Policy Research Initiative
Projet de recherche sur les politiques

SUSTAINABLE DEVELOPMENT
BRIEFING NOTE

Towards a National Capacity for Integrated Landscape Management Modelling

Highlights

- Land-use management and Strategic Environmental Assessments (SEAs) need improved tools to consider complex interactions and cumulative effects of multiple land uses; Integrated Landscape Management Models (ILMM) could satisfy this policy need.
- Barriers to the development and use of ILMM include jurisdictional and thematic silos, uncoordinated data policies, and hesitancy among potential users to be "early adopters."
- A variety of frameworks for a national ILMM capacity would help address these barriers; all need federal leadership.
- ILMM would be particularly useful to establish a clear, consistent, rigorous, and scientifically defensible process for Strategic Environmental Assessments.

Background

Sustainable development needs early analysis of trade-offs between economic, environmental, and social priorities. As noted by the Commissioner for the Environment and Sustainable Development, Canada lacks the capacity to identify and quantitatively assess the complex interactions between various land-use decisions. This leaves even the most progressive attempts, such as Strategic Environmental Assessments (SEAs), unable to effectively evaluate proposed policies, programs, and plans.

New tools are needed for SEAs and other land-use decision processes to: rapidly and reliably evaluate the long-term economic, environmental, and social costs of different policy and management options; identify, in advance of decision-making, interactions and cumulative effects that cross sectoral and jurisdictional lines; and provide opportunities early in the decision-making process to explore ways to mitigate negative effects on the environment, society, and the economy. Integrated Landscape Management Models (ILMM), described in an earlier briefing note in this series[1] (Integrated Landscape Management Models for Sustainable Development Policy Making), may be such a tool.

ILMM, like the MetroQuest model, can reduce stakeholder conflict and increase the quality of land-use decision-making. Photo courtesy of Dave Biggs.

1 Available by following the "Publications" links at <www.policyresearch.gc.ca>.

Canada

A Vision for a National Integrated Landscape Management Modelling Capacity

What a National ILMM Capacity Must Have:

- Must include public education and delivery programs
- Must link existing programs across institutions and governments
- Must have start-up and long-term funding (private, governmental, or other)
- Must have a formalized means to collate and disseminate information and skills
- Must provide support for policy advice and research activities
- Must have peer review, certification, or other credibility-assurance processes

What a National ILMM Capacity Should Be:

- A community of modellers and other experts with experience working together and with stakeholders to assess land-use decisions
- A system for ensuring multiple expert inputs and stakeholder involvement
- A means for training support for modellers and users including community stakeholders and decision-makers
- A suite of spatially explicit, multi-scale models and modelling tools including:
  - economic, social, ecological, and geophysical factors
  - past, present, and future (forecasting and backcasting) capabilities
  - qualitative and quantitative approaches

ILMM have been used successfully to reduce conflict among stakeholders by including them in model development and by graphically demonstrating potential effects of decisions. They also allow fine-tuning of decisions by making it quick and easy to test alternative scenarios. ILMM show possible unintended and unexpected consequences of a decision that may involve the cumulative impacts of previous or anticipated future developments. This includes identifying complex interactions that may exist between seemingly disparate management or policy decisions, making ILMM particularly useful to establish a clear, consistent, rigorous, and scientifically defensible process for SEAs. Finally, ILMM can provide a rapid and objective assessment tool by improving the consistency and quality of information available for policy- and resource-decision making.

In order to derive these benefits, ILMM must become an established tool. The data that are required to feed ILMM must be available and accessible. And stakeholders, often reluctant to become early adopters of unfamiliar technological approaches, must have confidence in the ILMM process, and the ability to understand and interpret its outputs.

A recent workshop discussed possible roles, benefits, and challenges of developing a Canadian national ILMM capacity.[2] The participants identified the overall objective as establishing "a suite of validated modelling techniques and products that are accessible, understandable, and usable by modellers, decision-makers, and the public." A number of challenges were identified for such a program, notably, that it be

2 A workshop report is available by following the "Sustainable Development" and "Publications" links at <www.policyresearch.gc.ca>.

informative but not prescriptive, and that it focus on expanding existing expertise through knowledge and data-sharing across sectors/jurisdictions. Strong federal government leadership was seen as imperative, particularly with regard to: providing support and direction for provincial and territorial initiatives; knowledge and systems development; policy and implementation support; and data and model accessibility.

Participants defined a vision in which a suite of models and modelling approaches, based on the best available science and representing different social, economic, and environmental processes (e.g., transportation, land-use allocation, hydrology, soil erosion, wildlife viability, etc.) are readily accessible. Models could be connected in different combinations to address various environmental problems or questions.

