

Linking climate change and sustainable development at the local level

LIVIA BIZIKOVA^{1*}, JOHN ROBINSON², STEWART COHEN³

¹ Adaptation and Impact Research Group (AIRG), Environment Canada and The Maurice Young Centre for Applied Ethics, The University of British Columbia, 6356 Agricultural Road, Vancouver, BC, V6T 1Z4, Canada

² Institute for Resources, Environment and Sustainability (IRES), University of British Columbia, 2202 Main Mall, Vancouver, BC, V6T 1Z4 Canada

³ Adaptation and Impacts Research Division (AIRD), Environment Canada, Department of Forest Resources Management, Faculty of Forestry, University of British Columbia, 4617–2424 Main Mall, Vancouver, BC, V6T 1Z4 Canada

At continental and regional scales, numerous long-term changes in climate have already been observed, including changes in arctic temperatures and ice, widespread changes in precipitation amounts, wind patterns and aspects of extreme weather such as droughts, heavy precipitation, heatwaves and the intensity of tropical cyclones (IPCC, 2007a). The magnitude of observed impacts and anticipated future consequences of climate change has focused the attention of public and policy-makers not only on climate change adaptation and mitigation, but also on current notions of development. It is increasingly being recognized that climate change and development interact in a circular fashion (Downing et al., 2003). Specifically, climate change vulnerability and impacts influence prospects for development, and in turn, the development path not only determines greenhouse gas (GHG) emissions affecting future climate change, but also influences capacities to adapt and to mitigate climate change.

Although there is an empirical understating of the linkages between climate change and development, the bulk of current research discusses these linkages at the theoretical level without providing venues for their implementation. This special issue explores potential venues for integrating adaptation and mitigation within a development context, particularly at the local–regional levels. It is targeted towards scientists and policy-makers searching for innovative bottom-up approaches building on increasing local concerns about climate change. It seems that regional- and local-scale actions could provide a rich array of examples and best practices to interpret, guide and implement larger-scale initiatives including strategies for post-Kyoto 2012.

This special issue examines the questions of how to integrate adaptation and mitigation within a development context, particularly at the local–regional levels. As described below, the issues of policy formation, decision-making, governance and behavioural change require a focus at the local level if substantive progress is to be achieved. In particular, this Issue will present suggestions on how to include sustainable development thinking and policy in order to assist with the creation of local implementation pathways to increase the opportunities and capacity for effective mitigation and adaptation. In many communities, the principles of participation, social learning

■ *Corresponding author. *E-mail*: liviab@interchange.ubc.ca

and scenario development will be vital for successful implementation of adaptive, mitigative and sustainable development approaches. In addition, the policy focus needs to shift away from an exclusive concentration on environmental and climate change policies to embrace a broader set of tools, processes and policies.

Milestones in research addressing climate change and sustainability

In 1992, Article 2 of the United Nations Framework Convention on Climate Change (UNFCCC) emphasized the stabilization of GHG concentrations at levels allowing natural adaptation of ecosystems, and ensuring food security and sustainable economic development (UN, 1992). Some light on the relationship between development and climate change was shed by the IPCC SRES and post-SRES analyses,¹ which showed a significant impact of the development path on emissions, concentrations of GHG, and consequently on the magnitude of needed adaptation and mitigation responses. In particular, scenario families with an emphasis on global (B1) and local (B2) sustainability led to the lowest level of CO₂ concentrations and highest level of adaptive capacity, and consequently to higher resilience compared with the rest of the scenarios (Swart et al., 2003).

Since the publication of these results in 2000 and 2001, a growing literature has emerged that examines the relationship between climate change and sustainable development. This literature is mainly focused on analysing low-emission and clean energy pathways, mainstreaming climate change into development efforts in developing countries, and suggesting frameworks of integrated models to analyse these linkages (for example, Markandya and Halnaes, 2002; Metz et al., 2002; Winkler et al., 2002; Wilbanks, 2003).

