Policy Research Initiative | Projet de recherche sur les politiques

Integrated Landscape Management Modelling
Workshop Report

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Canada

Integrated Landscape Management Modelling

Workshop Report

February 28–March 1, 2005

Ottawa

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February 28-March 1, 2005, Delta Hotel, Ottawa, Ontario

Executive Summary

Sound land-use decision-making requires that social, economic, and environmental values be balanced, and that any repercussions within these three areas due to a decision taken in another be identified and taken into account. Land-use planning and environmental impact assessments (both aspects of integrated landscape management) could be improved, and the decision-making process better informed, through the use of integrated landscape management models (ILMM).[1] More than 60 experts met in Ottawa to develop a vision for a national ILMM capacity for Canada, with particular reference to policy, technical, and logistical limitations and needs. Participants came from all levels of government, industry, and non-governmental organizations. Over the two-day workshop, they focused on identifying: the types of services and roles that ILMM approaches should provide in Canada; technical and logistical constraints that currently limit the development and use of integrative models; and possible strategies for addressing implementation gaps between policy, management, and research. These discussions laid the foundation for a vision of a national ILMM capacity and identified the need for federal leadership in facilitating its development.

[1] Integrated Landscape Management Models for Sustainable Development Policy Making. Briefing Note Series. Policy Research Initiative: <http://policyresearch.gc.ca/doclib/SD_BN_IntLandscape_E.pdf>.

Introduction

Environmental monitoring programs across Canada show that the integrity of ecosystems, watersheds, and environmental and human health are being hurt by certain land-use activities; notably, pollution from industrial and municipal runoff, habitat fragmentation, and interference with surface water and groundwater hydrology. These impacts are not solely the result of local land uses. Global factors, particularly climate change and the introduction of invasive species, also have significant impacts on landscapes and economies across Canada. However, no mechanism is in place to identify or understand the long-term ramifications of such factors. Moreover, no framework exists in Canada to promote the use of integrative, multi-generational approaches to sustainable land-use planning, and there is no requirement to incorporate sustainable development objectives into national, regional, or local policy decision-making. Land-use planning and policy are largely sector- or agency-specific. As a result, the cumulative impacts of land-use activities, and any interactions between such activities or policies on environmental, economic, and social well being, are not considered. Although this lack of integration is partially the result of knowledge and regulatory divisions along jurisdictional and sectoral boundaries, it is further exacerbated by the absence of any coordinating authority or resource base capable of supplying relevant information and expertise to planners.

Current directions in environmental policy in Canada increasingly require "place-based" (rather than activity-based) approaches for sustainable land- and resource-use planning. Accordingly, there is, at present, considerable interest in establishing a multi-partner, interdisciplinary approach to guide policy and decision-making in national-scale programs such as the Canadian Environmental Framework Strategy and the Agricultural Policy Framework. Novel analytical approaches are required to fully examine potential interactions and cumulative impacts associated with different land- and resource-use strategies over different spatial and temporal scales.

ILMMs comprise a suite of quantitative, projective tools for examining how the ecological and socio-economic features of an area are likely to change as a result of different policy and management decisions. The scale and application of existing ILMM applications vary according to their individual objectives. These approaches are increasingly used for sustainable transportation planning, urban growth planning, and, to a lesser extent, for cumulative impacts assessments at municipal and regional scales. A national strategy is required to expand the application of ILMM decision support systems to larger scales capable of evaluating the implications of cross-sectoral activities on socio-economic and environmental well being.

To understand the potential for ILMM tools, leading international and Canadian researchers, managers and policy makers came together from a wide range of sectors to develop a vision for a national capacity for ILMM in Canada. Another key objective of the workshop was to critically examine the existing approaches, identify what worked, what did not, and why, both from a product perspective and a project management perspective. The collective experience of workshop participants was

used to provide advice on project design and management frameworks for a national scale initiative, which can be implemented in the short-term and sustained over the longer term, to develop a national capacity for ILMM in Canada.

I. Workshop Overview and Context

The discussion about a national ILMM vision followed a structured path, starting with the potential roles for ILMMs in environmental planning in Canada, and how to make ILMM approaches accessible to decision-makers and land-use planners across the country. Participants agreed that integrated models can be a useful and cost-effective approach for assessing the effects of different environmental and land-use policies. At the end of the workshop, the discussions focussed on the possible roles of centralized institutions, such as data coordination centres or clearinghouses. The group also examined the potential of regionally based programs, and practicalities associated with establishing the necessary skill sets, knowledge base, and resources for a world-class ILMM capacity in Canada. This included the need to advance the use of ILMMs for risk- and cumulative-effects assessments.

