SUSTAINABLE DEVELOPMENT IN

RESIDENTIAL LAND USE PLANNING

By Jill Grant

with Darrell Joudrey & Patricia Manuel

Research Associates: John Zuck & Susan Guppy

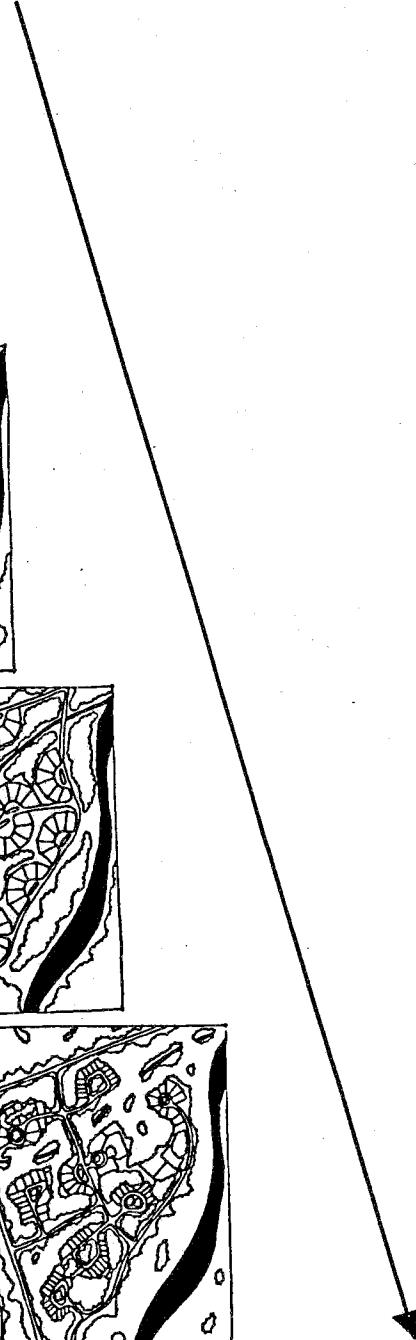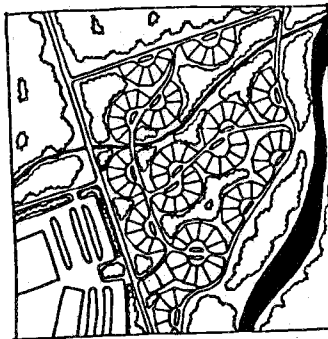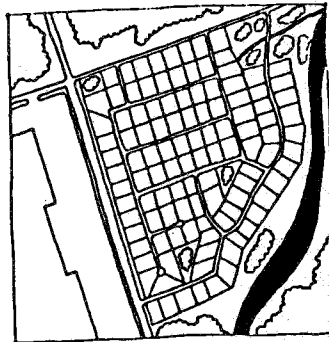Nova Scotia College of Art and Design
Environmental Planning Department
5163 Duke Street, Halifax, N.S.

April 1993

SUSTAINABLE DEVELOPMENT
IN RESIDENTIAL LAND USE PLANNING

SUSTAINABLE DEVELOPMENT IN RESIDENTIAL LAND USE PLANNING

ABSTRACT

In recent years, the governments of several Canadian provinces have produced strategies to promote sustainable development. This research study of three Nova Scotian communities considers whether residential land use planning practice is changing in response to the idea of sustainable development. Sustainability implies an approach to land development that meets human needs without undermining natural processes or landscape function.

Through reviewing policies, regulations, and practice in three communities, the authors attempt to determine whether land development protects landscapes. The analysis reveals that while most of the participants in the land development process agree with sustainable development in principle, in practice land development continues to destroy landscape functioning and to consume natural resources.

The authors recommend that the government of Nova Scotia act to make the province's **Sustainable Development Strategy** a land use policy with the force of law. Legislation like the Planning Act should be amended to reflect a commitment to sustainability. The province should encourage private land owners to become stewards of the land. The report proposes key indicators which communities can use to measure their progress towards sustainability.

Acknowledgements

SUSTAINABLE DEVELOPMENT IN RESIDENTIAL LAND USE PLANNING

Table of Contents (Page)

Tables and Illustrations [page]

v

EXECUTIVE SUMMARY

In recent years, the governments of several Canadian provinces have produced strategies to promote sustainable development. Despite the growing ideological commitment to a new approach to the environment, communities in many parts of the nation continue with "business as usual". This research study of three Nova Scotian communities considers whether residential land use planning has begun to change in response to the idea of sustainable development.

The Nova Scotia Round Table on Environment and Economy published **The Sustainable Development Strategy for Nova Scotia** in 1992. The **Strategy** emphasizes the importance of reconsidering traditional definitions of development, and re-orienting attention to protecting the environment. This research study adopts the **Strategy's** approach to sustainable development.

> **Sustainable development implies adaptation and improvement in a context in which communities seek to protect natural processes and landscape function, and to conserve resources for future generations.**

By defining "sustainable development" as that which protects natural processes and landscape function, the study focuses on safeguarding the environment and its resources for future generations. The authors developed a framework for evaluating sustainability which builds from key principles or aims:

    a) maintain and restore natural processes and functions,
    b) protect natural resources for future generations,
    c) minimize settlement impacts on natural systems,
    d) reduce the use of resources (especially non-renewable),
    e) reduce waste outputs from residential developments,
    f) increase public involvement in promoting sustainability,
    g) promote efficiency, choice, and adequacy in housing,
    h) provide healthy social environments.

Through reviewing policies, regulations, and practice in three communities, the authors attempt to determine whether land development protects landscapes and promotes sustainability. The City of Dartmouth, the Town of Truro, and the Municipality of the

County of Kings participated in the study. The research team examined provincial and local policies and regulations; interviewed provincial and local policy makers, civil servants, developers, and environmental activists; assessed representative residential developments in the study communities.

The analysis reveals that while most of the participants in the land development process agree with sustainable development in principle, in practice land development continues to ignore landscape functioning. Plan policies nod in the direction of sustainability, but the initiatives taken to promote sustainability (e.g., recycling) have not often protected landscapes from significant modification. The land use planning process in Nova Scotia, as in many jurisdictions, is designed to encourage and facilitate development, not to enhance sustainability.

Several barriers inhibit good intentions. Jurisdictional and organizational barriers spread responsibility for land management over several government departments and between levels of government. With their own sectoral interests to protect, departments have not jumped readily onto the sustainable development cart. Geographic and cultural barriers contribute to a sense of regional deprivation and an economy based on resource extraction. Sustainable development may require new attitudes toward the land, and toward the community.

The authors suggest that the province combine opportunities, incentives, and regulations in framing an approach to sustainable development. They offer four recommendations:

Recommendation 1:
> The Province of Nova Scotia should adopt the **Sustainable Development Strategy** (1992) as a provincial land use policy under the Planning Act.

Recommendation 2:
> The Province of Nova Scotia should amend the Planning Act and other legislation as necessary to give municipalities the authority and responsibility to protect natural processes and landscape function.

Recommendation 3:
> The Province of Nova Scotia and local governments should promote private stewardship programs for developers and land owners who support sustainable development.

Recommendation 4:
   The Province of Nova Scotia should identify key indicators to measure and
   monitor progress towards sustainability.

The report concludes by identifying key indicators which the province can use to assess
progress towards sustainability. Over the long term, sustainable residential development
must protect ecosystem integrity so that economic viability and social equity may follow.

Map of Nova Scotia
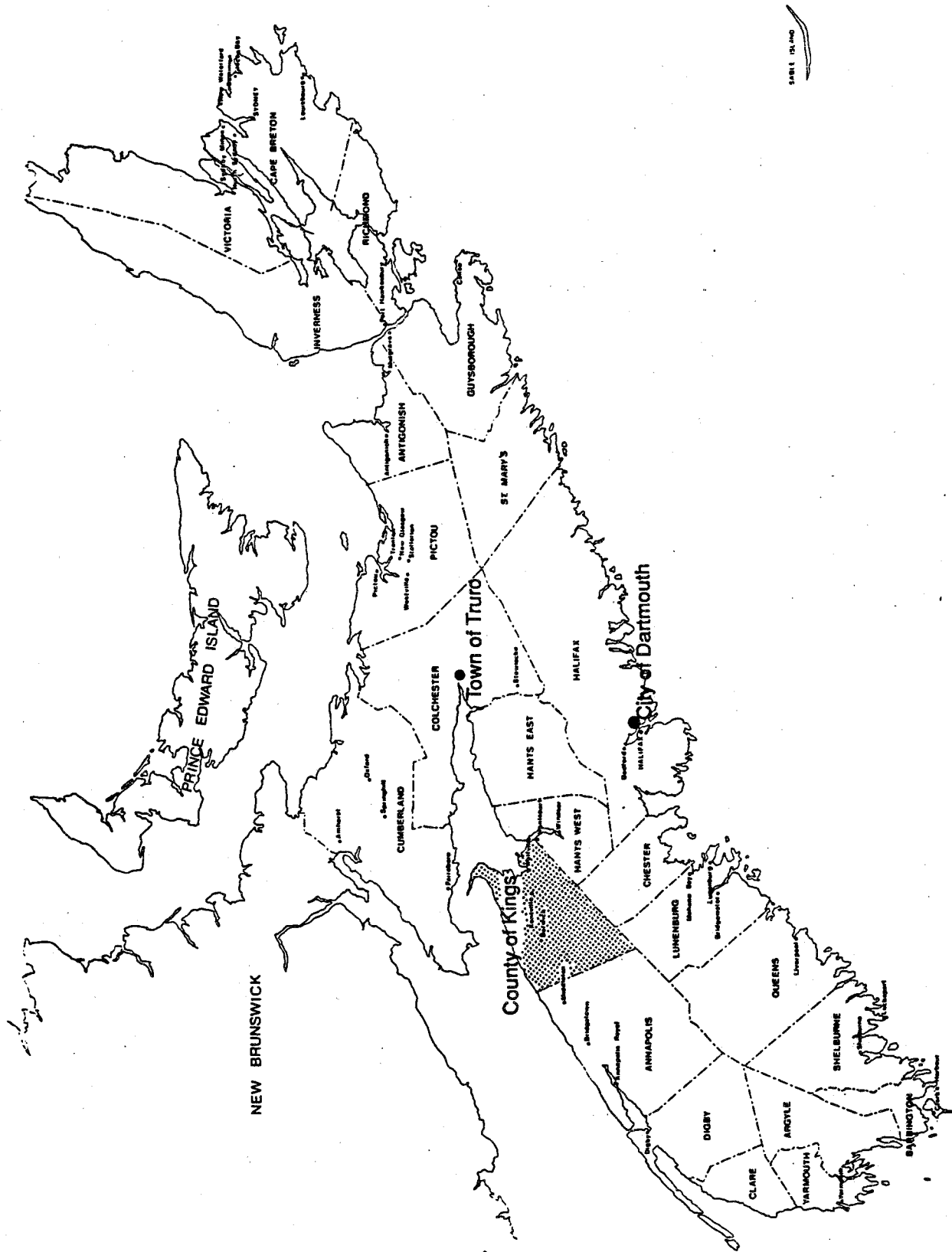
DÉVELOPPEMENT DURABLE ET PLANS D'OCCUPATION RÉSIDENTIELLE DES SOLS

RÉSUMÉ

Ces dernières années, les gouvernements provinciaux ont mis sur pied des stratégies de promotion du développement durable. Malgré un engagement idéologique croissant à l'égard de cette nouvelle façon d'envisager l'environnement, bien des collectivités canadiennes font comme si de rien n'était. La présente étude, portant sur trois collectivités de la Nouvelle-Écosse, vise à déterminer si les municipalités ont commencé à modifier les plans d'occupation résidentielle des sols afin de tenir compte du concept de développement durable.

En 1992, la table ronde de la Nouvelle-Écosse sur l'environnement et l'économie a conduit à la publication d'un document intitulé «The Sustainable Development Strategy for Nova Scotia» (stratégie de développement durable pour la Nouvelle-Écosse). Ce document fait ressortir l'importance de revoir les définitions traditionnelles de développement et de réorienter les efforts afin de protéger l'environnement. La présente étude adopte le principe de la stratégie de la Nouvelle-Écosse à l'égard du développement durable.

