Understanding Regions: A Framework for Description and Analysis

D. Scott Slocombe
Department of Geography and
Environmental Studies
Wilfrid Laurier University
Waterloo, ON N2L 3C5

The goal of this paper is to provide a conceptual framework for collecting, organizing, and interpreting information to meet the needs of planning and managing for such complex, transdisciplinary purposes as sense of place, multiculturalism, ecosystem integrity, and sustainability. Although these purposes are not really new to planning and management, they are being re-emphasized and becoming increasingly common and important in urban, regional, and environmental planning and management (Cartwright 1991; Richardson 1989; Turner 1988). To some, they call for an entirely new theory and practice of urban and regional planning and design (Calthorpe 1993; Krieger 1991). The aim here is less grand: to outline a basic conceptual framework for understanding regions that clarifies concepts, and to provide some simple illustrations of the framework.

My spatial focus is regional; regions in the sense of coherent entities, defined on the basis of similar biophysical, cultural and socio-economic characteristics. Such regions, or ecosystems to use the more evocative, less administratively biased term, are of growing interest to planners and managers. The goals and problems planning and management must address can increasingly be defined less and less within single, existing management units at a single

Parts of this research were supported by the Canadian Social Sciences and Humanities Research Council and Wilfrid Laurier University. I am grateful to Dr. Greg Walker and two anonymous reviewers for their comments on earlier drafts of this paper. This paper was originally presented to the Pacific Regional Science Conference Organization and Canadian Regional Science Meetings July, 1993 in Whistler B.C.

ISSN: 0705-4580 Printed in Canada/Imprimé au Canada

hierarchical level. As planning and management goals and practice become more complex and inter- and multi-disciplinary, regional description and analysis become less and less a straightforward, expert, scientific process. The framework presented here addresses and makes explicit problems related to kinds of description, interpretation, perception, and intention in regional description and analysis.

The need for a new conceptual framework is seen as a reflection of new and long-standing problems with traditional, and even some newer, approaches to regional description and understanding. These problems are less due to narrowness of focus or data collection, than to narrowness in interpretation and integration of available information and related problems. In the absence of a broad framework which addresses issues of the nature of information, means of interpreting it, and the influence of actor perceptions and intentions, a range of problems frequently arise. These include collection of too much, irrelevant information; difficulty collecting and integrating relevant qualitative information; failure to acknowledge the influence of perceptions and intentions in colouring interpretation of data in normative planning contexts; and difficulties reconciling conflicting views of the nature and future of a region.

Such problems have perhaps been most obvious in many environmental assessment processes in Canada, and elsewhere, in the last twenty years. Good examples include the assessments of hydrocarbon development in the Beaufort Sea and pulp and paper mills in northern Alberta. Vast amounts of information have been compiled, interpreted in diametrically opposite, impenetrable ways by different groups, and ultimately only fostered conflict rather than improving decision-making (Conacher 1988; Mulvihill and Keith 1989; Rees 1983). More recently, similar problems have been seen in controversial land use planning processes and decisions such as those in British Columbia on Clayoquot Sound, Vancouver Island, and elsewhere (for example, Province of B.C. 1993; CORE 1994). For some, many of these problems may be attributed to a lack of theoretical orientation in environmental planning generally (Briassoulis 1989).

There is nothing new to observing that information may be hard to come by, or hard to filter; that the potential kinds and sources are near infinite while resources for collection, organisation, and analysis are distinctly finite; that it is hard to predict what information is needed in advance of the need, and that environmental and economic information need to be linked (for example Briassoulis 1986; Isard 1972; Perloff 1957). What is new, at least in the sense of an extension of the work of earlier regional scientists and planners, is increased recognition of the complexities of regions in terms of diverse interests, the interaction of natural and artificial systems, the potential for unpredictable change and effects of actions, and the need for and effects of increased public participation (see, for example, Filion 1988 in the community development context). It is these factors, all of which are common to planning and managing for complex, multidisciplinary goals, that require new concepts and approaches to describing and understanding regions. The next section outlines some key

conceptual approaches for understanding a region, which lead to the specific framework outlined in the following section.

Background

Two complementary perspectives on regions and the goals of planning and management within them underlie the framework presented in this paper. First, regions or greater ecosystems are viewed as complex, changing, nonequilibrium systems. This view has been developed and illustrated in detail elsewhere (for example, Bowonder 1987; Boyden 1992; Grzybowski and Slocombe 1988; Slocombe 1989, 1990). Fundamentally, it means recognizing and working to understand several key characteristics of regions or greater ecosystems as socio-biophysical systems:

- complexity of structure and process;
- nonlinear dynamics and the inevitability of change;
- uncertainty of system evolution and the effects of actions;
- connectedness of different dimensions of the region;
- self-organizing capacities;
- unique and region-specific characteristics and character.

