Environmental law for the future

Reflecting on future learning pathways for environmental law

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At a glance

- There are interconnected global challenges being aggravated by the climate emergency, which require an urgent shift away from institutional and disciplinary silos towards a new mindset.
- Complex problems such as the resource nexus are commonly assessed through quantitative scientific methods, but the analysis of the legal architecture in which resource trade-offs and conflicts happen is just as important. Thus, advancing discussions beyond the dominant technocratic approach into a legal sphere is key.
- By combining computer science (through the use of Artificial Intelligence and machine learning algorithms to identify patterns in big data analysis), law, resource efficiency and trade-offs between sectors and resource use (through metrics, indicators and models), advances can be promoted towards ecological intelligence.

Overcoming disciplinary silos

Worldwide, we are facing unprecedented challenges from pollution and the climate emergency, to water scarcity and pandemics. Between 1950 and 2015, global annual plastic production increased from 2 million tonnes to 381 million tonnes, but only 9% of the total amount discarded was recycled.[1] Most of that plastic currently sits in landfills, dumpsites and oceans or has been incinerated, emitting polluting gases. The increasing temperatures, rising sea levels and shifts in river flow and rainfall patterns due to climate change aggravate the problem and result in more frequent and severe natural disasters. The number of weather-related hazards has tripled since 1980, representing 74% of all reported losses (US$2.6 trillion) and 61% of all lives lost (1.4 million) in disasters.[2] This trend is predicted to continue, so conflicts and risks are becoming further amplified, with higher losses and impacts that certainly undermine current and future development efforts that respect planetary boundaries and human rights. Worldwide, the IPCC estimated that 680 million people live in the low-lying coastal zones, a figure that is projected to increase to more than one billion by 2050.[3] Around 40% of the global population lives within 100 km of the coast and is at risk of sea level rise which could see places like Rio de Janeiro, New York and Shanghai underwater.[4] Supply security issues are on the rise with regards to water, energy, food and land. Half a billion people are living in areas marked by erosion[5] and more than 1.4 billion people are living in areas marked by extremely high water vulnerability (a combination of the highest levels of physical water scarcity and the lowest levels of drinking water services).[6] As demand grows, competition for resources increases and more conflicts involving water, energy and food are expected, with impacts on livelihoods and the environment.

Significant progress in environmental law, policy and regulation has been made over the past century, especially in the development of more integrated pollution controls, but there is much more to be done. New trajectories are needed to address the environmental issues that humanity is currently facing. There is a need to move from development and planning to implementation and results. This could start with educational environmental programs that combine environmental law with other fields, such as computer science, by expanding the learning based on laws (such as those relating to clean water, clean air, endangered species and all other laws) with case studies and practice at local, national and international levels, to include a wise use of technology and interdisciplinary methods. This includes the use of technology and models to sustain the changes required in regulations and laws. Furthermore, it would broaden the capacity to equip individuals with the necessary skills to analyse problems holistically from a range of disciplinary perspectives.[7] Even though universities have been successful in implementing sustainable development into management practices, the radical curricula reform that could fully equip students to put society on a more ecological and sustainable track is yet to happen.[8] This is unsurprising because ecological intelligence, which rejects the division of analysis into disciplines and favours experiential learning,[9] is the most difficult form of environmental education.[10] However, it is exactly the fragmented disciplinary

approach that continuously makes it difficult for individuals to fully understand and address the challenges emerging from the dynamic context of the climate emergency where the speed and scale of social, economic and ecological changes are on the rise, while inequalities are being exacerbated in ways that are impossible to tackle within knowledge silos. For example, the resource nexus notion – critical interlinkages between two or more resources (water, energy, food, land and materials) used in a given context towards systems of provision[11] – requires a holistic approach to support sustainable development of natural resources through the understanding of trade-offs among sectors and interdependencies between systems.[12] Given that justice aspects are underexplored in this body of research,[13] legal scholars can help develop new frames, plural pathways and fairer solutions to resource use and access, considering who is currently being excluded from preferred solutions to conflicts and decision-making processes.