Le développement durable suppose l'adaptation et l'amélioration dans un contexte où les collectivités cherchent à protéger les procédés naturels et les fonctions du paysage ainsi qu'à préserver les ressources pour les générations futures.

En définissant le «développement durable» comme une façon de protéger les procédés naturels et les fonctions du paysage, l'étude met l'accent sur la protection de l'environnement et de ses ressources au profit des générations futures. Les auteurs ont élaboré un cadre d'évaluation des mesures de promotion du développement durable fondé sur les principes ou objectifs clés suivants :

a) préserver et rétablir les fonctions et procédés naturels;
b) protéger les ressources naturelles pour les générations futures;
c) réduire au minimum les répercussions des aménagements sur la nature;
d) limiter l'utilisation des ressources (surtout celles qui ne sont pas renouvelables);
e) réduire la quantité de déchets produits par les quartiers résidentiels;
f) accroître la participation du public à la promotion du développement durable;
g) encourager l'efficience, le choix et la qualité en matière de logement;
h) offrir des milieux sociaux sains.

En examinant les lignes de conduite, les règlements et les pratiques de trois collectivités, les auteurs cherchent à déterminer si l'aménagement du territoire contribue à protéger les sols et respecte les principes du développement durable. Les localités participantes sont celles de Dartmouth, de Truro et du County of Kings. Les chercheurs ont examiné les lignes de conduite et les règlements provinciaux et municipaux, ont interrogé les décideurs provinciaux et locaux, les fonctionnaires, les promoteurs et les écologistes et ont évalué des aménagements résidentiels représentatifs dans

les collectivités participantes.

L'analyse révèle que même si la plupart des responsables du processus d'occupation des sols acceptent le principe du développement durable, il s'avère qu'en pratique les sols continuent d'être aménagés sans que leurs fonctions soient prises en considération. Les lignes de conduite régissant l'aménagement des sols lorgnent en direction du développement durable, mais les initiatives prises en ce sens (comme le recyclage) n'ont pas contribué à protéger les sols contre d'importantes transformations. En Nouvelle-Écosse, comme dans bien d'autres territoires, le processus de planification de l'occupation des sols est conçu pour encourager et faciliter les aménagements, non pour promouvoir le développement durable.

Plusieurs obstacles nuisent aux bonnes intentions. La responsabilité de la gestion foncière est en effet partagée par plusieurs ministères et différents paliers de gouvernement. Comme ils ont leurs propres intérêts sectoriels à protéger, les ministères ne se sont pas associés d'emblée au projet de développement durable. Les obstacles géographiques et culturels ont contribué à créer un sentiment de privation régionale ainsi qu'une économie basée sur l'extraction des ressources. Le développement durable peut nécessiter l'adoption de nouvelles attitudes à l'égard des sols et de la collectivité.

Les auteurs suggèrent que la province prenne en compte les occasions, les mesures d'encouragement et les règlements pour se doter d'un bon cadre de promotion du développement durable. Voici leurs quatre recommandations :

    1ʳᵉ recommandation :
        La Nouvelle-Écosse doit adopter la stratégie de développement durable décrite dans le document intitulé «**The Sustainable Development Strategy for Nova Scotia**» (1992) et en faire une ligne de conduite provinciale en vertu de la loi sur l'aménagement.

    2ᵉ recommandation :
        La Nouvelle-Écosse doit amender la loi sur l'aménagement et, au besoin, toute autre loi afin de conférer aux municipalités l'autorité et la responsabilité nécessaires à la protection des procédés naturels et des fonctions du paysage.

    3ᵉ recommandation :
        La Nouvelle-Écosse et les municipalités doivent promouvoir des programmes de gérance privés à l'intention des promoteurs et des propriétaires fonciers qui appuient le développement durable.

    4ᵉ recommandation :
        La Nouvelle-Écosse doit repérer des indicateurs clés qui lui permettront de mesurer et de surveiller les progrès accomplis dans l'optique du développement durable.

Le rapport conclut en signalant des indicateurs clés dont la province pourrait se servir pour évaluer les progrès réalisés en matière de développement durable. À longue échéance, le développement durable dans le secteur de l'occupation résidentielle des sols doit protéger l'intégrité de l'écosystème de manière à ce que s'ensuivent la viabilité économique et l'équité sociale.

CMHC ✹ SCHL

Helping to house Canadians

Question habitation, comptez sur nous

National Office

Bureau National

700 Montreal Road
Ottawa, Ontario
K1A 0P7

700 chemin Montréal
Ottawa (Ontario)
K1A 0P7

Puisqu'on prévoit une demande restreinte pour ce document de recherche, seul le sommaire a été traduit.

La SCHL fera traduire le document si la demande le justifie.

Pour nous aider à déterminer si la demande justifie que ce rapport soit traduit en français, veuillez remplir la partie ci-dessous et la retourner à l'adresse suivante :

> Le Centre canadien de documentation sur l'habitation
> La Société canadienne d'hypothèques et de logement
> 700, chemin de Montréal, bureau C1-200
> Ottawa (Ontario)
> K1A 0P7

TITRE DU RAPPORT : _____

_____

Je préférerais que ce rapport soit disponible en français.

NOM _____

ADRESSE _____
rue   app.

_____
ville   province   code postal

No de télephone ( ) _____

PART ONE:

PROBLEM FRAMEWORK

1: SUSTAINABLE RESIDENTIAL LAND USE PLANNING

Ministers of the federal government, federal agencies like CMHC, government bureaucrats in various ministries, and professional organizations of planners have spoken strongly in recent years of the urgency of re-orienting residential land use planning policies to promote sustainable development. However, we find no consistent evidence that a new paradigm influences development form in Canadian residential environments.

In this study we examine land use planning in Nova Scotia to review local responses to sustainable development. Provincial political leaders have committed Nova Scotia to the idea of sustainable development by, for example, appointing a Round Table on Environment and Economy, and by releasing the *Sustainable Development Strategy for Nova Scotia* in early 1992. Similarly, the organizations which represent and certify professional planners in Canada have affirmed their support for sustainable development through publications and conferences directed at their members. We wondered whether the political and professional rhetoric supporting sustainable development has begun to influence local decisions about the development of residential environments. Is land use planning policy and practice responding to the challenge?

The objectives of the research included the following:

*   to identify sustainable residential development policies and practices for Nova Scotian municipalities,

*   to review land use policies and regulations (for the province, and for a set of municipalities),

*   to determine whether land use planning policies and decisions taken in recent years responded to the rhetoric of sustainable development, and

*   to discover any barriers to promoting sustainable development in Nova Scotia.

Defining Sustainable Development

Sustainable development came to political prominence in Canada following the release of *Our Common Future*, the report of the Brundtland Commission (WCED 1987). Responding to increasing evidence of environmental degradation, the Commission argued

that governments should take a new approach to development: one that respects the rights of, and conserves resources for, future generations. Continued economic growth would proceed hand in hand with environmental conservation and management. New opportunities to promote greater equity and citizen participation would follow.

While the concept of sustainable development embodies several potential contradictions (as between economic growth and the conservation of environmental resources), it enjoys widespread popularity in political and professional circles. The federal government announced the formation of an International Institute for Sustainable Development Centre, and federal agencies promote the concept through workshops and research reports (e.g., D'Amour 1991). The Canadian Institute of Planners and other professional organizations sponsored conferences, journal issues, and working papers on sustainable development (e.g., Jamieson 1991; Perks and Tyler 1991; Richardson 1989). Fusing ideological elements of both right and left, sustainable development offers something for everyone.

Proponents of "sustainable development" may advocate a wide array of different approaches to the use of natural resources. Some talk about "sustainable growth": for them, future economic expansion depends upon avoiding environmental catastrophe (WCED 1987). Others see "sustainable ecosystems" as pivotal: survival of natural systems relies upon people reducing their demands on the environment (Rees and Roseland 1991). Conflict over the meaning of sustainable development hinges on two factors: (1) what we hope to sustain, and (2) what we mean by development.

The *Sustainable Development Strategy for Nova Scotia* adopts the definition of sustainable development advocated by the World Conservation Strategy (IUCN 1980).

> *"Sustainable development is used in this strategy to mean: improving the quality of human life while living within the carrying capacity of supporting ecosystems."*

Inherent in the idea of sustainable development are two fundamentals: the first imperative is to protect life support systems; the second is to provide for the development of human society. Traditionally, development has been widely interpreted to mean economic growth and industrialization. In the context of finite environmental resources, continuing quantitative economic growth is not possible. However, development as qualitative improvement can be pursued as a goal of sustainable development. As the *Sustainable Development Strategy for Nova Scotia* puts it,

> *"Sustainable development will require society to make a fundamental attitudinal change as we become aware of the emerging need to address the conflict inherent in*

an economic system that has promoted an ever-expanding consumption of resources within a world system of finite resources. This adaptation argues for a shift from an emphasis on growth (an expansion in the scale of the physical dimensions of the economic system) to an emphasis on development (adaptation and improvement in knowledge, organization, and technical efficiency)". (N.S. Round Table 1992: 7-8)

Without maintaining the productive capacity of the earth, human society cannot continue to develop. Human agency clearly threatens global life support systems. Reduced productivity of local ecosystems contributes to global deterioration. The precept, "think globally and act locally" has become a cliché, but it applies perfectly in this context. People must begin to recognize the limits to the environment's capacity to support human demands. We can begin to act at the local level to account for our impacts on the environment. Before we can think about additional economic growth or promoting greater social equity, we must first ensure that the ecosystems that sustain us survive.

In this research we have selected an approach to sustainable development that sees protecting natural environmental processes and productive landscape function as essential for future human existence. As William Rees says,

> *"The evidence suggests ... that we may be fast approaching absolute limits to material economic growth. We no longer have the luxury of 'trading-off' ecological damage for economic benefits if we hope to have a sustainable future. The maintenance of global ecological integrity necessarily becomes our highest priority and must be ... taken account of in every local and regional development decision."*
> (Rees 1990: 23)

Our primary concern in advocating sustainable development must focus on sustaining natural processes and landscape functions: species survival and ecological diversity depend on landscape function. Economic vitality and social equity may follow only if the environment continues to thrive.

As the *Sustainable Development Strategy* begins to imply, we must reconsider traditional definitions of development which link "quality of life" with measures of consumption. Human development may mean adaptation and improvement in qualitative terms without requiring wholesale destruction of natural resources and landscape function. Through the post-war era development has often implied industrialization, modernization, and technological improvements. In a sustainable community, we may define development as guaranteeing the satisfaction of basic human needs in healthy communities.

4

For the purposes of this project, we define sustainable development in the following terms.

> **Sustainable development implies adaptation and improvement in a context in which communities seek to protect natural processes and landscape function, and to conserve resources for future generations.**

Sustainable development in residential environments requires a different approach to planning than our communities have traditionally used. Sustainable residential development entails the following principles or objectives:

* to conserve natural processes and resources, and minimize the environmental costs and consequences of development,

* to reduce the long term economic costs of residential development while accounting for the real environmental and societal costs of development,

* to create healthy communities which provide for the needs of the full range of residents.

The primary goal of sustainable development requires that we protect natural processes and landscape functions to conserve options for the future. We must live off the "interest" or "income" generated by the environment, not erode the "capital" upon which survival depends.

Sustainable development also implies that human uses of the environment will continue. People need shelter, jobs, and amenities.[1] We canconstruct residential environments with minimal disruption to natural processes. We must safeguard natural resources for future use. We should reduce the long term costs of residential development by improving efficiency. "Minimizing economic costs" does **not** mean shoddy manufacturing or slap-dash development practices: it implies full accounting for the long-term operating costs of residential development (including developer's costs, owners' costs, societal costs, environmental resource opportunity costs). All community members need safe, adequate, and affordable shelter.

---

[1] We might argue that long-term sustainability requires reduction in human populations. Exponential growth in human population defies sustainability. We do not have an estimate of the sustainable human population level for Nova Scotia.

