Operationalising stakeholder insights for adaptation – best practices to engage stakeholders and bridge academic, government and local knowledge for action

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Abstract

This research addressed adaptation to climate change, focusing on institutional adaptation, water scarcity and extreme events in vulnerable watersheds in Canada and South America. This paper describes the collaborative research model utilised on two major initiatives, designed specifically to bridge adaptation science with stakeholders. Natural and social scientists committed to cross-disciplinary relationships and integration. Researchers worked with stakeholders, practitioners, government, and boundary organisations, who helped link research with stakeholders' needs. A relationship-centred research model is complex and difficult to manage but better positioned to directly influence policies and practices. Increased efforts at knowledge outreach are recommended to improve research-for-impact.

Keywords: *Collaborative adaptation research model, Boundary organisation, Stakeholder values, Natural and social sciences, Vulnerability*

Introduction

Vulnerability to water scarcity in semi-arid watersheds was studied under the *Institutional Adaptation to Climate Change (IACC)* research in Canada and Chile (2004-09). Vulnerability to extreme events (floods, droughts, storms) was studied under the *Vulnerability and Adaptation to Climate Extremes in the Americas (VACEA)* research in Canada, Chile, Argentina, Brazil, and Colombia (2011-16). In Canada, researchers collaborated with the *Prairie Farm Rehabilitation Administration (PFRA)*, a boundary organisation highly respected for its important historic role in helping stakeholders adapt to climate and water stress. This paper focuses on the 165,000 km^2 South Saskatchewan River Basin spanning Saskatchewan and Alberta in Western Canada, historically prone to water scarcity, floods, and severe multi-year droughts.

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Methodology

This paper describes the collaborative adaptation research model utilised in the IACC and VACEA research (i.e. the methodology, see **Figure 1**; Diaz, 2009, 2016). Natural and social scientists examined past and present climate vulnerability and adaptation strategies to cope with climate and water stressors. Historic and current climate and water risks affecting socio-economic activities were investigated to understand impacts from water scarcity, droughts and extreme events. Quantitative and qualitative data on vulnerabilities and adaptive strategies were collected to understand coping mechanisms in targeted watersheds. Semi-structured stakeholder interviews and workshops with rural communities, practitioners, the agricultural sector, water agencies, government institutions and NGOs were conducted to gather ethnographic and social science data to assess community vulnerability, stakeholder values, institutional capacity and governance. Geographers, climatologists, agrologists, and engineers studied historic climate impacts on water resources to understand risk exposure. Sociologists, human geographers, economists, and political scientists investigated human systems to better understand rural vulnerability, water management and conflict, economic impacts, and regional adaptive capacity. Future climate scenarios, regionally downscaled, were modeled to determine future risks. PFRA's historic adaptation role was studied. As an IACC and VACEA collaborator, PFRA also conducted research, provided and gathered data, facilitated researcher engagement with practitioners, liaised with industry and government, and helped translate research findings to stakeholders. Opportunities and constraints for future adaptations to reduce vulnerability and strengthen resilience were explored by researchers and practitioners.

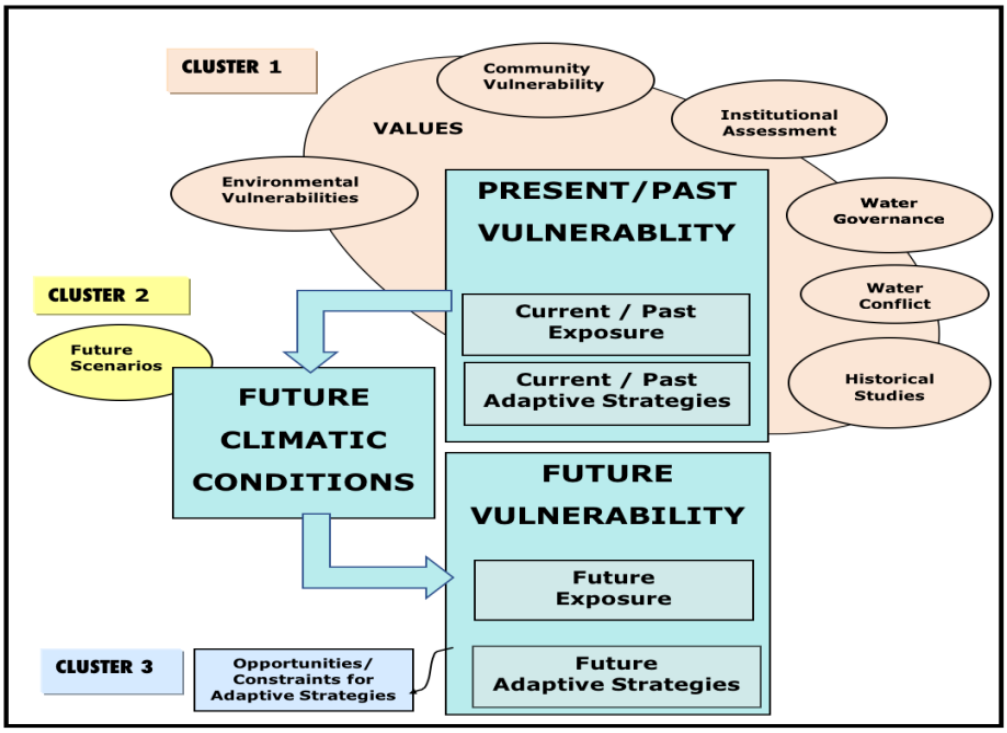

Figure 1. Collaborative Adaptation Research Model - Vulnerability Assessment Model (Source: after Diaz, 2009)