In 2003, the *Climate Policy* special supplement on 'Climate Change and Sustainable Development' (Munasinghe and Downing, 2003) synthesized many of the latest developments in this area. This supplement identified two distinct approaches to climate change and sustainable development: integrating sustainable development into climate change policies and *vice versa* (Cohen et al., 1998; Swart et al., 2003) and presented an actual case study showing synergies between climate change responses and sustainable development in Vietnam (Dang et al., 2003). In their Editorial, Downing et al. (2003) emphasized the importance of conducting innovative assessments at the local and regional scales to address 'real vulnerabilities' by an involvement of stakeholders to help integrate values and economic reasoning within adaptation and mitigation actions.

Since then, the IPCC Fourth Assessment has identified the linkages between climate change and sustainable development, and between adaptation and mitigation as crosscutting themes across the Working Group II and III Reports. The recently published Working Group II 'Summary for policymakers' (IPCC, 2007b) stresses the importance of sustainable development in reducing vulnerability to climate change, as well as the role of climate in impeding nations' abilities to achieve sustainable development. However, it also states that only a few plans and cases promoting sustainability explicitly included climate change.

A recently published special issue of *Mitigation and Adaptation Strategies for Global Change* lists a number of examples of potential and actually implemented linkages between adaptation and mitigation in various sectors, including forestry, agriculture, water and insurance. The syntheses (Wilbanks and Sathaye, 2007) and other papers in the issue (Bhandari et al., 2007; Golkany, 2007) conclude that, with respect to promoting integrated adaptation and mitigation measures, the focus should be on sustainable development to provide a context for a mixture of adaptation and mitigation, depending on the magnitude and rate of climate change in particular local contexts. It recognizes a need for developing local capacities to enable realistic implementation pathways, and in this way to increase the chances in coping with progressing climate change.

Climate change and sustainable development at the local level

Expanding on this rich body of knowledge generated during recent years, this special issue of *Climate Policy* takes the research further by exploring an integrated approach considering the linkages among climate change adaptation (A) and mitigation (M) in the context of sustainable development (SD), which we refer to as AMSD. AMSD puts sustainable development first in recognition of the importance of development pathways on the level of emissions, available capacities, and character of actual responses to climate change. Like Wilbanks and Sathaye (2007), we emphasize that the linkages between adaptation and mitigation are highly context-specific and place-based depending on the priorities guiding development. In this way, AMSD emphasizes that climate change adaptation and mitigation are a part of the wider development goals in transition towards sustainability. Moreover, the effectiveness of adaptation and mitigation measures on their own is limited, especially those that aim for behavioural changes without challenging the underlying development pathway.

AMSD is built around principles of participation, scenario development, and social learning; and will be applied in local case studies in British Columbia and Ontario, Canada. The AMSD approach, for instance, suggests a participatory process that includes the following four stages: identifying a local sustainable development scenario, explicitly linking climate change impacts, identifying linkages between adaptation and mitigation, and developing an integrated AMSD implementation strategy. The process is iterative in order to incorporate the learning experiences of the gradual inclusion of climate change impacts, and the linkages between adaptation and mitigation measures and the local sustainability vision. At each stage of the process, we distinguish a number of methods including backcasting, trade-off analyses, strategy building, and number of participatory activities including local development goal selection, involving local knowledge in describing local systems, interpreting climate change impacts, and creating institutional partnerships (Bizikova et al., 2007).

Conducting local studies targeting sustainable development first, and then linking to climate change, raises complex issues. Such local studies will probably enhance interdisciplinary approaches; however, they will require robust data and information at a relatively small scale, and will rely heavily on multi-sector partnerships developed in an explicitly participatory process. Although we are optimistic regarding the potential value of participatory processes, it is important to recognize some concerns related to the application of these methods, including difficulties in engaging participants due to the considerable time requirements involved, and in adding to the pressure already being felt by local-scale decision-makers as national and international initiatives are downloaded onto their jurisdictions. We believe that interest in participation can be enhanced by creating opportunities for participants to be involved in setting up the overall research agenda and in fostering increases in their participatory capacities through shared learning exercises.

Focus of this special issue

The articles in this issue explore the integration of adaptation and mitigation responses, and capacities at the local development context by addressing three crucial questions that interact directly and indirectly with policy formation and execution, decision-making and governance:

1. From the local perspective, how do key synergies and trade-offs affect different responses to climate change involving adaptation and mitigation? And how could an integrated approach support local-scale actions rather than discouraging them?

