12-2016

The use of scenarios in legal education to develop futures thinking and sustainability competencies

Michelle Mei Ling LIM
Singapore Management University, michellel@smu.edu.sg

Andrew ALLAN

The Law Teacher

ISSN: 0306-9400 (Print) 1943-0353 (Online) Journal homepage: https://www.tandfonline.com/loi/ralt20

The use of scenarios in legal education to develop futures thinking and sustainability competencies

Michelle Lim & Andrew Allan

To cite this article: Michelle Lim & Andrew Allan (2016) The use of scenarios in legal education to develop futures thinking and sustainability competencies, The Law Teacher, 50:3, 321-340, DOI: 10.1080/03069400.2016.1241048

To link to this article: https://doi.org/10.1080/03069400.2016.1241048

The Law Teacher, 2016
Vol. 50, No. 3, 321–340, http://dx.doi.org/10.1080/03069400.2016.1241048

Routledge
Taylor & Francis Group

The use of scenarios in legal education to develop futures thinking and sustainability competencies

Michelle Lim[a]* and Andrew Allan[b]

[a]*Lecturer, Griffith Law School, Griffith University, Gold Coast, Queensland, Australia;* [b]*Senior Lecturer, Centre for Water Law, Policy and Science, University of Dundee, Dundee, UK*

Achieving sustainability requires a populace equipped to deal with complex, interacting and ever-changing realities as well as uncertain futures. There is however a significant lack of focus on developing sustainability competencies within legal and governance education. Legal education plays a key role in shaping sustainable futures. Long-term sustainability relies on lawyers, judges and policy-makers being able to make optimal decisions in the present when faced with significant uncertainty about the future. This paper discusses how the combination of problem-based learning (PBL) and scenario-based pedagogical approaches can provide an authentic contextualised learning environment to empower law students to deal with the challenges of global change. The paper highlights the potential of the approach to equip students with the skills to work through plausible future challenges; to consider a range of options; and to manage interacting environmental, social and economic issues in an adaptive fashion. The paper describes how the approach was applied in the context of the Water Law Master's (LLM) course at the University of Dundee. The paper concludes with recommendations of how scenario-based approaches could be used in other contexts and further highlights the importance of such approaches in developing sustainability competencies through the legal curriculum.

1. Introduction

Achieving sustainability requires a populace equipped to deal with complex, interacting and ever-changing realities as well as uncertain futures. There are therefore growing calls for a reorientation of higher education towards sustainability in order to address the challenges of global change.[1] At the same time there is an emerging need for law and policy which are integrated, adaptive and forward looking. Despite this, the trend within higher education institutions is to place the development of sustainability expertise within the remit of environmental and life sciences. There is therefore a significant lack of focus

*Corresponding author: michelle.lim11@gmail.com

[1]M. Rieckmann, "Future-Oriented Higher Education: Which Key Competencies Should Be Fostered through University Teaching and Learning?" (2012) 44 *Futures* 127, p. 128.

on the development of sustainability competencies within legal and governance education.[2]

Legal education however plays a key role in shaping sustainable futures. The work of lawyers, judges and policy-makers (many of whom have come from a legal background)[3] can prohibit or legitimise particular environmental practices. Legal education is therefore highly influential due to its part in shaping these governance actors.[4]

Rieckmann stresses the important role that universities can play in shaping future societies through the generation of new knowledge while contributing to the development of key competencies. These competencies enable individuals to participate in socio-political processes that move society towards sustainability.[5] Given the important role that rules and institutions play in shaping these processes this further highlights the importance of incorporating sustainability awareness and futures thinking within the legal curriculum.

Sustainability education differs from environmental education as it not only needs to incorporate human equality and economic concerns in addition to environmental ones, it also requires building capacity to envision a better future.[6] A focus on sustainability in higher education should therefore enable learners to not only acquire and generate knowledge but also develop a "future-oriented and global perspective of responsibility" and an ability to reflect on the interconnected and complex nature of contemporary issues and the flow-on effects of decisions.[7]

Managing the future is however a "wicked" problem. The complex interdependencies and contradictory and shifting nature of the problem make it difficult or impossible to solve. There is no definitive formulation of the problem nor unequivocally "best" solutions.[8] Scenarios are therefore widely used in futures studies to create plausible narratives of the future. They provide a mechanism for thinking deeply and creatively about the future while preparing for multiple plausible futures.[9] The identification of multiple assumptions about the future facilitates contingency planning,[10] in part because it limits the virtually infinite range of possibilities and makes planning more feasible.

[2]N. Graham, "This Is Not a Thing: Land, Sustainability and Legal Education" (2014) 26 *Journal of Environmental Law* 395, p. 411.
[3]J. Pitt, "How a Law Degree Could Launch Your Career in Politics", *The Guardian*, 27 January 2015, https://www.theguardian.com/law/2015/jan/27/law-degree-politics-career (accessed 20 October 2016).
[4]Graham, *supra* n. 2, p. 395.
[5]Rieckmann, *supra* n. 1, p. 128.
[6]Rieckmann, *supra* n. 1, p. 129.
[7]M. Barth, J. Godemann, M. Rieckmann and U. Stoltenberg, "Developing Key Competencies for Sustainable Development in Higher Education" (2007) 8 *International Journal of Sustainability in Higher Education* 416, p. 416.
[8]P. Hjorth and A. Bagheri, "Navigating Towards Sustainable Development: A System Dynamics Approach" (2006) 38 *Futures* 74, p. 78.
[9]P. Bishop, A. Hines and T. Collins, "The Current State of Scenario Development: An Overview of Techniques" (2007) 9 *Foresight* 5, p. 5.
[10]Hjorth and Bagheri, *supra* n. 8, p. 78.