Participants identified that one of the largest impediments to a national ILMM capacity is an "implementation gap," created by the absence of any formal requirements or mechanisms to invest in this unfamiliar approach. This challenge is similar to that faced by any new technology in the marketplace. Unless this knowledge and information transfer gap is addressed, ILMM approaches may not be adapted as quickly and as effectively as they could be. As such, the adoption of predictive and projective analytical planning tools would benefit greatly from strong leadership by the federal government. However, participants stressed that such a role must be facilitative rather than directive. In particular, support and direction are needed to advance existing and new initiatives by reducing barriers to adopt this novel approach, facilitating knowledge and systems development, as well as through technology transfer and public access.

The workshop was structured around a limited number of plenary presentations, thereby maximizing time for ground and roundtable discussions. The workshop schedule is in Appendix A and a list of participants is in Appendix B.

The State of Modelling in Canada

The existing ILMM capacity in Canada is mainly housed within the private sector, universities, and government agencies. Since most of the models developed to date are regionally based, there has been little communication or knowledge transfer between the various modelling initiatives in Canada. It was also noted by American participants that a similar problem exists within the United States; although, federal initiatives do exist to build private-public collaborations in the U.S. Modellers acknowledged that modelling initiatives would benefit greatly from increased dialogue and knowledge transfer. And, that this is especially necessary to build modelling capacity for multi-scale, integrative scenario modelling and cumulative effects assessments. Strong leadership was identified as a key requirement for

creating a national capacity, since both their application and the data used in the models would have to be relevant on local and regional scales. The idea of establishing a framework to facilitate model development and integration to better reflect the needs of decision-makers was strongly supported.

The following definitions were used at the workshop:

Landscape: A geographically defined area including all of its attributes, the boundaries of which are defined by a set of natural environmental and ecological variables. This may include, for example, an area over which major disturbances have a similar effect. However, from a policy perspective, a landscape is an area where the impact of decisions is felt, and does not necessarily correspond with jurisdictional boundaries. It is thus not scale-bound: the size of the area of interest will vary according to the issue at hand.

Integrated: Refers to the dynamic and static interconnections or relationships that exist between factors, and includes both ecological and human variables that are causally linked.

Scale: Refers to scope, meaning temporal and/or spatial components of a system, and includes all components of the unit of interest.

II. Plenary Presentations

There were two plenary presentations; one to set the stage, and the other to learn from the U.S. Army Corps of Engineers' experience. Presentations were followed by roundtable discussions to consider and compare experiences and lessons learned.

The Environment for an ILMM Capacity in Canada

Kathryn Lindsay (Environment Canada) discussed the application of ILMMs based on her involvement with both large- and small-scale ILMMs, particularly alternative futures and scenarios. Her experience indicates that there is no single optimal scale; rather, the appropriate scale needs to be identified for each problem in question. Thus, different scales are required for different policy and management issues. A number of important challenges and needs were identified; particularly, how such models might be introduced into policy planning.

The Realm of the Possible: An Example of a National ILMM Approach from the U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers (USACE) has developed what may be the world's largest integrated modelling program; there may be many useful lessons from their experiences.[2] Beverly Getzen & Jean O'Neil (USACE) outlined the structure,

[2] Although USACE has a strong riparian focus to their research, their models are comprehensive in including all relevant environmental features (e.g., wildlife, land-use activities, socio-economic data, pollution, etc.).

reporting system, authority, and implementation of research and modelling conducted by the USACE for the "public good". USACE has a central headquarters and multiple regional divisions and districts, each with a series of operating projects. Modelling activities are completed in collaboration with local agencies within regional offices, but are overseen by policy and coordinating staff within headquarters. Although model development occurs in the regions, they are also facilitators for model development because they contract some of this work to other organizations. The program mandates a series of activities, notably an annual report on integrated management activities and a requirement for local funding for every project.