2. What would such responses imply in terms of the capacities required to reduce vulnerability as a part of the local development pathways based on the principles of sustainable development?
3. What methodological approaches exist that would help to achieve both mitigation and adaptation responses to climate change embedded in the context of local sustainable development?

Focusing on a sustainable development perspective, Thomas Wilbanks' article focuses on navigating through 'the trajectory of change' towards local sustainability with explicit responses to climate change. This requires exploring the opportunities that resulted from combining the strengths of local, national and even global scales, and also developing linkages to deliver the experiences and knowledge from higher scales to the local level. Because each scale offers different types of opportunities for AMSD cases, Rob Swart and Frank Raes propose linking adaptation and mitigation at an early stage of development initiatives in order to identify these opportunities in the context of particular projects. To facilitate the shared adaptation and mitigation actions, both articles emphasize the need to create institutional partnerships that will provide venues to mainstream the identified responses from diverse scales into development initiatives.

Sarah Burch and John Robinson address the challenges of exploring the linkages between responses to climate change and development by reframing the very similar, yet separate, concepts of adaptive and mitigative capacities, and by developing the idea of response capacity. Response capacity represents a broader pool of development-related resources from which adaptive and mitigative capacities, and actual actions, are derived. Additionally, they are themselves embedded in socio-economic and technological development pathways. Beyond available capacities, however, Ian Burton et al. stress the role of international policy development, and its guiding principles of transforming capacities to actual mitigation and adaptation actions. This suggests that distinguishing between adaptation and mitigation is a rather artificial dichotomy reflecting the state of research at the time of the negotiation of the UN Framework Convention. It argues in favour of viewing the responses to climate change as deeply rooted in society. Consequently, these cannot be addressed without sufficient linkages to the responses of societal development needs.

To help operationalize the AMSD approach, we present case studies that link both types of responses within the development context. Focused on urban infrastructure, Matthias Ruth and Dana Coelho discuss a role of scenarios and strategies that are robust enough to capture future development paths, and to foster adaptive and anticipatory management options. Finally, in the case study from Kenya, Siri Eriksen and Karen O'Brien discuss the responses to climate change that are needed in order to reduce vulnerability as well as to improve development status at the local level. Their article stresses the presence of considerable differences between vulnerability and poverty reduction measures, and suggests that attention should be given to expanding narrowly defined methods for reducing biophysical risks towards policies aiming for sustainable development.

To move from the realm of identified responses to actual policies, Charlie Wilson and Tim McDaniels apply the principles of structural decision-making to support the AMSD decisions operating on multiple temporal and spatial scales, and multiple scales of governance. They see AMSD decisions as an outcome of pluralistic decision processes, often involving civil society through explicit stakeholder involvement.

Policy implications and conclusions

This broad array of articles identifies a number of challenges in integrating the diversity of actors, scales, sectors and governance structures that seem to be necessary to 'fit together' in order to

benefit from the proposed AMSD approach. A local and regional focus is required to create concrete alternatives and directions within given development pathways. These individual small-scale actions could create a rich basis of examples to push the actions at national and global scales. In fact, effective actions at larger scales tend to be limited without these bottom-up encouragements. Larger-scale actions are then shaped and fine-tuned in association with smaller-scale stakeholders and, in fact, in large part implemented through smaller-scale actions (Burton et al.; Wilbanks).

In order to advance interconnected adaptation and mitigation capacities and responses to climate change within the context of sustainable development, a number of methodological challenges are identified in this issue. These include actions to:

1. *Enhance multidisciplinary assessments in developing complex policies.* These need to address climate change by accounting for the underlying development values and principles of applied models and assessment tools. This involves balancing the focus, especially in adaptation from biophysical risks associated with climate change and in mitigation from narrowly-defined sectoral GHG reduction policies, with the specific risks and opportunities to address issues such as well-being, response capacity, and processes shaping vulnerability (Eriksen and O'Brien).
2. *Expand participatory integrated assessment to built models.* This should facilitate the involvement of stakeholders in defining the course of development pathways, and create a context for the linkages between adaptation and mitigation by linking impacts and vulnerability to climate change with effectiveness of mitigation efforts (Ruth and Coelho).
3. *Elaborate the linkages between adaptation and mitigation capacities and actions.* This entails analysing the diversity of their dimensions, including social, economic, institutional, technological and cultural characteristics; and identifying shared areas, connections, and consequently potential reinforcements between adaptation and mitigation strategies (Burch and Robinson; Swart and Raes).
4. *Develop methodologies to assess trade-offs between adaptation and mitigation in respect of uncertainties within climate scenarios.* In this context, diversity of values and development priorities create support for actions and policies (Burton et al.; Wilson and McDaniels).
5. *Promote two-way communication in defining projects and disseminating results in collaboration with stakeholders.* This should be an explicit objective of the research projects.

