, the diagnostic of environmental law as the law of negative externalities can also be derived from mid-range (meso) accounts. Thanks to a five-year project which brought together contributions of over fifty distinguished colleagues, a comparative map of environmental law as an overall technology has now been developed.[8] From this mapping exercise, it appeared very clearly that there are significant commonalities across environmental law systems, particularly at the level of policy instruments. These can be organised under four broad headings: command-and-control regulation (including planning processes, protection of sites, and standards), market mechanisms (taxation and trading schemes), informational techniques (environmental impact assessment, public participation, and labelling) and injury-based mechanisms (liability regimes, human-rights approaches). These different techniques have emerged over time and are not used to the same extent in each country. It is remarkable, however, that none of them are designed to interfere with the underlying transaction. That is particularly clear for corrective market mechanisms, informational techniques and ex-post facto techniques, but also of the most traditional embodiments of a 'command-and-control' policy intervention, site protection and licensing/standards. True, unlike other policy instruments, the latter techniques often introduce prohibitions making certain transactions (e.g. mining in a protected area or the production of toxic chemicals) unlawful. But even these techniques have either been applied in an accommodating manner, as in nineteenth century France and Britain, or made more 'efficient', through the use of market mechanisms in conservation law[9] or the possibility of commercialising dangerous substances on the basis of a

'risk management' assessment.[10] From an industrial and, more generally, production perspective, such environmental law systems are perceived as 'red tape' or, in other words, hurdles and requirements which, however, rarely prohibit a given transaction; they only place outer bounds on the ability to conduct it. Whether one's characterisation is that of 'red tape' or that of minimal adequate safeguards, the perception is generally correct. The system is not designed to block the underlying transaction (as, for example, encroachments on private property are deemed simply unlawful), only to 'regulate' its negative side effects.

What the unfolding environmental crisis has emphasised is that such side effects - 'negative externalities' - can be monstrous, reaching geological proportions with climate change and biodiversity loss, amongst other problems. It thus becomes somewhat grotesque to see them as 'side' effects, as mere marginal problems generated by an otherwise properly functioning market. If production processes and markets are failing at a geological scale, how can they remain the core of what law organises, whereas the failings are regulated by a peripheral layer of 'environmental law'? We formulate this question in these normative and somewhat polemic manner to set the stage for next section, where we hope to show why a purely normative critique is not sufficient to change this framing in a realist, effective and/or fair manner.

2. The Normative Critique

The normative critique of production and consumption processes, whether organised under capitalism or socialist planned economies, has deep roots ranging from the many strands of what was later termed 'environmental ethics',[11] to a diverse body of scientific work emphasising the interconnections between human activity and the natural world through bio-geo-chemical cycles (embodied in concepts such as the biosphere, Gaia, the Anthropocene or planetary boundaries),[12] to more targeted criticisms of environmentally unequal exchange[13] or the economic growth paradigm[14] or, conversely, more general accounts of ethical standards for techno-sciences.[15]

Environmental law has rarely featured in such normative accounts, other than peripherally or in passing. But some legal scholarship has drawn upon such accounts to emit a criticism of environmental law. One line of argument, in a volume edited by A. S. Garmestani, C. R. Allen, focuses on the limited adaptability of environmental law as a technology to regulate ecological systems.[16] The critique aims, above all, to refine the technology to make it be adapted, indeed adaptable, to the specificities of ecological systems. Other lines of work focus, instead, on the need to strengthen, sometimes reconceive environmental law, whether at the level of principles or constitutional provisions or, more generally, as regards the very conception of what law 'should' achieve or aim for. Some illustrations are the works of N. Robinson on a reconceptualization of sustainability through certain key principles, such as cooperation, nature stewardship, resilience, foresight, sufficiency, well-being, and justice,[17] that of R. Steinberg on ecological constitutionalism,[18] or that of K. Bosselmann[19] on the definition of an ecological rule of law. More recently, the Anthropocene narrative has also attracted some attention from other legal scholars, in particular D. Vidas,[20] L. Kotzè[21] and one of us,[22] with the aim to understand the implications of this proposed new epoch of the geological timescale for law. These and other works[23] address, from different perspectives, the shortcomings of law, including environmental law, to rise to the environmental challenges we face today. The critique is normative in that it highlights the ineffectiveness and/or unfairness of modern law when seen from an environmental light. But the very normative character, in some cases ambitiously stated, comes at the price of realism.