A formalized mechanism will be critical for such a program to be successfully implemented. There will be a need to address the technology transfer gap to ensure the models are actually used in policy and land management planning. This translates into a need to evolve a structure to Canada's ILMM capacity that will integrate ongoing research activities and facilitate inclusive consultations and knowledge transfers among experts in policy, members of the public, government, industry and scientific research communities. With that challenge in mind, five possible operational models can be identified:

1. Central National Modelling Facility

Coordination and integration could be managed through a central modelling facility, such as an institute that either supports or brings in modellers and policy analysts from governmental and non-governmental organizations to address particular stakeholder needs. All stages of work, such as the integration of modelling approaches, policy need identification, and implementation, would benefit from the collective experience of a range of professionals working on a focussed, common problem over a finite time period. The federal government would help identify and formalize partnerships among stakeholders and researchers and establish funding and communication services and the dissemination of information. This would, in some ways, resemble the International Institute for Applied Systems Analysis in Austria, which is supported by a number of European countries.

2. Centres of Excellence

Under a "Centres of Excellence" plan, individual centres would be distributed at universities or government laboratories across Canada by region or jurisdiction, by theme (e.g., geographic, sectoral), or by some mix of the two. A central policy hub would coordinate and ensure knowledge transfer and implementation between regional centres. The hub would bring together policy people from across all levels of government. This could resemble, and even build on, existing programs such as the Natural Sciences and Engineering Research Council (NSERC) networks of centres of excellence. The European Union (EU) is adopting a similar approach to coordinate among its various national policies.

3. Provincial or Regional Centres

A national modelling capacity could also aim specifically at regional priorities through the establishment of provincial or regional centres. In contrast to the academia-based centres of excellence, these regional centres would be run and directed by the provincial governments in coordination with the federal government. This has the benefit of building long-term capacity and expertise within governmental agencies (a major client group), with short- or long-term collaborations occurring, as required, with academic or private organizations. A formalized federal-provincial/regional reporting and communications mechanism would facilitate integration of ongoing and new programs over a national scale. The focus and organization of the centres could be based on jurisdictional or thematic research lines.

4. Central National Coordination Facility

A centralized facility could be established to facilitate data and knowledge transfer only. Although such a facility would not be actively involved in model development, it would play a critical role in data identification, conversion, delivery, data sharing agreements and gaps, and appropriate model identification. It could also facilitate and direct expert workshops, formalize client relationships, and develop client communication mechanisms. The U.S. National Biological Information Infrastructure and Canada's National Land and Water Information Service could serve as prototypes for such a facility.

5. Highly Distributed

A national, coordinated, peer-to-peer initiative could allow dialogue, knowledge transfer, and stakeholder involvement to occur independent of active integration strategies. This would likely not emerge without substantial leadership. Structured somewhat like the e-Dialogues for Sustainable Development Project (initiated by Royal Roads University, the Public Policy Forum, and the Policy Research Initiative, this project runs a series of "real time" electronic dialogues on specific policy themes pertaining to sustainable development), this would provide coordination only and would, in some ways, be the easiest way to develop a national modelling community, although it might not be adequate to address key issues such as data access and model interoperability protocols.

Challenges For The Development of a National ILMM Program

There are several challenges in developing a national ILMM capacity, including the common issues and requirements associated with all integrative and cross-jurisdictional projects. The major barriers are: a lack of leadership in intergovernmental integration and knowledge transfer; policy and mandate conflicts between jurisdictions; the absence of incentives such as policies requiring the use of ILMM for SEAs to help overcome early adopter anxiety; data access and compatibility issues; lack of coordinated funding for modelling efforts; and a number of lesser issues mainly revolving around the need for coordination and leadership.

There are also technical and social challenges, particularly with privacy and cross-jurisdictional issues. Clear authority is beneficial, as is early stakeholder involvement. Ultimately, there will be trade-offs and compromises that must be reached through discussion and common understanding.

Conclusions

ILMM represent a strategic means for dealing with uncertainties that are a critical but missing part of integrative management initiatives, such as climate change mitigation, environmental impact assessments, and biodiversity conservation.

A national capacity for ILMM should increase Canada's collective capacity and technological expertise, not duplicate existing work. It would improve the consistency and predictability associated with the decision-making process. The federal government must take a leadership role to develop a national ILMM capacity for Canada; the payoff will be better, and possibly faster, land-use management decisions and reduced stakeholder conflict.