Sustainable development will produce healthy communities in which residents meet their needs for shelter, security, participation, and a clean environment. Sustainable residential environments will require considerable cultural change, and may entail some limits on rising standards of living (especially in affluent societies). Traditionally Canadians have defined "success" in terms of a big house on a big lot. Cultural attitudes towards landscapes, privacy, and leisure may inhibit our willingness to adopt sustainable practices. Can we change our values and ideas about our communities rapidly enough to adapt? Protecting environmental resources for future generations may imply new kinds of communities where social responsibility entails significant spatial and behavioural changes. A sustainable society operates differently from the one we know.

A Landscape Ecology Approach

In developing a model of sustainable residential environments we have chosen to draw on a landscape ecology approach. Landscape ecology recognizes the complex interconnections between human activities and natural processes in the environment (Forman and Godron 1986). It recognizes that ecosystems constantly adapt and change. Sustainable ecosystems do not need system stability, but ecological integrity and diversity. Change is inevitable in natural systems, as individual organisms die and species succeed each other. Sustainability requires that landscape processes and functions proceed even as the landscape changes and adapts.

Landscapes are mosaics, or complex patterns, of spatial heterogeneity. Landscapes affected by people incorporate a diverse array of textures (e.g., paved surfaces, forest patches) and scales (e.g., hectares of grass, small clumps of bushes) in their matrix. When human activities disrupt landscape processes they may adversely affect ecological integrity and system productivity. For example, removing hedgerows in farmers' fields may destroy wildlife corridor habitat. We can, however, provide for the human use of many environments without completely destroying the landscape mosaic or pattern. As Figure 1 illustrates, in deciding how to develop residential areas, we can incorporate housing into an indigenous landscape pattern, or we can create artificial landscapes. While some activities, like strip mining, totally obliterate indigenous landscapes, many other activities offer opportunities for sensitive landscape planning which attempts to protect landscape function.

Figure 1: LANDSCAPE PATTERN

ARTIFICIAL LANDSCAPE

Patches of landscape;
mostly asphalt, grass, buildings

Heavily modified
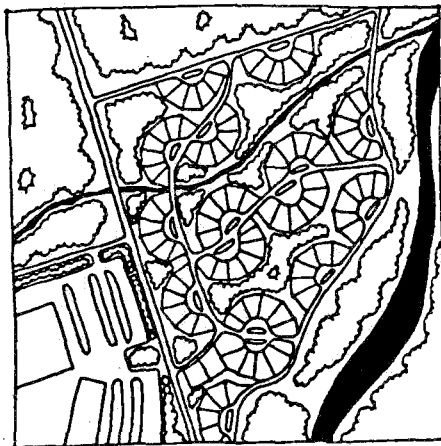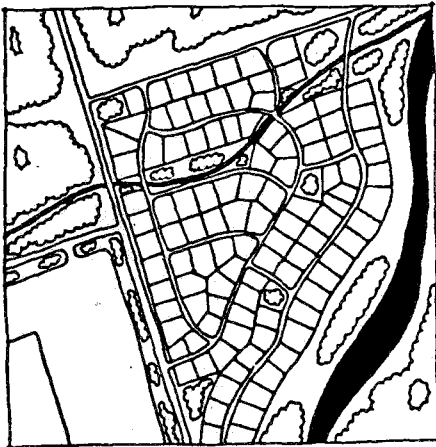
INDIGENOUS LANDSCAPE

Housing patches in landscape;
mostly habitat and gardens

Limited modification

Sustainability depends upon maintaining the ecological integrity of the landscape through long time cycles (decades or centuries). If an activity damages the ecosystem over either the short or the long term, it is not sustainable.

> *"The key slowly changing or foundation variables underlying ecological integrity are soil, biological production, biological diversity, fresh water, oceans, and air, and those underlying human aspirations are basic human needs of food, health and housing, fuel, and cultural cohesion and diversity. Many of the variables are interlinked and change together, producing the slow cycles of change expected in sustainable environments. Certain nearly irreversible variables with long recovery times are of special concern in sustainable environments."* (Forman 1990: 268)

From an ecological perspective, then, human actions which threaten foundation variables or which create irreversible effects are clearly not sustainable. If we remove or damage soil, for instance, we destroy the land's capability to support life. Sustainable development activities must promote, not undermine, ecological integrity.

Landscape ecology offers a discipline that encompasses both landscape and cultural development. In order to ensure continued functioning of ecological systems while meeting the needs of human society, we can maintain an indigenous or "natural" matrix that should include all of the habitats representative of or special to the area. We do not want to lose vital habitat. Adding "artificial" or built environment "patches" should not disrupt natural landscape corridors, especially along drainage patterns. Ideally, residential development would occur as patches in the landscape that do not interfere with landscape functioning. Planned open space within residential developments should form part of the indigenous landscape matrix to preserve natural habitat.

Forman (1990: 274) hypothesizes that we could determine:

> *"... an optimal spatial configuration of ecosystems and land uses to maximize ecological integrity, achievement of human aspirations, or sustainability of an environment."*

Such optimal configurations would strive to maintain the functional integrity of landscapes but would recognize the uniqueness of individual landscapes. Where we seek sustainability, landscape ecology suggests that we consider each residential area in the context of its existing or planned landscape. With perfect knowledge, and guided by the principle of maintaining functional integrity, we could determine the most appropriate residential design and practices for any landscape. Without perfect knowledge, our evaluation of appropriate

design and planning practices derives from the goals we set ourselves. In this instance, we aim for landscape sustainability. With that goal in mind we can begin to establish principles that generally conserve natural processes and resources, reduce the costs (environmental, economic, social) of development, and create healthy communities.

A Landscape Continuum

No landscape on the earth today has completely escaped the effects of human development activity. Nonetheless, we may conceive of a "landscape continuum" from more to less "natural" (see Figure 2). On one end of this continuum we find highly disturbed "artificial" landscapes, modified extensively by human actions; on the other end, minimally disturbed landscapes, essentially "indigenous" in character. Humans may live and work in all kinds of landscapes. Traditional development activities tend to transform indigenous landscapes into more extensively modified landscapes; the process reduces biological diversity and increases the need for energy subsidies. As we move towards sustainable development, however, we should attempt to protect and promote indigenous landscape patterns in which human activities do not disrupt essential natural processes, destroy the productive capacity of a landscape, or require extensive energy subsidies.

Figure 2: LANDSCAPE CONTINUUM

Indigenous Landscape
*Protect natural
  processes/functions
*Diverse mosaic
*Solar-based power
  (self-sustaining)

Implications
*protects diversity
*new way of life
*reduced population
*development fits
  into environment

TRADITIONAL DEVELOPMENT

SUSTAINABLE DEVELOPMENT

Artificial Landscape
*Disrupt natural processes
*Modify surface
*Unproductive without
  energy subsidies
*Homogeneous

Implications
*undermines diversity
*high standard of living
  (for some)
*development destroys
  environment

2: PLANNING FOR SUSTAINABLE LANDSCAPES

Who controls landscapes in Canada? Three levels of government, and land owners. The constitution divides authority over land between the federal and provincial levels of government. Both levels of government have some interest in resources such as farmland, forests, waterways, and minerals. Under various acts, the province gives municipalities the right to control local land use and development. (We discuss provincial policies in greater detail in Part 2.) Ultimately, though, in most parts of the country the owners of the land play the major role in protecting or destroying the landscape.

If we could begin with a clean slate in our efforts to plan for sustainable communities, we probably would not choose to impose the type of municipal planning system which currently predominates in Canada. The regulatory approach to community planning (characterized by land use bylaws and subdivision regulations) took shape to control and promote economic growth and property values. Making a societal commitment to sustainable development forces us to reconsider our operating procedures. What methods promote sustainability most effectively? In some circumstances, we may conclude that existing planning tools and techniques are adequate for the task; in other cases, they are not. Over the long term, we require more than minor housekeeping adjustments to transform Canadian land use planning into planning for sustainable communities.

Are communities using existing tools and techniques to move towards greater sustainability? Have they begun to consider performance standards which could evaluate whether development meets environmental criteria (Kendig et al. 1980). Have municipalities incorporated policies in their plans to reflect the principles of sustainable development? Communities may use regulations and procedures to encourage sustainable land use practices or to discourage wasteful traditional approaches. A community that commits itself to sustainable development may remove barriers to sustainability, or may adopt policies and practices that directly promote sustainability.

In our study of Nova Scotia communities, we evaluated three types of activities to determine whether communities are making progress towards sustainability.

* policy statements,

* implementation tools,

* results.

Municipal planning documents and other materials issued by municipal governments often include policy statements which reflect decisions taken by local council or staff. While policy does not guarantee results, it indicates that members of the community have expressed an intent to meet some or all of the objectives of sustainability. In this study, we were not concerned with whether municipalities use the language of sustainable development; the rhetoric of sustainable development has rapidly appeared in municipal government documents as it has in federal documents. Instead, we wondered whether the policies and intentions reflect the philosophical tenets of sustainable development as we define it: that is, do municipalities seek to protect landscape function while permitting development?

Implementation tools included in land use bylaws, subdivision regulations, and other local bylaws may constrain development form and community behaviour. Bylaws affect the options available to community residents. Some implementation tools may allow sustainable development, while others prohibit it. The effect of a particular implementation tool may differ according to context: for example, a regulation allowing residential infill may promote sustainability in one situation (e.g., where shelter replaces grass monoculture in a well-serviced area), but may undermine sustainability in another situation (e.g., where shelter replaces an area used for food production).

In the long term, results must become the key indicators of sustainability. Sustainable residential environments should exist within diverse and productive landscapes. In the context of Nova Scotian communities, we can look at recent development experience to determine whether new residential environments support the principles of sustainability. As part of this study, we examined development practices in residential areas for evidence that they protected landscape function.

We recognize that at this time our communities are far from sustainable. Measuring the condition of ecosystems often provides a litany of human impacts. Nonetheless, many communities are making efforts to adopt sustainable land use practices. This study of planning in Nova Scotia allows us to evaluate evidence of progress towards the goals of sustainability. Some of the knowledge we need to assess sustainability may not currently be collected in appropriate ways. Monitoring progress towards sustainability may require that we begin to collect new information, or organize existing information in different ways.

Operating Principles and Aims

In order to develop indicators for sustainable residential environments we derived basic operating principles or aims based upon our objectives and the landscape ecology approach[2]. We suggest that communities moving towards the sustainable development of residential environments are those which:

a). maintain and restore natural processes and functions,

b). protect natural resources and resource lands for future generations,

c). minimize settlement impacts on natural systems,

d). reduce the use of resources (especially non-renewable),

e). reduce waste outputs from residential developments,

f). increase public involvement in promoting sustainability,

g). promote efficiency, choice, and adequacy in housing,

h). provide healthy social environments.

These aims elaborate upon the basic elements of sustainable development: ecological integrity, economic viability, and social equity. As we have argued above, the first requirement, for ecological integrity, is of primary importance, although the others must follow. The aims articulated here are inter-related and overlapping. Each aim has a slightly different emphasis: for example, aim (b) focuses on protecting limited natural resources and resource lands for the future, while aim (d) more generally seeks to reduce the overall use of resources. Sustainable development is difficult to define and measure. We have used these aims to define potential indicators which would allow us to measure communities' progress towards sustainability.

---

[2] We would like to thank Susan Holtz, of the National Round Table on Environment and Economy, and the staff of the Nova Scotia Department of Municipal Affairs and Department of Housing for their helpful comments on our efforts to clarify aims and develop potential indicators.

The next section discusses the rationale and implications of each aim we identified. As the reader will recognize, our efforts to determine whether communities achieved these aims depended upon a combination of quantitative and qualitative evaluation. Ultimately we hope to develop an easily implemented set of quantitative indicators; however, meeting that target may require considerable qualitative assessment of progress along the way.[3]

Aim (a). To maintain and restore natural processes and functions

Sustainable communities will seek to protect and conserve natural resources. Human development inevitably modifies landscapes. Placing residential development on the landscape requires maintaining or restoring natural processes and functions. Development must not interfere with the ecological integrity of landscape mosaics.