It is certainly not unthinkable that a normative critique of a legal system may lead to radical change, as the abolition of slavery in the XIX century shows. Such abolition marked the end of a triangular system of trade that had in many ways served as the engine of the English industrial revolution,[24] although remnants of slavery lingered on for over a century and, alas, they have not disappeared. A different, although telling example of how a non-economic value (not arising this time from a fully-fledged normative critique) may intrude into the very core of production and consumption processes is offered by the lock-down measures adopted in most countries in response to the COVID-19 pandemic of 2020. Other radical measures reaching the transaction's core have been adopted in revolutionary periods, in the form of massive land reform programmes or resource nationalisations. Such processes are unrelated, on

their face and their triggers, to environmental protection, but they illustrate that normative reasons can lead to widespread and sometimes radical changes of social organisation. Yet, three main aspects set the unfolding environmental crisis apart.

The first is the unprecedented geological scale of the problems arising from human activity. This is not a matter of importance, as it is not possible to introduce a hierarchy of importance between largely 'incommensurable' challenges such as climate change, global health security and/or the fight against racial discrimination. Such incommensurability is one of the reasons why it is simply impossible to 'optimise' utility, as that entails allocating a value (using the same metrics) to matters as different as racial discrimination, climate change, poverty eradication, and the like, which could then be used as the basis for a calculation of optimisation. Technically, that is not difficult. One can always artificially (and arbitrarily) ascribe values and portray the exercise as 'objective' or 'scientific'. Normatively, it is impossible. And the overall outcome of the optimisation exercise has as little value as the initial quantification. But, although not more important, the scale of the problem remains truly unprecedented because the bio-geo-chemical processes that sustain life on the biosphere are being interfered with at a planetary scale.

The second concerns the lack of clarity of the diagnostic. However complex the management of a pandemic may be, a key aspect of the solution can be at least imagined in the form of a vaccine, which would be rolled out in a relatively short period of time (months to years). Similarly, however complex the roots of racial discrimination may be, a clear first step – driven by normative considerations – is to remove any entrenchment of racial inequality in the law, followed by both empowerment of oppressed communities, education to eliminate racial biases and enforcement of equality laws and accountability. There are examples where the problem has been, if not solved, at least positively addressed. By contrast, the environmental crisis unfolding before our very eyes stems from too many different root causes, which human societies do not yet seem ready to do away with. Hence the overall structure of environmental law as the law of negative externalities, a law which takes as its starting-point the preservation of the processes that it aims to keep within certain bounds. Such bounds have either grossly misunderstood human impacts on the biosphere or been fine-tuned since their inception following different parameters, economic ones, which themselves set the bounds for the bounds set by environmental regulation. Both the abolition of slavery and lock-down measures broke such bounds.

The third aspect stems from the latter observation. Environmental protection, much like human dignity or health protection, normatively requires the possibility of breaking economic bounds, at least in some cases. Stating that environmental protection must be achieved without interfering with production and consumption processes, as they are presently organised and at their present scale, would be much like caring for slaves' welfare without abolishing slavery. Yet, given the scale of the problem and the lack of a clear diagnostic, most of the actions to be taken are not clear-cut and may, indeed, be counter-productive. Guidance is needed on 'deciding how to decide'.[25] This is where the mis-framing of environmental law as an optimisation technology – whether crude or sophisticated – becomes significantly misleading and hence a major, perhaps the main obstacle to align realism, effectiveness and fairness.

