

CUMULATIVE EFFECTS RESEARCH: ACHIEVEMENTS, STATUS, DIRECTIONS AND CHALLENGES IN THE CANADIAN CONTEXT

BRAM NOBLE

*Department of Geography and Planning
University of Saskatchewan
Saskatoon, Saskatchewan, Canada
b.noble@usask.ca*

Received 13 November 2014

Revised 15 January 2015

Accepted 20 January 2015

Published 25 March 2015

This paper reflects on the state of cumulative effects research in Canada and future directions and challenges. The assessment and management of cumulative effects has been an enduring theme in the impact assessment literature, and scholars have consistently identified the challenges to assessing and managing cumulative effects under regulatory, project-based impact assessment. Current research on cumulative effects is focused largely on the development of frameworks and methodologies to advance cumulative effects assessment and management from individual projects to broader regional scales, and on developing the science and tools for assessing and monitoring cumulative effects. Ensuring that scholarly research continues to shape cumulative effects practice in the future requires that scholars not only attempt to improve practice under current existing regulatory processes, but also push the boundaries to ensure that decision processes also evolve so as to be accommodating of new and innovative approaches to cumulative effects at regional scales. This requires interdisciplinary approaches and sustained research funding, both of which present practical challenges to scholars, and research programmes that are developed in collaboration with industry, governments and communities.

Keywords: Cumulative effects; research; innovation.

Introduction

Over the past 40-plus years scholars have directed their attention to various aspects of impact assessment (IA), including participation, follow-up, indigeneous engagement, privatised agreements, and IA effectiveness. Research has focused on a range of sectors, from energy to forestry, and tackled practice- and theory-based challenges. Amongst the enduring themes in IA research, and one that has gained considerable attention from practitioners, regulators, and communities, is that of assessing and managing cumulative effects (CE). Cumulative effects have gained much attention from the international scholarly community in recent years (e.g. [Wärnbäck and Hilding-Rydevik, 2009](#); [Franks *et al.*, 2010](#); [Weiland, 2010](#); [Cooper, 2011](#)), particularly since the emergence of strategic environmental assessment ([Bragagnolo *et al.*, 2012](#)). In the North American context, however, cumulative effects has a long tradition in both research ([Beanlands and Duinker, 1983](#)) and practice ([CEARC, 1988](#)). In Canada, cumulative effects have long been one of the most contested aspects of IA, and recently the weapon of choice for those opposed to project development.

[Fischer and Noble \(2015\)](#) argue that is time to take stock of IA research to date in order to achieve a better grasp of achievements and gaps and, in doing so, further understand what makes IA effective. This paper reflects on the state of CE research in Canada and future directions and challenges. Addressed in this paper are not the *only* areas of CE research, and this paper is certainly not comprehensive of the works of all CE scholars. The issues addressed are a reflection of my own experiences in the field, a product of discussions with colleagues, and a review of the scholarly literature.

Achievements: What we Know that we Know

The foundational principles of CE were established in the 1980s through the pioneering work of [Beanlands and Duinker \(1983\)](#), and expanded throughout the 1990s by scholars from diverse fields. Scholars have advanced CE principles, frameworks and applications in social assessment ([Mitchell and Parkins, 2011](#)), wildlife management ([Gunn *et al.*, 2014](#)), aquatic systems ([Squires and Dubé, 2012](#)), and land-use planning ([Noble, 2008](#)) to name a few. Multiple CE tools and approaches have also been developed, including scenario-based modelling ([Francis and Hamm, 2011](#)) and risk-based methods ([Dubé and Munkittrick, 2001](#)).

As CE research and IA practice have evolved, a consistent theme in the scholarly literature is the challenges to assessing and managing CE under regulatory, project-based IA. Through empirical research across multiple jurisdictions

and sectors, scholars have identified several challenges to CE practice including a focus on project approval rather than sustainability (Duinker and Greig, 2006); the poor use of science in regulatory IA (Seitz *et al.*, 2011); the lack of consistency in ecological indicators (Ball *et al.*, 2013); and limited attention to socio-ecological thresholds (Parlee *et al.*, 2012). Scholars from *outside* the IA community (Schindler and Donahue, 2006) have warned about the dangers of the current approach to CE management, and scholars *inside* the IA community tend to agree that the approach to CE, under current IA, may be doing more harm than good (Duinker and Greig, 2006).