Problem-based learning (PBL) is an authentic learning pedagogical approach, which places a problem at the centre of the learning experience. The rationale is that by stimulating student curiosity in solving a particular problem, students develop skills to address real-world challenges while developing the ability for self-directed learning. PBL has been used in a range of disciplines and is increasingly widespread in law teaching. PBL has generally been geared toward legal practice.[11] It is however essential that law graduates are able to facilitate the further development of the law to address global environmental change while developing skills in legal drafting and an understanding of the effects of governance and institutional frameworks on legal effectiveness.

Through the use of scenario development methods and extending PBL, the approach discussed below aims to equip students with tools to manage uncertainty and to identify legal and institutional means by which to anticipate and manage possible future challenges. The approach also aims to promote interdisciplinary and long-term thinking about the responses required to address unprecedented contemporary and future challenges.

We first analyse how PBL approaches have been used in the legal curriculum. Through a subsequent discussion of scenario approaches in developing futures thinking we then illustrate the potential of scenario-based approaches within the PBL context to contribute to the incorporation of sustainability competencies into the law curriculum. We then describe how the process was carried out with Master's (LLM) students at the University of Dundee and the lessons learnt from this process. We conclude with recommendations of how scenario-based approaches could be used in other contexts and further highlight the importance of such approaches to achieve sustainability.

2. Problem-based learning (PBL)

PBL refers to "learning which results from the process of working towards understanding of, or resolution of, a problem".[12] With beginnings in medical education, the PBL approach is now used in multiple disciplines. Though the approach has become increasingly fluid and flexible through its use in varied contexts two concepts remain central. First, a problem is at the forefront of the learning process. Therefore, instead of starting by assisting students to master content, the focus is instead on a problem. It is the problem that provides the stimulus and starting point for learning. Second, PBL is student-centred. The

[11]R. Batty, "Well There's Your Problem – The Case for Using PBL to Teach Law to Business Students" (2013) 47 *Law Teacher* 243; J. Moust, "The Problem-Based Education Approach at the Maastricht Law School" (1998) 32 *Law Teacher* 5; M. Moskovitz, "Beyond the Case Method: It's Time to Teach with Problems" (1992) 42 *Journal of Legal Education* 241.

[12]H. Barrows and R. Tamblyn, *Problem Based Learning: An Approach to Medical Education* (New York, Springer Publishing Company, 1980) p. 1.

emphasis is on enabling students to acquire particular skills and information rather than the communication of expert knowledge from teacher to student.[13]

PBL aims to prepare students for continuing education and to help them to become effective problem solvers.[14] The approach enables students to learn to solve problems by finding, framing and analysing the issues themselves.[15] PBL begins with a problem presented as a catalyst for learning. This student-centred approach emphasises the process of students constructing knowledge for themselves and instead of simply reciting information they are forced to engage more deeply with the material.[16] Learning is self-directed, collaborative and dictated by the problem. Instead of an expert seeking to relay information through lectures the teacher has an altered role as a facilitator and helps students construct their own knowledge by working through the problem.[17] The approach provides a way for students to gain a proper grasp of legal concepts, the connections between various rules and their application to the dynamic and untidy problems of the real world.[18]

PBL approaches in the legal curricula are not novel. In the context of legal reform the problem method was presented in the Association of American Law Schools (AALS) 1942 report as a pedagogical device which "forces the law student to reflect on the application of pertinent materials to new situations".[19] The approach has also been adopted in the Maastricht Law School for the last 30 years.[20] The PBL approach in legal education is however predominantly practice oriented.[21]

The realities of global change require an extension of PBL objectives beyond the practice of law to the development of real-world skills for shaping the law. In combination with the scenario-based approach discussed below, PBL lends itself to equip learners with an understanding of the wider governance context necessary for the effective implementation of law while developing an appreciation of the importance of planning for a range of different futures.

3. Scenario development approaches

Scenarios are the archetypical product of future studies. They provide a mechanism for thinking deeply and creatively about the future while preparing for multiple plausible futures.[22]

[13]Batty, *supra* n. 11, pp. 249–250.
[14]Moust, *supra* n. 11, p. 5.
[15]Moskovitz, *supra* n. 11, p. 246.
[16]Batty, *supra* n. 11, pp. 251–252.
[17]J. Macfarlane and J. Manwaring, "Using Problem-Based Learning to Teach First Year Contracts" (1998) 16 *Journal of Professional Legal Education* 271–298, pp. 272–274.
[18]Batty, *supra* n. 11, p. 244.
[19]Moust, *supra* n. 11, p. 7.
[20]Ibid., p. 10.
[21]Batty, *supra* n. 11; Moskovitz, *supra* n. 11; Moust, *supra* n. 11.
[22]Bishop *et al*., *supra* n. 9, p. 5.

Recognising both the legal context in which we are working and the divergent understanding of scenarios,[23] which can be quantitative and qualitative, we adopt in this paper the van Notten definition, which describes scenarios as:

> Consistent and coherent descriptions of alternative hypothetical futures that reflect different perspectives on past, present and future developments, which can serve as a basis for action.[24]

In other words, scenarios are sets of narratives where each narrative describes a plausible future. A scenario-driven approach seeks to offset the risk of being unprepared for the uncertainties that the future holds[25] by limiting these uncertainties to their key elements and therefore circumventing the enormity of choice that can impede planning.[26] A sustainable future relies significantly on generations of students and subsequently decision-makers equipped with forward-looking mindsets. Scenarios therefore provide an ideal way for introducing futures thinking into the classroom.