3. From 'Optimising' False certainties to 'Steering' Under True Uncertainty

The future of environmentally-relevant policy interventions lies in revisiting how decisions on transformational actions are assessed. The expression 'environmentally-relevant policy interventions' is selected to emphasise two main dimensions. First, many policy decisions – well beyond the sub-set usually called 'environmental' – are relevant, sometimes crucial, for environmental protection. It is obvious that economic policy is environmentally-relevant. Similarly, policies concerning population, education, energy, agriculture, planning, regional development, etc., are all clearly relevant for environmental protection. Secondly, the reference to 'policy interventions' is intended to bring back the role of the State not just to correct a 'market failure' through an instrument aiming to internationalise the cost of a negative externality or otherwise regulate its effects, but to steer socio-economic processes in certain broad directions. This requires not only getting rid of the taboo surrounding industrial policy, long entertained by proponents of pure market action, but also

reconceptualising the role of State in 'steering' the sustainability transition, which cannot be envisioned as 'picking the winners' who will then go on to optimise 'utility'. In other words, it is the very idea that 'utility' can be 'optimised', whether through the market or through State intervention, which is simply not realistic enough. Environmentally-relevant decision-making needs a much more realistic compass to navigate the critical 2020–2030 decade and beyond. What could that compass be? In order to characterise it, it is first necessary to come back to the shortcomings of the current compass.

The current compass for decision-making as it concerns both environmental law and, more generally, environmentally-relevant decision-making is still entirely shaped by the idea of transactions and externalities or, more generally, by the conception that 'utility' can be 'optimised'. This critique has deep roots. A useful and concise overview of the critiques against a widely used tool embodying the idea of allocative efficiency, namely cost-benefit analysis (CBA), is provided by our Cambridge colleague J. Aldred.[26] At the simplest level, CBA assumes that all the possible outcomes of a given action and their probabilities can be objectively known. Both assumptions are untrue, and they are so to a point that goes beyond the mere simplifications necessarily entailed by any theorising; they make CBA unsuitable to represent, let alone guide, any policy seeking the transformation of an economy from 'brown' to 'green'. If by assumption, all possible outcomes are known, then there is no room to take into account the very processes of 'disruption' that so pervasively characterise our present times. Such disruptive processes would be at best random exogenous occurrences, not normal (representable) ones.

If the set of outcomes simply does not include potential major and disruptive outcomes, how can one purport to objectively set the probability of each outcome? And even 'assuming' that all possible outcomes are known (as a limited set of outcomes can only be fixed by assumption), their probabilities may simply not be objectively ascertainable or, in other words, they may fall within a broad range (e.g., between 50% and 0.00000001%) which makes them unsuitable to guide action. Another major problem raised by the pretence that an allocation could be found which 'optimises' overall 'utility', is that one would have to measure widely different interests and values, life, employment, biodiversity loss, air pollution, GDP, national security, health, etc. using the same metrics. Much has been written for example, on the social cost of carbon, which is in essence an attempt to force it into the narrow and simplistic lenses of CBA. If you know the social cost of carbon, it is argued, you can 'correct' its negative externalities so as to bring 'utility' to its 'optimum'. As noted earlier, the problem with this and other reductions to a single metric is not one of 'technique', it is one of fundamental uncertainty and incommensurability. Measuring the social cost of carbon would require knowing all possible future outcomes and their probabilities, which, as explained earlier, would assume away unknowable outcomes (those not considered) that may be decisive (e.g. disruptive) for the evolution of the system. Even assuming such fundamentally uncertain outcomes away, measuring the social cost of carbon entails reducing incommensurable values to one single metric (utility) through value judgments, which tend to be hidden under an appearance of scientific objectivity and rigor. This can provide a basis for the determination of intrusiveness of environmentally-relevant laws and policies.

The bulk of our environmental law systems rest on this underlying - normatively questionable and scientifically inaccurate – assumption. In addition to the challenges raised by uncertainty and incommensurability, an additional problem lies in the fact that to accurately represent the dynamics of technology (e.g. lock-ins or, conversely, disruptions), it is necessary to take into account the aggregate dynamics of a system. There are properties of systems that are only displayed at the level of the system, not of the units. This has been known for at least a century, although the managerial disciplines, such as economics and law, seem to have remained impervious to this insight.