Status and Impact of Current Research

In response to these challenges, research appears to be unfolding on two fronts. First, scholars are focusing on the development of frameworks and methodologies to advance CE practice from the project to the regional scale (Gunn and Noble, 2009; Fidler and Noble, 2013). The concept of regional CE is not new, promoted by the Alberta Society of Professional Biologists in the mid-1990s (Kennedy, 1995). A recent federal government report (Noble, 2013) also identifies multiple regional frameworks across Canada focused on various aspects of CE assessment, management and monitoring. With release of the *Canadian Council of Ministers of the Environment* (2009) guidance on strategic assessment, regional frameworks for CE have gained considerable momentum, including in Alberta's oil sands (Johnson *et al.*, 2011), in British Columbia's Elk Valley (see www.elkvalleycemf.com), and in Ontario's mineral-rich "ring of fire" (Chetkiewicz and Lintner, 2014).

Second, scholars are tackling the basic science requisites for understanding CE (Greig and Duinker, 2011; Seitz *et al.*, 2011; Ball *et al.*, 2013), and developing and testing new methods and tools for CE assessment and monitoring (Dubé and Munkittrick, 2001; Squires and Dubé, 2012). There are several CE science-based research and monitoring initiatives across Canada, most led by university researchers but often in partnership with industry, communities and governments. One example is the Canadian Watershed Research Consortium, under the Canada Water Network (<http://www.cwn-rce.ca/>). The initiative supports six research nodes across the country, consisting of partnerships between stakeholders, decision makers and researchers, for the purpose of developing practical CE monitoring frameworks. A major challenge, however, is that the science of CE and the planning frameworks to support CE management have advanced in silos (Schindler and Donahue, 2006).

Future Directions

The scholarly community has made significant progress in establishing the foundations of CE, evaluating and reporting on practice, and developing the frameworks and science to advance CE understanding. That said, there are at least four key areas that require more attention if research is to have continued influence on shaping future practice.

First, scholars must not lose sight of regulatory practice. Whilst advancing regional CE approaches is necessary, proponents are still required, under regulatory IA, to assess the CE of their projects. Researchers have provided much more criticism of practice than guidance on how to improve practice within the constraints of the regulatory system — a system that has existed for decades and is unlikely to change any time soon. What is practicable under project-based IA, and what represents a reasonable standard of CE practice for project proponents, needs further consideration by the scholarly community.

Second, research to support the evolution of CE assessment and management cannot occur in isolation of decision making processes. [Hegmann and Yarranton \(2011: 486\)](#) argue that “in pursuing the future evolution of CE [assessment], we must ‘go beyond CE [assessment]’ by avoiding its isolation as a stand-alone product and instead embrace its inclusion within the halls of public decision making.” Researchers must do more than argue the need for better CE assessment; it must test decision making processes and explore the legal and regulatory options to link-up regional CE with other instruments that support or inform decisions, including project-based IA and land use policy and planning provisions.

Third, research is needed on the capacity to implement and sustain CE programmes. [Parkins \(2011\)](#) described CE programmes in Canada as “short-term bursts of activity” and “short-lived organisational commitments.” Many regional CE initiatives fail at the point of implementation ([Noble, 2008](#)), or lose the long-term support of those involved ([Lawe et al., 2005](#)). Some research has emerged on the capacity for regional CE initiatives (e.g. [Sheelanere et al., 2013](#)), but it has not been expanded to address broader governance issues, providing guidance for the long-term viability of CE programmes.

Finally, there is an opportunity to shape practice as it unfolds. There are several regional CE initiatives that are either unfolding or at the early stages of development (e.g., British Columbia’s CE framework; Alberta’s regional strategic assessment for the oil sands; and regional assessment in northern Ontario). Researchers must become engaged in the development and implementation of such initiatives, bringing to practice the lessons learned from cases reported in scholarly literature. This requires a scholar-practitioner model, whereby scholars work

alongside practitioners in the development and implementation of new CE programmes, treating them as long-term experiments or living laboratories.

