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Using climate models to inform community adaptation in BC

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Authors: Ian M. Picketts, MNRES, PhD candidate, University of Northern British Columbia and Trevor Q. Murdock, Lead, Regional Climate Impacts, Pacific Climate Impacts Consortium
Editors: Neil Thomson, Dr. Hisham Zerriffi, Jessica Worsley

Issue

Critics have recently reopened the debate on climate-change adaptation approaches, suggesting that the use of localized - or downscaled - projections is not ideal or necessary. The critics contend that using downscaled climate information is a misguided 'top down' approach[i]. They assert that it is more valuable to pursue a 'bottom up' approach to adaptation, wherein future scenarios are created based on historic data, current climate variability and other stressors, such as population growth[ii]. While academics have carried on this debate for years, it can be confusing for those embarking on adaptation efforts[iii]. This brief acknowledges the issues raised by critics and argues that a bottom-up approach can also benefit from the use of climate models to inform community adaptation in British Columbia (BC), using examples from a recent adaption planning exercise in Prince George.

Background

Adapting to the impacts of climate change is now a reality for which communities must recognize and prepare. However, local governments are often constrained by lack of staff time, resources and expertise. Downscaled climate model projections can fill a gap here; they offer an important source of information[iv] that can be used to assess risks and inform adaptation, even though there are challenges with accurately communicating their outputs. Indeed, many guidebooks recommend their use to inform adaptation in Canada[v,vi].

University of Northern British Columbia (UNBC) researchers have been working alongside Prince George City staff for several years to assist the community in adapting to climate change. An early step was to partner with the Pacific Climate Impacts Consortium (PCIC) to create a detailed overview of climate information for Prince George[vii]. This information has been used extensively by the City, and informed a workshop with senior local staff and others designed to create a list of possible climate-related impacts and prioritize adaptation measures[viii]. During the workshop, PCIC presented a suite of global climate model (GCM) projections for the 2050s. Participants were instructed to focus on the full range of

projections, not only the mean or the median values. Maps showing downscaled Regional Climate Model (RCM) projections for central BC were used to illustrate spatial variability, and uncertainties associated with the projections were communicated to participants. Differences in projections arise mainly from variations in how individual models represent the physics of climate, natural climate variability and differences in greenhouse gas emissions scenarios.

The climate model outputs were effective in helping participants to identify vulnerabilities, determine possible impacts, and to build capacity and set adaptation priorities beyond what would have been gained from the bottom up approach alone. Based on this example, downscaled climate models can help communities to:

- conceptualize and understand the reality of climate change;
- understand the magnitude of changes expected;
- identify, assess and prioritize local impacts;
- envision impacts that might not be apparent if extrapolating only from historical conditions; and
- help to prioritize difficult and/or costly adaptation decisions by providing quantitative information.

There were some challenges that centre on the importance of accurate communication. For example, providing a range of uncertainty can lead participants to believe that the level of confidence in projections is so low that they are not useful. However, presenting a future projection without explicitly explaining the range of uncertainty is misleading and could lead to maladaptation.

Recommendations

1. **Use projections to inform 'bottom up' assessments**
   The Prince George example and existing frameworks, such as the ICLEI – Local Governments for Sustainability Guide[v] – illustrate how communities can adopt the 'bottom-up' approach *and* use regional climate projections to inform adaptation.

2. **Properly communicate limitations and uncertainty**
   Localized future climate scenarios using RCM simulations or statistical downscaling are associated with considerable uncertainties and do not reflect all of the environmental and social factors that will impact future climate change[v]. Taking the time to communicate results, explain uncertainties and answer related questions is crucial. In the Prince George example, it was useful to remind participants that uncertain information (e.g. population projections) is commonly used to inform local planning and engineering initiatives.

3. **Present information in multiple formats**
   Presenting different types of information (such as graph results of GCM outputs and RCM maps) assists with participant learning and helps to explain different types of uncertainty.

Conclusion

Despite limitations and uncertainties, climate models are valuable tools that help build capacity and inform adaptation at the community level. Projections *can* be effectively integrated with a 'bottom-up' approach (e.g. working with stakeholders to assess climate vulnerability[iv,v,vi]); thus, the implication that using climate projections is at odds with 'bottom

up' approaches is false. This is illustrated by the experience in Prince George where stakeholders effectively used models to inform adaptation by considering specific future conditions and associated local impacts, albeit with appropriate recognition of the uncertainties implicit in all downscaled climate projections.

Please send relevant comments and queries to picsbp@uvic.ca.

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Further Reading

For more information about critiques of the use of downscaled climate information

[i] Pielke, R.A., Wilby, R.L. 2012. Regional climate downscaling: what's the point? EOS Transactions of the AGU 93(5), 52-53.

[ii] Wilby, R.L., Dessai, S. 2010. Robust adaptation to climate change. Weather 65(7), 180-185.

Additional Sources

[iii] IPCC 2007: Climate Change 2007: Impacts, Adaptation and Vulnerability, Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E Hansen, Eds., Cambridge University Press, Cambridge, UK, 976pp.

[iv] Collaborative for Advanced Landscape Planning, 2010, Local Climate Change Visioning and Landscape Visualizations: Guidance Manual, University of British Columbia, 85pp.

[v] ICLEI. 2011. Changing climate, changing communities: guide and workbook for municipal climate change adaptation. Available at: http://www.iclei.org/fileadmin/user_upload/documents/Canada/Changing_Climate/ICLE076_-_NRCan_Guide.pdf

[vi] Bizikova, L., Neale, T., Burton, I. 2008. Canadian Communities' Guidebook for Adaptation to Climate Change. Vancouver, BC: Environment Canada and University of British Columbia.

[vii] Picketts, I.M., Werner, A.T., Murdock, T.Q., 2009. Climate Change in Prince George: Summary of Past Trends and Future Projections. Pacific Climate Impacts Consortium, Victoria, BC.

For more information about the Prince George workshop and its outcomes

[viii] Picketts, I.M., Werner, A.T., Murdock, T.Q, Curry, J., Déry, S.J., Dyer, D. 2012. Planning for climate change adaptation: lessons learned from a community-based workshop. Journal of Environmental Science and Policy 17, 82-93.