A better compass should be capable of accurately representing and guiding environmentally-relevant laws and policies that achieve the immense socio-economic transformations that must occur in the critical 2020–2030 decade. We need to change the way in which we 'decide how to decide'. In a world where one could perfectly predict the future, deciding the level of effort to mitigate industrial activities as that which is made economical by the level of damage that these activities may cause in the future may seem appealing. The problem, however, is that the value of such future damage is not a reliably knowable quantity. It is characterised by such uncertainty that it is not usable in scientific

analysis. The empirical burden of CBA and optimisation methods in general is therefore so great that, in practice, data is frequently decided by convention rather than empirically measured (e.g. the UK carbon valuation[27]), and thus debatable as a scientific method. Moreover, optimisation is itself not an empirically validated scientific description of the observed behaviour of very many natural or human systems, if any. That we should allow decision-makers to consider that economic systems can be optimised gives them a false sense of control and knowledge.

It is also notable that the choice of information to include in CBA is itself generally a normative choice, and this politicises the work of analysts, while the legitimacy lies with the decision-maker. In particular, the requirement of estimates of probabilities for outcomes may lead to the inclusion or omission of uncertain variables and processes, where knowledge is scarce. In the case of climate change, climate damages are typically included while the benefits of innovation are not, and this happens more by convention than for any scientific reason. Innovation generally opens options for economic prosperity, but by definition, the outcomes of innovative activities cannot be known probabilistically. If only well characterised quantities are used in CBA, then a status quo bias arises due to the present system being naturally better characterised than the system towards which a transition is desired. This is a simple reflection of fundamental uncertainty.

Any alternative to CBA and optimisation methods should involve at the core a recognition of fundamental uncertainty, and thus test the empirical reliability of quantities used. In a political and economic culture in which CBA cannot be easily rooted out or replaced as a compass (for example, the Anglo-American world), the most realistic approach would be to generalise it into a Risk-Opportunity Analysis (ROA), which avoids the above scientific integrity problems. A ROA approach takes a starting-point that the future is intrinsically not knowable with probabilities and that the best one can realistically do is to carry out both risk and opportunity assessments to guide decision-making. This is not an optimisable problem. When recognising fundamental uncertainty, the direction of the transformation of any institution or system, notably an economic or technology system, is itself uncertain, and therefore the focus shifts from attempting to determine the exact outcome of decisions towards attempting to identify the direction of travel they set in motion. This approach avoids the false sense of precision generated by the use of CBA and optimisation-based approaches, and it allows decision-makers to appreciate what worse and best case scenarios can emerge from decisions. For example, are the (unquantifiable) risks of extreme detrimental outcomes (e.g., a financial crisis or, even worse, environmental collapse) worth taking, against the opportunities generated by successfully setting in motion a transition in approximately the desired direction (environmental resilience and economic performance based on green sectors)?

4. Conclusion

Returning now to environmentally-relevant laws and policies, one may ask whether mainstreaming a ROA approach (replacing or generalising CBA) requires an overhaul of our legal systems or only of our understanding of their operation? The answer to such question is that a radical change in our understanding is a necessary but not sufficient condition and that an entire overhaul of legal systems is not necessary. What would be necessary and could be sufficient is a change of understanding, which finds expression in key areas of legislation and policy-making, so as to steer – on the basis of a more accurate and sophisticated understanding of the role of law as a technology – the socio-economic processes in an overall desirable (not optimal) direction, trying as much as possible to avoid disastrous outcomes (whether known or unknown/unknowable), while increasing the resilience (reducing the 'brittleness') of the system. That may possibly be achieved without a fundamental overhaul of legal systems, but it will necessarily require acceptance that, when necessary, policy interventions will interfere with the heart of an underlying transaction.

An example, to make these concepts more understandable, can be investment in fossil fuels. Policies that preserve or even encourage continued investment in fossil fuels drive socio-economic systems in a questionable direction, not only in terms of emissions of greenhouse gases but also in terms of economic/unemployment exposure resulting from an ailing sector. Continued support in some cases (very high-cost producers with limited capacity for diversification of their economies, or

even high-cost producers in diversified economies but where the fossil-fuel sector has a decisive political impact) may lead to disastrous results (the shut-down of an entire sector of the domestic industry, with the associated economic, social and political costs). The more the industry becomes dependent on costly direct or indirect subsidies, the more its brittleness (lack of resilience) increases, with a simple change of government or subsidies policy being enough to trigger the collapse.