The lessons learned from managing this national scale, hierarchically based modelling program were (see also Appendix D):

- Integration and scaling: Data needs to be discipline-specific; however, discipline-specific approaches are an impediment rather than an aid to communication. System-wide approaches, such as the alternative futures/scenarios, facilitate communication.
- The Basics: Data and model quality are very important. Inventories, mapping, and data management are required to support model development.
- Conflict: Both technical and social considerations can present challenges, particularly with private and cross-jurisdictional issues. Clear authority is beneficial, as is early stakeholder involvement. Moreover, spatial and geographic integration must balance needs and services. Ultimately, trade-offs must be reached through discussion and common understanding. However, scenario modelling during the planning stages of a project can reduce conflict in the end by allowing stakeholders to understand, upfront, the possible consequences of different decisions.

Sectoral Plenary Presentations: Perspectives on Policy Needs in Canada

A panel presented sectoral perspectives on policy needs and the potential value of ILMM approaches (Appendix C). Panelists were: Bob McLean – Environment Canada; Dean Smith – Agriculture and Agri-food Canada; and Gordon Peeling – Mining Association of Canada. Some of the main themes raised were:

- There is a need to standardize approaches, goals, and guiding principles across sectors.
- Predictive tools are needed to help identify the true costs and benefits of different management and policy actions.
- Integration is necessary across sectors but is beyond the scope of the private sector to complete.
- The federal government should provide a mechanism or tool to deal with cumulative effects across sectors.

- The private sector wants secure tenure, clarity of process, and a clear understanding of their current and probable future responsibilities and obligations.

III. Roles for ILMM

To date, integrated landscape management approaches have been applied to land- and resource-planning without the use of projective, analytical models. New technologies, data sources, and modelling tools allow us to improve the quantitative and projective nature of these approaches by developing decision support tools. ILMM approaches represent a means to address the policy and management needs in Canada because they would: standardize approaches; allow policy, environmental, social and economic outcomes to be evaluated; and identify complex interactions and cumulative effects across sectoral and jurisdictional boundaries in an explicit and quantitative way.

In order to develop a vision for a national capacity for ILMM, it is first necessary to identify its roles. The largest role is improving the quality of land-use and policy decisions by making scientific knowledge, and its implications, accessible to all stakeholders. Integrative landscape models are already used in areas with a high potential for conflicting land use and management. Here they contribute to the establishment of formalized mechanisms for stakeholder participation in planning. National support for the use of systems approaches with stakeholder participation could contribute to:

- harmonizing environmental management and policy across jurisdictions;
- eliminating duplication and overlap in federal/provincial/territorial regulatory matters;
- enhancing working relationships between different orders of government, the private sector, and the public; and
- reducing conflicts associated with spatially relevant planning at national scales.

The use of scientifically based analytical modelling tools is required to address the highly complex suite of interactions that exist between global warming, ecosystem functioning and health, human well-being and land and water degradation. Some of the most pertinent questions are:

1. What are the principal uncertainties or obstacles to effective long-term decision-making for sustainability?
2. What are the current condition and trends in ecosystems and the services they provide?
3. What are the implications of this current state and trends for human well being?
4. What would be the consequences of various plausible land-use and policy decisions for ecosystem functioning and human well being?
5. What can be done to improve environmental and human health?

6. What is the current state of ILMMs as landscape management, planning and policy development tools?

ILMM approaches were considered as a tool for quantitative assessments of risk and uncertainty associated with different policy options, and a means for identifying complex interactions that may exist between seemingly isolated management decisions. Their scalability also means that they can be used to generate questions about cross-sectoral/jurisdictional outcomes of local, regional, and national policy and management choices. In regard to complex problems or interactions (particularly those with multiple causes, critical applications for integrated landscape modelling approaches are:

- Environmental assessments
- Evaluating trade-offs and consequences of different management options
- Risk assessment (e.g., water and habitat protection)
- Land cover needs and land-use planning
- Goal setting (i.e., help public, decision-makers, stakeholders, etc., understand the consequences of different choices and what they want)
- Policy evaluation – simulate outcomes of different policy options
- Decision support (policy, management, planning, etc.)

IV. Implications for the Vision

Because ILMM models aim to increase knowledge and understanding of the implications of different choices for environmental, societal, and economic well being, particularly over the long-term, they represent a strategic means for dealing with uncertainties that are a critical but missing part of integrative management initiatives (e.g., climate change, carbon sequestration, environmental impact assessments, etc.).