4. The use of scenario-based approaches in PBL to develop sustainability competencies through legal education

Learning plays a fundamental role in achieving resilience in social-ecological systems.[27] Spellman cites multiple studies that indicate that investment in education builds human and social capital within communities and that these communities are better able to sustain themselves while responding to and shaping change.[28] She illustrates how imagining multiple possible paths for the future through the use of scenario development methods can enable individuals and societies to better comprehend the range of options while identifying priorities for action in order to plan for a better future. Spellman also suggests that the explicit practice of scenarios thinking in educational settings could enhance a person's willingness to engage in stewardship activities.[29] At the same time, Graham laments the intellectual insularity of the law and the

[23]See for example P. van Notten, J. Rotmans, M. van Asselt and D. Rothman, "An Updated Scenario Typology" (2003) 35 *Futures* 423, p. 424; Bishop *et al*., *supra* n. 9, pp. 6 and 25.
[24]P. van Notten, "Scenario Development: A Typology of Approaches", in OECD, *Think Scenarios, Rethink Education*, Schooling for Tomorrow (Paris, OECD Publishing, 2006) p. 70; P. van Notten, *Writing on the Wall: Scenario Development in Times of Discontinuity* (Universal Publishers, 2005) p. 7.
[25]Bishop *et al*., *supra* n. 9, p. 5.
[26]A. Allan and E. Barbour, "Integrating Science, Modeling and Stakeholders through Qualitative and Quantitative Scenarios", ESPA Deltas Working Paper No. 5 (2015).
[27]C. Folke, S. Chapin III and P. Olsson, "Transformations in Ecosystem Stewardship", in F.S. Chapin III, G. Kofinas and C. Folke (eds), *Principles of Ecosystem Stewardship: Resilience-Based Natural Resource Management in a Changing World* (New York, Springer, 2009) p. 121.
[28]K. Spellman, "Educating for Resilience in the North: Building a Toolbox for Teachers" (2015) 20 *Ecology and Society* 1, 46, p. 2.
[29]Ibid. p. 4.

lack of interdisciplinary engagement that traditionally characterises the discipline. She also points out that the separation of law's sub-disciplines often goes unchallenged. These traits are reproduced in legal education and thus form a barrier to adaptation by limiting opportunities to develop skills that draw connections between legal and other forms of knowledge as well as between law's sub-disciplines.[30] Scenarios are therefore a key tool in developing sustainability competencies in the legal curriculum and in education more widely. By facilitating the consideration of a range of possible future situations and interconnections beyond traditional legal and institutional silos the process also equips students with more comprehensive real-world understanding.

Meta-analyses and syntheses of PBL methods conducted over the last 20 years generally indicate that PBL approaches are more effective than traditional methods in developing professional and clinical skills.[31] The most recent of these studies suggest that PBL is also superior with regard to long-term knowledge retention.[32] Traditional teaching methods tend however to be better in terms of the acquisition of knowledge of the subject particularly in knowledge assessments conducted immediately post-course.[33] PBL fits within the constructivist theory of education practice where learners construct their own understanding of the subject through experience and reflection. The learner is an active agent that builds meaning as a response to the instructional situation and comprehension forms part of an active and constructive process.[34]

Self-directed learning and the ability to respond to changing contexts are essential skills required to grapple with complex sustainability issues. Long-term sustainability outcomes rely on decision-makers being able to make optimal decisions in the present when faced with significant uncertainty about the future. The combination of PBL and scenario-based pedagogical approaches provides an authentic contextualised learning environment aimed at empowering students to deal with the challenges of global change. Scenario-based approaches in a PBL setting are potentially of particular importance for the development of the "future-thinking" skills required to achieve sustainability. Such an approach will equip students with the skills to work through potential challenges; to consider a range of options; and to manage interacting environmental, social and economic issues in an adaptive fashion.

[30]Graham, *supra* n. 2, p. 409.
[31]M. Albanese and S. Mitchell, "Problem-Based Learning: A Review of Literature on Its Outcomes and Implementation Issues" (1993) 68(1) *Academic Medicine* 52; F. Dochy, M. Segers, P. Van den Bossche and D. Gijbels, "Effects of Problem-Based Learning: A Meta Analysis" (2003) 13 *Learning Instruction* 533–568; J. Strobel and A. van Barneveld, "When Is PBL More Effective: A Meta-Synthesis of Meta-Analyses Comparing PBL to Conventional Classrooms" (2009) 3(1) *Interdisciplinary Journal of Problem-Based Learning* 44–58.
[32]Strobel and van Barneveld, *supra* n. 31.
[33]Albanese and Mitchell, *supra* n. 31, pp. 57–58; Dochy *et al*., *supra* n. 31, p. 550; Strobel and van Barneveld, *supra* n. 31.
[34]Moust, *supra* n. 11, pp. 29–30.

The section below discusses the application of scenario-based approaches in a PBL context at the University of Dundee. The case study provides grounded analysis of the potential of the approach for developing sustainability competencies through the legal curriculum.

5. Case study: PBL and scenario-based approaches within the Water Law LLM at the University of Dundee

The approach adopted and described below emerged from an interdisciplinary project involving the authors – the ESPA Deltas project.[35] A significant part of the project involved bringing together expertise from the natural and social sciences, and linking these with priorities and preferences expressed by decision-makers with regard to issues concerning the environment, land and natural resource use, and livelihoods in a region of south western Bangladesh. The method applied to this task was based on the development of narrative scenario futures. Subsequent quantification of these texts transposed the narratives into a form that could be processed through mathematical modelling.

In mid-2014, the authors led the preparation and drafting of the "ESPA Delta Scenario Narratives". The scenario drafting process was strongly influenced by the views of stakeholders. The aim of the process was to develop plausible descriptions of three possible future scenarios that were mutually coherent and internally consistent.