Research Challenges

There are several challenges to ensuring influential CE research; noted here are certainly not the only ones. First, IA is a scholarly discipline and a professional practice. Impactful research thus requires attention to IA policy and practice, and cooperation with industry, regulators, and/or communities. This can be challenging given that much of the research stemming from universities is conducted, in part, by graduate students as part of their training programmes, which does not usually involve a practice or engagement component. It is also difficult when proponents, regulators and communities have different demands or expectations about CE, and the socio-political environment in which CE assessment unfolds can be highly adversarial.

Second, the future of CE assessment as a tool to assist decision-making “is dependent on the evolution of decision making to make better use of it” (Hegmann and Yarranton, 2011: 489). Researchers must push the boundaries of institutional arrangements to shape future directions and, ultimately, better practice. Interdisciplinary research that bridges the social and natural sciences is critical to ensure mutual advancement in CE tools and the decision-making processes that make use of the knowledge generated. A significant constraint is that the major funding bodies established to support university-based research, the Tri-Agencies (Natural Sciences and Engineering Research Council, Social Sciences and Humanities Research Council, Canadian Institute for Health Research) are highly siloed and thus discouraging of truly integrative research agendas.

Finally, it would be dismissive not to address the challenges of securing sustained research funding. Notwithstanding an increase in the base budgets of the Canadian Tri-Agencies under the 2014 federal budget, funding success rates are low. Between 2010 and 2014, for example, Tri-Agency funding success rates for social science scholars ranged from 17 to 37%.¹ This is not an excuse for any lack of IA research output or impact, but it does mean that scholars need to be creative in securing research funding to support their work; this includes building enduring research partnerships with industry, governments and/or communities.

¹Based on Social Science and Humanities Research Council of Canada programme statistics for Insight, Insight Development and Standard Research grants. Available at <http://www.sshrc-crsh.gc.ca/results-resultats/stats-statistiques/index-eng.aspx>.

References

- Ball, MA, BF Noble and MG Dubé (2013). Valued ecosystem components for watershed cumulative effects: An analysis of environmental impact statements in the South Saskatchewan River watershed, Canada. *Integrated Environmental Assessment and Management*, DOI: 10.1002/ieam.1333.
- Beanlands, GE and PN Duinker (1983). *An Ecological Framework for Environmental Impact Assessment in Canada*. Hull, QC: FEARO.
- Bragagnolo, C, D Geneletti and T Fischer (2012). Cumulative effects in SEA of spatial plans: Evidence from Italy and England. *Impact Assessment and Project Appraisal*, 30(2), 100–110.
- Canadian Council of Ministers of the Environment (2009). *Regional Strategic Environmental Assessment in Canada: Principles and Guidance*. Winnipeg, MB: CCME.
- CEARC (1988). *The Assessment of Cumulative Effects: A Research Prospectus*. Hull, QC: Canadian Environmental Assessment Research Council.
- Chetkiewicz, A and A Lintner (2014). *Getting it Right in Ontario's far North: The Need for a Regional Strategic Assessment in the Ring of Fire*. Toronto ON: Wildlife Conservation Society and EcoJustice Canada.
- Cooper, L (2011). CEA in policies and plans: UK case studies. *Environmental Impact Assessment Review*, 31(5), 465–480.
- Dubé, MG and K Munkittrick (2001). Integration of effects-based and stressor-based approaches into a holistic framework for cumulative effects assessment in aquatic ecosystems. *Human Ecological Risk Assessment*, 7, 247–258.
- Duinker, P and L Greig (2006). The impotence of cumulative effects assessment in Canada: Ailments and ideas for deployment. *Environmental Management*, 37(2), 153–161.
- Fidler, C and BF Noble (2013). Advancing regional strategic environmental assessment in Canada's western Arctic: Implementation opportunities and challenges. *Journal of Environmental Assessment Policy and Management*, 15(01), 1350007.
- Fischer, T and BF Noble (2015). Impact assessment research: Achievements, gaps and future directions. *Journal of Environmental Assessment Policy and Management*, 17(1), 1501001.
- Francis, SR and J Hamm (2011). Looking forward: Using scenario modeling to support regional land use planning in Northern Yukon, Canada. *Ecology and Society*, 16(4), 18.
- Greig, L and P Duinker (2011). A proposal for further strengthening science in environmental impact assessment in Canada. *Impact Assessment and Project Appraisal*, 29(2), 159–165.
- Gunn, A, D Russell and L Greig (2014). Insights into integrating cumulative effects and collaborative co-management for migratory tundra caribou herds in the Northwest Territories, Canada. *Ecology and Society*, 19(4), 4.
- Gunn, J and BF Noble (2009). A conceptual basis and methodological framework for regional strategic environmental assessment (R-SEA). *Impact Assessment and Project Appraisal*, 27, 258–270.