Some immediate policy applications and opportunities in Canada, identified by workshop participants include:

(i) Strengthen existing and new management planning projects

- Support existing programs (e.g., Agricultural Policy Framework)
- Build links between existing programs (e.g., biodiversity conservation)
- Cumulative effects assessments (e.g., Strategic Environmental Assessments)
- Facilitate the development of a "Policy Lifecycle" for adaptive management and planning $(\text{Development}>\text{Implementation}>\text{Assessment})_n$

(ii) Integration, conflict identification and mitigation

- Increase coordination among federal/provincial/territorial environmental, economic and social sustainability objectives and goals (empower local stakeholders and communities)

- Identify opportunity to reconcile regional differences (e.g., various forms of wetland classification)
- Identify and reduce potential policy and mandate conflicts in land-use planning (e.g., within and across federal and provincial departments)
- Increase consistency in application, implementation, and management across regions
- Identify and evaluate responsiveness of environmental, social and economic sustainability indicators (e.g., biodiversity, water protection, etc.)
- Increase public role in directing federal conservation efforts, including, for example, habitat protection initiatives and fisheries management decisions
- Identify and mitigate conflicts through stakeholder participation. Examples of conflict types include:
    - accessibility conflicts – e.g., Native vs. commercial fisheries
    - "grey" or cumulative effects outcomes – e.g., multiple causes for cod fishery collapse
    - inter-governmental conflicts – e.g., fisheries dispute in the St. John River due to the lack of any clear authority, good information systems, and ambiguous accountability

(iii) Knowledge acquisition

- Increase understanding of links between resource use and environmental health
- Create capacity for evaluating choices for reducing carbon emissions (e.g., relative assessments of sequestration, innovation and other planning options), water protection (e.g., watershed planning), and other sustainability targets
- Identify sustainable targets for urban and rural planning/growth and emerging areas of concern through simulation and scenario modelling (e.g., groundwater, invasive species, transportation corridor development)
- Allow sustainability goals to be set over ecologically appropriate spatial and temporal scales by highlighting trade-offs and benefits on multiple scales

(iv) Spin-off benefits

- Inventory of landscape, landscape issues, data, and modelling approaches and increased accessibility to the inventory
- Greater predictability in business environment through the identification and management of different levels of uncertainty (and cumulative effects mitigation)
- Improved cross-sectoral and jurisdictional communication in planning (create links between federal-provincial/territorial-municipal governments and private sector)
- Integration of cities (municipal) planning with larger landscape/ecosystem context (link rural-urban goals on national and eco-regional scales)
- Quantative deliverables for commitments (e.g., emissions reduction, carbon sequestration, biodiversity conservation, etc.)
- Indicator and standards developed for evaluation using ILMM models

- Supply data needs for models to help direct research at the most critical knowledge gaps

Challenges in Applying ILMMs

Currently, modelling tools are infrequently applied to policy and management issues that are otherwise difficult to resolve. Although accessibility and knowledge transfer were identified as critical needs to increase their use, the principal obstacles for the implementation and delivery of these decision support tools were political rather than technical in nature. Consequently, participants emphasized the importance of ensuring that politicians and decision-makers understand and have confidence in the possibilities and feasibility of ILMMs. Participants identified a suite of challenges, and the commitments needed to address those challenges:

Challenges:

- Existing silo structure of governance
- Funding support
- Identification of evaluation and reliability testing criteria
- Data and model output incompatibilities
- Skills gap (differing levels of knowledge and training required for all users/public, and a shortage of highly qualified personnel for ILMM development)
- Absence of legal or regulatory requirements to use ILMMs
- Limited quality of science on integration
- Unforeseen cultural and political impediments
- Maintaining coordination in a long-term evolving initiative

Actions and commitments required to meet challenges:

- Coordinate across diverse and varied political and sectoral objectives
- Establish long-term funding opportunities
- Create data standards (eg., through peer-review process)
- Build new partnerships with universities and other research groups (national & international)
- Identify and engage stakeholders/partners
- Find a political champion and increase public understanding and support
- Establish a formal framework for science-policy integration
- Identify incentives to facilitate locally driven initiatives/partnerships
- Establish legal or regulatory requirements to use ILMMs to reduce the barrier to adoption of this novel approach
- Conduct additional research and science to increase quality of science on integration (adaptive management)

To establish the credibility for ILMMs in Canada, it will be necessary to address these challenges. Ideally, this can be done through their application in a series of small projects (pilot studies), with particular emphasis on demonstrating their immediate and long-term value for assessing the costs of benefits of different policy trade-offs, standards testing, and sustainable land and resource planning. Participants noted that

there are many well-established pilot-projects that could be used to advance this work.