Taken individually, many of these ideas have a reasonably long history. The complexity of urban and regional structure and process has a history going back to the early human ecologists, formalized later by others (for example, Pred 1975; Boyden et al. 1981). Uncertainty in urban, regional, and environmental planning have been examined almost as widely in conceptual and practical terms (Christensen 1985; Holling 1977; Morley and Schachar 1986). The dynamic, nonlinear, self-organizing character of cities and regions has received quantitative and qualitative attention more recently (Crosby 1983; Marchand 1984). And there is a strong, if minority, tradition of attending to regional uniqueness, character and complexity in ideas of place (for example, Kemmis 1990; Lynch 1976; MacKaye 1928). What is new is the effort to explore the connections between all these aspects of regions, and to integrate them in the context of the multidimensionality and connectedness of regions, which was recognized, for example, by McHarg (1969).

Second, the purpose of understanding regions is assumed to be planning and management of them; for, in particular, complex, systemic purposes such as sustainability and ecosystem integrity (see, for example Angermeier and Karr 1994). This can be seen to imply adoption of broadly systemic approaches and methods, particularly what have been termed ecosystem approaches in a range of disciplines (Slocombe 1991), and to specifically require ecosystem-based management: management of coherent, self-similar areas as single units (Slo-

combe 1993a, b). Such an approach can be seen as entailing certain substantive and procedural activities:

- describing parts, systems, environments and their interaction
- holistic, comprehensive, trans-disciplinary approaches
- including people and their activities in the ecosystem
- describing system dynamics through concepts of stability, feedback, etc.
- defining the ecosystem naturally, for example bioregionally, instead of arbitrarily
- looking at different levels/scales of system structure, process and function
- recognizing goals and taking an active, management orientation
- incorporating stakeholder and institutional factors in the analysis
- using an anticipatory, flexible, research and planning process
- entailing an ethics of quality, well-being, and integrity
- recognizing systemic limits to action -- defining and seeking sustainability.

In general, this sort of management may be seen as requiring three key steps: redefining management units to avoid the arbitrariness of most existing administrative units; developing an understanding of the extent and sources of pattern and change in a region, and formulating planning and management frameworks that foster an adaptive, participatory approach to meeting needs and change. The first is deeply constrained by existing structures, and may have to be approached conceptually. This paper specifically addresses the conceptual context of the second of these steps.

The following sections extend traditional approaches to regional description and analysis as one part of the broader framework and theory of ecosystem approaches and ecosystem-based management. This is a view of regions as complex, dynamic, entities with many interacting parts evolving independently and together at different spatial and temporal scales. Developing understanding of a region must reflect and take account of regional complexity -- in terms of characteristics, control processes, and spatial and temporal scales. The increasing interdependence of these dimensions at multiple scales in the context of complex systems goals such as sustainability is central to the need for new frameworks for developing understanding (see Figure 1). First, a conceptual framework is presented which discusses the activities of description, interpretation, perception, and intention. Then specific methods and examples for each are discussed.

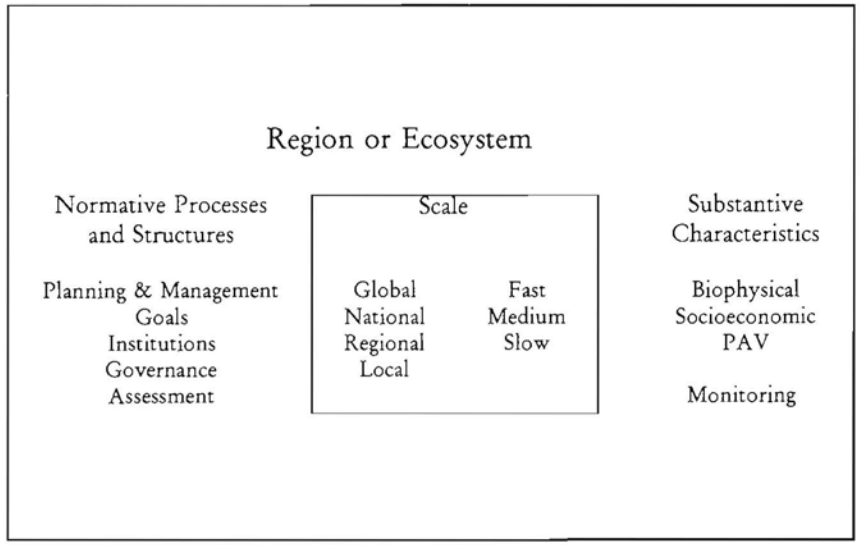

FIGURE 1 The Regional Interaction of Normative Processes and Substantive Characteristics

Conceptual Framework

This section provides a simple, standard framework with implications for developing understanding of a region. The conceptual framework presented here highlights four qualitatively different activities that contribute to developing understanding of a region. Each contributes more strongly than others to production of certain components of understanding -- but all are interrelated to some degree, and should be iterated in practice. The conceptual framework identifies several distinct and complementary activities and products for understanding regions or ecosystems (see Figure 2). These stages provide the basis for more detailed discussion of information needs, uses and methods in the next section.

