1. Accelerating the evolution of environmental law through continuous learning from applied experience

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Objective understanding of whether a legal instrument is effective involves consideration of the purposes of the instrument and its real-world effects. This is at least partly an empirical enquiry, similar to policy evaluation. It requires factual evidence of outcomes and data to underpin hypotheses about the causes of outcomes. These empirical enquiries must go beyond instrument design and the actions of legal agencies. Practical outcomes will often reflect context issues like social and cultural receptivity to legal arrangements, politics, economic capacity and impacts, and the dynamics of socio-ecological systems. As well, the resources invested to support a legal instrument, and the implementation strategy, are often determinants of success.

The question that this raises is whether our legal scholarship is suited to addressing implementation questions beyond doctrinal, procedural and philosophic/jurisprudential concerns. If legal scholarship is indeed concerned with improving the effectiveness of the environmental law system, this suggests the need for methodologies and knowledge that can illuminate the empirical questions: what works, when, and why?

In this chapter we consider arguments for and against a more empirical environmental law scholarship. We discuss a scholarship that grafts onto our discipline’s concern for improving legal instruments (such as statutes, judgments) and values (rights, responsibilities and justice), a focus on the efficiency and effectiveness of the environmental governance system, and the role of empirical analysis as a basis for cumulative learning. We also consider the use and limits of the scientific method for driving improvement in the effectiveness of environmental law.
Implicit in a scholarly discipline is a shared theory of knowledge and methods (epistemology, methodology), and a collective effort to systematically improve these. Commentators on law’s approach to advancing knowledge have suggested that particularly environmental law scholarship could be improved through an empirical scientific mode of investigation, with explicit theories as the basis for hypotheses testing on the basis solely of objective data, peer critique of methods and conclusions, and the minimisation of subjectivity in content matter. Others suggest that the exclusion of non-objective concerns will distort legal enquiry, given legal concerns like ‘justice’, ‘fairness’, ‘weight of evidence’, and ‘motive’.\(^1\) They point to the fact that many of the law’s essential concerns (and many of its effects) are immeasurable. We suggest that a science/doctrine polarity is not constructive in practice.

We suggest that a constructive methodological path is to recognise that research on the effectiveness of environmental law is a strategic investigation rather than either a philosophic or a scientific one. The purpose is real-world improvements, and the variables in the state of the world include objective facts, subjective beliefs and dynamic systems that are changing even as they are investigated. The goals of the law are also heterogenous and dynamic. As a result, proposed real-world reforms must rely upon a mixture of deduction (conclusions following directly from analysis of data) and induction (conclusions informed by judgement), and they must anticipate a future that cannot be objectively deduced. Such analyses involve both objective and subjective elements, and the methods are plural and pragmatic. We suggest an integrative method that can help legal scholars tackle effectiveness, that does respect the objectivity dimensions of empirical scientific research but is not so narrow as to exclude the essential subjective aspects of the law.

1. METHODS AND PURPOSE(S) OF ENVIRONMENTAL LAW SCHOLARSHIP

Environmental law scholarship serves mixed purposes. It facilitates teaching; provides a context for teachers to advance their knowledge; and generates knowledge to improve environmental law outcomes, which are largely behavioural. Legal instruments and institutions are an important aspect of these investigations, but behaviour responds to many factors.

\(^1\) Hesselink (2009).
This suggests the need for an accepted theory of behaviour change within the discipline to underpin our investigations. This theory is lacking.²

Our scholarly enquiry should build understanding of behavioural outcomes from environmental law, taking account of other interventions (for example, economic and social interventions). Research should explore causal relationships and alternative legal, and other, strategies, taking account of the impacts of different contexts. A governance instrument that works in a wealthy jurisdiction with a strong rule of law is less likely to be effective in a jurisdiction struggling with poverty and weak governance.³ An approach that works in an urban area may be inefficient in an area of sparse settlement. Beyond the legal instruments and institutions effectiveness might depend upon:

- the commitment and capacity of the implementation organisations;
- political and community support or opposition;
- synergies or conflicts between legal and other forms of intervention;
- context factors, including economic drivers, community attitude, the behaviour of the powerful and biophysical dynamics.

The weakest link in the chain of implementation will determine the effectiveness of that chain. Failure in any aspect can derail implementation. Many of these issues are not the subject of conventional legal research.⁴ Some fall within the view of management or political scientists, economists, biophysical scientists, and behavioural experts. Thus any scholarly approach to improving environmental law implementation must involve insights from other disciplines, different types of research questions, and different methodologies to those of traditional legal scholarship.