V. The Grand Vision

To identify potential enabling environments, financial, regulatory, and policy considerations were examined in a series of breakout sessions. The development and implementation of ILMMs will require the establishment of mechanisms for knowledge transfer, communication and stakeholder participation (i.e., the users, decision-makers, academics, local communities, public, etc.), and integration across different jurisdictional and sectoral boundaries.

Requirements identified by workshop participants in Canada include:

1. ILMM Framework

Goal: To achieve sustainable landscapes by resolving land-use conflicts. This would be realized through the analysis of policy options, adaptive management, and iteration, and would provide optimal societal benefits and credibility to the process of interactive, modelling-based policy development and planning.

a. The capacity for modelling is linked with policy needs (results are incorporated into policy)
b. New policy and policy options are explored and evaluated using modelling approaches (informed decision-making also includes managers)
c. A framework is used to facilitate use of models by decision-makers (information and knowledge transfer)
d. Shared understanding and goal setting are used to identify trade-offs and reduce conflict
e. Success can be modeled and tested post-hoc through modelling
f. The framework incorporates an iterative process with continuous learning

2. Modelling Capacity

Goal: ILMM involves a suite of connected models that use a modular structure (tool box) based on a pool of expertise. Important aspects are:

a. That it is spatially explicit, multi-scale, and/or hierarchical
b. That it integrates economic, social, geophysical and ecological factors
c. That it considers past, present and future scenarios (fore- and back-casting options)
d. That it is both quantitative and qualitative in its methods
e. That it has peer review, certification or other credibility assessments
f. That it is ground-truthed (and adaptive)

g. That some or all of it is, in part public domain, open-source (i.e., software and data)
h. That it will be supported on an ongoing basis in terms of model application and development

3. Data Capacity

Goal: Economic, social, and environmental data is accessible, including model outcomes. Data should be accessible through indexed inventories, directories, and metadata repositories. Commitments from national and provincial/territorial governments will be required to coordinate efforts among authorities and to update data regularly. An open source toolkit is available to convert/crosswalk data to various formats, data types, etc.. Important aspects are:

a. That data is centrally stored or managed (clearinghouse, repository – e.g., National Land and Water Information Service, National Forest Information System)
b. That data is either open access or shared under pre-arranged conditional agreements
c. That data sharing be facilitated through formal agreements or legislation, as required
d. That critical data gaps are strategically addressed in a coordinated manner

4. Knowledge Capacity

Goal: Development and support of knowledge at all levels (model development, policy developers, managers, private sector, public, etc.). Ecological, social, and economic researchers and public and private stakeholders will all require different training and information to make these toolkits and their outcomes accessible and transparent. Important aspects are:

a. That training and knowledge programs be developed
    i. General user forums, workshops, seminars, etc.
    ii. Formal training options to provide a base of highly qualified personnel (e.g., within academic and other institutions to standardize terminology, etc.)
b. Capacity for training and knowledge transfer for:
    i. Planning (policy analysts, managers, etc.)
    ii. Modelling (users, stakeholders, etc.)
    iii. Policy development (policy analysts, managers, etc.)
    iv. Training outreach for non-government, local, and others
    v. Development of appropriate teaching curriculum (environmental science, geography, political science, etc.)

5. Engagement

Goal: Develop a policy to identify ways to engage stakeholders (provide opportunities for participation). Important aspects are:

a. That stakeholders perceive clear value of participating
b. That participation be easy, cost-free, transparent, and user-friendly
c. That a process or mechanism for dealing with conflict (mitigation) and trade-offs be developed to support users
d. That stakeholder engagement incorporates social considerations and engages the public through innovative information, participation, or other mechanisms

6. Marketing and Funding

Goal: That "The Landscapes Canada Project" engages support by providing public with community-led resource planning capacity. Canada should be seen as an international leader in protecting critical global resources (freshwater, natural processes for carbon sequestration). This has been done through branding and demonstration of the value of this program for the environmental issues of the day. Important aspects are:

a. That all governments participate and link efforts to existing programs and commitments
    i. Federal: bio-economy; sustainable development; climate change; cumulative effects (environmental assessments)
    ii. Regions: Federation of Canadian Municipalities (cities program); water protection.
    iii. Non-governmental, industry, academic and public: public good focus (knowledge, socio-economic and environmental health and well being)
b. That Canada aim to export knowledge to assist developing countries in resource protection and "smart urban growth" (adaptation and mitigation)
c. That funding and support be established through stakeholder agreement through private-public programming