- Hegmann, G and TA Yarranton (2011). Alchemy to reason: Effective use of cumulative effects assessment in resource management. *Environmental Impact Assessment Review*, 31, 484–490.
- Johnson, D, K Lalonde, M McEachern, J Kenney, M Gustavo, A Buffin and K Rich (2011). Improving cumulative effects assessment in Alberta: Regional strategic assessment. *Environmental Impact Assessment Review*, 31(5), 480–483.
- Kennedy, AJ (ed.) (1995). *Cumulative Effects Assessment in Canada: From Concept to Practice*. Calgary, AB: Alberta Society of Professional Biologists.
- Lawe, LB, J Wells and Mikisew Cree First Nation (2005). Cumulative effects assessment and EIA follow-up: A proposed community-based monitoring program in the Oil Sands Region, northeastern Alberta. *Impact Assessment and Project Appraisal*, 23(3), 205–209.
- Mitchell, RE and JR Parkins (2011). The challenge of developing social indicators for cumulative effects assessment and land use planning. *Ecology and Society*, 16(2), 29.
- Noble, BF (2008). Strategic approaches to regional cumulative effects assessment: A case study of the Great Sand Hills, Canada. *Impact Assessment and Project Appraisal*, 26(2), 79–90.
- Noble, BF (2013). *Development of a Cumulative Effects Monitoring Framework: Review and Options Paper*. Yellowknife, NT: DIAND.
- Parkins, JR (2011). Deliberative democracy, institution building, and the pragmatics of cumulative effects assessment. *Ecology and Society*, 16(3), 20. doi.org/10.5751/ES-04236-160320.
- Parlee, BL, K Geertsema and A Willier (2012). Social-ecological thresholds in a changing boreal landscape: Insights from Cree knowledge of the Lesser Slave Lake region of Alberta, Canada. *Ecology and Society*, 17(2), 20.
- Schindler, DW and W Donahue (2006). An impending water crisis in Canada's western prairie provinces. *Proceedings of the National Academy of Sciences USA*, 103, 7210–7216.
- Seitz, NE, CJ Westbrook and BF Noble (2011). Bringing science into river systems cumulative effects assessment practice. *Environmental Impact Assessment Review*, 31(3), 172–179.
- Sheelanere, P, BF Noble and R Patrick (2013). Institutional requirements for watershed cumulative effects assessment and management: Lessons from a Canadian trans-boundary watershed. *Land Use Policy*, 30, 67–75.
- Squires, A and MG Dubé (2012). Development of an effects-based approach for watershed scale aquatic cumulative effects assessment. *Integrated Environmental Assessment and Management*, DOI: 10.1002/ieam.1352.
- Wärnbäck, A and T Hilding-Rydevik (2009). Cumulative effects in Swedish EIA practice: Difficulties and obstacles. *Environmental Impact Assessment Review*, 29(2), 107–115.
- Weiland, U (2010). Strategic environmental assessment in Germany: Practice and open questions. *Environmental Impact Assessment Review*, 30(3), 211–217.