The water-energy-food nexus is a typical example of a complex problem with challenges to find optimal solutions due to limitations of incomplete, but constantly evolving knowledge bases, shifts in conflicting interests, different temporal and spatial scales, and the impossibility of reaching universal agreement on how the problems should be framed.[14] The law faces escalating challenges in tackling complex problems of this kind, which, by definition, do not accept definite answers and should constantly be revisited in light of its ever changing nature of conflicts and shifting interests. These challenges require an excellent understanding of the law and of policy issues, as well as skills oriented in the context of interdisciplinarity.[15] Complex problems are assessed through inter-/transdisciplinary research, participatory processes, transparency, theoretical innovation, systems thinking, iterative participatory re-framing, pragmatic solutions, a possibility-driven approach and threshold delimitation.[16] From a legal perspective, the conflicts emerging from complex problems such as the water-energy-food nexus require consideration of the substantive, institutional and procedural dimensions of decision-making processes to advance solutions in fair and equitable ways. The balancing of legal principles[17] through inclusive, in-depth and transparent procedures under a dedicated second-degree institutional environment that transcends those of existing sectors has been developed as a novel contribution of interdisciplinary research in this field, combining law with social sciences and quantitative approach based on metrics to capture the critical interlinkages between water and electricity resource use.[18]

Expanding the interdisciplinary dimensions of environmental law and teaching

Even though complex problems such as the resource nexus are commonly assessed through quantitative scientific methods, the analysis of the legal architecture in which trade-offs happen is just as important, so advancing discussions beyond the dominant technocratic approach into a legal sphere is key to manage rising conflicts and potential governance shortcomings fairly and inclusively. However, in the context of disciplinary silos, the technical and normative institutional dimensions of complex problems are rarely taught together. Within the former, issues are usually assessed in physical terms through metrics, indicators, integrated modelling, life-cycle assessment, footprint analysis, material flow and accounting, with a focus on risks, security and economic rationales. Within the latter, laws, policies, regulation, planning and institutions are analysed considering aspects of co-governance of resources, environmental justice, regulatory capture, policy coherence, scale and politics. The move away from the institutional and disciplinary silo mentality is key to address the rising complexity of problems, as well as to enhance understanding from theory to practice.

We have seen advances and innovative teaching approaches, such as the teaching module Metrics, Modelling and Visualisation of the Resource Nexus module developed by Spataru.[19] This module follows an interdisciplinary and multidisciplinary approach, combining indicators and metrics with modelling and scenarios of resource use, practical case studies to understand trade-offs considering different policies and regulatory conditions, while also being supported by interactive workshops seeking to raise awareness on environmental law. These are usually part of interdisciplinary programmes targeting students from different disciplines that are interested to pursue a truly interdisciplinary approach to the economics, policies and strategies of sustainable resources. On the other hand, at undergraduate level, we have also seen the move away from education for sustainable development towards ecological intelligence. For example, the global environmental justice strand of the Global Citizenship Programme offered by University College London presented different scientific, social, technological, anthropological, legal and political aspects of climate change to undergraduate students spanning diverse disciplines.[20] Both approaches are useful to demonstrate ways in which education is evolving across the three point-scale as developed by Holder:[21] education for sustainable development (ESD), sustainability literacy and ecological intelligence.

In order for environmental law to overcome the unprecedented challenges from pollution and the

climate emergency to water scarcity, we propose enhancing the trajectory of teaching it, by combining computer science (through the use of Artificial Intelligence and machine learning algorithms to identify patterns in big data analysis) law, resource efficiency and trade-offs between sectors and resource use (through metrics, indicators and models). This can promote important shifts in the way that interdisciplinarity and multidisciplinary is conceptualised and implemented, with the potential to promote positive change in the operation of resource use, social behaviours, markets, governance practices and cultures. Such skills and knowledge will equip environmental lawyers to obtain and analyse big data, to understand resource trade-offs, critical interlinkages of systems of provision to detect policy failures, monitor progress and to take action. This can help transform the way in which disciplines and sectors are working, including how and by whom information and the understanding of complex problems is being developed and responded to. Law programmes are designed to comprise specific modules and therefore lack a more holistic approach due to disciplinary silos. The same is true for most programmes offered by universities, so learning and building on successful approaches will be key. We highlight the inclusion of the normative-institutional dimension of the water-electricity nexus in research and teaching as one of the successful approaches to bridge knowledge silos between law and other highly technocratic areas of knowledge, assessing the trade-offs and conflicts of the resource nexus.

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Endnotes

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