² An important behavioural dimension of our work is that the effectiveness of environmental law is less concerned with the control of aberrant individuals than with changing the norms of the larger population. For this reason, theories about law and behaviour that have developed through the study of crime are not likely to be of great value for our discipline.
⁴ For an example of this expanded perspective see Lim (2012). See also Harding, Hendriks and Faruqi (2009); Hunter, Salzman and Zaelke (2011).
2. ‘FOOD FOR THOUGHT’ ON ENVIRONMENTAL LAW SCHOLARSHIP

Various authors, discussed later in this chapter, have raised significant questions about our methodologies and scholarly approaches. Most argue either for or against a scientific empiricist epistemology. An alternative is an epistemology that is neither purely discursive (doctrinal/philosophical and inductive) nor scientific (empiricist and deductive). Rather a strategic epistemology that blends both forms of investigation and synthesis, focused upon finding pragmatic solutions for real world human behaviour challenges is needed. This goes beyond the mere pragmatism proposed for multi-method policy research,5 and adopts the analytic structure of corporate and military intelligence gathering and decision-making. In this strategic epistemology, matters of values and belief (axiology) inform choices of direction, inductive choices are made about likely futures, scientific deductions are used to better understand central facts, and pragmatic choices are made about resources and plans. To frame our argument for such an approach, we begin by examining critical views about environmental law epistemology and methodology.

Professor Faure, at the 2009 IUCN Academy of Environmental Law Colloquium in Wuhan, considered empirical studies of implementation of environmental governance.6 He proposed that the environmental law academy should embrace a serious concern for the effectiveness of legal instruments in our approach to research, through a more empirical and multi-disciplinary approach. He distilled themes about success/failure and instrument and technology design, based on the available empirical data.7 He considered liability rules, regulation, command and control versus market instruments, taxation, emissions trading, and combinations.8 In addition, he considered the significance of enforcement and implementation and suggested some principles about the use of empirical data:

It is indeed crucial for any policy instrument, be it command and control or market-based, that the policy maker has clear ideas on the effects of the instruments chosen in practice. This requires ex ante consideration of the available empirical research since the choice of a particular instrument is often based on assumptions about its effects that may be merely theoretical.

6 Faure (2012).
7 Ibid.
8 Ibid.
Good legal policy also requires serious *ex post* evaluation studies to examine whether a particular instrument or policy was indeed able to achieve the goals expected by the legislator.9

His ideas resonate with a critique of environmental law by Fisher, Lange, Scotford and Carlane in their paper ‘Maturity and Methodology: Starting a Debate about Environmental Law Scholarship’.10 This paper makes the ‘very simple argument that environmental law scholarship can only come of age when scholars face the methodological challenges of environmental law research head on. This is because a lack of explicit and widespread discussion about methodology in environmental law scholarship has hampered the academic development of the subject and threatened the worth of environmental law as an intellectual discipline.’11 They suggest that environmental law suffers from incoherence due to the relative newness of the field and the complexity of the issues (including the necessity of spanning disciplines) and assert that it has been difficult for the discipline to develop scholarly standards.

Whilst the criticisms themselves are empirically unsupported, the authors pose significant questions about methods and standards, and law’s capacity to systematically improve the effectiveness of environmental governance. They describe four challenges: the speed and scale of change; the interdisciplinary nature of research and practice; the diversity of governance; and the multi-jurisdictional nature of environmental law.12 These help to explain, but they certainly do not justify, research practices that lack scholarly integrity and which limit real advancement. The paper indicates the need for the discipline to reflect upon its research questions, methods, and institutional structures and for explicit debates about quality in environment law scholarship.

A study by McGrath, ‘Does Environmental Law Work? How to Evaluate the Effectiveness of an Environmental Legal System’,13 explores links between environmental law and environmental outcomes. In a scientifically ideal world this analysis would begin with a well-developed theory of causality accepted within the discipline. That theory would take into account the variables of instrument design, implementation institutions, context, resources and implementation strategy to allow prediction of outcomes. On that basis it would be possible to test the validity of

9 Ibid, 6.
11 Ibid, 214.
12 Ibid.
13 McGrath (2010).
the predictions and thus to refine theory and practice. In the absence of such a substantiated theory and methods for interpreting real-world outcomes, the author uses ambitious inference to pose a theory as a starting point. The history of economics and psychology (for example) indicates the necessity for such a starting step to facilitate the shift from broad assumptions to a validated theory of behaviour.

Using an approach drawn from natural resource policy, the study evaluates environmental law by reference to biophysical outcomes, using the ‘pressure, state, response’ logic. This brings into focus many difficulties in adopting an outcomes focused view of environmental law. One is articulating the relationships between the law, specific legal and administrative actions and the (third party evaluated) pressures, ecological conditions and biophysical system responses. Other variables, such as political contexts, social system dynamics, resourcing constraints and economics, were not analysed (reflecting the conventional treatment under this method of reporting). Whilst simplification is arguably essential for this type of policy analysis, the narrowing of causal considerations points to methodological challenges in theorising about complex environmental law issues.