Traditionally, and nearly inevitably in a scientific or professional study, knowledge is based on description. In rough order of declining frequency, quantitativeness, and replicability one usually seeks to collect biophysical (features, species, ecosystems), economic (income, employment, value), and social (institutions, actors, social forces, culture, norms, behaviour) information. Description is traditionally seen as objective, the collection of "raw" data. In principle, such objectivity is perhaps possible, more so for biophysical than for economic data, and still less for social data. But it is undoubtedly very rare in practice. Descriptive data are the foundation of developing understanding, not the whole structure; other activities are also necessary. A major purpose of this framework is to make these other activities explicit, and to distinguish them

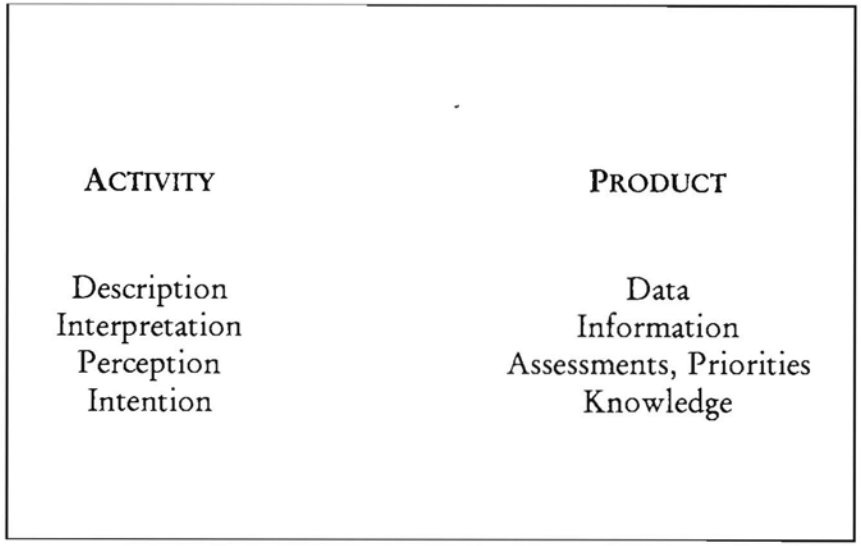

FIGURE 2 Steps in Developing an Understanding of a Region and Associated Products

from description: the collection of basic, raw data.

Typically, the raw data of descriptions are modified with interpretive methods or disciplines to look for patterns or explanations. Thus, for example, geographical methods and knowledge help identify and understand spatial patterns; historical methods and knowledge may help identify significant events, individuals, and patterns in time; mathematical methods help to identify and test the significance of a wide range of patterns. Interpretation inevitably involves an element of subjectivity, from choices about the patterns being sought to the purposes of the interpretation or analysis and the choice of what is significant. Yet the results are generally far more useful and influential than simple data. Interpretation may be said to yield information: raw numbers or data organized and interpreted through linking to experience and theory. There is frequently a tendency to move too quickly from description to interpretation. This is a mistake for it is apt to lead to hasty data collection, its unwitting modification by early interpretation, and relatively unconscious interpretation of data from limited points of view.

Interpretation may be extended and made more transparent, particularly in applied contexts, by considering perceptual factors such as perceptions, attitudes, opinions, and values (PAV). This entails explicit consideration of people and their actions, goals, and ideas. It is an effort to recognize and build in the subjective dimensions of description and interpretation. This is likely to yield results that are both more accurate (less deceptive) descriptions and more useful (more widely accepted and supported) tools of future action than allegedly

objective, impartial, expert processes and descriptions. Perception, too, contributes to creating information from raw data. Considering such factors explicitly and to some degree separately from description makes the process of developing an understanding more transparent, repeatable, accessible, and reflective of varied perspectives. An example is definition and understanding of sense of place. It has a long history (Lynch 1976) and more recently is being recognized as having real quantitative effects in economic development (Bolton 1992).

Description, interpretation, and perception are fundamental components of understanding. But there is a basic difference between scientific understanding and the use of that understanding as a tool or means to an end in an applied context. That difference lies in intentionality: seeking data, information, and understanding with particular applied (for example, policy, political, practical) motivations. For example, forecasting seeks to identify the possible, the probable, and the unlikely; planning deals with desired, proposed and predicted options; and management manipulates causes and effects to make things happen. Urban, regional, and environmental planning and management drive a pursuit of understanding that is highly intentional. It is a truism that different groups in the same and different planning and management processes seek to use or develop understanding for very different aims. Their descriptions, interpretations, and perceptions may be very different (creating roles for mediators and negotiators, and lawyers). Intentions, like perceptions, need to be made explicit in developing an understanding, and the effects of different intentions on understanding need to be explored.

Genuine understanding or knowledge that avoids or reduces problems while achieving widely desired goals requires integration of descriptive data and interpretive, perceptual, and intentional information in a transdisciplinary synthesis. (This is necessary, but may not alone be sufficient!) Such a synthesis needs to go beyond disciplinary boundaries, special interest boundaries, and individual knowledge boundaries. Just as standard frameworks have long been used to identify and organize the data necessary in an environmental impact statement or regional economic profile, a guide beyond basic collection of data to the additional steps which minimize specialization and misrepresentation of data by making clear the steps and assumptions involved is now needed. Perhaps also, as mediators bring people together through conflict resolution, complementary specialists are needed to guide development of transdisciplinary databases and understanding of regions and ecosystems.