Representative Concentration Pathways (RCPs) have been developed which describe four possible climate futures by reflecting four greenhouse gas concentration trajectories. The Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) adopted these RCPs in 2014. The IPCC recognises the importance of socio-economic scenarios to improve interdisciplinary analysis of climate change and response options. Therefore, in a complementary process at a workshop in Boulder, Colorado in 2011 a set of Shared Socioeconomic Pathways (SSPs) were agreed which provide a set of global narratives that set out five different plausible global socio-economic futures for the twenty-first century. These narratives are referred to collectively in this paper as the "Boulder Scenarios".[36]

The broad scope of the ESPA Delta scenarios was inspired by the Boulder Scenarios.[37] The starting point for the ESPA Delta scenarios was a consideration

[35]"Assessing Health, Livelihoods, Ecosystem Services and Poverty Alleviation in Populous Deltas" (NE/J002755/1), funded with support from the Ecosystem Services for Poverty Alleviation (ESPA) Programme.
[36]Ibid.
[37]See IPCC – Core Writing Team, R. Pachauri and L. Meyer (eds), *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (Geneva, IPCC, 2014). See also B. O'Neill, T. Carter, K. Ebi, J. Edmonds, S. Hallegatte, E. Kemp-Benedict, E. Kriegler, L. Mearns, R. Moss, K. Riahi, B. van Ruijven and D. van Vuuren, *Meeting Report of the Workshop on the Nature and Use of New Socioeconomic Pathways for Climate Change*

of how each of the global scale Boulder Scenarios[38] would play out in Bangladesh. Each of the ESPA Deltas narratives incorporates many elements. The first round of stakeholder meetings identified almost 100 separate components relating to food security, health and livelihoods, natural resource management and governance. The narratives that were developed as a result of this first meeting split these disparate elements into six broad categories: land use; water; international cooperation; disaster management; environmental management; and quality of life and livelihoods.

These elements were revised in the light of critical examination by 100 local experts and policy-makers. This process produced agreed descriptions of what Bangladesh might look like in 2050 in the form of "business as usual", "less sustainable" and "more sustainable" scenarios.

To frame preliminary discussions with stakeholders on the scenarios and to keep discussion within manageable limits, boundary conditions were imposed. These boundary conditions reflected credible assumptions regarding how certain elements of Bangladesh's climatic and hydrological circumstances might look in 2050, based on the best available simulated projections for the country. This process is described in detail in the ESPA Deltas Working Paper No. 5, and the full text of the scenario descriptions is set out in Appendix I of that document.[39] Appendix I of the current paper sets out the summarised narratives that were used in the Water LLM.

When introducing scenarios in the context of PBL in the Water LLM at the University of Dundee, the plausible futures described for Bangladesh formed the basis for discussions regarding the suitability of the legal and governance situation in the country. These discussions led to analysis of the reform needed to achieve a desired future. Students were provided with summarised versions of the official ESPA Deltas narratives. These summaries reflected a particular focus on water. Most references to changes that need to be made to water resources legislation were removed and narratives were renamed A, B and C (instead of the "less sustainable", "business as usual" and "more sustainable" titles of the official narratives). The titles were changed so as not to influence student thinking in the examination of each of the plausible futures.

Students were also given relevant baseline legislation consisting of the Environment Conservation Act,[40] Environment Conservation Rules,[41] Canals Act,[42] Embankment and Drainage Act,[43] Groundwater Management Ordinance[44]

Research, Boulder, CO, November 2-4, 2011 (2012): https://www2.cgd.ucar.edu/sites/default/files/iconics/Boulder-Workshop-Report.pdf (accessed 1 December 2015).
[38]O'Neill *et al*., *supra* n. 37.
[39]Allan and Barbour, *supra* n. 26.
[40]Environment Conservation Act 1995 (Bangladesh).
[41]Environment Conservation Rules 1997 (Bangladesh).
[42]Canals Act 1864 (Bangladesh).
[43]Embankment and Drainage Act 1952 (Bangladesh).
[44]Groundwater Management Ordinance (1985) Bangladesh.

and the Water Act.[45] The relevance of the legislation provided was determined by the influence each piece of legislation had on water resources management (e.g. quantity, impoundments, quality and land use). Students were informed that Bangladesh is a riparian rights jurisdiction and were provided with an outline of the current political and institutional context (see Appendix II) and maps of the Ganges-Brahmaputra-Meghna (GBM) basin and of Bangladesh.

Two groups were chosen in class by splitting the room in two. Students were given a week to prepare and were given the following instructions:

> Each group represents the Government of Bangladesh (GoB) in the year 2015. Your Ministries have conducted extensive interdisciplinary stakeholder and expert consultations to develop 3 plausible futures for Bangladesh in the year 2050 (i.e. the scenario narratives). The futures are not predictions, but merely snapshots of what the future could look like. Over the coming week you should:
>
> (1) Familiarise yourselves with the scenario descriptions and the institutional background document. You should go through all the relevant legislation bearing in mind that this is based on a riparian rights foundation, and identify the gaps and problems in the existing legislation and institutional context;
> (2) Determine the legal, institutional and governance changes that need to take place in order to maximise the positive aspects and minimise the negative elements of each of the 3 scenarios.
>
> You will be provided with additional instructions in class. We recommend that you meet as a group to prepare and to allocate reading of legislation between you.

On the day of the class students were provided with climatic information, but with no detail as to the likely impact of this on the narratives they already have. The climatic information provided consisted of an assumed temperature rise of two degrees; sea-level rise of 0.25m; fewer wet days per year (i.e. more frequent dry spells and increased drought risk); more frequent heavy rainfall; greater risk of flood events; increased frequency and intensity of cyclones; increased freshwater flows into Bangladesh resulting in higher maximum flows and lower minimums.