McGrath discusses alternative approaches for evaluating the effectiveness of an environmental legal system. The approaches vary in their objectives, terminology, and methods. Whilst all have intuitive validity none have been verified in a systematic way. He observes, consistent with other authors, ‘that the majority of legal writing regarding environmental legal systems is descriptive, explanatory and interpretative rather than evaluative’ and provides illustrations supporting this point. On this basis he opts for his method. This analysis must ultimately come up against the problems of complex causality, context, and resourcing that will defeat pure scientific objectivity in any environmental law evaluation. Regardless of these limitations, it provides a pioneering contribution to understanding outcome causality in environmental law.

Environment law specific critiques of legal epistemology sit alongside broader critiques of the scientific integrity of legal scholarship.
Herring argues that a scientific approach to law, using specified questions, hypotheses, methods and testing based upon empirical data, is honoured in the breach. He provides a nuanced analysis of the potential overlaps and conflicts between legal doctrinal and theoretical research and the potential for legal research using the scientific method:

The doctrinal scholar does not simply discover an aspect of the natural world. This scholar observes, organizes, and analyzes the law, and through this process, even if it is purportedly only descriptive in nature, participates in the human effort to construct the law and a particular society. She is not engaged only in the incremental discovery of what is. Rather, she is engaged in the incremental analysis of what is, and often the construction of what ought to be. By observing, explaining, analyzing and critiquing legal doctrine, the doctrinal scholar often attempts to channel, if not direct, the development of the law. The doctrinal scholar’s participation in the process of constructing what is being studied (the law) differs markedly from the scientific scholar’s process of discovery. Consequently, the legal scholar dedicated to the scientific method engages in scholarly projects that differ in nature from those of the doctrinal scholar.18

This reinforces our view (and that of other critics) that practical outcomes are distinct research matters, not subsets of doctrine or legal theory. A functionally complete scholarship must merge legal enquiry based upon discourse with enquiry based upon scientific empiricism. This synthesis of objectivity, subjectivity and a concern for pragmatic discussions mirrors key aspects of strategic decision-making.

Posner’s discussion of the evolving nature of legal scholarship suggests the need for change in scholarly enquiry within the legal discipline. He suggests a lack of self-reflection and self-criticism, highlighting causes such as the explosion of the amount of law, a decline in faith in the law and its autonomy, and the rising prestige of science as a basis for knowledge. He concludes that a ‘purely verbal, purely lawyer’s scholarship, in which the categories of analysis are the same as, or very close to, those used by the judges or legislators whose work is being analyzed – a scholarship moreover in which political consensus is assumed and the examples of regulation. He highlights issues such as agency capture and the increasing dominance of industry/economic rationales in the design and implementation of environmental and other regulation.

18 Ibid.
20 Ibid.
insights of other disciplines ignored does not fit comfortably into today’s scholarly Zeitgeist.  

Posner proposes to embrace new styles of interdisciplinary legal thought. The trajectory he maps indicates increasingly ambitious attempts to distill testable hypotheses from fragmented rules and judgments. Applying this to environmental law scholarship the challenge is in overcoming the ‘noise’ of everyday developments to identify underlying abstract concepts that can be identified (retrospectively) as the basis for objective hypotheses.  

Ulen sees a movement towards scientific empiricism within the legal discipline. He argues that there are aspects of legal scholarship which are clearly ‘scientific’ but that there are material differences, notably, the absence of ‘widespread and commonly accepted theoretical core or paradigm and accepted standards and methods of empirical or experimental verification’.  

Within (applied) policy studies, it is known that methods must cope with the multi-dimensional and dynamic nature of the variables, ‘chaotic’ politics, the pervasive effects of values and perception and the gap between theoretical and applied effectiveness. Rittel and Webber characterised many environmental issues as ‘wicked problems’ having no definitive, optimal or objective answers. Problem framing to distill a clear specification of the desired goals is said to be critical to policy methods, but in environmental law goal clarity is problematic. The political process of law making can involve ‘bundling’ different and sometimes competing goals, to create compromised solutions. Apparently specific terms (such as ‘precautionary principle’, ‘consultation’, or ‘inter-generational equity’) mask many competing objectives. To decide post hoc that a particular version of plural goals is ‘true’ is a distortion that is common, and perhaps essential, to policy research in the same way that grand assumptions about behaviour and structure are essential to economic policy research. Methodology problems are not likely to be effectively solved by assuming away the messy realities, merely to create

21 Ibid, 773.  
22 Interestingly, a thought process that mirrors thought processes of ‘strategising’, as described by Ohmae (1982).  
23 Ulen (2002).  
24 Ibid, 893.  
26 Rittel and Webber (1973).  
27 Dovers (2005) 60.
the pretence of tractable ‘scientific’ research questions that fit available methodologies.