Adopting Aim (a) entails significant alteration in traditional planning for residential environments. Some municipalities have made attempts to protect development from natural functions in areas such as floodplains. However, the idea of regulating artificial environments, such as paved surfaces, is uncommon. A landscape ecology approach to sustainable residential environments would require that we site residential uses within a landscape context, rather than completely modifying the landscape to suit residential uses. We must make sure that creating residential landscapes does not limit environmental choices in the future.

Using landscape pattern as an indicator of ecological integrity is appropriate at the municipal level. Landscape ecology theory suggests maintaining adequate size, configuration, and connectivity between habitat lands to accommodate the requirements of naturally occurring species in the landscape. Development activities, including residential site planning, must maintain indigenous habitat composition and avoid fragmenting the landscape matrix: habitat patches must not become so small that they exclude interior species, or so disconnected that species emigration and regional extinctions occur. Residential uses should remain small patches within the landscape.

The *Natural History of Nova Scotia* (Simmons et al. 1984) provides baseline data concerning typical habitats for the province: it identifies habitat needs, type, size, configuration, and variety of key indicator species. We can use habitat characteristics and

---

[3] In developing the evaluation framework and indicators, we have drawn substantively on the work of Rees and Roseland (1991) and MacLaren (1992).

key species as indicators of the sustainability of the landscape pattern. In a predominantly urban landscape we could ask: are characteristic habitat patches included in the urban landscape pattern mix? Are patches connected via habitat corridors? Are patches connected to an indigenous matrix beyond the urban development area? Does the municipality have policies or regulations requiring the conservation or restoration of habitat lands? Are programs in place to encourage residents to conserve or create habitat? In other words, is development nestled within the landscape (or does it replace the indigenous landscape)?

In predominantly rural landscapes we might ask: are the developed patches contained so that the indigenous matrix still provides connections between habitat areas? Do developed patches threaten critical environmental resource patches (such as lakes, ponds, wetlands)? Do the developed patches disrupt connections in the indigenous matrix by creating physical barriers to movement (e.g., roads) or by degrading the quality of corridors (e.g., removing vegetation along streams)?

We can look at municipal policies to determine whether the community seeks to maintain ecological integrity and landscape function. Do communities encourage residents to use land between buildings for food production, forest growth, or wildlife habitat? Efforts to enhance "naturalization", replacing artificial monocultures with local wildflowers and indigenous species, promotes biological diversity and production. Using pesticides and herbicides, on the other hand, threatens environmental and human health.

Communities may have policies or regulations which impede efforts to promote sustainability. For example, if "unsightly premises" or "minimum standards" by-laws penalize those who fail to mow their lawns, then the regulations may diminish the potential for naturalization. By-laws restricting urban agriculture (such as keeping chickens for domestic use) may limit the potential for greater household self-sufficiency in food production. A community might, for instance, choose to adjust property taxes to reward sustainability, if provincial legislation allowed such tax remissions. Do municipalities have the authority and the powers to make policies and regulations which promote sustainability and protect landscape mosaics?

A sustainable community would protect environmental quality. Do municipalities act to maintain landscape function? Does municipal policy require environmental review, assessment, or audit before development? Is performance enforced and monitored?

Municipalities engage in watershed management and planning to protect their water supplies. They may restrict development activities which affect water quality or quantity.

14

Municipalities work with provincial guidelines to protect waterways and wetlands. In some cases they may attempt to limit removal of vegetation around waterways, or may require developers to adopt special practices to prevent erosion. How effective are provincial guidelines? Do municipal policies discourage development on steep slopes? Does policy attempt to protect erosion prone soils or acid generating slates? Does policy seek to avoid development on flood plains? Does policy seek to protect waterways from development? Does the municipality accept ecologically important lands for park land dedication? Does it attempt to purchase such lands?

Municipalities may attempt to protect the physical functioning of landscapes: for example, they may encourage developers to maintain natural drainage systems. Grassed drainage ditches, wetlands, and storm water retention ponds allow storm water to percolate into the water table. Some municipalities prohibit home owners from piping storm water from the roof into the sewer system. Does policy allow or require natural (on-site) storm water drainage? Do developers employ natural drainage systems?

Many communities have degraded indigenous landscapes. Developers fill wetlands, strip off vegetation. Houses spring up in fields where food once grew. To make our communities more sustainable over the long term we must address the problems of degraded habitats and disrupted landscape mosaics. Does the municipality have policies that promote restoring or rehabilitating damaged environments? Does policy prevent further degradation, or compel land owners to clean up degraded landscapes?

In general, policy should attempt to limit disruption of landscapes by urban uses such as structures and impermeable surfaces. It should protect vegetation and soil. Policy and implementation should maintain or restore the biological and physical functioning of landscapes. For example, we should protect wildlife corridors and patches. Municipal policies should build on provincial policies to enhance societal protection of the environment and to safeguard the productive capacity of the land.

Aim (b). To protect natural resources and resource lands for future generations

A sustainable community must protect natural resources and resource lands in residential areas. Communities should locate urban uses to conserve important natural resources as opportunities and amenities for future generations. Residential development cannot continue to degrade vital natural systems, or lay waste to limited agricultural lands. It is important to protect highly productive lands from other uses that destroy productive potential. We must protect the basic elements of air, land, and water to allow sustainability.

15

We face difficult choices in planning sustainable residential environments: how can we place housing in landscapes while protecting the vital resources and diversity of those landscapes? Our primary concern must be to protect ecological integrity in residential landscapes. Habitat protection and conservation are central because from them we derive renewable resource opportunities. We can never replace the earth's non-renewable resources. As long as we continue to use non-renewable resources, we deplete the resources available to future generations. We must take steps now to protect vital resources and resource lands from abuse.

As we examine communities to determine their progress toward sustainable residential environments we may ask a number of questions, such as, has the community acted to protect or conserve natural resources (including forested land, farm land, wetlands, mineral deposits, lakes, topsoil, rivers, streams, coastal areas)? Municipalities may have taken actions to protect some resources but not others. Has the community mapped resource lands? Has it designated resource lands for protection or conservation?

Policies on conserving natural resources may be entrenched in Municipal Planning Strategy policies, and implemented through conservation zoning, environmentally sensitive area designation, or through municipal purchase of land. Analyzing municipal documents and interviews with municipal officials will reveal whether the community policy promotes, allows, prohibits, or has no effect on protecting natural resources. If we look at the experience of the community, we may determine whether the community has succeeded in protecting natural resources and resource lands.

In the process of assessing communities, we may ask other relevant questions: were any subdivision permits granted with provisions to protect natural resources? If yes, are they monitored? Does the municipality have penalties for those who destroy natural resources? We must recognize that disputes will arise over which resources to protect. A given landscape could hold many resources: forest habitat, agricultural potential, mineral deposits, surface water. In moving to protect resources, communities face difficult decisions and must set clear priorities. Protecting vital natural resources and habitat areas from development is essential, but only part of the extensive effort of sustainable development. We must also ensure that landscape functions and processes continue even as we provide housing and employment for community members.

Aim (c). To minimize settlement impacts

In sustainable communities, development should have the least possible impact on landscape functioning. This requires efficient use of space, services, infrastructure, and resources in residential environments. Sustainable development demands significant changes in the way we design and use residential environments: it implies minimizing the amount of landscape displaced by urban uses.

Enhancing sustainability in urban residential landscapes may entail some increase in net residential densities, at least in the short term[4]. Certainly most advocates of sustainable development promote greater urban densities. In recent decades the size of the average suburban lot has continued to increase even as average household size decreased (see Table 2-1): as a result, urban densities decline, and rural landscapes disappear. Since 1951, the mean number of persons per household in Canada stood at 4.0; in 1991, the mean fell to 2.7. The size of dwellings constructed has not fallen in the same way. Statistics on mean dwelling unit size in Canada are difficult to obtain: anecdotal evidence would indicate that home sizes have increased or remained constant during the post-war period. We need to make better use of our existing building stock: at the same time as some households face homelessness, many households are "over-housed", with few people in a large unit.

Table 2-1: Mean Number of Persons per Household

	1951	1961	1971	1981	1991
CANADA	4.0	3.9	3.5	2.9	2.7
Nova Scotia	4.2	4.0	3.7	3.0	2.7
Dartmouth	4.1	4.2	3.8	2.9	2.6
Truro	3.7	3.6	3.2	2.6	2.3
Kings Cty	3.9	3.9	3.6	3.0	2.7

Source: Census of Canada.

---

[4] If human populations continue to increase, then net urban densities will probably have to increase so that we do not destroy more of the indigenous landscape matrix. However, as Rees (1990: 20) argues, *"The deteriorating biosphere suggests that human populations and the present scale of economic activity may already exceed global carrying capacity."* Decreases in human population levels would eventually reduce population density which, in the long term, will be more sustainable.

Retail and warehouse space lies idle in many communities. Making better use of existing housing resources and urban infrastructure is essential. A sustainable community must provide housing for all of its residents without obliterating the rural landscape. A sustainable community must also provide residents with sufficient privacy, amenities, and control over shelter to maintain health and well-being. In some cases, greater density will prove sustainable. However, increasing density is not a panacea. With poor planning and site design high density housing can disrupt the functioning of the landscape. The long term approach to sustainability suggests a transition to lower urban densities where a large portion of the landscape remains productive instead of urbanized, and where a large proportion of the community works at or near home.

In well-serviced urban areas municipalities may encourage greater density in a number of ways. Residential infill allows builders to construct homes between existing buildings. Residential conversion implies subdividing existing dwelling units to create new units (as in a basement flat). Infill and conversions increase efficiency in residential environments because they allow greater use of existing infrastructure and services; unfortunately, infill housing may remove opportunities for protecting habitat corridors or growing food between buildings. Converting vacant commercial and industrial buildings to residential uses offers municipalities opportunities to provide additional housing without consuming more landscapes.

Cluster development is an approach sympathetic to protecting natural processes and landscape function. It involves grouping housing units tightly together in a landscape so that they can share servicing structures and costs (while simultaneously protecting the prevailing landscape mosaic or significant landscape patches). Thus cluster development provides the economic and social benefits of high density settlements while conserving landscape function.

Regulatory planning policies traditionally impose density limits. North Americans have significant fears about density. Some of our perceived need for abundant light and air derives from the early years of this century when public health improvements gave rise to planning standards. In part, however, North American communities translate a frontier vista of wide open spaces onto the residential landscape through regulations on lot size. By contrast, residential environments in Europe or Asia have much greater densities than do our own urban areas. While Europeans use hedge rows and stone walls to demarcate private areas, and Asians develop self-discipline to shut themselves off from the view and earshot of their neighbours, North Americans rely on vast lawns and distance for privacy. This penchant to separate ourselves spatially from our neighbours makes our built forms unsustainable in the long term: sprawl obliterates indigenous landscapes; asphalt, grass, and

18

imported ornamental varieties replace productive habitats. Given different cultural traditions, we could use most of the space between structures for the maintenance of natural landscape functions, or for food or fuel production; at present, however, the land between homes often has little use.

In examining municipal regulations, we can consider whether the rules encourage or discourage sustainability. The effects of regulations depends upon other policy results. For example, a requirement for a minimum lot size of 60 feet instead of 35 feet will make land more expensive to service and to purchase. A well-kept lawn requires greater subsidies of energy and displaces a diverse landscape mosaic. In the context of traditional subdivision practices, a larger lot is less sustainable. However, if residents grow their own food, maintain a wood lot, or protect a wetland on their property, then a larger lot can enhance household self-sufficiency and biological diversity , and ultimately contribute to community sustainability). Accordingly, we must judge the rules in a landscape context. Given existing practices in residential environments, many of our land use regulations discourage sustainability. If lifestyles and cultural practices change, we could make existing urban landscapes considerably more productive.

We should set land use regulations to protect the ecological integrity of landscapes. One of the most significant impacts from urban uses derives from the amount of impermeable surface generated. Hard surfaces destroy biological functioning and alter physical functioning. Pavement prevents rain water from percolating through the soil to replenish ground water supplies; it increases the speed of run-off and alters natural drainage patterns. We should examine policies and regulations to determine if they restrict the amount of impermeable surface generated during development. Provincial road regulations are a significant offender in this regard because they demand wide road surfaces, even on local roads. Sustainable residential environments should promote natural infiltration of storm water and should limit the amount of impermeable surface on the landscape.