7. Structural Capacity

Goal: Develop a series of thematic or regional hubs or centres that focus on a particular subject, study area (e.g., boreal forest) or jurisdictional issues (e.g. watershed protection). The hub could either be supportive of the development of modelling capacity, or could be a *part* of the modelling capacity (See Figure 1). Important aspects are:

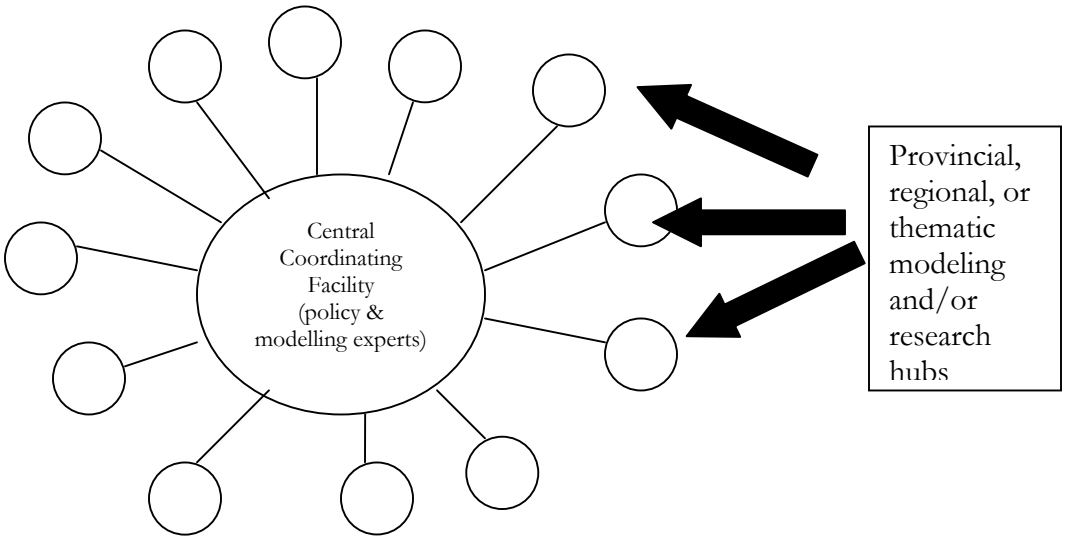
a. That a central hub, at the national level, integrates interdepartmental policies and programs that have implications for land-use planning and supports provincial programs and activities (coordinate between nodes, e.g., USACE), as well as supports a network of developers or programs. Although this could be a federal responsibility, it could also take the form of a new, non-profit

crown agency for sustainable land- and resource-planning and policy development. The hub could serve any number of roles: as a data clearinghouse, central distributor, provider of technical advice, steering committee advice, or policy advice. “Arms” should link the hub and regional areas. This could include:

   i. Peer-to-peer (e.g., universities, non-governmental organizations, hybrids between industry and other sectors, etc.)
   ii. Provincial hubs
   iii. Regional support from municipalities (to address cumulative effects and provincial data management issues on a local scale)

b. That the scope of the collective structure or framework includes fine scale plans, sectoral plans, municipal plans, etc.
c. That the central hub and its components be: non-prescriptive, collaborative, focussed (clear mission); have advance knowledge; collate and disseminate information; provide policy advice/information; promote research; be politically sanctioned; and have secure funding or access to funding
d. That it avoid “reinventing the wheel” by focusing on growth and the establishment of connections between existing activities, both governmental and non-governmental (e.g., data sharing/clearinghouses, model development, data collection and mapping efforts, etc.)
e. That, if necessary, agreements can be arranged to facilitate data sharing, transfer, privacy, etc.
f. That the federal government serve as a national coordinator and facilitator of standardization (common community of practice) and knowledge transfer across jurisdictions
g. That it be overseen or coordinated by an inter-agency steering committee

Figure 1



VI. Conclusion

Workshop participants identified a number of characteristics for an integrated modelling capacity. The requirements were for *A suite of validated modelling techniques and products that are accessible, understandable, and usable by modellers, governmental staff, decision-makers, and the public.* However, the federal government's leadership was seen as imperative to advance the use of land- and resource-planning for sustainable development in Canada, particularly with regard to providing support (both financial and coordination/leadership) for provincial and territorial initiatives, knowledge and systems development, and accessibility.