3. THE CHALLENGE OF EMBEDDED AXIOLOGY

Environmental law scholarship is more than functional and is not values-free. It advances social values that may (or may not) be held by the majority of a community. The scholarship of environmental law is often concerned with converting philosophical aspirations into tangible social arrangements. It often takes a stance upon issues of justice that is counter to the views of power holders. Axiology\(^{28}\) is central to a discipline that is concerned with implementing norms and values. This mitigates against positivist methods which aim to strip out subjectivity. Lawyers’ suspicion of empirical methods may reflect a visceral concern for the erosion of a philosophy of knowledge that has a real concern for justice.

Many sustainability principles reinforce the importance of values as the basis of environmental law rights and obligations:\(^{29}\)

1. inter-generational and intra-generational equity;
2. the right to environmental quality;
3. the obligation not to cause environmental harm;
4. the precautionary principle;
5. the common heritage of human kind;
6. the polluter and user pays principles;
7. obligation to prevent pollution;
8. the right of public participation and access to information;
9. environmental impact assessment of projects and proposals likely to have significant environmental impacts.

Some of these (viz. (2), (4), (6), (8) and (9)) have legal expression in conventions, standards, national laws and environmental indicators. Others are advancing towards law. Legal pluralism, law and anthropology and customary law scholarship are important in developing a richer understanding of law as a normative system, with a potentially interesting intersection between empirical and philosophical research.

Whilst acknowledging that a positivist empirical model will not properly accommodate the transformative role of environmental law, even

\(^{28}\) The scholarship of ethics and values.

in this aspect of our scholarship scientific objectivity could advance transformative aims. Environmental law scholars often seek to develop social justice through instruments such as Agenda 21, the Rio Principles and the Millennium Development Goals.\textsuperscript{30} This type of environmental law advocacy relies on assumptions that legal instruments, such as the principles in the Aarhus Convention, will improve participation and thereby sustainability outcomes. Whilst observation suggests that in many situations these approaches have been useful, observation also suggests that often the transfer of real power has not occurred. It is an empirical question whether, when and how real empowerment occurs. Reed rightly suggests that there is inadequate research on the relationship between participation by stakeholders, social learning and behavioural change.\textsuperscript{31}

4. CAN (AND SHOULD) OUR SCHOLARLY APPROACH BECOME MORE ‘SCIENTIFIC’?

Standing apart from arcane debates about the scientific method, an appropriate definition of the essence of the scientific method for the purposes of legal scholarship is provided by an eminent legal institution:

The United States Supreme Court has laid out a four-step inquiry regarding whether testimony should be accepted as ‘science.’ In \textit{Daubert v. Merrell Dow Pharmaceuticals, Inc.}, the Court established these four steps:

\begin{itemize}
  \item The theoretical underpinnings of the methods must yield testable predictions by means of which the theory could be falsified.
  \item The methods should preferably be published in a peer-reviewed scholarly journal.
  \item There should be a known rate of error that can be used in evaluating the results of the assertions.
  \item The methods should be generally accepted within the relevant scientific community.\textsuperscript{32}
\end{itemize}

Finding a basis for a shared theorising and empirical testing in our field is not easy. Environmental law scholarship copes with diverse issues (such as various aspects of water, air, pollution, mining), heterogeneous legal systems within different jurisdictions and different legal instruments and governance structures. Implementation occurs in varied ecological,
political, economic and social contexts. These characteristics push our scholarship towards being descriptive rather than analytic.\textsuperscript{33} This results in a lack of explicit research questions, limited descriptions of causal hypotheses, and a failure to test outcomes against specific predictions. Our academic discourse uses argumentation focused around values, instruments and to a lesser degree institutional arrangements, rather than hypothesis based empiricism. This reflects the absence of a common ground for more universal research questions, theory, and comparative data and methods.

Disciplines tend to evolve towards increasing specialisation and heterogeneity. During the Enlightenment, fields of science that now have distinct questions and methodologies were unified. Over time astronomy, physics and chemistry evolved into specialisations, and thence into distinct sub-fields. Early biology (like much environmental law research today) was descriptive (viz. Linneaus), then observational of empirical facts (viz. Darwin) before branching out into experimental methods. Disciplinary boundaries also tend to blur as ideas from one field lead to discoveries in another and thence into integrated methods. The iconic demonstration is the Nobel Prize winning work of Linus Pauling that integrated physics and chemistry to identify radical insights into the biology of plants and thence the foundations of molecular biology.