A more detailed framework can be derived from the mutual interaction of descriptive, interpretive, perceptual, and intentional data and information. The following sections explore the methods and kinds of data necessary for producing the more rigorous, balanced, and useful understanding that is needed to foster complex goals and processes within regions and societies.

Application

The conceptual framework given above provides general direction for the development of an understanding of regions. This section provides more specific comments on each of the components identified above, together with examples of application of relevant approaches and benefits of doing so. Examples will be drawn from two regions that are, and have been, the subject of continuing study in the context of urban, regional, and environmental planning and management: the greater Kluane ecosystem of the Yukon, Alaska and B.C. and the Grand River watershed of southwestern Ontario. Each is briefly introduced here, before discussing the components of the framework in turn.

The greater Kluane ecosystem is defined by watersheds and physiographic features. It has a long history of native settlement and resource harvesting. Non-native exploration and settlement in the region were originally catalyzed at the turn of the 20th century by gold and copper mining and big-game hunting. Kluane National Park Reserve was established in 1976 and covers 22,015 km^2, 40% of the greater ecosystem. Together with the adjoining Wrangell-St. Elias National Park and Preserve (established in 1980), and Glacier Bay National Park, it is a UNESCO World Heritage Site. The B.C. government has recently protected the adjoining Tatshenshini/Alsek region in northwestern B.C. The lower, outer slopes of the parks, and the adjacent valley and mountain slopes are forested, and home for some of the largest concentrations of large mammals found anywhere in North America. There is a regional population of about 1,000 people, 40% native, with a median income somewhat lower than for Yukon as a whole. This produces strong local desires for greater economic opportunities. The national parks are the region's main resource, yet have few access roads and generally prohibit hunting, trapping, and mining activity.

The Yukon part of the region, in particular, has seen a range of planning and other studies in recent years. In late 1987, preparation of a Greater Kluane Regional Land Use Plan began under joint federal, territorial and native auspices. A Regional Land Use Planning Commission with local and government representatives was established in August 1988, and public hearings were held to identify issues and goals. The process explicitly sought balanced development, emphasizing tourism along the Alaska Highway corridor, and coordination between federal, territorial and native planning initiatives. Although the results of the process were only advisory, it was a unique opportunity for diverse groups and interests to listen to each other and consider opportunities to integrate their needs and goals. (The entire program was scrapped in July 1991 due to Federal budget cutting and Federal/Territorial politics.) The Yukon Conservation Strategy also involved a process of public consultation through workshops and publication of drafts for comment. The final document, released in 1990, was an advisory strategy that sought to guide development and sustainable use of renewable resources; a stable, healthy non-

renewable resource sector; protection of the environment and natural and human heritage; benefits and opportunities for Yukoners from resource development; community and public involvement in resource and conservation decision making; and understanding of aboriginal resource management practices and knowledge. More formally, an umbrella final agreement was reached in March 1991 on a settlement of the Council of Yukon Indians comprehensive land claim. In addition to new territory-wide planning and assessment boards and commissions, there will be more detailed sub-agreements with local bands which will impact economic development and resource planning and management in the region. (Slocombe 1992b provides details on this region.)

The Grand River watershed in southwestern Ontario covers almost 7,000 km^2, including several major cities, and a total population of about 800,000. The Grand River watershed is typical of southwestern Ontario watersheds and drains into Lake Erie. It has been extensively modified by two centuries of non-native settlement, and has a history and current character comparable to many other watersheds throughout the southern Great Lakes Basin. It is somewhat unique in having relatively extensive natural areas within it, including significant stands of rare Carolinian forest types. The watershed can be divided into three parts. The northern third is primarily agricultural, with a number of small towns and villages. The middle third includes several expanding, medium-sized cities (Kitchener-Waterloo, Cambridge, Brantford) and is extensively developed. The lower third of the basin is the least intensively settled, but is largely used for agriculture and recreation near Lake Erie. As with any core, developed area the region is planned and managed by a complex mix of city, regional, Conservation Authority, provincial and federal government agencies. There is no overall planning or coordinating agency, although the Grand River Conservation Authority could take a more integrative role than it does. There are extensive research and planning projects at the University of Waterloo, Wilfrid Laurier University, the Grand River Conservation Authority, and the Ontario Ministry of Natural Resources which are addressing the entire basin. Nelson and O'Neill (1989) provide a good overview of the Basin.

Description

Describing a region entails two important questions: what to describe and how to describe it. This section emphasizes the latter, while observing that there is a need to describe the region comprehensively at a basic level; and to go beyond that in areas of regional uniqueness, dynamicism, uncertainty, or growth. Thus, in Kluane, much effort goes into understanding large mammal ecology and back country recreation; while in the Grand River watershed the emphasis is on urban and agricultural land use, and water quality and quantity issues. For most regions, there is usually a great deal of information available. It is often poorly organized, used, and interpreted; remedying that is one

emphasis of this section and even the paper as a whole.