The participants' vision encompasses a suite of models and capacity for continued model development and support based on best available science, and representing different social, economic, and environmental processes such as transportation, land use allocation, hydrology, soil erosion, wildlife viability, human health, and so forth. Models would be connected in various combinations to address different environmental problems. Participants agreed broadly on the functional components required within a national modelling program but recognized that a formalized mechanism would be critical if such a program were to be successfully implemented. One of the principal gaps identified was in the transfer and implementation of the modelling efforts into policy and land management planning. In summary:

1. The policy relevance and accessibility of landscape planning models would benefit from: increased knowledge transfer between projects; greater input from policy analysts and land use managers.
2. Barriers to the development and use of integrated planning tools across jurisdictional and thematic boundaries highlight a potentially valuable role for federal involvement.

VII. Next Steps

Organizers

1. Refine meeting outcomes, produce a report, publish this document)
2. Pursue ADM/DM conversations to promote and engage people on applications of ILMM; work with the Integrated Landscape Management Coalition (ILMC) and others to arrange presentations by ILMC with Deputies of Environment Canada and Natural Resources Canada, as well as Central Agencies as the opportunity arises (ongoing)
3. Draft briefing note (anticipated publication in May, 2005)
4. Converse with other jurisdictions and analytical discussion of implementation gap in a peer-reviewed publication (ongoing)
5. Draft possible Memorandum to Cabinet (fall/spring 2006)

Participants

1. Communicate with regional representative on ILMM applications
2. Promote ongoing initiatives (local and those of other workshop participants)

APPENDIX A: Workshop Schedule

"Toward the development of an Integrated Landscape Management Modelling Capacity in Canada"

FEBRUARY 28 & MARCH 1, 2005

DELTA OTTAWA HOTEL (VICTORIA ROOM)

Agenda

OBJECTIVES

This workshop will contribute to the shaping of a vision for a National Integrated Landscape Management Modelling (ILMM) capacity in Canada by:

- Analyzing the ILMM environment in Canada.
- Developing elements of a vision for ILMM in Canada.
- Identifying the governance, infrastructure and resource implications of the vision.
- Identifying the "next steps" path forward in the process of developing and operationalizing the vision.

DAY 1

8:00 **Registration & Poster and Software Demonstration Session (Part 1)**

9:00 **Welcome** — Ian Campbell, PRI; Ken Harris, EC

9:15 **Introductory Process / Review of Expectations** — Warren Wilson (Facilitator)

The "Environment" for ILMM Capacity in Canada

9:30 **The Canadian Context for ILMM** — Kathryn Lindsay, EC
- The current state of ILMM in Canada
- How we operate
- Jurisdictional challenges

9:55 **Open Forum / Question & Answer Period**
Table group and plenary discussion
- What were the key messages?
- What questions of clarification do we have?

10:15 **Health Break**
Poster and Software Demonstration Session

10:45 **The Experience from the U.S. Army Corps of Engineers** — Beverley Getzen, Jean O'Neil, USACE

11:30 **Open Forum / Question & Answer Period**

12:00 **Lunch Break**

13:00 **Discussion & Lessons Learned**
Table followed by plenary sharing
- Based on the presentations, and experience with other models/projects;
  - What are the lessons learned?
  - What has worked well and what hasn't?

14:00 **Policy Needs and Experience in Canada** — Robert McLean, EC
Panel Presentation — Dean Smith, AAFC
Gordon Peeling, MAC

14:45 **Open Forum / Question & Answer Period**

15:15 **Health Break**
Poster and Software Demonstration Session

15:30 **Discussion: Policy Needs and Opportunities**
Table followed by plenary sharing based on panel presentation
- What are some of the policy and program decision support needs that could be addressed if we develop ILMM capacity in Canada?
- What are some of the policy or management challenges that would have to be addressed for ILMM capacity to be successfully established and maintained in Canada?
- What are some of the opportunities?

16:30 **Wrap-up of Day 1** — Ian Campbell
Ken Harris
Warren Wilson

17:00 **Poster and Software Demonstration Session**

DAY 2

8:00 **Poster and Software Demonstration Session (Part 2)**

9:00 **Getting Started** — Ian Campbell
- Key Messages from Day 1 — Ken Harris
- Review & feedback — Warren Wilson

A Vision for a National ILMM Capacity

9:10 **Discussion on Vision**
Using a "preferred futuring" approach
- If Canada were the model of the world in the year 2010…
  What would National Integrated Landscape Management modelling capacity be in Canada?
  What will we aspire to create?