Such evolutions within disciplines have a strong social impact, as Kuhn documented with his work on scientific revolutions.\textsuperscript{34} As suggested by a commentator from another discipline (geography):

Learned societies are under substantial pressure to find new structural solutions in promoting the continuing development of their respective disciplines. The mission hasn’t changed. Scholarly associations are still charged with guiding, from a discipline’s perspective, the process of problem articulation, theory generation, data handling, and knowledge content organization. But as each society pursues its role of disciplinary core and boundary definition, in an age of interdisciplinary thought and communication, it runs the risk of becoming overly defensive in warding off the perceived encroachment of other disciplines.\textsuperscript{35}

Environmental law scholarship is evolving into plural forms, pursuing distinct questions using different forms of enquiry. The term ‘environmental law’ is a ‘category of concealed multiple reference’ as defined by

\begin{itemize}
\item Kuhn (1996).
\item Cohen (1988).
\end{itemize}
Stone: a single term embracing many distinct meanings. Figure 1.1 highlights the interaction between traditional (discursive) methods and more recent (more empirical) concerns.

At the heart of legal scholarship is doctrine and theory, but procedural tactics and legal outcomes are intertwined. Often the outcomes of law reflect the procedural skills of the lawyer more than doctrine. The methods used to explore these central themes are the mainstream of legal scholarship.

‘Surrounding’ these intra-disciplinary issues are areas that cannot be fully characterised as purely doctrinal or empirical. Three stand out: jurisprudence, legal institutional studies and legal economics. The methods are often discursive and abstract, but can be informed by empirical considerations (for example the use of models as economic argumentation). Jurisprudence tends towards methods akin to legal discourse but informed by philosophic concepts that may be capable of general application. The outer circle in Figure 1.1 represents where legal culture and methods are most likely to intersect with many other

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36 Stone (1964), particularly Ch. 7.
37 There is sometimes a misleading assumption that models are empirical rather than a specialised form of discourse. Models are merely mental constructs of a more complex reality, which may or may not reliably reflect that reality.
disciplines. Environmental law scholars often engage with these diverse fields, depending upon the applied issues with which they are concerned.

This poses many challenges for legal scholarship. To illustrate: Sparrow notes, in relation to regulation, that:

The topic of regulatory reform touches an alarming number of established academic disciplines. To deal with the subject in a comprehensive way would demand mastery of criminal justice, compliance psychology, public regulation, public administration, public management, organizational theory, political science, institutional analysis, program evaluation, economic, crime prevention, sociology, criminology, regulatory law, and the emerging risk sciences. To speak with any authority, perhaps academic commentators should also be required to know the particular sciences relevant to each regulatory field: biology, chemistry, and physics (for environmental protection); industrial engineering and industrial hygiene (for occupational safety and health); toxicology, radiology, and medicine (for public health).38

The journey from the centre to the outer circle involves a shift from discourse towards empiricism. Many advances are likely to span theories and methodologies. For the scholar, it suggests the need for many skills, knowledge, methodologies and research projects. Given the limits to an individual’s capacity, this pushes our research away from legal traditions of individual enquiry towards multi-disciplinary teams. This is a methodological, managerial and sometimes personal challenge.

We do not wish to trivialise the dangers of going down a methodologically plural pathway. Law is a discipline where values are pivotal. Many issues cannot be dissected into simple questions or clearly enunciated hypotheses amenable to empirical tests. Many of the key questions are multi-faceted. Simplifying the issues to fit an empirical methodology is not likely to represent a significant advance. Karl Popper suggests that:

Long-term prophecies can be derived from scientific conditional predictions only if they apply to systems which can be described as well-isolated, stationary, and recurrent. These conditions are very rare in nature, and modern society is surely not one of them.39

Rarely are socio ecological-legal systems neither messy nor bordering on chaotic, and environmental governance issues present ‘vicious’ analytical challenges. The risk of elevating methodological purity over practical utility in coping with complexity ought not to be dismissed. We need a new approach that combines the strengths of traditional jurisprudence

38 Sparrow (2000) XVII.
with the strengths of traditional science. It should not be a case of adopting one in preference to the other, but a matter of finding an integrative approach that suits the realities of environmental law and its social purpose.

5. GENERATING AN EPISTEMOLOGY OF IMPLEMENTATION

Scientific method is a disciplined foundation for systematic improvement across many fields. Originally concerned with learning about physical phenomena (that is, the physical sciences) these fundamentals have also proven to be useful in metaphysical enquiry concerned with human behaviour and abstract notions such as values (that is, the social sciences).

Enlightenment ideas reflected the research questions of the time. The focus of attention was upon discoveries in the physical world. The fundamental endeavour was to dethrone subjective, religious belief as ‘science’ – to de-legitimise axiological enquiry. This was achieved through an epistemology that prioritised proof based upon empirical assessment of physical phenomena. Empiricism became entrenched as (indeed synonymous with) the scientific method. As demands for reliable knowledge expanded from physical phenomena to metaphysical concerns, the ‘social sciences’ emerged. Whilst some social sciences embraced the methodological positivism of the physical sciences, practical concerns and philosophical movements suggested limits to the universality of the positivist mode.