Students were given 1.5 hours to work through the scenarios and the legislation to prepare a presentation on how they would amend the existing legal, institutional and governance framework to maximise positive components of the described futures while minimising the negative components within these futures. At the end of the time a representative from each group presented the group's work to the class and responded to questions

[45]Water Act 2013 (Bangladesh).

from the other group and the authors. The session concluded with a group discussion which included consideration of how their answers would differ if they were asked to consider economic development instead of livelihoods; areas where livelihoods and environmental protection could both be accommodated; questions of equity and who the winners and losers in each of the narratives are; other issues that need to be considered in the interests of sustainability; and how answers would differ if they were focused on a different sector. Feedback forms were provided and students completed these in detail at the end of the class.

Reflections on the class

The students arrived well prepared and there was a good level of discussion within the groups. It was interesting to observe the different approaches taken by the two groups. The first group inferred a causal link between the effectiveness and appropriateness of the legal and institutional frameworks and the desirability of outcomes within each of the scenarios presented. Scenario A presented a much rosier future and Scenario C a much bleaker one. Scenario B lay somewhere in between. The first group therefore inferred that the legal and institutional frameworks in Scenario A were working but not so in Scenario C. In contrast, Group 2 examined the tools provided in existing legislation and aimed to extrapolate how these might be used in the future. Both groups concluded that enforceability and enforcement of legislation and the transparency and accountability of the governance frameworks were crucial to determining likely potential futures.

Student feedback was overwhelmingly positive. In both the feedback forms and in person, students commented that while they found the exercise challenging they appreciated the opportunity to "do something different"; to "engage with law in a way that makes a difference"; to "consider a wide range of issues at once" and to have a tool they could use in their future careers which would enable them to consider a wide range of options. Other comments included that the consideration of cross-sectoral issues and legislative enforcement and effectiveness had broadened their thinking about how different parts should interact and how this often fails to happen.

Neither group conducted sufficient analysis of the relationship between livelihoods and environmental protection. Group 1 did however address economic development in more detail than the second group. There was limited consideration of riparian rights issues.

Improving future classes

Student approaches to tackling the task suggest that in the future, clearer instructions should be given as the issues provided did not get the traction we were hoping for. Instructions should also specifically ask for the gaps and

problems in the legislation to be addressed in detail in the presentations. As we did not include these specific instructions the students' appraisal of the legislation was rather favourable. It is possible that the favourable assessment of the legislation stems from student experience with legislation up to this point in their careers where law students are not generally asked to challenge legal texts. Specific instructions to critique the legislation could therefore also promote critical thinking skills.

On reflection, when running this course in the future further thought should be given to the composition of the student groups. One of the two groups was made up entirely of students from a civil law background and who had only just started their master's course a couple of months beforehand. The other group consisted of students who were advanced in their programme. Greater attention should therefore be paid to the composition of groups in future classes.

6. How do I introduce scenarios into my classroom?

The application of the scenario-based approach within the Water LLM at the University of Dundee benefited significantly from narratives developed as part of the ESPA Deltas project in Bangladesh. The use of the ESPA Deltas scenarios as a pedagogical tool illustrates the benefits of thinking creatively to enable research outcomes to be incorporated into teaching. We provide below a few strategies that could be employed by law teachers keen to introduce futures thinking into the classroom but who have yet to develop narratives of possible futures or do not have the time or experience to do so.

Using the "Boulder" Scenarios

As indicated above, the narratives presented in the Water LLM at the University of Dundee were modelled closely on the global level Boulder Scenarios. The Boulder Scenarios therefore provide an excellent resource for the use of scenarios in law teaching. Law teachers could for example use the Boulder Scenarios as a backdrop against which to consider national or local issues. They could also be used directly to assess the adequacy of existing international legal and institutional frameworks to address the issues presented in a range of plausible futures.

The use of the Boulder Scenarios in this manner finds support from van Vuuren *et al.* who appreciate the place of tailor-made scenarios through individual studies but explain that shared scenarios among the research community could provide a valuable resource for researchers who are unable to or prefer not to develop their own narratives. At the same time the use of common scenarios facilitates integration across disciplines and integrated research questions.[46]

[46]D. van Vuuren, E. Kriegler, B. O'Neill, K. Ebi, K. Riahi, T. Carter, J. Edmonds, S. Hallegatte, T. Kram, R. Mathur and H. Winkler, "A New Scenario Framework for Climate Change Research: Scenario Matrix Architecture" (2014) 122 *Climatic Change* 373, p. 374.

Interdisciplinary collaboration within institutions

Graham stresses that in order to address the current environmental crisis it is essential to tackle the problems created by the fragmentation of knowledge and information systems.[47] She emphasises the importance of recognising, researching and teaching the links between law and non-law disciplines with regard to environmental decision-making.[48]

Law teachers seeking to use case-specific scenarios, such as those alluded to by van Vuuren *et al.*,[49] could partner with other disciplines to co-produce specific scenario narratives. Departments in the disciplines of geography, economics or business would likely contain the necessary expertise and experience in developing these narratives. The introduction of scenarios into the legal classroom thus also provides a means by which to promote interdisciplinary collaboration.

7. Conclusions

Scenarios offer an invaluable tool for planning for the uncertainties of our future. Their introduction into the legal classroom provides a way to equip the next generation of lawyers, lawmakers and decision-makers with a means to minimise potential negative components of possible futures while planning for and shaping a governance trajectory most likely to maximise the potential positives. Scenarios can enable future thinking in law graduates and provide them with an appreciation of the need to consider what the law should be rather than accepting what the law is.