In sum, then, we seek to minimize the impacts of human settlement on the functioning and productivity of the landscape, and on the diversity of landscape mosaics.

Aim (d). To reduce use of resources (especially non-renewable)

A sustainable community would not drain its resources, or operate in a "deficit financing" mode. We can only use resources at the rate at which we generate them. To make residential environments more sustainable we must reduce our demand for resources, and make greater use of renewable sources of energy and materials. The watchwords of a sustainable community are reduce, reuse, recycle, and replant.

19

We can meet our objective of balancing energy budgets by increasing energy income from renewable sources, and reducing energy expenditures. The objective of balancing material budgets is more difficult since we have no effective income of non-renewable materials: there will never be more gold than is in the ground today. Therefore, we must reduce the amount of materials we use and increase efforts to reuse and recycle products.

Ecological theory suggests that developing systems are unstable and not conservative: they rely on imports of energy to support rapid growth. Stable systems are conservative and maintenance oriented: they import limited energy and materials (soil, water, elemental constituents, food, etc.). Sustainable communities will operate as stable systems. Indicators of sustainability will reflect measurements of energy and material flow in the environment to demonstrate how conservative and efficient a community is. Sustainability indicators would include measures of the type and amount of energy and materials imported, and the amount captured or converted directly in the community (e.g., solar energy, local food production).

Municipalities may develop policies to promote renewable energy sources both in public buildings and in private developments. Solar heating, wind power, small-scale hydro-electric generation, and wave power are all possible renewable energy sources. Communities should encourage residents to use high efficiency heating systems. Policy or regulations might deal with wood burning stoves, heat exchangers, efficient oil burners, and district heating. One important initiative for reducing depletion of non-renewable energy resources involves site planning and landscape design for energy efficiency. Solar heating can significantly reduce energy costs while simultaneously improving the livability of a home. In a relatively cool climate like Nova Scotia's, the sun's warming rays prove most welcome. Careful site planning and landscaping can shelter homes from cold winds, or place deciduous trees to shade southern exposures during the heat of the summer. New "earth energy" systems have considerable potential as well. Do municipal policies and regulations encourage developers to design for energy efficiency, or assist home owners who want to convert to alternative energy systems?

Not all buildings are energy efficient. Municipalities could encourage residents to improve insulation in older homes. Grant programs and low interest loans can help low income households improve their homes. Communities can promote energy efficient housing designs, and discourage wasteful building types. Some building regulations, such as height limits on detached, semi-detached, or town housing may inadvertently promote energy wastage; multi-story walk-up housing may prove more efficient than the standard sprawling single storey building. Through conservation and conversion programs, municipalities could promote greater sustainability.

Sustainable communities will have to reduce the use of non-renewable energy in transportation by encouraging walking, cycling, and use of mass transit. A compact urban form promotes reduced energy use. Providing housing near employment centres gives residents the option of walking to work. Do policies advocate providing services and facilities within walking distance of residential areas? Those who choose to walk, run, or cycle to work will need shower facilities at their place of employment, safe routes for running and cycling, and secure parking facilities for bicycles. People should be able to work from their homes. Limiting downtown parking may promote mass transit. Sustainable communities would encourage mass transit for commuting. Weaning Canadians from excessive car use will probably take a combined strategy: effective land use policies, high gasoline prices, and changing cultural values.

Modest gains in energy use may result from reducing traffic speed. Narrow streets, one-way street systems, cul-de-sacs, speed bumps, or tight curves may slow traffic down or discourage people from using their vehicles for short trips. Slower traffic and reduced traffic volumes also make residential neighbourhoods safer and more pleasant.

Greater attention to reducing, recycling, and reusing resources and materials in residential environments will make an important contribution to sustainability. We must make a transition to using renewable resources managed for sustainability. If we cut a tree, we must plant other trees for future generations. We must act as stewards of the land. We can begin to grow more of our food close to home. We will transform the disposable consumer society as we take responsibility for our effects on the environment.

Aim (e). To reduce waste outputs

In addition to limiting our use of vital resources we must reduce the wastes we generate. We must leave a clean and healthy environment for the future. Clean air, land, and water are essential prerequisites of ecological integrity.

Municipalities may adopt various policies and practices to reduce wastes. Pollution control charges may encourage water conservation and reduce waste volumes. Treatment plants can process sludge for further use (as soil enhancers or as fuel). In rural areas, on-site waste treatment is common. Where clustered housing enhances services and protects landscape integrity, we may prefer package treatment systems. The goals in establishing a treatment plan for any community, small or large, include protecting ecological integrity and employing technology appropriate to community resources. Communities should treat waste water to an acceptable level for environmental quality. Do communities ensure that

toxic pollutants and heavy metals do not enter the waste water stream?

Communities can re-use or recycle many wastes. Some municipalities are composting wastes and encouraging households to compost garden and vegetable wastes. Curbside recycling programs encourage households to collect materials for recycling. Programs which limit the amount of garbage collected per household may discourage people from generating large volumes of wastes. Local furniture or clothing exchanges can facilitate the re-use of household products. Do waste reduction and recycling policies apply to multi-family housing as well as to low density neighbourhoods? Apartment dwellers should be able to compost their wastes collectively for use on allotment or community gardens.

Communities can collect household hazardous wastes for special treatment. Hazardous wastes present a serious risk today. In some communities, hazardous materials may be stored in or near residential areas. Do communities have facilities for collecting and safely storing hazardous wastes?[5] Do communities arrange for the safe disposal of old appliances, especially those with CFC coolants?

One of the largest generators of wastes in the residential environment is construction. Building practices prove wasteful of many resources. Do communities encourage builders to take greater measures to avoid waste, and to reuse salvageable materials?

Communities should consider how to benefit from wastes which they cannot re-use or recycle. Sanitary land fill sites become more difficult to find with each passing year. Some communities have chosen to incinerate wastes, and capture the energy generated in the process. If technology meets environmental and health standards, then incineration may be a viable option in the short term as communities develop strategies for reducing resource use and for increasing recycling and re-use. Over the long term, however, incinerating non-renewable resources is not sustainable. Unfortunately, communities may become wedded to incineration technology as a short term remedy only to find they cannot afford to divorce themselves from it over the long term.[6]

---

[5] The Province of Nova Scotia is currently trying to find a site for an incinerator to treat hazardous wastes. As with most such siting exercises, the Province has met considerable resistance.

[6] For example, the Halifax Metropolitan area has decided to purchase a multi-million dollar incinerator to burn a given proportion of its waste stream. Proponents see the incinerator as a viable alternative to a large wet landfill site. Opponents fear that the minimum volume requirements of the incinerator will undermine recycling programs.

Do communities protect air quality in residential environments? Who monitors industrial emissions? Do we acknowledge and avoid health risks from wood smoke and pesticide application? Some of the institutions and businesses which locate in or near residential areas may generate wastes which threaten human health and the environment: dry cleaning establishments, hospitals, supermarkets, and other industries will have to adopt sustainable environmental practices.

Aim (f). To increase public involvement

We cannot create sustainable communities without full participation from community residents. Moving towards sustainability takes commitment: it means changing the way we live. Municipalities will have to provide support, information, and education to help people develop the skills they need to create sustainable residential environments.

Most communities already have groups which promote sustainability. Environmental groups have sponsored recycling projects and environmental awareness. Some communities have groups active in the area of public health or "healthy city" projects. Gardening advocates promote organic practices and community composting.

Municipal policy and initiatives can support such community groups. For instance, municipalities can make land available for community gardening. Communities can establish sustainable development round tables at the local level. Do municipalities assign staff to promote sustainable development? The nature of the tasks given to staff may indicate the importance the municipality gives to public education, information, and participation.

To get the community involved in sustainability initiatives, municipalities have to recognize the needs and abilities of different user groups. Community members differ in their demands on residential environments. Sustainable communities will have to meet diverse needs to create residential spaces that are accessible and appropriate for people.

Sustainable development requires that communities nurture a sense of stewardship and volunteerism. Each member of a sustainable community must accept greater responsibility for the fate of the planet, and work diligently to protect resources for future generations.

Aim (g). To promote efficiency, choice, and adequacy in housing

Sustainable communities should make a wide range of housing opportunities and choices available for residents. People need safe, clean, efficient, and affordable shelter suited to their requirements and circumstances. Housing affordability has become a serious problem in our communities. Rates of homelessness have escalated in the last decade as income failed to keep pace with increasing housing costs. Without overcoming inequities, we will find sustainability impossible to achieve.

As we examine municipal policy we must consider whether the community has identified affordability as a priority and developed implementation devices to remedy the problem. For example, does the municipality have a housing office? Does the municipality purchase land for housing? Does the municipality provide social housing for low income households?

The favoured building type in our society is the detached house. If total population levels are sufficiently low, then we can develop sustainable communities of detached homes. However, total population levels show no signs of declining. Also, a significant proportion of the population cannot afford the cost of a detached house. Multi-family housing forms such as semi-detached, town houses, apartments, group homes, and mobile homes provide housing choices for a variety of households. Do municipal policies, regulations, and actions encourage developers to construct a range of housing types, prices, and tenures?

Municipalities could encourage developers to build housing for a wider range of households by offering incentives or penalties. In some jurisdictions, communities must zone a certain proportion of land for multi-unit dwellings. In other areas, developers earn density bonuses for marketing dwellings at affordable prices. Do communities use devices like "comprehensive development districts" (planned unit developments) to create a cross-section of housing types?

Staff and councils can either facilitate groups providing efficient and adequate housing, or can hinder them. Does the municipality speed approvals for affordable housing? Does the municipality work with the Department of Housing to provide affordable housing? Does the community put up road blocks (such as excessive requirements) to sustainability?

Many land use regulations drive up both the environmental and economic costs of providing housing. We should examine policies and regulations to determine if they allow low cost servicing options. Regulations should respond to ecological integrity and human health, as well as to other cultural values and traditions.

Aim (h). To provide healthy social environments

Sustainable communities will enhance environmental health and human health. Sustainable approaches will create residential environments in which people find their basic needs met in a supportive social environment. If communities can achieve the aims indicated above (a through g), then they will improve health opportunities for residents.

Public health advocates, planners, and many politicians have come to recognize that "health" involves more than the absence of disease. Health depends also on security, employment, fulfilment, and hope for the future. The idea of healthy communities has largely paralleled the concept of sustainable development. In 1988 the Canadian government funded a national "Healthy Communities Project". The project supported community initiatives to promote community health. Like the concept of sustainable development, "healthy communities" links notions of economic well-being, environmental health, and community participation. The differences are of emphasis: the healthy community concept focuses on individual and collective health and well-being, whereas sustainable development advocates environmental health.

Many of the individual and collective problems of modern societies derive from unsustainable environmental and cultural practices. We can envision a healthier community in which problems of stress, crime, mental illness, illiteracy, inequality, and intolerance diminish as we move towards more sustainable development models.

The model of the good society inherent in the concept of sustainable development (and healthy communities) may not be a "leisure society". It offers a future of social responsibility and participation. It suggests, for instance, that people may get to school or work under their own power. It could generate a diverse landscape of garden plots, woodlots, and unkempt fields of wildflowers. We cannot fool ourselves into thinking the transition to such a model would come easily. A sustainable society requires new attitudes and new approaches to living with the land.

Summary

Identifying the aims of sustainable development revealed many questions we can ask of municipal planning practice. It demonstrates the range of options available to communities to promote greater sustainability. At the same time, the discussion begins to reveal the potential for contradictions and disputes about sustainability: e.g., do we prefer dense urban settlements or self-sufficient rural enclaves? Depending on which aim we accord highest priority, we may envision different models of sustainable residential environments.

3:   MEASURING SUSTAINABILITY

Having clarified our aims and principles, we proceeded to develop an evaluation framework for measuring communities' progress toward achieving sustainable development. The framework used for analysing relevant documents and interview results appears as **Appendix A.**

One of the first steps in the research program involved an attempt to develop indicators of sustainability. Following upon the IUCN (1991) report, *Caring for the Earth*, we identified three types of indicators.