Post-positivism attempted to deal with the constraints of methodological positivism, notably its inability to cope well with subjectivity. Post-positivist methods brought a greater awareness of subjectivity and context, a new language for discussing research and knowledge and the recognition of qualitative methods as scientifically legitimate. This trend towards research of non-measurable phenomena as legitimate data from which valid theory can develop, has led to the development of ‘pragmatic’ research approaches. These largely reject the ontological purity expectations of earlier methodologies, accepting that both qualitative and quantitative methods can yield valid knowledge. An aspect of these developments is that the values of the researcher and the research subjects can be legitimate aspects of research, re-legitimising ‘axiology’ alongside methodology in some (but not all) disciplines. However, the re-legitimising of subjectivity is far from completely accepted in science, nor is the role of beliefs and subjective conclusions the same as it was.
prior to the enlightenment. Subjectivity remains suspect as a basis for disciplined enquiry, for very good reasons.

Environmental law has also evolved. Much of the pioneering environmental law scholarship emerged in the 1960s, where the focus was upon creating doctrine and establishing practice. The concern of legal scholarship was upon the inner circle of doctrine, theory and procedure. In this context it was hard to see how methodological positivism could be truly relevant to environmental law.

Gradually, the middle circle of jurisprudence, legal economics and institutional research evolved towards critical reflection. We can trace an increasingly plural conception and a recognition of the legitimacy of diverse theoretical perspectives (for example, environmental jurisprudence or the application of ecological economics to environmental regulation). Embracing a greater concern for outcomes and implementation issues will move the focus of some scholarship towards empiricism upon which to base theories about what works and what does not under various circumstances. With the advent of pragmatic methodology, which can incorporate value and values (axiology), comes the possibility of bringing aspects of environmental law scholarship into alignment with contemporary understandings of the scientific method.

The editorial of Environmental Governance (the book resulting from the 2009 Colloquium of the Academy of Environmental Law) put forward the following challenge:

It is clear that our scholarship will have to expand further, so that we can marry to good doctrinal approaches a new set of methods to provide comprehensive and sophisticated governance solutions to a world increasingly in need of them. This will involve moving to a systems framework, and deepening our thinking about instruments and institutions. This can only be done if we can draw upon the knowledge that exists in economics, social sciences and the biophysical natural sciences, but without submerging laws concern for social justice and the lawyers learned scepticism about simple solutions to complex problems.40

A significant reason for accepting this challenge is because the scientific method imposes a structured approach to continuous improvement. Whilst the sharing of jurisdiction-specific examples allows scholars to draw their own inferences, this is a poor replacement for a discourse based on clearly specified research questions, hypotheses and tests of validity.

40 Ibid, xxxi.
A second reason for adjusting our thinking about epistemology and methodology is that a ‘non-science’ approach limits our ability to fruitfully interact with empirical disciplines, and to take leadership in the development of the knowledge that is necessary for more effective environmental governance. The culture of the law, with its recognition of values as vitally important to the practical resolution of social challenges, brings an important dimension to the policy and practice of sustainability. This would probably not be sufficiently advanced by ‘scientific’ or ‘economic’ disciplines.

History suggests that the success of any legal intervention is far from assured. The strategic variables can be interpreted through many disciplinary lenses. A variety of approaches has emerged in the social policy sciences that can help us to understand these issues. These include action research, grounded theory, engaged research including participative systems modelling, narrative enquiry, qualitative and quantitative survey methods, citizen juries, meta-analysis of prior studies, case studies or triangulation using different enquiries to bridge the gap between problem ‘messiness’ and scientific rigour. A focus on implementation requires objective measurement of outcomes and evaluation of causes (of which the operation of the law is one component).

Policy research is characterised by a pragmatic mix of methods, as a response to complexity. Pragmatism does not mean a lack of commitment to objective evidence, but it reflects that purer forms of the scientific method are often not realistic. Ann Majchrzak, in her book on methods...
for policy research,\textsuperscript{42} defines five characteristics of policy research that, in part, resonate with research on applied environmental law. She suggests that such research is intrinsically multidimensional, uses an ‘empirico-deductive’ method that is (or ought be) focused upon variables that are malleable with intervention (rather than those which cannot be effected), responds to the needs of the users and incorporates values.\textsuperscript{43} She highlights methods including ‘focused synthesis’, based upon literature and interviews, as well as secondary analysis of field experiments, qualitative methods, surveys, case studies, cost benefit and cost effectiveness analysis. Majchrzak argues that a combination of different methods is needed. In an interesting aside she states:

Unless the finding is both politically and statistically significant, it is probably not worth noting.\textsuperscript{44}