A first priority for improving description is integrating local and traditional knowledge with expert, quantitative knowledge. These sources can add considerably to understanding of a region. In some regions, they are absolutely essential. They usually entail different methods of data collection and yield different kinds of data -- more verbal, anecdotal, comparative, and subjective. Local and traditional knowledge have hardly been tapped in the Grand River Basin; but are beginning to be utilized, particularly in wildlife management and land use planning, in the Kluane region. Elsewhere, the Canadian Arctic Resources Committee's Hudson Bay bioregion project is a first-rate example of a large-scale project seeking to integrate traditional and scientific knowledge in an environmental planning and management context (Sallenave 1994). The project uses community facilitators and workshops to collect traditional knowledge and then integrate it with scientific knowledge. Organizing and interpreting such data, however, is often problematic, which leads to the second priority.

Collecting and organizing available information on a region is an increasingly complex task. There are numerous tools which can assist in this. Some are well-known, if often poorly used, such as geographic information systems and computer databases. Others are less well-known such as micro-computer simulation and data visualization. The key is finding tools to dynamically link different kinds of data, somewhat in the fashion of "multimedia", and use it to foster flexibility, adaptability and accessibility in the collection and use of data. This, in turn, can support the third priority for improving regional description. Collecting and organizing information has begun for the Grand River Basin, utilizing a suite of relatively inexpensive software packages (see Sharpe and Slocombe 1995).

Third, standard regional descriptions have tended to focus on static, structural description with at best limited historical data. For example, the Canadian Parks Service's two-volume *Resource Description and Analysis* for Kluane National Park Reserve, and existing regional plans in the Grand River watershed, have very limited historical data. Some governments' interest in state of the environment reports is broadening the historical base (for example, the Regional Municipality of Waterloo in the Grand River Basin), but there is still little attention to regional dynamics, processes, and change (Hutton 1993 provides an interesting exception at a general level). This needs to change, and perhaps is changing slowly with studies of change in the context of the information society, sustainability, etc. More varied and more accessible manipulable data are key to providing the base for identifying patterns that may lead to identification of dynamics and efforts to influence change. This is an entry point or prerequisite for interpretation.

Overall, new kinds of data allow consideration of new and important questions such as how a region is changing, has changed, might change in the future; how to better define management units; and how to better define and

identify the unique, coherent features of a region (place, culture, bioregion, etc.) as a basis for planning, managing, and community building. These are activities still not found in most regional descriptions and assessments (see, for example, Conant et al. 1983).

A simple example can be found in work on the Grand River Basin where a database program has been used to provide the ability to page through graphs of population change by municipality since 1840. Several different patterns appear repeatedly and are illustrative of identifiable economic, cultural, and administrative processes of change such as industrialization and regional government. Another example can be found in the use of small-scale GIS in Prince William Sound, on the edge of the Greater Kluane Ecosystem. As a first step toward ecosystem management, the Copper River Delta Institute and Prince William Sound Science Centre joined with Conservation International to produce an initial, small-scale resource inventory and assessment as a basis for further work (Thomas et al. 1991). This concise, map-based presentation and analysis is an excellent example of collection, organization, and synthesis of information to foster understanding as a basis for management.

Interpretation

Everyone interprets data; the point to be made here is the need for multiple interpretations in understanding a region. As a minimum, data interpretations and analyses ought to be undertaken using several contrasting disciplines and perspectives, for example economic, historical, ecological, and political. This will allow comparison of perspectives and exploration of analogies that may be identified during the process. This approach supports a view in which different disciplines are seen less as providing different and incommensurate interpretations, and more as providing representations of different dimensions of the environment for an observer -- representations which are necessary to gain a full understanding of a region. Such a multidimensional interpretation fosters transdisciplinarity and a synthesis of varied data and interpretations (see, for example Costanza 1991; Jantsch 1971). Moving in this direction is important as one-dimensional interpretations are at once the cause of much conflict and the root of many later, spin-off problems, including externalities. Varied, complex interpretations are also very useful in developing indices and monitoring for complex regions and change.

An example of this sort of interpretation can be found in studies of the Kluane region and the Great Lakes Basin as nonequilibrium systems, subject to nonlinear dynamics and sudden, qualitative change (Slocombe 1989, 1990). In these works a simple tabular format was used for interpreting and contrasting events in terms of major system dimensions such as biological, physical, economic, cultural, and political. Interpretation of change was undertaken from the perspective of several disciplines to elucidate nonequilibrium dynamics at

different scales within the system. Elsewhere, environmental historians are increasingly sensitive to, and utilizing, these kinds of multidimensional interpretations (Worster 1994).

Perception

Perceptions, attitudes and values (PAV) act on least two levels -- those of the people within the region and the people doing the study. The results of description and interpretation need to be modified by information at both these levels of perception. Within a region people's perceptions, attitudes and values help determine the region's evolution and the outcomes of management actions. Some information on perceptions at this level is increasingly included in studies, through actor-systems research and the like (for example, Burns et al. 1986). More specific data could be used to help promote, educate, and plan regional change. Rather than passively using aggregated data on public reactions to proposals and actions, more topically-focused, geographically-specific data on public perceptions could be a tool for understanding and interacting with the public through participatory methods to better introduce perceptual factors in description, interpretation, and intention.