Achieving the Vision in Canada

11:00 **Discussion: Implications for the Vision (How do we get there?)**
- How will we build this in Canada?
- What are the resource implications?
- What are existing resources that can be leveraged?

12:00 **Lunch Break**

The Path Forward

13:00 **Implications discussion continued**

- Who else should be engaged in the development of an ILMM capacity in Canada?

14:00 **Next Steps & Closing Comments** — Ian Campbell, Ken Harris

15:00 Closure

APPENDIX B: Workshop Participants List

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APPENDIX C: Sectoral Plenary: Perspectives on Policy Needs in Canada

1. Environment Canada - Bob McLean

- tendency exists to be narrowly focussed on site-specific issues (e.g., water, birds, species-at-risk)
- lots of activity but often little progress
- there will never be enough data, actions are required concurrently with data and knowledge acquisition (i.e., adaptive management)
- trade-offs are inevitable (must be accepted by all sectors)
- governance mechanisms are required to support decision-making
- landscape management decisions must be made at the community level
- ILMM is an acceptable way to practice federalism:

    Steps: 1. Define objective
    2. Identify needs and existing capacity
    3. Identify a strategy to achieve goals (authority, roles, etc)

    Next steps: institutions and governance

2. Agriculture and Agri-Food Canada - Dean Smith

- agricultural lands are facing changes (quality and quantity) across Canada
- cause and effect relationships need to be understood (e.g., farming activities should correspond to the local soil and drainage properties)
- Sustainable development will be required across sectors to deal with larger landscape issues (unify different sectors for planning at meaningful temporal and spatial scales)
- agricultural management needs to be equivalent to climate change management in approach
- needs to develop appropriate policy that is anticipatory and planning-oriented (e.g., changes in human population densities and land use patterns)
- currently, no way exists to share data. Infrastructure is required to support data and to ensure it is accessed and used appropriately
- cooperation and collaboration are required across sectors for knowledge transfer and policy planning

3. Mining Association of Canada (MAC) - Gordon Peeling

- MAC, like several other national-scale industrial associations are trying to develop integrated datasets (there is no mechanism to share the data they collect with others)
- standardized approaches and goals are required/beneficial (MAC works off a set of identified guiding principles)
- environmental cost of transferring national capital to social capital needs to be determined

- sectors exist as silos, much like different governments across Canada, some means of integration is necessary (but beyond the scope of the private sector in need)
- federal government needs to provide a mechanism to deal with cumulative effects ACROSS different sectors
- want secure tenure, clarity of process, and understanding of their responsibilities

APPENDIX D: Lessons Learned

The experience of policy and modelling experts in the room generated the following list of critical considerations:

- the tools and technical expertise exist, but institutional bridges are required to match landscape needs across political and sectoral boundaries and to increase knowledge among end-users:
    - approaches must deal with clearly defined issues at scales that are appropriate (time and space);
    - visualisation approaches increase accessibility to all stakeholders;
    - there is no single modelling approach for ILMM, but coordination is needed to properly build on existing programs/capacity (value added with other national initiatives);
    - inventories and data repositories are needed to facilitate integration and development of analytical approaches to deal with complex problems;
    - early and continued stakeholder engagement and strong cross-sectoral partnerships are critical for driving local change(s) but will only occur if community is involved in decision-making/planning;
    - -knowledge and data sharing agreements will be necessary to address data accessibility/sharing issues, including knowledge transfer and sharing between public and private sectors;
    - policy needs are not always known to model developers and policy and land planners are unaware that policy options can be evaluated through the use of scenario models (policy goals do not inform research objectives);
    - model accuracy must be provided through a process of coordinated data collection, reliability testing, and adaptive management (meta-data/meta-model standards);
- an implementation gap exists between researchers and planners. Methods for developing research-based management and policy analysis approaches are not supported or accessible (e.g., decision structures);
- not all scales have authority, creating gaps in management and planning at scales involving multiple political boundaries. These will not be addressed by local, municipal, regional, or provincial/territorial initiatives - central leadership is required;
- knowledge transfer between researchers and decision-makers is difficult in the absence of formalized procedures or requirements to do so;
- modelling approaches should be integrated into regulatory requirements (e.g., Strategic Environmental Assessments);
- Cumulative effects models of land, air, water, and social impacts are too complex for individual stakeholders to manage and provide a clear opportunity for federal leadership and involvement.
- Institutional or individual champions are invaluable