> *"Primary indicators measure the condition of the ecosystem or species concerned. Secondary indicators measure human impacts. Tertiary indicators measure actions to reduce impacts."* (IUCN et al. 1991: 199)

The IUCN structure proved helpful in allowing us to develop a classification for the varied policies, regulations, and practices which would indicate progress towards sustainability. Primary indicators offer "best case" scenarios: ideally, we should measure ecosystem health to determine whether communities have achieved sustainability. Unfortunately, in many cases communities do not currently collect the necessary information to employ the primary indicators suggested. Hence we more frequently are able to measure the impacts of human activities on environmental systems (secondary indicators), or the efforts communities take to reduce human impacts on the environment (tertiary indicators).

For each of the identified aims we tried to suggest primary, secondary, and tertiary indicators which might measure progress towards sustainability. Some of the aims translated readily into indicators. In most cases, we found it difficult to determine appropriate items or amounts for measurement. For example, we can easily check off "yes" or "no" if we want to know whether a community has a tree cutting by-law, but what amount of conservation open space is "sustainable"? Also, how do we deal with variations in community policies? Not all "flood plain policies" are equally effective. While communities have adopted quality standards for some variables (like drinking water), we lack the conceptual framework or consensus for measuring many important ecosystem variables (like landscape productivity).

Indicators of Sustainability

As we worked with the evaluation framework its deficiencies grew clear. The list of indicators was not complete or definitive. Some duplication occurred across the aims. The framework certainly facilitated the analysis of land use planning in the sample communities, but required modifications for future use. The tables presented here summarize the indicators which proved most helpful. Before we can apply the indicators in other communities, greater quantification and elaboration will be necessary. We must identify appropriate amounts for quantifiable items; we should clarify minimum requirements for policy initiatives or regulatory tools. In sum, we used the framework as an analytical aid; it offers others a starting point for further research.

Tables 3-1 to 3-8 demonstrate the indicators we found most relevant for measuring progress towards sustainability in developing residential environments. Unfortunately, we could not obtain information for many of the indicators, so they proved less useful than expected. Each table presents items related to the aims developed in Chapter 1.

Table 3-1 includes among its primary indicators measures related to environmental quality. We could, for example, measure the levels of sulphur dioxide or ash particles in the air in our communities. Communities will have to establish parameters of acceptable performance for these primary indicators. Many of the secondary indicators can be measured readily: the percent of flood plain modified for development, for example. Tertiary indicators show that communities have a number of potential policies, practices, and regulations which can attempt to reduce human impacts on the environment. For instance, we can easily determine whether a community demands an environmental review of development before it occurs; however, the information it collects and the thoroughness of the review may differ. We could not evaluate landscape structure or species viability given the methods used in our study. Some of the information we had hoped to get, as in "conservation open space", proved unavailable: communities may not define "open space" and "conservation" in concrete terms, and do not keep records which allow us to determine the amount.

Table 3-1: Indicators for Aim (a)
TO MAINTAIN AND RESTORE NATURAL PROCESSES AND FUNCTIONS

Primary	Secondary	Tertiary
Landscape structure - connectivity - productivity Species viability - diversity - representation - numbers - health Conservation open space ratio (conservation lands to total land base) Environmental quality - water - air - land	Hectares of habitat destroyed - wetlands - forests - other Indigenous habitat type lost Indigenous species lost Volume of run-off from modified landscape Volume of soil loss Percent of landscape covered by impermeable surfaces Percent of flood plain modified by development	Areas designated for protection - sensitive areas - flood plains - wetlands Controls on development - erosion - tree cutting - filling wetlands - acid drainage - buffers - impermeable surfaces Environmental review before development Environmental monitoring Management plans for natural areas - watershed lands - flood plains - coastal zone - Environmentally Sensitive Areas - storm water Restoration plans Municipal purchase of conservation lands

Table 3-2: Indicators for Aim (b)
TO PROTECT NATURAL RESOURCES FOR FUTURE GENERATIONS

Primary	Secondary	Tertiary

Resource lands held for future use
- forest lands
  - old growth
  - representative
  - other
- mineral lands
- farmland
 	
Resources protected for future use
- topsoil
- ground water
- surface water
- ocean
- air
 	
Resources used in sustainable way
- farming ratio (organic to traditional)
- forestry ratio (selective to clear-cutting)
- Percent of households with kitchen gardens
	Reforestation of cleared land
	
	Loss of use of resource
	- beach closures (days per beach per year)
	- water supply inadequacy (days per year)
	- shellfish closures
	- fossil fuel depletion
	
	Hectares of resource lands lost to development
	- forests
	- mine land
	- farmland
	- wetlands
	
	Resource use per capita
	- water
	- fossil fuels
		Municipal round table for sustainable development
		
		Management plan
		- forest lands
		- mineral lands
		- farm land
		- water supply
		
		Tree planting program
		
		Community gardens
		Kitchen gardens
		
		Controls on development
		- vegetation
		- fill quality
		- soil storage
		- borrow pits
		- dumping
		- air emissions
		- effluent quality
		
		Controls on activities
		- pesticides
		- herbicides
		- fertilizers
		- composting
		- mowing
		- conservation

Table 3-2 illustrates indicators which may measure progress towards aim (b), to protect natural resources for future generations. Among the primary indicators suggested we find farmland held for future use. Urban growth in Canada relentlessly consumes prime

29

farmland and removes its potential for future generations. Sustainable development requires that we protect farmland from uses which would restrict agricultural activity. Secondary indicators, such as the amount of farmland lost to development, reveal the impact human activities have had on resources. Tertiary indicators, such as community gardens, kitchen gardens, and controls on dumping show that communities encourage residents to protect the resource potential of the landscape.

Table 3-3 gives indicators for limiting settlement impacts on ecosystems. Primary indicators measure ecosystem function: does development destroy landscape corridors or isolate habitat patches? Secondary indicators include measures of the ratio of impervious to total surface area. Implementing a development boundary reveals community efforts to reduce impacts from sprawling urban settlement, and offers an example of a tertiary indicator.

Table 3-3: Indicators for Aim (c)
TO MINIMIZE SETTLEMENT IMPACTS ON ECOSYSTEMS

Primary	Secondary	Tertiary
Ecosystem function - corridors intact - patches linked - successional processes protected	Hectares of indigenous ecosystems lost Net population density Impervious surface ratio (impervious to total surface)	Lot regulations: - coverage limit - size limits Development boundary or greenbelt Density policy Landscape practices - protect natural systems - limit cut/fill - control wastes - avoid hazards

Table 3-4 illustrates measures for reducing the use of resources. Primary indicators would assess the total use of resources in the ecosystem. Secondary indicators measure resource use per capita. Tertiary indicators, such as "right to sun" provisions, can show community commitments to reducing resource use and encouraging conservation and conversion strategies.

Table 3-4: Indicators for Aim (d)
TO REDUCE USE OF RESOURCES

Primary	Secondary	Tertiary
No depletion of resources	Fossil fuels used per capita Percent of households using renewable energy supply Water consumption per capita Mineral use per capita	Design controls, energy standards - conversion and conservation programs - passive solar - "right to sun" - R2000 homes Home occupations allowed Transportation plan - mass transit - park and ride - mixed use zones - cycling lanes Water conservation - metered use

Table 3-5 shows indicators for aim (e), reducing waste outputs. Tertiary indicators include recycling programs and municipal composting programs. Secondary indicators measure participation rates and wastes generated. Primary indicators for this aim are difficult to specify, but could include some measure of resource cycling through the ecosystem.

Table 3-5: Indicators for Aim (e)
TO REDUCE WASTE OUTPUTS

Primary	Secondary	Tertiary
Materials cycle through ecosystem	Wastes for disposal generated per capita Per cent of waste stream recycled Per cent of households with access to doorstep recycling pick up Air emissions generated Liquid wastes for disposal generated per capita Percent of waste water treated Composting facilities - percent cycled	Recycling program Tipping fee Goods exchange programs Limits on non-reusable materials - ban disposable products - asphalt re-use Waste water program Composting program Hazardous waste treatment - household - appliances - industrial

Table 3-6 presents indicators of aim (f), to increase public involvement. Tertiary indicators show community efforts to promote participation. "Primary" (ecosystem status) and "Secondary" (impacts on ecosystems) indicators seem less applicable for this aim than for the others: we have chosen to describe the rates of participation in community affairs as Primary Indicators.

Table 3-6: Indicators for Aim (f)
TO INCREASE PUBLIC INVOLVEMENT

Primary	Secondary	Tertiary
Voter turnout Percent active in community and provincial affairs		Opportunities for involvement - citizen committees, boards - public education Community groups active Staff person to promote sustainability Programs for private stewardship Policy to involve all groups - challenged - minority - women - poor

Table 3-7 shows indicators for aim (g), to meet housing needs. Tertiary indicators reveal the community's commitment to meeting needs: how many units of social housing are available, for example? Secondary indicators may include local vacancy rates and home ownership rates. Primary indicators measure housing status in the community.

Table 3-7: Indicators for Aim (g)
TO PROMOTE EFFICIENCY, CHOICE AND ADEQUACY IN HOUSING

Primary	Secondary	Tertiary
All members of population well-housed	Vacancy rates	Units of social housing available
Diverse choice in housing stock	Waiting list for social housing	Housing office with staff
	Rent to income ratio for poorest households	Municipal land banking for affordable housing
	Dwelling units below standard	Regulations require mix of housing types and cost
	Home-ownership rates	

Table 3-8 presents indicators for aim (h). Primary indicators of a healthy and healthful community reflect the health status of individuals and social units, and reveal the extent to which the community meets needs. Secondary indicators measure health and social problems that reflect a lack of sustainability. Tertiary indicators show whether the community has adopted programs or actions to try to meet health and social needs.

Table 3-8: Indicators for Aim (h)
TO PROVIDE HEALTHY AND HEALTHFUL COMMUNITIES

Primary	Secondary	Tertiary
Basic needs of all people met Health status of community residents	Crime rates Rates of illness - "environmental" - mental health - infant mortality Achievement - educational - employment - income	Healthy Community Project or other public health project - well woman/baby clinics - education programs Recreation and activity programs - community clean-ups Health risk assessment policy Provide local facilities - schools - parks

With this evaluation framework in hand, we began to examine planning practice in three Nova Scotian municipalities to determine whether residential land use planning was achieving these aims. We were not able to find information to satisfy all of the questions our framework led us to ask. In Part Two of this report, we present the findings of our review of documents, interviews with key actors, and study of land development practices in the communities.

Study Method

Having developed a working evaluation framework, we first reviewed provincial policies, acts, and regulations to determine whether they promoted sustainability. We followed up with interviews with staff who implement provincial policy. Chapter 4 in Part Two discusses provincial policies.

We identified three communities which were reviewing their planning documents during the period from 1989-1991, and which provincial officials saw as supporting the principles of sustainable development. We examined their municipal planning strategies (original and new drafts), land use by-laws, and other municipal policy documents and by-laws. Extensive interviews with municipal planners, development officers, local councillors, and developers followed. Telephone interviews with citizens involved in environmental or public health groups in the communities completed the survey. Chapter 5 describes our findings on the municipal case studies. Chapter 6 reviews the attitudes of the civic leaders, citizens and developers we interviewed.

With the help of planning and development staff in the communities, we selected residential developments to examine for evidence of sustainable development practices. We compared recent developments with areas developed in the late 1970s or early 1980s. Chapter 7 provides a summary of our evaluation of subdivision design.

PART TWO:

FINDINGS

In this part, we present the key findings of our research program. First we discuss provincial policies, practices and regulations which affect residential land use planning. We present the comments of respondents from various government departments to illustrate the concerns that provincial staff have about the land development process, and about sustainable development. Second, we introduce our three study communities. We evaluate policy and practice in each community, and consider responses from planners and development officers. Third, we discuss the attitudes and concerns of civic leaders, developers, and citizens. Finally, we describe the results of our analysis of land use planning practices in the three communities studied.