The perceptions, attitudes and values of those seeking understanding of a region colour interpretations of data, perceptions of actions, and identification of feasible alternatives. The implications of this for planning and management of the South Moresby region of British Columbia were examined in Grzybowski and Slocombe (1988). Variation in actor perceptions, attitudes and values are a central reason why new planning and assessment boards being created in Yukon as a result of land claims will have equal native and non-native representation. Objectivity is an illusion, and analysts should always seek to identify their own predilections, if not outright prejudices. Incorporation of multidisciplinary interpretation and multiple forms of knowledge and perspectives are one way of limiting the effects of specific perspectives of the analysts. Another key tool for recognizing and incorporating perceptions, attitudes, and values at all levels is public participation. The very process of interaction and communication can serve as a lever for making perceptions visible and challenging and discussing special ones. This was one result of the Greater Kluane Regional Land Use Planning process.

In both the Kluane/Wrangells and the Grand River Basin one can see many examples of incorporation of perceptions, attitudes and values in analysis and planning. Changing views of such things as the role of government, the role of resources in economic development, and the influence of public citizens in government are major forces in both regions. Changing public attitudes toward the environment and lifestyles are being used highly proactively and cleverly by regional official policy plan review processes in the Regional Municipalities of Waterloo (in the Grand River Basin) and Ottawa-Carleton in Ontario.

Intention

Perceptions, attitudes and values are closely linked to goals or intentions. One way of distinguishing them is to see PAV as a complex result of an individual's education, upbringing, and experience to date; intentions are a more local and specific statement of goals in a particular (planning and management) context. perception and intention interact and colour each other in a particular situation, but they are not equivalent. As with perception, the intentions of both the public and the analyst need to be considered. Taking account of public intention may be seen as part of taking account of their perceptions, attitudes, and values. The required processes and consideration are essentially the same and likely best done together.

Detailed analyses of intention and perception in a region frequently produce results different from expectations (or perception). Analyses of the processes of park establishment and the results of public input to those processes in the Kluane/Wrangells highlight the complexity of perception and intention, their interrelationships, and their importance in understanding outcomes (Bryan 1991; Lappen 1984). The evolution and development of the current environment and development policy in the Kluane region has been very much a result of the interplay of the conflicting goals of different local and distant interests. The Grand River Basin's greater size, population, and proximity to large population centres has meant that at least recent history is much more a reflection of general policies and directions. The recent revision to the Waterloo Regional Official Policies Plan is much more driven by local, environmental and sustainability goals and interests.

The analyst's intentions are a different matter. They are much more formal and likely to have a very strong impact on all the stages of developing understanding in a region -- indeed, at some level they should, for different goals have different knowledge needs. But intention should not constrain data collection too much, any more than should specific perceptions for it leaves open the probability of neglecting potentially important information. Perhaps the most important step in integrating intention into development of understanding is making it explicit, and exploring implications of different intentions for developing understanding in a particular region -- a variation on identifying and exploring alternative plans. Identifying intention is also a key part of institutional analysis, and design of planning and management frameworks for implementation. The Greater Kluane Regional Land Use Planning Process was very much a process that identified goals and intentions of sectors in the region.

Conclusions

Developing understanding of a region for planning and management purposes

should not depend on any single way of knowing. Any single way of knowing, whether process-oriented or substance-oriented, can be improved and made more realistic and useful by encompassing multiple kinds of knowledge and multiple ways of knowing. Developing understanding of complex regions for meeting complex needs requires recognizing that there is more to description than objective facts. In fact, it requires starting over in a complex process not simply of description, but of developing understanding: a complex, recursive, reflexive process including how intentions colour interpretations and perceptions to yield descriptions; of how interpreted descriptions can colour intentions and perceptions; of how perceptions and experience can colour valuation of data; and how different experiences of a region can produce different, equally relevant knowledge of it. Planning and managing, as common means of achieving intentions in society, have implicitly, if not explicitly, reflected this dependence of understanding on interpretation, perception, and intention: different theories and practices of planning and management emphasize different ways of knowing, different dimensions of society and environment.

Regions are complex systems with social, economic, political, biological, physical and other characteristics. The goals planning and management seek to achieve, need to achieve, are increasingly equally complex in similar ways. The necessary understanding of regions cannot be obtained from traditional, "objective", reductionist description alone. It also requires explicit attention to interpretation, perception, and intention. The necessary wider range of information types on a wide range of topics can be obtained, often is available from existing sources. Organizing and using information in new ways are key.

There are three basic guidelines which can be derived from the outline provided above. First, description and understanding must be distinguished: description is a part of understanding, but only a part. Second, developing understanding requires attention to many substantive details of data (choice, collection, organization, measurement, and assessment) and to many procedural details (how best to interpret data and reflect perceptual and intentional factors). Developing understanding must be a conscious, reflective, and reflexive process in which substance and process interact and iterate. Third, complementarily, and in parallel, there should be interaction and iteration from general and conceptual knowledge to specific and applied knowledge. Thus, for example, in developing understanding a study might move from regional history to theory to concepts to frameworks to methods to tools, and back again; all the while balancing and drawing on description, interpretation, perception and intention.