Regardless of any significant remaining research gaps, the urgency of climate change calls for prompt decision outcomes. Policy-makers at the local level are in the difficult situation of trying to reconcile a wide diversity of local development visions with trade-offs over limited resources, at a time when more actions, both in mitigation and adaptation, will be needed in order to tackle future climate change impacts, as well as to protect us from climate-related surprises. Therefore, viewing adaptation and mitigation as separate fields of action and policy without direct linkages may work against the implementation of opportunities that are perhaps not the most significant contribution to emission reduction, or avoided climate damage, but which can still offer tangible local benefits. Such local actions may:

1. *Include climate change impacts in the local development planning process.* An AMSD approach has implications for much more than climate or environmental policy. Local taxes, infrastructure investments, land-use regulations and budget planning processes all have major implications for local or regional development paths and thus for adaptation and mitigation options and impacts. The local context frames the linkages between adaptation

- and mitigation, and therefore the policy mix of adaptation and mitigation will differ from place to place.
2. *Evaluate socio-economic scenarios currently utilized in the local planning processes, and develop new scenarios as needed.* This is needed in order to uncover underlying principles directing the development trajectory that can be used to guide long-term development policies, including infrastructure and natural resource management in the community.
 3. *Pay attention to diverse levels of capacity and vulnerability to climate change within the community, while developing adaptation and mitigation strategies.* Specifically, this means including those with a low level of adaptive capacity in capacity-building activities in order to lower their vulnerabilities and to create opportunities for them to be part of the solution.
 4. *Develop linkages between the diversity of institutions focused on climate change adaptation, mitigation, and development at the local level.* This will help identify synergies between their institutional actions, promote networking, and foster communication, and in this way create opportunities to minimize trade-offs of narrowly focused development actions and response to climate change.
 5. *Identify institutional partners at regional, national and international level in development of integrated responses to climate change.* This will promote knowledge-sharing from a diversity of cases in order to develop innovative links between development and climate change and provide guidelines for policy-makers working on the larger scale on how to inject development to climate change and *vice versa*.
 6. *Approach universities, research institutions and local experts to develop shared projects to meet identified research needs while addressing local climate policy needs.* Collaboration with local practitioners is vital to create case studies, and reap the benefits of mutual learning.

Acknowledgements

We thank the contributors and the reviewers of the articles for this special issue. We also gratefully acknowledge the continuous support of the Adaptation and Impacts Research Division of Environment Canada for the International Workshop on AMSD Linkages in Vancouver, Canada (April 2006) which initiated the collaborative effort on AMSD, including our current case studies. We are also grateful to our colleagues at the University of British Columbia for their contributions, and engagement in the AMSD initiative.

Note

1. SRES emissions scenarios are scenarios of the IPCC Special Report on Emissions Scenarios (SRES) and post-SRES scenarios are modified versions of the SRES marker scenarios such that CO₂ concentrations are stabilized early in the 22nd century (Nakicenovic and Swart, 2000; Schlesinger and Malyshev, 2001; Metz et al., 2002).

References

- Bhandari, P.M., Bhadwal, S., Kelkar, U., 2007, 'Examining adaptation and mitigation opportunities in the context of the integrated watershed management programme of the Government of India', *Mitigation and Adaptation Strategies for Global Change* 12, 919–933.
- Bizikova, L., Burch, S., Cohen, S., Robinson, J., 2007, 'Climate change and sustainable development in the local context: linking research with local opportunities and challenges', *Global Environmental Change*, under review.