Findings

Since post-European settlement in the late 1800s, the Canadian prairie region has adapted to cope with water scarcity lasting from two- to three-years in duration, albeit with serious social and economic impacts. However, the dendrohydrology and climate modeling research clearly depicted the region as vulnerable to a wider climate variability than the instrumental record indicates. Future climate scenarios depict warmer, wetter winters and hotter, drier summers, reduced stream flows and risk of more extreme events (droughts, floods). Stakeholders understood future climate variability better when compared to historic records and experience (Marchildon, 2009a; Sauchyn et al, 2016).

Historic analysis of PFRA (1935-2013) demonstrated its boundary organisation role. Canada created the agency to help the prairie region recover from multi-year droughts (1920s-30s). Its mandate was to aid in rehabilitating and conserving the Prairie Provinces' soil, land and water resources for improved regional economic security. As a technical organisation, PFRA worked with scientists, universities, industry, and government to test water and agronomic adaptive practices in the field. By linking science with adaptive practices, PFRA enabled the agricultural-dependent region to better understand its natural capital limitations. Best practices for soil/water conservation and agricultural production were developed to support the region's current sustainable crop and livestock production. Stakeholders and practitioners viewed PFRA as an effective organisation (Marchildon, 2009b).

Natural and social science research discovered that stakeholders are concerned about future vulnerabilities and coping capacity (Diaz, 2009; Hurlbert et al., 2009; Corkal et al., 2011). Stakeholders identified limitations in existing adaptation practices, local/regional planning, water data/management, and governance. They identified a need for:

i) better inter-agency coordination and government leadership;
ii) incorporating climate change science in water management and regional planning;
iii) strengthened resilience with anticipatory long-term climate and water plans;
iv) more integration of government and community adaptation initiatives;
v) simplified water governance;
vi) participatory planning;
vii) conflict resolution mechanisms;
viii) better water data; and,
ix) interdisciplinary approaches for adaptation.

Values analysis research revealed different stakeholders' motivations as *market (economic), autonomy (choice), society (equity),* and *place (culture)*. It was demonstrated that values drive adaptation decision-making. Differing values may lead to conflict, but values mapping helps stakeholders and decision-makers identify adaptation choices (Corkal et al., 2016).

Our results show that wicked problems like climate change adaptation require integrative solutions with diverse stakeholders. Integrative research is not appealing to all. It is complicated, time-consuming and forces discipline-defined researchers to think beyond their expertise, in areas that may not seem relevant. Researchers may be averse to engaging with stakeholders before the work is complete, especially without direct incentives. External integration with government, end-users, and diverse stakeholders is very challenging (Mussetta and Hurlbert, forthcoming). Findings from IACC and VACEA show that adaptation research and its knowledge translation are constrained without sufficient institutional capacity. Resilience can be strengthened with institutional adaptation and improved governance.

Collaborative research to better understand how climate change affects environmental and social systems is complex. It requires integration of different research disciplines, commitment, leadership, and effective project planning/management. Active government roles strengthen research impact. Engagement between researchers and stakeholders establishes context, provides stakeholder knowledge on operations and governance, and improves outreach. Boundary organisations can enable adaptation research, cross-disciplinary integration, and incorporation of practitioner knowledge. Post-research, an ideal boundary organisation will act with government agencies to bridge adaptation science with practice change (see **Figure 2**).