This conception of developing understanding integrates the principle-based approaches of many environmental issue discussions with the impact-based approaches of economists, engineers, and narrowly-conceived environmental impact assessment. Clearly, a good, widely-acceptable "solution" in planning or assessment needs to consider both principles and impacts, description and perception/intention.

As the Leopold matrix provides a framework for collecting detailed descriptive data about a project, its environment, and its impacts so an overall framework for developing understanding of a region (which in turn, might be context and frame for understanding a specific environmental impact statement) is now needed. Much attention is given currently to specific results or recommendations for monitoring, trend identification, simulation, indicators, indices, and state reporting; I argue that what is also needed is something broader which facilitates understanding at a regional scale through knowledge of how a system works, is connected. This means going beyond impact-based approaches toward more principle-based approaches, that will be inevitably broader and be more likely to provide data sets and understanding necessary to answer new questions in the future, that we cannot anticipate now. This is, really, a prerequisite for good indicator identification and monitoring. The best state of the environment reports are moving in this direction (compare Government of Canada (1991) and B.C. Ministry of Environment, Land and Parks (1993)). The next stage in this research will involve detailed testing of the framework from this paper through its use to guide detailed data collection and development of understanding in the Kluane and Grand River ecosystems.

The framework provided here is an outline for evaluating and planning regional studies to support planning and management activities. At root, it is collection and analysis of complex information that is needed. There are many examples of detailed frameworks for basic description of regions. What has been lacking is a framework for working with these descriptive data to build understanding from them. This paper has suggested a simple start with the potential for wide and complex application and development.

References

Angermeier, P.L. and J.R. Karr. 1994. "Biological Integrity versus Biological Diversity as Policy Directives". *BioScience*, 44: 690-697.

Bolton, Roger. 1992. "Place Prosperity vs. People Prosperity Revisited: An Old Issue with a New Angle". *Urban Studies*, 29: 185-203.

Bowonder, B. 1987. "Environmental Changes in Developing Countries: A Systems Perspective". *Journal of Applied Systems Analysis*, 14: 81-98.

Boyden, S. 1992. *Biohistory: The Interplay Between Human Society and the Biosphere*. Carnforth: Parthenon Publishing.

Boyden, S. S. Millar, K. Newcombe and B. O'Neill. 1981. *The Ecology of a City and its People: The Case of Hong Kong*. Canberra: Australian National University Press.

Briassoulis, H. 1986. "Integrated Economic-Environmental-Policy Modelling at the Regional and Multiregional Level: Methodological Characteristics and Issues". *Growth and Change*, 17: 22-34.

_____. 1989. "Theoretical Orientations in Environmental Planning: An Inquiry Into Alternative Approaches". *Environmental Management*, 13:

381-92.
B.C. Ministry of Environment, Lands and Parks and Environment Canada. 1993. *State of the Environment Report for British Columbia*. Victoria.
Bryan, M. 1991. *Actors and Attitudes in the Development of Kluane National Park Reserve*. B.A. thesis. Wilfrid Laurier University.
Burns, Tom R., T. Baumgartner and P. DeVille. 1985. *Man, Decisions, Society: The Theory of Actor-System Dynamics for Social Sciences*. London: Gordon and Breach.
Calthorpe, Peter. 1993. *The Next American Metropolis: Ecology, Community, and the American Dream*. New York: Princeton Architectural Press.
Cartwright, T.J. 1991. "Planning and Chaos Theory". *Journal of the American Planning Association*, 57: 44-56.
Christensen, Karen S. 1985. "Coping with Uncertainty in Planning". *Journal of the American Planning Association*, 51: 63-73.
Commission on Resources and Environment (CORE). 1994. *Vancouver Island Land Use Plan*. Victoria: Queen's Printer.
Conacher, A. 1988. "Resource Development and Environmental Stress: Environmental Impact Assessment and Beyond in Australia and Canada". *Geoforum*, 19: 339-52.
Conant, F. P. Rogers, M. Baumgardner, C. McKell, R. Dasmann, and P. Reining, (eds.). 1983. *Resource Inventory and Baseline Study Methods for Developing Countries*. Washington D.C.: AAAS.
Costanza, R. 1991. "Goals, Agenda, and Policy Recommendations for Ecological Economics", in R. Costanza (ed.), *Ecological Economics: The Science and Management of Sustainability*. New York: Columbia University Press.
Crosby, Robert W. (ed.). 1983. *Cities and Regions as Non-linear Decision Systems*. Boulder: Westview.
Filion, P. 1988. "Potentials and Weaknesses of Strategic Community Development Planning: A Sudbury Case Study". *Canadian Journal of Regional Science*, 11: 393-411.
Government of Canada. 1991. *The State of Canada's Environment-1991*. Ottawa: Supply and Services.
Grzybowski, Alex G.S. and D. Scott Slocombe. 1988. "Self-organization Theories and Environmental Management: The Case of South Moresby". *Environmental Management*, 12: 463-478.
Holling, C.S. 1977. *Adaptive Environmental Assessment and Management*. Chichester: Wiley.
Hutton, Thomas A. 1993. "Visions of a 'Post-Staples' Economy: Structural Change and Adjustment Issues in British Columbia". Whistler: PRSCO and CRSA Meetings.
Isard, W. 1972. *Ecologic-Economic Analysis for Regional Development*. New York: The Free Press.
Jantsch, E. 1971. "Inter- and Trans-Disciplinary University: A Systems