Graham argues that sustainability-focused legal education reform would enable the institution of law to shift from a negative influence on the adaptive capacity of society to a positive one.[50] To achieve this she stresses that law teachers need to facilitate connections between categories of law to enable students to view the legal system as an integrated whole.[51] The use of scenarios in the PBL context facilitates cross-sectoral and interdisciplinary thinking. It urges students to consider factors beyond legal texts such as the socio-economic and physical environment as well as the institutions necessary to facilitate effective implementation of the law now and in the future. The approach also stimulates reflection on what improvements are required in contemporary legal and institutional structures and consideration of how future frameworks could be designed.

As indicated above the use of scenarios and projections is not limited to considering environmental issues. The approach can be adapted to areas such as economics, finance and social science and is likely to be particularly

[47]Graham, *supra* n. 2, p. 410.
[48]Ibid., p. 411.
[49]van Vuuren *et al.*, *supra* n. 46, p. 374.
[50]Graham, *supra* n. 2, pp. 397–398.
[51]Ibid., p. 411.

important in areas of law where policy decisions may need to be taken in response to a multitude of external influences and factors. For example property lawyers needing to understand possible impacts of sea-level rise and resource use benefit from this forward-looking approach. There could be implications for the development of torts law as the failure to mitigate climate change and environmental deterioration could give rise to a failure of governments to meet the duty of care owed to current and future generations. As global change in general and global environmental change in particular will likely require responses today to a range of uncertainties the introduction of scenarios and futures thinking would be an invaluable introduction to the law curricula in a range of areas including but not limited to international law, human rights and areas of law related to risk and planning as well as resource use in areas such as energy, water and food security.

The future is uncertain. The development of sustainability competencies among law graduates is therefore essential to ensure that they are equipped to address a range of possible futures. The overall benefit of the approach we have presented is in its capacity to nurture forward-looking future lawmakers, practitioners and scholars while providing these law graduates with a specific problem-solving tool to explore and plan for multiple aspects of the future while making choices today which hedge against future risk.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This work is based on findings from the 'ESPA Deltas; Assessing Health, Livelihoods, Ecosystem Services and Poverty Alleviation in Populous Deltas' (NE/J002755/1) project which was funded with support from the Ecosystem Services for Poverty Alleviation (ESPA) programme. The ESPA programme is funded by the Department for International Development (DFID), the Economic and Social Research Council (ESRC) and the Natural Environment Research Council (NERC).

Appendix I. Three scenario narratives provided to students

Legal frameworks for water management

Scenario narratives

Three scenarios have been prepared, describing *possible* futures in Bangladesh in the year 2050. They consist of a mixture of positive and negative elements, and none purports to be more plausible or likely than the others.

Scenario A

Land use

Cultivated areas continued to be dominated by rice, but diversification of crops, especially the more intense cultivation of cash crops, driven by better access to markets (local and international) and effective agricultural extension and educational outreach, has flourished. The environmental impact of shrimp cultivation has decreased substantially in extent due to the adoption of more sustainable techniques. Investment in agricultural research and development, along with adoption of more climate-smart agricultural techniques, has bolstered the use of high yield varieties and more salt-tolerant varieties because of the need to reduce the area under crops, in the interests of environmental protection and natural flood defence.

This pressure to reduce or at least maintain no more than existing levels of agricultural land has been helped by the general stabilisation in population numbers and continuing (if slightly reduced) rural–urban migration. The proportion of urban against rural populations has risen steadily, thereby increasing the need for greater intensification of agriculture, a process that has not been alleviated by the global marketplace.

Greater intensification of agriculture has led to a slight deterioration in soil quality parameters. This has been offset by special development programmes that have produced new crop varieties that are suitable for coastal areas and less hazardous to soil health. The proportion of chemical fertilisers and pesticides used has declined compared to organic manure and integrated pest management.

Coastal protection has been extended, mainly through the efforts of the Delta plan, using a mixture of structural and non-structural options. Better zoning and monitoring of land use change have been beneficial, and the quality of land use management is now one of the key factors in the management of water use. Conflict over land use, including over ownership rights, has been very much reduced, due mainly to improvements in transparency and accountability through the land ownership cadastre and significant improvements to the local judicial hierarchy.

Water

Surface water flow patterns in the Ganges and Brahmaputra rivers have varied over time, the arrival of the monsoon has become less predictable and periods of drought extended due to the impacts of climate change. With better coordination between the states riparian to these rivers however, management of water resources in Bangladesh has been able to make progress. The application of efficient land and water management practices and effective enforcement processes in India have enhanced predictability and availability of flow into Bangladesh and reduced levels of industrial and nutrient pollution.

Similar progress has taken place in Bangladesh: advances in communications technology provide regulators with detailed knowledge of river flow, level and quality in real time, with sophisticated modelling ability aiding the regulation of water use management.

The successful achievement of the Millennium Development Goals, and subsequent iterations, has created a society where the vast majority of the population have access to piped water in their homes and improved sanitation facilities. This improvement in drinking water availability, combined with the use of deeper aquifers in many places has helped people avoid the problems associated with consumption of saline and arsenic-contaminated water. There has been a major focus on conjunctive management of surface water and groundwater. Adequate upland flow has been ensured in water

channels through the construction of the Ganges Barrage that has helped preserve the coastal estuary ecosystem threatened by seawater intrusion.

As part of the general improvement in the management of water resources, principles of subsidiarity have been applied such that local management of water takes better account of upstream and downstream needs. Cooperation between these has therefore improved, helped by the cross-sectoral management of water resources as a whole and effective compliance monitoring. Levels of conflict between users and sectors, and justiciable disagreements have consequently fallen.