This reflects the dichotomy of policy research, where good and comprehensive investigations combine scientific deduction and empirical integrity with the messy, chaotic and subjective calculus of real-politik and human values. At least in the investigation of environmental law reform, to suggest that research has integrity only where it limits the exercise of the researcher’s judgement about moral or social values, likely future contexts or the projected behaviour of people and organisations would be absurd. These are all unavoidable part of the effectiveness concerns of environmental governance. Even in relation to objective matters, it is unrealistic to exclude some subjective judgement and estimation, because there are many dimensions to the questions of anticipated performance of a legal instrument, and these factual dimensions are dynamic and context dependent. The law reform researcher is faced with the choice of excluding axiological and non-deducible variables that are significant to real-world outcomes, or using estimation in the absence of the resources and methods to investigate all the many aspects that might be empirically tractable in theory but not in practice.

Many questions about environmental law scholarship do however invite more scientific empirical investigation:

\begin{itemize}
  \item To what extent, and under what conditions, do different forms of legal intervention work in achieving environmental and social justice outcomes?
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\textsuperscript{42} Majchrzak (1984).
\textsuperscript{43} Ibid, 18–20.
\textsuperscript{44} Ibid, 69.
To what extent and under what conditions are market instruments, or social interventions like education programs, likely to be more effective than traditional legal interventions?

How and under what conditions can market or other interventions be synergistic with legal interventions, to secure outcomes that are ‘greater than the sum of the parts’?

What legal or institutional arrangements do enable effective community engagement and participation, including benefit sharing, in natural resource governance?

We do not have accepted theories within the discipline for these issues, upon which to base testable hypotheses. We should expect that initial theories about such issues would be context contingent, with limited predictive value – the history of science suggest that this is so with most initial theories. The earliest theories in sciences (such as physics or chemistry) were metaphysical speculation based upon observation rather than upon rigorous science. The same can be said of the social sciences such as economics or psychology. The normal pathway towards reliability is from early stage (‘pre-paradigmatic’) theories that are inefficient, towards mature understanding based upon the accumulation of experience and experimentation. However, the march of science suggests that even with a limited initial theory, it is possible to develop specific testable hypotheses and over time to evolve greater robustness and ‘generalisability’. There is no reason why environmental law could not embark upon such a synthesis using heuristics reflecting experience as a starting point.

6. A POTENTIAL INTEGRATIVE FRAMEWORK?

We have argued that whilst there is a legitimate concern about how integrity will be assured in our scholarly pursuit, the perceived science/non-science polarity is deceptive. Applied environmental law involves a complex mix of factual matters amenable to empirical scientific methods, axiological issues where discourse and reason are the investigative tools, and matters of values weighting and predictions where judgement (informed by reason and data) is the investigative mechanism. For applied environmental law the true goal is not the pursuit of knowledge per se, rather it is improved social justice and ecological sustainability outcomes within a socio-economic system that places emphasis upon

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45 Teece (1986); Abernathy and Utterback (1978) 44–7.
wealth. At this level the aim of legal research is not scientific (the pursuit of knowledge as an end) but pragmatic (the pursuit of knowledge for applied ends). Finally we have observed that governance outcomes are the result of complex socio-ecological systems rather than legal arrangements alone.

We conclude that an effective scholarship of implementation will have to: adopt a pragmatic approach, use mixed methods and embrace axiology but with scientific standards of integrity and structured improvement. We will need new integrative frameworks because our purpose is real-world social and ecological improvement. Merely adding knowledge will be insufficient to deliver outcomes which go beyond knowledge alone.

Finding applied solutions to human problems of dynamic complexity is a core pursuit of strategy, where dynamic and poorly understood variables determine the outcome of policy action. Kenichi Ohmae’s ‘The Mind of the Strategist’ distills the thought processes of successful strategists. From investigation of complex reality the strategist distills their own ‘theory of the world’ about relationships and drivers of the relevant system. They use this to determine priorities for intervention.46 Experience tests whether these judgements are reliable. Achieving clarity based upon investigation of what is causally important, judging where intervention is likely to be effective in a future context is a necessary choice, and determining what actions will achieve the desired goal, are essential in an integrated framework. The elements of this strategic epistemology (as distinct from scientific epistemology) seem relevant to framing our approach to a disciplined investigation of applied environmental law. Table 1.1 outlines some questions that are posed for applied environmental law, and possible methodological implications for environmental law research.47 This table is focused upon investigation of law reform, but similar issues arise in investigation of the performance of legal governance arrangements.