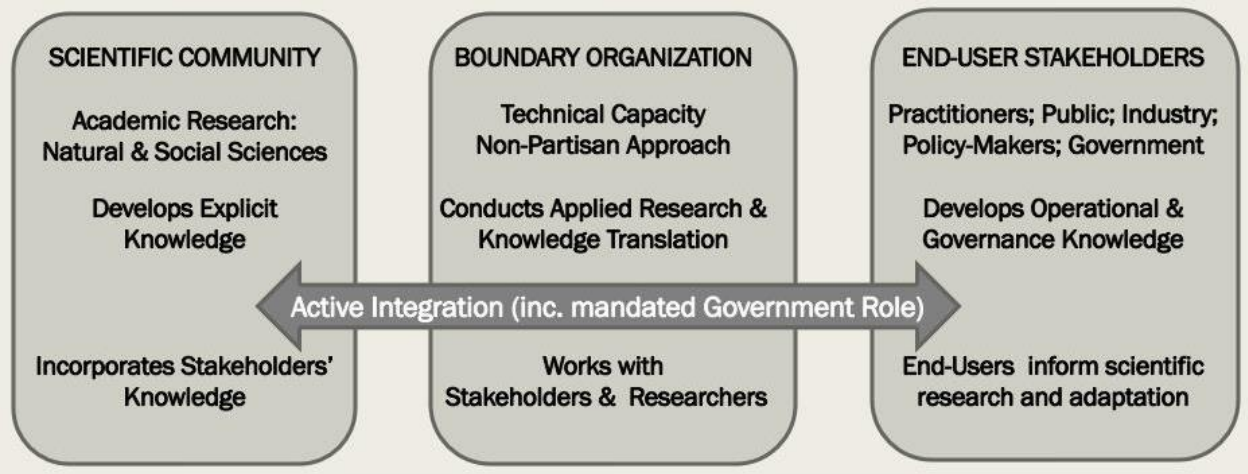

Figure 2. The Ideal Boundary Organisation bridges research with stakeholder outreach (Source: adapted from Batie, 2008; Clark and Holliday, 2006)

Conclusions

Building on IACC and VACEA findings, a strengthened collaborative approach is recommended for adaptation research. Researchers need to be more effectively engaged with policy-makers, boundary organisations, stakeholder practitioners and communities of practice throughout the project. Mandated researcher and government roles need to be included in adaptation research, to improve science translation to stakeholders, encourage adaptive change, and strengthen institutional adaption.

Adaptation research requires a science translation component to extend the science beyond "publication" to a new "adaptation practice" end-state. Outreach should also include more cross-disciplinary integration of the natural and social sciences, and cross-country initiatives to help countries learn from each other's adaptation approaches.

Boundary organisations and government leadership can help translate adaptation science and influence policy and practice. Though challenging, a properly delivered relationship-centred research model will enable researcher-practitioner collaboration, increase potential for research impact and lead towards more transformative adaptations.

Acknowledgements

We thank Polo Diaz for research leadership and Vanessa Corkal for critical review. Funding for IACC was provided by the Social Sciences and Humanities Research Council of Canada (http://www.parc.ca/mcri/). Funding for VACEA was provided by the International Development Research Centre and Canada's Tri-Council. http://www.parc.ca/vacea/

References

Batie, S. (2008). '*Wicked Problems and Applied Economics*'. Amer. J. Agr. Econ. 90 No.5, 1176-1191

Clark W. and Holliday, L. (Rapporteurs) (2006). '*Linking Knowledge with Action for Sustainable Development: The Role of Program Management*'. Summary of a Workshop, National Academies Press.

Corkal, D., Diaz, H. and Sauchyn, D. (2011). 'Changing Roles in Canadian Water Management: A Case Study of Agriculture and Water in Canada's South Saskatchewan River Basin'. Int. J. of Wat Res. Dev. Vol.27, No. 4, 647-664.

Corkal, D., Morito, B. and Rojas, A. (2016). 'Ch. 11 – Values Analysis as a Decision-Support Tool to Manage Vulnerability and Adaptation to Drought, in Vulnerability and Adaptation to Drought'. (eds) Diaz, H., Hurlbert, M. and Warren, J. 376 pp. University of Calgary Press. Available: http://press.ucalgary.ca/books/9781552388198

Diaz, H. (2009). '*Institutional Adaptations to Climate Change (IACC)*'. Integration Report: The Case of the South Saskatchewan River Basin. Available: http://www.parc.ca/mcri/pdfs/papers/int01.pdf

Diaz, H.P. (2016). '*A Conceptual Framework for Understanding Vulnerabilities to Extreme Climate Events*', in Climate Change Adaptation, Resilience and Hazards. (eds) Leal Filho, W., Musa, H., Cavan, G., O'Hare, P., and Seixas J. Climate Change Management. Springer, Cham. pp143-146.

Hurlbert, M., Diaz, H., Corkal, D., and Warren, J. (2009). '*Climate change and water governance in Saskatchewan, Canada*'. Int. J. of Climate Change Strategies and Management, Vol.1, No.2, 2009, 118-132.

Marchildon, G. P. (Ed.) (2009a). 'A Dry Oasis – Institutional Adaptation to Climate on the Canadian Plains', 318pp. CPRC Press, Regina.

Marchildon, G.P. (2009b). 'The Prairie Farm Rehabilitation Administration: Climate Crisis and Federal-Provincial Relations during the Great Depression'. The Canadian Historical Review 90.2.

Mussetta, P., and Hurlbert, M. (Eds.) (Forthcoming). 'Interdisciplinary Vulnerability Studies in the Americas: Extreme Weather and Climate Change'. Cambridge Scholars Publishing Ltd.

Sauchyn, D., Julian Velez Upequi, J., Masiokas, M., Ocampo, O., Cara, L., Villalba, R. (2016). '*Ch. 2 Exposure of Rural Communities to Climate Variability and Change: Case studies from Argentina, Colombia and Canada*', in Implementing Climate Change Adaptation in Cities and Communities. (eds) Leal Filho, W. et al. Climate Change Management, DOI 10.1007/978-3-319-28591-7_2, Springer, Switzerland.