International cooperation

Detailed multi- and bi-lateral treaties have been agreed by GBM basin states addressing water issues, closely linked to agreements on trade and energy distribution. Independent management authorities are in place, with detailed compliance and reporting requirements, and national legal and policy frameworks work to effect these agreements.

Environmental management

Mangrove forest cover has been maintained in the Sundarbans at the levels seen earlier in the century. The result has been an increase in terrestrial and aquatic biodiversity as the mangrove belt has expanded along the coast. The forest has benefited from improvements in water quality, but the balancing of livelihood maintenance for those living in the vicinity, and protection of biodiversity, remains problematic.

Soil and water health has increased overall, driven by improvements in water quality and the use of state-of-the-art agricultural techniques. Although saltwater intrusion remains problematic, better surface/groundwater management and improved polder maintenance has helped to keep this in check.

Quality of life and livelihoods

Standards of education in the countryside have leapt exponentially, especially for females. This, coupled with agricultural intensification and the managed expansion of decentralised urban hubs, has perpetuated general levels of migration away from the countryside. The gradual erosion of the traditional village and regional hierarchies and power structures has opened up a wide variety of possible livelihood alternatives for those in the case areas. The principal agents of this erosion have been the astonishingly rapid development of mobile technology (providing greater visibility for those working against the law), more effective enforcement mechanisms resulting from economic development, and improvements in educational ability stemming from enforced mandatory standards.

Scenario B

Land use

While the rate of change in land use has risen, there has been a gradual move to increased diversification of crops, for example to include more wheat and more vegetables, with continuing increases in shrimp production. Due to improvements in cultivation techniques (following decent hikes in the level of investment in research and

development), more efficient use of fertilisers and pesticides, more targeted subsidy programmes and the use of high-yield varieties, yield per hectare for all crops has increased. Consequently, although cultivated areas given over to rice have decreased, overall production has risen.

Reductions in the level of resource conflict, between farmers and fish-farmers for example, along with the enhanced role of agricultural extension officers and more integrated rice/fish farming, provide positive contributions to increasing farm yield, along with higher levels of understanding of appropriate techniques on the part of farmers. Overall, these have the effect of cancelling out the detrimental impact of the changes in seasonality that have been experienced. Less helpfully, the combined effect of more intensive land use and patchy environmental management compliance has been an increase in land degradation.

The extent of coastal defence infrastructure has been enhanced, and natural flood barriers, such as the mangrove forest, have been slightly reduced in extent. Regulation of land use, including for flood plain and sectoral use zoning, has improved, as have levels of central and devolved planning capacity.

Water

Improvements to the technology used for irrigation have been driven in part by a reduction in the amount of water coming down from India, with some reductions in predictability of availability and water quality. Predictability and availability are affected in part by increased river regulation in Nepal, India and China with water pollution levels being driven by a combination of lower flows and higher levels of upstream industrial pollution. These improvements in irrigation have been to some extent offset by a significant overall increase in the use of water for agriculture.

As a result of the decreasing flow in cross-border rivers, accretion is increasing, with erosion also increasing in the upper reaches of the delta.

International cooperation

Maintaining these levels of cooperation has not been aided by a deterioration in the extent to which basin states on the Ganges and Brahmaputra rivers are cooperating, both with respect to water and in relation to trade. This is one of the most significant drivers of the reduction in transboundary flows.

Environmental management

After decades of reasonably stable forest cover, the mangrove forest in the case area has suffered a small degree of encroachment. With reduced levels of water flow and increasing use of agricultural fertilisers across the country, for example, water quality has deteriorated to a certain extent, with governance capacity having improved to some degree but not sufficiently to control diffuse pollution. Improvements to water supplies have not been quite adequate to compensate for this, and consequently levels of water-borne diseases have risen slightly. Protection of biodiversity has been detrimentally affected by a government focus on economic development though efforts by civil society groups to remedy this have been stepped up.

Quality of life and livelihoods

Progress in the availability of mobile communications has enhanced awareness of legal rights and obligations, and improved access to information to a great degree. Enforcement of these rights has improved slightly, in line with some advancements in local enforcement capacity (through better local government empowerment), though these are somewhat restricted by a lack of progress on the capacity of local courts to process claims.

Scenario C

Land use

Areas that were formerly cultivated have been given over to a mixture of saltwater shrimp and to a lesser extent, rice, respectively serving the export market and local consumption needs of subsistence farmers. Freshwater prawn production has decreased. Saltwater shrimp production has taken increasingly large shares of cultivable land, pushing subsistence farm land into areas more vulnerable to inundation and less protected by coastal engineering infrastructure. More intensive rice cultivation is characterised by high levels of fertiliser use, although yields per hectare have not risen as fast as they might because R&D priorities have focused on producing shrimp for the richest nations.

Inter-sectoral cooperation (e.g. between fishermen and farmers) is on the decrease, and intra-sectoral conflict between the owners of industrial farming concerns (and their tenant farmers), and subsistence farmers is growing. Scarcity of available secure land and the difficulty in obtaining clean water for irrigation from reduced water resources exacerbate disagreements. Agricultural extension officers prioritise the production of exportable crops, leaving subsistence farmers struggling to take advantage of new techniques and subsidies, and subject to heightened levels of insecurity as seasonal cropping patterns change with the climate.

In addition to the encroachment of saltwater shrimp production, mangrove forests have been slowly sacrificed to commercial agriculture, salt pans and unplanned urban spread, as a result of a combination of the government need for hard currency, increasing soil and surface water salinity, and population migration from rural poverty. Vulnerability to flooding has therefore increased as natural barriers have been removed and existing embankments are poorly managed due to lack of financial resources and sectoral conflicts. While floodplain and land use zoning is in place, implementation levels are low because of a lack of enforcement.