Accepting that environmental law instruments are often ineffective or can create perverse outcomes,48 it is important that we can systematically learn from experience. Approaches to learning from experience are reflected in widely used approaches such as ‘The Scientific Method’, the

46 Ohmae (1982).
47 For a detailed discussion of a strategic architecture for sustainability research see Martin and Verbeek (2006).
48 The statement can equally be applied to market instruments, property rights, communal action and social persuasion. There is no meta-research that conclusively supports the conventional.
### Table 1.1 Questions and methods in applied environmental law

<table>
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<tr>
<th>Environmental governance strategic questions</th>
<th>Methodological dimensions of the question</th>
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<tr>
<td>PURPOSE: What is the policy objective of the proposed legal intervention?</td>
<td>The more ambiguous the purpose of a legal intervention, the less precise will be the investigation and the possible research conclusions. However, oversimplification of complex purposes will reduce the reliability of the conclusions. Research of the ‘policy objective’ question can involve consideration of social needs and preferences (empirical research and philosophical discourse), evaluation of statements of purpose and policy (documentation), analysis of political preferences and dynamics (empirical, documentary and discourse analysis); and the functional needs underpinning the need for action (social, ecological, economic research). Synthesis will involve weighing diverse interests and values (judgement). Investigation might also be required about whether a legal intervention will be more or less effective than interventions (nil-action, market instruments, or social interventions like education). Methods for investigation might include historical analysis, discourse, benefit/cost analysis, systems analysis and modelling.</td>
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<td>CONTEXT: What are the context variables and how might they impact on outcomes?</td>
<td>Since context is everything outside the phenomena being considered, the starting point is to determine what is relevant and feasible to investigate. This is a judgement (possibly informed by methods like systems mapping). Context is dynamic, so descriptive research (‘what is the context’) will yield insufficient information to determine likely impacts on strategies to be implemented over time. Forecasting methods include unaided judgement, scenario methods, expert panels or community research (for example, futures Delphi research), or modeling. Context spans topics including the socio-ecological system, economics, cultural issues, political dynamics, technological trajectories and the functioning of ecological systems under biophysical and use assumptions. There are many research methods for these aspects. A first level of context is the organisational or institutional context of the possible intervention, in particular the capacity and commitment of the implementing agencies. Organisational and political research methods are relevant. A second level of context is the community or group whose behaviours are to be changed by the proposed intervention. How they might react involves considerations like attitude and values (social research), political dynamics (political methods), patterns of incentive (economic systems), and their capacity to respond to the interventions (economic and human capacity analysis).</td>
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Environmental governance

**Strategic questions**

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<th>Resources: Can (and will) sufficient resources be deployed to support the intervention?</th>
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<td>Resources, not conceptual brilliance, largely determine the outcomes of strategy. The capacity of the responsible agency to implement is an important consideration, but the capacity of the targeted community to respond suitably is also critical. Strategic resource analysis has three main concerns: determining what resources are required, deciding whether (and how) they can be secured, and managing logistics. This involves financial aspects (accounting, budgeting and economics), human capacity (human resource management), and organisational systems (logistics, systems management, general management).</td>
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<th>Strategy: What activities and allocation of resources will result in achievement of our goals, given likely conditions?</th>
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<td>This decision is where analysis and judgement are integrated. Environmental law strategy (unlike military or management) lacks decision-making frameworks to support choices such as: (1) Choosing between a legal or another form of intervention; or (2) determining the complementary cocktail of legal and other interventions; or (3) deciding between potential legal instruments (public law, private law) or design characteristics. The available methods generally rely on discourse and individual judgement.</td>
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<th>Implementation and Improvement: Who must do what, when and how to achieve effective implementation? And how will we learn from implementation experience, to improve outcomes.</th>
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<tr>
<td>Various forms of planning provide methods for analysing the implementation of legal governance. An important consideration is methods of continuous improvement/adaptation based upon objective analysis of outcomes.</td>
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</table>

Deming ‘System of Profound Knowledge’, which transformed into ‘Total Quality Management’, or ‘Adaptive Management’. All share a commitment to the disciplined use of objective data about outcomes to fuel continuous improvement.

Complex ‘wicked problems’ do require diverse, pragmatic methods for scholarly investigation. It is also true that environmental law must engage with issues where many aspects are immeasurable and so the scientific ideal of objectivity is limited. However, these characteristics of our scholarship do not alter the fact that all research requires a disciplined framework to ensure the integrity and generalisability of findings. Legal

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49 For classical illustrations of this see Von Clausewitz (1873) and Tzu (1910). In commercial strategy, resource concepts of the firm and corporate strategy mirror this perspective.
research focused on outcome effectiveness should reflect to the fullest extent possible the integrity mechanisms of science – clear articulation and transparency of methods and data, identification and disclosure of the limits of generalisability of conclusions and proper peer review. It is, we think, in the pursuit of scientific standards of integrity rather than a direct application of the scientific method, where some of the criticisms of our scholarly approach are most telling. Regardless of methodology, in all cases the scientific safeguards of integrity should be considered essential. This is not yet the case, but it is achievable.

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