4: THE NOVA SCOTIA EXPERIENCE

The Province of Nova Scotia followed the federal government's lead in promoting sustainable development by establishing the Nova Scotia Round Table on Environment and Economy. In early 1992 the Round Table released the *Sustainable Development Strategy* for Nova Scotia. Implementing the Strategy will take considerable government initiative because it reflects new priorities and directions for the province. The *Strategy* articulates a commitment to a new philosophy towards development. However, at this point in time, its official status remains unclear. Until the province adopts it as a government policy of some kind, it hovers in the political ether.

We discovered during interviews with staff in other provincial government departments that the *Strategy* is not well known. All government departments with an interest in land had an opportunity to participate in developing the *Strategy* or commenting on it; however, many front-line civil servants have not seen it, and have little idea of the philosophy behind it. Most departments have not yet revised their practices or policies to fulfil the goals of the *Strategy*. Given the sectorally based interests of provincial government, most departments see "sustainable development" as an initiative of the Department of the Environment.

This chapter briefly reviews the policies, practices, and regulations of provincial departments whose mandates affect land use planning for residential environments. We examined various policy documents from the departments, including discussion papers, legislation, guidelines, and regulations. We interviewed staff in the departments either in person or by telephone. In the following sections, we highlight our discussions with staff in those departments.

Housing

The Department of Housing and Consumer Affairs holds large parcels of land in Nova Scotia which it develops for moderate and low cost housing. As part of a regional planning exercise in the late 1960s and early 1970s, the province identified areas for urban expansion and began an acquisition policy that resulted in substantial land holdings. Over the years it has developed large residential tracts in Halifax County, and smaller subdivisions in other urban centres in the province. Provincial development activity has helped to keep lot prices reasonably low; the inflation in housing prices which hit many central and western Canadian communities through the 1980s did not affect Nova Scotia. Of course, as Housing staff pointed out to us, Nova Scotia does not suffer from land pressure to the same extent that larger urban centres do.

With a population of just under 900,000, Nova Scotia is relatively sparsely populated and difficult to service. Some of the staff in Housing wondered whether the province needs a higher population for greater sustainability. Staff suggested that viable urban centres require a certain population level: some amenities cannot be provided to small communities. The model of sustainable development which interested Housing staff differed substantially from the model we proposed to them. While they did not disagree with protecting ecological integrity, they placed a higher priority on economic viability and social equity than we did.

Housing's focus on providing housing sometimes brings staff in conflict with people who focus on protecting environments or preventing neighbourhood change. Staff's primary concern is to build housing; what they called "gold-plated" environmental standards make their task more difficult. Performance standards make the job of developing land exceedingly technical. Staff believe that communities should adjust the rules to accommodate human needs. One staff member affirmed the importance of people in the ecosystem, and the primacy of their needs over other considerations.

The Department lays out subdivisions, arranges for local planning approvals, contracts for infrastructure, and then sells lots. It operates according to local regulations, and leaves final site development to the private sector. Accordingly, staff follow rules set by local authorities, and cannot modify practices employed by builders and occupants. Protecting landscape function has not been the key element in their planning except when communities force the issue[7].

Housing staff recognize the significance of sustainable development and are trying to determine how the Department should respond to it. They hope to commission a study to develop guidelines for planning "sustainable subdivisions". Staff made clear that while they have no desire to interfere with landscape function in planning residential areas, they would oppose standards that make it more difficult to provide housing for Nova Scotians.

---

[7] For example, the Department's effort to gain approval for a development in the Albro Lake area of Dartmouth was delayed many years by local opposition. The project finally received approval after the Department agreed to protect 60% of the site as parkland.

Transportation

The Department of Transportation and Communication sets standards for road development in the province. Municipalities generally follow provincial standards in setting road dimensions and patterns. The Province requires a 66 ft right of way for standard roads. On provincial highways, contractors clear existing vegetation from the entire right of way and regrade the area to drain water from the road way. After construction, the verges are sodded or hydro-seeded, and grass mowed each summer to prevent regeneration of indigenous vegetation. Developers generally construct roads in residential areas to meet provincial standards.

Staff in Transportation believe that the Department has become more sensitive to the environment in recent years. On major highways the Department requires contractors to protect waterways with silt traps and other devices to prevent siltation; such standards may not apply to other roads. The Department commissioned a handbook of procedures (Porter Dillon 1991) which contractors should use to prevent environmental impacts when building 100-series highways.

Transportation staff did not feel that the Department could actively promote sustainable development which, they suggested, "mostly occurs in residential situations, like the subdivision". Their chief priorities in building roads include facilitating traffic flow, keeping costs reasonable, and accommodating necessary vehicles (snow plows, fire trucks). Ideas which suggest reducing vehicle speeds, encouraging smaller vehicles[8], or employing one-way street systems receive little support within Transportation.

While the Department has improved its performance in building 100-series roads, transportation policies and regulations remain a significant barrier to sustainable development as we define it. Roads continue to obliterate landscape function by disrupting natural drainage patterns, rupturing habitat corridors, and increasing the area of impervious surfaces. The Department will not find that the *Sustainable Development Strategy* resonates with its approach.

---

[8] For example, with the smaller fire vehicles used in earlier decades, smaller turning radii and narrower roads presented few problems. Our attachment to certain technologies may limit choices in our communities.

Health

Staff we interviewed in the Department of Health did not know that the province had a sustainable development strategy, but felt that the Department judged environmental quality as a high priority.

The Health Department has at least two areas of jurisdiction: the medical system and public health. The bulk of spending in the province is on the medical system. Environmental and public health have not traditionally received the same attention, although staff have made significant strides.

The Department has increased standards for water quality and sewage treatment in recent years: for example, the minimum lot size requirement for a septic field increased because of concerns about failing treatment systems in some areas. Because soils throughout the province are generally poorly drained, the Department felt that larger septic fields would provide better opportunities for absorbing effluent. The Department discourages small community sewage treatment plants because of operating problems some have experienced. The province has made it difficult for developers to get permits for package plants for isolated subdivisions, thus reducing options for cluster development in rural areas.

One respondent suggested that environmental protection costs more money which people don't want to pay. Citizens may find that their options for development decrease because of protective measures, and they may react negatively as a result. In general, Health staff supported greater environmental protection but worried that politicians may not be willing to implement the difficult measures necessary to enforce it.

Municipal Affairs

One of the tasks of the Department of Municipal Affairs is to monitor the Planning Act. Municipalities must follow the requirements of the Planning Act in setting out their policies and in regulating the use of land. The legislation's key purpose is to facilitate the development of land; it pays little attention to environmental protection.

The Planning Act (1983) allows municipalities to set minimum lot sizes, frontages, set-backs, and coverage. Municipalities cannot limit lot size or set any regulations which the Act does not specify. The Act presumes that municipalities want to promote development while restricting density and separating land uses. Some degree of environmental protection is enabled, but the Act does not seek to conserve ecological integrity or landscape function.

Respondents from the Department define sustainable development as minimizing the short term and long term environmental and economic costs of development. They see regulation of the environment as the domain of the Department of Environment, and concerns about community health as outside the realm of planning. They suggested that municipalities may not have the authority to make decisions of the sort needed to protect landscape function and natural processes.

Nova Scotia has 66 municipalities: the entire province is incorporated into some form of municipal government. The powers of the municipalities are set out in various acts and charters. The province has the legislative authority to give municipalities powers, or to take them away. As creatures of the province, municipalities depend on the province to give them the mandate to promote sustainability. In the fall of 1992, the government announced its intention to reduce the number of municipalities in the province. Municipalities in the major urban centres and in Kings and Pictou counties were advised to consider options for restructuring to a regional form of government. While the province cited the need for greater efficiency and rationalization of services in its call for restructuring, it has not asked municipalities to implement sustainable development.

Environment

The Round Table on Environment and Economy receives staff support from Environment personnel. Thus we find that Environment staff know about the *Strategy*, some are currently working on an implementation plan to put it into effect.

Traditionally the Department of Environment did not seem especially interested in community planning. However, as the Department began regulating waterways and wetlands in recent years, staff became more concerned about the effects of urban and rural development.

Municipalities with environmental engineers or planners on staff generally review plans of subdivision for compliance with provincial environmental regulations. Smaller municipalities do not have staff qualified to evaluate the environmental effects of a proposed development. Those municipalities may request an opinion from the Department of the Environment. When requested, Department staff may suggest some changes to protect waterways during development.

Developers require permits from the Water Resources Branch if they intend to alter water courses on the property. The Department's primary interest is keeping silt out of the waterway. It may recommend measures to control run-off during construction, and to limit erosion afterward. The Department does not require that developers maintain existing vegetation on a site, except in some areas as a buffer around waterways. In many cases, developers have stripped most of the vegetation off the land before they apply for approval to develop the land. No provincial regulations prevent or discourage owners from removing habitat or disrupting natural processes unless a waterway crosses the site.

Department staff indicated that approving subdivisions and developments is a municipal responsibility with which they do not want to interfere. In general, the Department has taken little interest in residential development; instead it has focused on areas outside of municipal jurisdiction. When we asked staff how the *Strategy* would affect land use planning in Nova Scotia, they said that Environment does not deal with land use policy; however, Municipal Affairs will have to cooperate and implement the *Strategy* when implementation policies are completed.

Natural Resources

The Department of Natural Resources amalgamates the former departments of Lands and Forests and Mines and Energy. The Department manages, develops, and protects the province's mineral lands, energy reserves, and forest resources.

Municipalities can choose to put forested land they own under a forest management plan. The Towns of Truro and Antigonish are managing their water supply lands as forest reserves. Lands and Forests staff suggest that most municipalities have little concern for managing resource lands other than their water supply lands. Municipalities tend to treat forest resources as a residual land use. The Department would like to see municipalities pay greater attention to conserving forested lands, and recognizing their economic and environmental uses.

Staff from the Mineral Resources division indicated that municipalities pay insufficient attention to mineral resources in land use planning. Municipal staff don't consult the Department before making decisions about appropriate land use: they need to include a mineral resources inventory as part of their planning process before zoning land for use.

Energy Division staff said that municipalities have no control over energy policy. However, they should allow flexibility in site design for energy efficiency. They could include energy considerations in their guidelines for development agreements. Unfortunately, road regulations make it difficult for municipalities to encourage energy efficiency in site planning: energy efficient development has to begin with planning the road system.

In sum, Natural Resources staff indicated that municipalities are not currently planning for resource protection or energy conservation. Some suggested that the province needs to adopt provincial land use policies that would commit municipalities to respecting vital natural resources.

Agriculture

The Department of Agriculture would like to see stronger policies to prevent the loss of farmland around small urban centres. Staff suggest that municipalities generally zone land to reduce potential land use conflicts, or to increase tax revenues. While some municipalities (like Kings County) have imposed penalities to try to protect farmland from conversion to residential use, local farmers often resist such practices.

Nova Scotia has no Class 1 or 2 farmland, but it needs to protect the best quality farmlands it has. Urban development does not threaten farmland here to the same extent as it does in Central Canada. Nevertheless, farmland is a limited resource which cannot be replaced.

Summary

Provincial departments may take a greater role in the development of land if the province's *Sustainable Development Strategy* becomes provincial policy. At this time the status and priority attached to the *Strategy* is unclear. Under the Planning Act (1983), the province can adopt provincial land use policies which would constrain the activities and choices of municipalities. However, the government has not adopted provincial land use policies under the act[9]. Although we cannot say that the province has no policies on land use, the major policy with the force of law for municipalities under the Planning Act requires them to facilitate development. The *Sustainable Development Strategy* remains an interesting, but under-utilized, document without authority.

Our interviews with provincial civil servants showed a wide range of attitudes toward protecting natural processes and landscape function. For generations the philosophy of the government and bureaucracy of Nova Scotia has been pro-development. Adopting a new ideology of sustainable development will not come easily in a government where each department has its own sectoral interests to consider.

---

[9] In March 1993, the province invited comments from the public on its proposal to adopt a Provincial Land Use Policy regarding the area around the Halifax Public Gardens. If accepted, this will be the first Provincial Land Use Policy in Nova Scotia.