Water

Water resources have decreased significantly as a result of a combination of a number of factors: the rapid development of construction upstream for the purposes of energy production, flood alleviation and irrigation schemes; the impact of the now fully implemented Inter-linking Rivers Project in India, conveying water from the Brahmaputra and Ganges to drier parts of the country; and large-scale transfers from the Brahmaputra river in China to provide water for northern irrigation schemes and domestic consumers in Beijing. The efficiency of industrial agricultural irrigation is high, but this is heavily reliant on the unregulated use of groundwater (driven in part by energy subsidies that fuel pumping), necessary because of the lack of surface water flow and the need to access higher quality water untainted by polluted surface water.

The spread of unplanned urban settlements, especially in Dhaka, driven by population growth in the country as a whole and by out-migration from coastal areas, has adversely affected water quality downstream as a result of a lack of sewage treatment works. Early advances in achieving development goals have been undermined by this population growth. Although economic gains have to a certain extent continued, they have not been sufficient to counteract changes in population patterns and location.

Levels of cooperation between upstream and downstream districts have decreased within Bangladesh, mirroring the rise in inter-sectoral conflict between land and water users. As land use ownership patterns have moved to a greater proportion of tenant farmers, local water management institutions have found themselves toothless and ineffective, with longer term management decisions being compromised by short-term priorities.

International cooperation

Cooperation in terms of access to global markets has increased in some ways, although exports are very much higher than imports. Cooperation at the more regional level has however deteriorated, with basin co-riparians in direct competition with each other, especially with respect to agricultural commodities. This has destroyed efforts to manage regional watercourses at the basin level, with corresponding impacts on the amount of freshwater flowing into Bangladesh. Remaining basin-level governance efforts are focused on maintaining flows needed for commercial agriculture and aquaculture.

Environmental management

Water quality has been detrimentally affected by the relatively low surface water flows coming into Bangladesh and diffuse pollution as a consequence of the liberal use of fertilisers both upstream and in Bangladesh itself. This has been compounded by the effluent resulting from the expansion of unplanned informal settlements. Encroachment in areas previously covered by mangrove has continued, with commensurate effects on biodiversity and the capacity of supporting ecosystem services. Civil society efforts to combat loss of biodiversity have been dissipated by a lack of inter- and intra-sectoral coherence, although the incidence of poverty has been responsible for an increase in the numbers of CSOs. Fish stocks in coastal rivers are under severe pressure, as are coastal fisheries, partly as a result of irresponsible shrimp farming methods and partly because of poor regulation and enforcement.

Levels of water-borne diseases have risen because poorer families have little alternative to using contaminated surface water for domestic use: groundwater levels have fallen below the limits of cheap pumps, and saltwater intrusion is common.

Quality of life and livelihoods

Population levels in the case areas have not changed drastically in recent decades, but this is only because higher fertility levels have been offset by stubbornly high mortality rates and the marked increase in outward migration. Livelihood sources also have not changed greatly, though the number of older

tenant farmers has risen, as people of working age have moved to industrial farms for employment, leaving the young and old behind. Remittances from family members who have moved abroad or to urban centres have diminished, but the capacity of the land to support the growing population, coupled with climate-driven changes in cropping cycles has meant that such migration has become a necessity.

Appendix II. Description of the governance context

The political and institutional context

The upstream political context

There are no basin-level agreements in place on any of Bangladesh's transboundary rivers. Data sharing between India and Bangladesh takes place only in the flood season. Bangladesh is trying to encourage the formulation of a basin agreement but India is not prepared to do so. India continues its practice of only concluding bilateral agreements.

National political context

Though the separation of powers is provided for in the Constitution, this is not observed in practice. The polarised political context and the excesses of executive power have a significant impact on government function. The lack of checks and balances results in the undue executive influence in the judicial and parliamentary arms of government. The politicised public service restricts the implementation of accountability measures and creates a further barrier to the formulation and implementation of policy and legislation.

The Parliament of Bangladesh, the Jatiya Sangsad (JS), has become a vehicle for passing government sponsored bills without public debate. The key weaknesses of Parliament are the lack of discussion, debate and scrutiny of proposals put forward by the executive. The executive controls the legislative agenda with the support of the Prime Minister and cabinet. The Parliament is therefore ineffective as an accountability institution to monitor government actions and the misuse of power. The ruling party's denial of opportunity to the opposition to criticise the government is one of the reasons why the opposition engages in long boycotts of the Parliament.

The justice and law enforcement sectors are consistently referred to as the two most corrupt in Bangladesh. Lack of resources, capacity constraints and political influence are the key causes of corruption in the judiciary. Inadequate salaries, poor working conditions, inadequate budgets, unreasonable workloads and lack of training opportunities all contribute towards eroding the morale and ethical standards of members of the judiciary and the police force and create incentives for corruption. The administration of justice is under-funded, painfully slow and inefficient.

Institutional context

Laws and institutions rarely include cross-cutting issues and are often confined within sectoral boundaries. There is a lack of integration and coordination between government ministries and departments and the relationships are often hostile. This is compounded by a fragmented legal regime and inconsistencies within laws and regulations.

Weaknesses in government planning structures in combination with the heavy reliance on donor funding result in donor initiated projects that are not directly related to national goals and policies.

The lack of enforcement, financial and technical capacity has a severe impact on implementation and management in Bangladesh. The effectiveness of legislation is compromised by the lack of enforcement. References to participatory approaches are increasingly appearing in policy documents and legislation. There is still the lack of meaningful participation of poorer members of society aggravating the marginalisation of the poor.