Approach to Education and Innovation". *Ekistics*, 32: 133-139.
Kemmis, D. 1990. *Community and the Politics of Place*. London: University of Oklahoma Press.
Krieger. A. (ed.). 1991. *Towns and Town-Making Principles*. Cambridge: Harvard University Graduate School of Design.
Lappen, M.A. 1984. *Whose Promised Land? A History of Conservation and Development Management Plans for the Wrangells and St. Elias Mountains Region, Alaska 1928-1980*. M.A. thesis. University of California.
Lynch, K. 1976. *Managing the Sense of a Region*. Cambridge: MIT Press.
MacKaye, B. 1928. *The New Exploration: A Philosophy of Regional Planning*. New York: Harcourt, Brace and Jovanovich.
Marchand, B. 1984. "Urban Growth Models Revisited: Cities as Self-Organising Systems". *Environment and Planning A*. 16: 949-964.
McHarg, I.L. 1969. *Design with Nature*. New York: Natural History Press.
Morley, D. and A. Schachar (eds.). 1986. *Planning in Turbulence*. Jerusalem: Magnes Press.
Mulvihill, P.R. and R.F. Keith. 1989. "Institutional Requirements for Adaptive EIA: the Kativik Environmental Quality Commission". *EIA Review*, 9: 399-412.
Nelson, J.G. and P. O'Neill (eds.). 1989. *The Grand as a Canadian Heritage River*. Occ. Paper 9. Waterloo: University of Waterloo.
Perloff, H.S. 1957. "Problems of Assessing Economic Progress". *Regional Income*, 21: 35-62.
Pred, A. 1975. "On the Spatial Structure of Organisations and the Complexity of Metropolitan Interdependence". *Papers of the Regional Science Association*, 35: 115-42.
Province of British Columbia. 1993. *Clayoquot Sound Land Use Decision: Background Report*. Victoria: Queen's Printer.
Rees, William E. 1983. "Environmental Assessment of Hydrocarbon Production from the Canadian Beaufort Sea". *EIA Review*, 4: 539-555.
Richardson, N. 1989. *Land Use Planning and Sustainable Development in Canada*. Ottawa: Canadian Environmental Advisory Council.
Sallenave, John D. (ed.). 1994. *Towards the Assessment of Cumulative Impacts in Hudson Bay*. Ottawa: Canadian Arctic Resources Committee, Environmental Committee of Sanikiluaq and Rawson Academy of Aquatic Science.
Sharpe, B.G. and D.S. Slocombe. 1995. "Building a GIS Database for Ecosystem Modelling in the Grand River Basin, Ontario", in *Proceedings of Decision Support - 2001*. Bethesda: American Society for Photogrammetry and Remote Sensing.
Slocombe, D.S. 1989. "History and Environmental Messes: A Nonequilibrium Systems View". *Environmental Review*, 13: 1-13.
Slocombe, D.S. 1990. "Assessing Transformation and Sustainability in the Great Lakes Basin". *Geojournal*, 21: 251-272.

Slocombe, D.S. 1991. *An Annotated, Multidisciplinary Bibliography of Ecosystem Approaches*. Waterloo: Cold Regions Research Centre, Wilfrid Laurier University.

Slocombe, D.S. 1992a. "Environmental monitoring in protected areas: review and prospect". *Environmental Monitoring and Assessment,* 21: 49-78.

Slocombe, D.S.. 1992b. "The Kluane/Wrangell-St. Elias National Parks, Yukon and Alaska: Seeking Sustainability through Biosphere Reserves". *Mountain Research and Development*, 12: 87-96.

Slocombe, D.S. 1993a. "Environmental Planning, Ecosystem Science, and Ecosystem Approaches for Integrating Environment and Development". *Environmental Management*, 17: 289-303.

Slocombe, D.S. 1993b. "Implementing Ecosystem-Based Management". *BioScience*, 43: 612-622.

Thomas, G.L., E.H. Backus, H.H. Christensen, and J. Weigand. 1991. *Prince William Sound: Copper River: North Gulf of Alaska Ecosystem*. Cordova: Prince William Sound Science Centre and Copper River Delta Institute and Washington D.C.: Conservation International.

Turner, R.K. (ed.). 1988. *Sustainable Environmental Management: Principles and Practice*. Boulder: Westview Press.

Worster, D. 1994. "Nature and the Disorder of History". *Environmental History Review*, 18: 1-15.