Environmentally-relevant laws and policies that steer the situation away from such direction of travel would certainly interfere with the underlying transaction, but doing so would be desirable economically, socially and environmentally.

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Endnotes

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[9] See A. Garcia Ureta, 'Nature Conservation', in E. Lees, J. E. Viñuales (eds.), *The Oxford Handbook of Comparative Environmental Law* (Oxford University Press, 2019), pp. 460-488, at 485; C. T. Reid, 'Protection of Sites', in E. Lees, J. E. Viñuales (eds.), *The Oxford Handbook of Comparative Environmental Law* (Oxford University Press, 2019), pp. 834-851, at 844-847; C. T. Reid, W. Nsoh, *The Privatization of Biodiversity?* (Cheltenham: Edward Elgar, 2016).

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[14] See Georgescu-Roegen, N., *The Enthropy Law and the Economic Process* (Cambridge MA: Harvard University Press, 1971); A. Gorz, *Ecologie et liberté* (Paris: Galilée, 1977); S. Latouche, *La Déraison de la raison économique: de l'efficacité au principe de précaution* (Paris: Albin Michel, 2001); F. Demaria, F. Schneider, F. Sekulova, J. Martinez Alier, 'What is degrowth? From an activist slogan to a social movement' (2013) 22 *Environmental Values* 191.

[15] See H. Jonas, *In Search of an Ethics for the Technological Age* (Chicago IL: University of Chicago Press, 1984) (originally published in German:*Das Prinzip Verantwortung. Versuch einer Ethik für die technologische Zivilisation* (Frankfurt am Main: Suhrkamp, 1979)); H. Jonas, 'Philosophy at the End of the Century: Survey of its Past and Future' (1994) 61/4 *Social Research* 815 (see the discussion of the ecological crisis starting at page 826).

[16] A. S. Garmestani, C. R. Allen (eds.), *Social–Ecological Resilience and Law* (New York: Columbia University Press, 2014)

[17] N. Robinson: 'Beyond Sustainability: Environmental Management for the Anthropocene Epoch' (2012) 12 *Journal of Public Affairs* 181; N. Robinson, 'Fundamental Principles of Law for the Anthropocene?' (2014) 44 *Environmental Policy and Law* 1.

[18] R. Steinberg, *Der ökologische Verfassungsstaat* (Frankfurt am Main: Suhrkamp, 1998).

[19] K. Bosselmann, *Im Namen der Natur: Der Weg zum ökologischen Rechtsstaat* (Bern: Scherz, 1992).

[20] See D. Vidas, O. K. Fauchald, Ø. Jensen, M. W. Tvedt, 'International law for the Anthropocene? Shifting perspectives in regulation of the oceans, environment and genetic resources' (2015) 9 *Anthropocene* 1.

[21] See L. Kotzé, 'Rethinking Global Environmental Law and Governance in the Anthropocene' (2014) 32 *Journal of Energy and Natural Resources Law* 121; L. Kotzé, 'Human Rights and the Environment in the Anthropocene' (2014) 1 *The Anthropocene Review* 1; L. Kotzè, *Global Environmental Constitutionalism in the Anthropocene* (Oxford: Hart Publishing, 2016).

[22] See J. E. Viñuales, *The Organisation of the Anthropocene. In Our Hands?* (The Hague: Brill Research Perspectives, 2018).

[23] See also E. Biber, 'Law in the Anthropocene Epoch' (2017) 106 *Georgetown Law Journal* 1.

[24] On the importance of this triangular trade for the inception of the industrial revolution in England see K. Pomeranz, *The Great Divergence: China, Europe and the Making of the Modern World Economy* (Princeton NJ: Princeton University Press, 2000).

[25] See the aforementioned working paper: EEIST, 'Policy brief: Deciding how to decide'.

[26] J. Aldred, 'Risk and Precaution in Decision-Making about Nature', in S. M. Gardiner, A. Thompson (eds.), *The Oxford Handbook of Environmental Ethics* (Oxford University Press, 2017), pp. 322-330.

[27] Government of UK, "Collection Carbon valuation;" available at: https://www.gov.uk/government/collections/carbon-valuation–2 (accessed on 12 January 2021).