- Burch, S., Robinson, J., 2007, 'A framework for explaining the links between capacity and action in response to global climate change', *Climate Policy* 7(4), 304–316.
- Burton, I., Bizikova, L., Dickinson, T., Howard, Y., 2007, 'Integrating adaptation into policy: upscaling evidence from local to global', *Climate Policy* 7(4), 371–376.
- Cohen, S., Demeritt, D., Robinson, J., Rothman, D., 1998, 'Climate change and sustainable development: towards dialogue', *Global Environmental Change* 8, 341–371.
- Dang, H.H., Michaelowa, A., Tuan, D.D., 2003, 'Synergy of adaptation and mitigation strategies in the context of sustainable development: the case of Vietnam', *Climate Policy* 3(S1), S81–S96.
- Downing, T.E., Munasinghe, M., Depledge, J., 2003, 'Special Supplement on Climate Change and Sustainable Development', *Climate Policy* 3(S1), S3–S8.
- Eriksen, S., O'Brien, K. 2007, 'Vulnerability, poverty and the need for sustainable adaptation measures', *Climate Policy* 7(4), 337–352.
- Golkany, I., 2007, Integrating strategies to reduce vulnerability and advance adaptation, mitigation and sustainable development. *Mitigation and Adaptation Strategies for Global Change* 12, 755–786.
- IPCC, 2007a, 'Summary for policymakers', in: S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor, H.L. Miller (eds), *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge University Press, Cambridge, UK.
- IPCC, 2007b, 'Summary for policymakers', in: M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson (eds), *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge University Press, Cambridge, UK, 7–22.
- Markandya, A., Halsne K. (eds), 2002, *Climate Change and Sustainable Development*, Earthscan, London.
- Metz, B., Berk, M., den Elzen, M., de Vries, B., van Vuuren, D., 2002, 'Towards an equitable climate change regime: compatibility with Article 2 of the Climate Change Convention and the link with sustainable development', *Climate Policy* 2, 211–230.
- Munasinghe, M., Downing, T.E. (eds), 2003, *Special Supplement on Climate Change and Sustainable Development, Climate Policy*, 3, Supplement 1.
- Nakicenovic, N., Swart, R.J. (eds), 2000, *IPCC Special Report on Emissions Scenarios*, Cambridge University Press, Cambridge, UK.
- Ruth, M., Coelho, D. 2007, 'Understanding and managing the complexity of urban systems under climate change', *Climate Policy* 7(4), 317–336.
- Schlesinger, M.E., Malyshev, S., 2001, 'Changes in near-surface temperature and sea level for the Post-SRES CO₂-stabilization scenarios', *Integrated Assessment* 2, 95–110.
- Swart, R., Raes, F., 2007, 'Making integration of adaptation and mitigation work: mainstreaming into sustainable development policies?', *Climate Policy* 7(4), 288–303.
- Swart, R., Robinson, J., Cohen, S., 2003, 'Climate change and sustainable development: expanding the options', *Climate Policy* 3(S1), S19–S40.
- UN (United Nations), 1992, *United Nations Framework Convention on Climate Change*, FCCC/Informal/84 GE.05-62220 (E) 200705 [available at <http://unfccc.int/resource/docs/convkp/conveng.pdf>].
- Wilbanks, T.J., 2003, 'Integrating climate change and sustainable development in a place-based context', *Climate Policy* 3(S1), S147–S154.
- Wilbanks, T.J., 2007, 'Scale and sustainability', *Climate Policy* 7(4), 278–287.
- Wilbanks, T.J., Sathaye, J., 2007, 'Integrating mitigation and adaptation as responses to climate change: a synthesis', *Mitigation and Adaptation Strategies for Global Change* 12, 957–962.
- Winkler, H., Spalding-Fecher, R., Mwakasonda, S., Davidson, O., 2002, 'Sustainable development policies and measures: starting from development to tackle climate change', in: K.A. Baumert, O. Blanchard, S. Llosa, J. Perkaus (eds), *Building on the Kyoto Protocol: Options for Protecting the Climate*, World Resources Institute, Washington, DC.
- Wilson, C., McDaniels, T., 2007, 'Structured decision-making to link climate change and sustainable development', *Climate Policy* 7(4), 353–370.