5: THREE MUNICIPALITIES

We selected our study municipalities from among those communities said to include politicians and/or planning staff committed to the principles of sustainable development.[10] Each of the communities had engaged in reviewing its Municipal Planning Strategy within the last three years. We selected one city, one town, and one rural municipality for the study: staff in the City of Dartmouth, the Town of Truro, and the Municipality of the County of Kings generously agreed to participate.

Table 5-1: Area, Population, Dwellings in Study Communities (1991)

Community	Area (km².)[11]	Population	Density[12] (pers/km²)	Dwelling Units	Persons per unit
Dartmouth	58.87	67,798	1157.56	26,148	2.59
Kings	2182.24	56,317[13]	25.81	20,473	2.75
Truro	38.09	11,683	306.72	5,073	2.30
Nova Scotia	52840.83	899,942	17.03	326,484	2.76

Source: 1991 Census of Canada

As Table 5-1 shows, Dartmouth is a medium sized city, the second largest in the province after Halifax. It has the highest population density of the three communities, with 1157 people per square kilometre. The rural municipality, Kings County, has a low population density: approximately half of the people in the county live in small urban centres like Wolfville and Kentville which have their own municipal governments. With approximately half of its land base as water supply lands, the town of Truro has a relatively low population density.

---

[10] Staff from Municipal Affairs assisted in the selection of study communities.

[11] Staff from each municipality provided estimates of the area in hectares: Dartmouth 6,739; Kings 223,160; Truro 4,124.

[12] The density per hectare in the three municipalities is: Dartmouth 10.06 persons per hectare; Kings 0.25; Truro 2.83.

[13] This number includes towns which are not under the jurisdiction of the rural municipality.

Household density (persons per dwelling unit) approximates the provincial average in Kings County, but is lower in the other two municipalities. The household density in Truro is lower even than that of the provincial capital, Halifax, which has an average of 2.32 persons per dwelling unit.

Table 5-2 indicates some significant differences in housing stock and home ownership rates in the three communities. Most of the dwelling units in Kings County are single detached homes, with 75% of the stock owner-occupied. By contrast, renters outnumber owners in Dartmouth, where multiple dwelling unit structures predominate. In Truro, just less than half of the building stock is single detached housing, but more than half of the housing stock is owner-occupied.

Table 5-2: Housing Type and Ownership

Housing Stock	Dartmouth	Kings[14]	Truro
Percent single detached	38.8	90.0	48.6
Percent owner occupied	39.9[15]	75.0	54.1[16]

We began our analysis of the communities by reviewing Municipal Planning Strategies, Land Use By-laws, and other relevant by-laws to determine whether policies and regulations reflected the principles of sustainable development. Using the evaluation framework and the potential indicators we identified (Appendix A), we summarized the documents for each community. We compared earlier plans and land use by-laws with recent revisions to determine whether the communities had altered their approach to promote greater sustainability.

Following analysis of plans and regulations we interviewed planners, development officers, community leaders, developers, and citizens active in environmental issues in the communities. We found that even in communities interested in sustainable development, municipal policies do not rate protecting landscape function as a high priority. Although

---

[14] Kings' estimates provided by county staff.

[15] Based on 1991 Dartmouth assessment information.

[16] Based on 1986 Census information.

recent planning documents often reflect increasing concern with limiting urban sprawl, promoting compactness, and encouraging mixed use areas, the regulations which enforce plan policies do little to change traditional development practices.

Table 5-3 summarizes land use regulations and policies in the study communities. We see that only Truro reduced the minimum lot size requirement in its revised plan (in keeping with a concern for increasing urban densities for efficient use of infrastructure). Dartmouth's requirements did not change substantively in the new draft, but switched to metric from imperial measures. In Kings, the minimum requirement for unserviced lots actually increased in response to concerns about the efficiency of on-site septic systems.

Table 5-3: Land Use Regulations and Policies

	Dartmouth		Kings County		Truro	
Plan Date:	**1978**	**(1991)**	**1979**	**(1992)**	**1983**	**(1991)**
Minimum lot size R-1[17] in sq.ft. (sq. metres	5000 (464.5	(464	6000	6000	(744	(604
Minimum lot frontage	50 ft	(15 m.	60 ft	60 ft	(24 m.	(20 m.
Minimum lot unserviced			20000 sq.ft	50000 sq.ft		
Minimum lot frontage unserviced			100 ft	200 ft		

In our discussions with staff and decision makers, we found support for the concept of sustainable development, but no clear consensus on the meaning or implications of the term.[18] We made our definition of sustainable development known to respondents, and proceeded to ask them whether their community policies and regulations supported the

---

[17] All regulations given for R-1, single detached housing zone.

[18] In her study of Canadian municipalities MacLaren (1991) found quite a range of definitions of sustainable development. We did not ask respondents to define the term.

aims we had identified.[19] While respondents lauded sustainability in principle, all cited problems that make sustainable development difficult to achieve in practice.

The next sections of the report briefly describe the three municipalities' approaches to development as articulated in planning policies and practices, and as explained by municipal staff in the planning and development departments.

---

[19] Questions sent to respondents and discussed in personal interviews are included in **Appendix B.**

City of Dartmouth

Located across the harbour from Halifax, Dartmouth in some ways serves as a "bedroom" community for the province's capital. With the largest industrial park in Atlantic Canada, however, the city has a solid employment base which fared remarkably well during the recession of the early 1990s.

After six years of community consultation, Dartmouth's Plan Review Committee presented a draft plan to Council in 1991. The plan reflected some of the aims of sustainable development in its environmental policies. However, given that Council rejected the plan, the fate of its policies remains uncertain. Dartmouth continues to operate under a plan passed in 1978 (amended many times subsequently) while staff work on revising the draft for Council to reconsider.

Dartmouth calls itself the "City of Lakes", and takes lake protection seriously. In the 1970s, it established the Dartmouth Lakes Advisory Board (DLAB) to review development applications which might affect lake quality. Composed of dedicated volunteers, the DLAB works closely with developers to ensure that construction activities do not reduce lake quality. Unfortunately, the DLAB has no staff to monitor the requirements which it sets for developers, and its recommendations have no binding effect on the end users of the land. Thus, for example, while the DLAB may require developers to preserve vegetated buffers around a lake, residents purchasing lots on the lake can cut down trees without penalty.

The 1978 Dartmouth Municipal Development Plan created a development boundary outside of which growth could not occur. Within the boundary all land had access to existing services (sewer and water). In the mid-1980s, however, Dartmouth Council amended the plan to remove the development boundary: this allowed residential development in unserviced areas. Now developers pay to install services in areas not already serviced. The change transferred responsibility for paying for services to the developer, but also moved the city away from its earlier philosophy of limiting sprawl.

As Table 5-3 shows, the requirements for lot size and frontage did not change substantively between the 1978 plan and the 1991 draft. However, the later draft provides a wide variety of new residential zones, and would allow smaller lots in comprehensive development districts.

Some by-laws adopted by Council to promote quality in urban environments may inadvertently inhibit planning for landscape function. For example, the Minimum Standards By-law (M-10, 1990) requires residents to mow their yards, remove heavy

undergrowth, and grade or fill their lot to prevent storm water pooling. Naturalized landscapes may fail to meet prevailing community standards under this by-law.

Conservation lands purchased and held by the City of Dartmouth include watershed lands around the municipal water supply, and partial buffers along some of the city's 23 lakes (Table 5-4 summarizes municipal initiatives). Water quality has been an issue in the community for many years, and the municipal water supply needs major improvements to meet new national drinking water standards. In 1974 the city commissioned a study of its lakes, but it has not updated the work in intervening years: quality in the lakes varies by season, and by the degree of urbanization around the shore. Most of the small streams which once flowed to the harbour now run through culverts or sewers.

The city has not designated environmentally sensitive areas for protection, although the draft plan included enabling policies. Environmental review or screening forms part of the analysis of applications for developments around lakes: Council refers projects to the Lakes Advisory Board. A 1992 plan amendment allows staff to consider protecting vegetation in cases of development agreements for apartment buildings. Most development permits, however, do not require environmental review.

Within the last decade, Dartmouth has taken several initiatives to promote conservation. The Water Utility meters water use and encourages conservation. The city collects newspaper, glass, metals and some plastics for recycling. The Parks and Recreation department gathers leaves and trees for composting, and has a tree planting program each summer. The city has no collection program for hazardous wastes. Council passed a by-law to restrict the dumping of hazardous materials into the sewer system, but the city has insufficient staff to enforce or monitor the by-law. Virtually all of the sewage from the city passes into the harbour untreated.

Fiscal restraint threatens the municipality's commitment to sustainable development. In 1991 the city had a full-time environmental engineer, a project coordinator for Healthy Dartmouth, and a three person Housing Office: as a result of lay-offs and staff reassignments, by 1992 only one-and-a-half of the positions remained. The city relies heavily on volunteers to promote sustainability.[20]

---

[20] The Lakes Advisory Board monitors lake quality; the Five Star Accessibility Committee facilitates access for challenged populations; the Healthy Dartmouth Committee works for public health.

Table 5-5 describes some of the development practices which promote sustainability in Dartmouth. Staff encourage developers to place roads along existing contours, to limit cut and fill near lakes, to use natural drainage where possible, and to control storm water during construction. In most instances, however, no standards are imposed on fill quality, and existing vegetation may be destroyed during the development process (except around lakes). In sum, Dartmouth has adopted some policies and practices which promote sustainability, but continues to employ many practices which limit progress toward that aim.

Illustration: Flyer Sent to Dartmouth Households by City (1992)

HOUSEHOLD HAZARDOUS WASTE

What is household hazardous waste?
Household hazardous waste is any household material or substance that, when improperly stored or disposed of becomes hazardous to the health of humans, animals, organisms or the environment. Many common household products such as paint, cleansers, etc. can be considered hazardous waste.

WASTE PAINT
Waste paint is by far the most common household hazardous waste. Until a permanent household hazardous waste program is established in the metro area, waste paint that can no longer be stored may be disposed of in the following manner:
Line a box with a plastic bag. Pour paint and absorbent material such as kitty litter or sawdust into bag, mix and let harden in well-ventilated area away from children and animals. Seal bag. Let inside of can dry and dispose of bag and can in household garbage.

For further information -

Environment Canada	426-7231
Nova Scotia Department of the Environment	424-7773
Metropolitan Authority - Solid Waste Division	421-6552
City of Dartmouth Engineering and Public Works	464-2189

Reduce Reuse Recycle

City of Dartmouth
Engineering and Public Works

9/92

52

Table 5-4: Initiatives for Sustainable Development

Initiative (Aim)	Dartmouth	Kings	Truro
purchase conservation lands (a)	water supply parks lake shores	watershed (municipal supply)	natural environment land
plan for conservation lands (a)	watershed plan in progress		MPS policies
municipal environmental review or audit of development (a)	some development agreements Lakes Advisory Board		development agreement process
environmentally sensitive areas designated (a)	watershed policy in draft plan	wetlands flood plains	watershed flood plains
flood plain mapping (a)		for some areas - not overly accurate	much of town in designated flood plain
agricultural land mapped (b)		available	
agricultural land designated (b)		yes	
forested land mapping (b)		Crown land mapped in 1979 - not upgraded	1983 plan process
forested land designated (a,b)		protected for forestry use - 151,525 ha.	watershed and park - 2843 ha.
wetlands mapping (a,b)	1974 lakes study	relatively poor mapping	available

53

Table 5-4 (cont) Initiative (Aim)	Dartmouth	Kings	Truro
wetlands designated (a,b)		some zoned as environmental lands	
wetlands protected from filling (a,b,c)	encourage developers to protect	prohibit contour change in flood plain	policy in draft plan
protection of vegetation (a,b,c)	limited - through development agreement process only	plan policy statements	through development agreement process
community garden allotments (b,h)	will be ready for 1993		
control of chemicals on lawns (c,h)	posting of signs required		policy in draft plan - watershed lands
water conservation program (d)	metered -public promotion, limits on hydrant use	metered	metered -public promotion
recycling of residential wastes (d)	newspaper, glass, metals, some plastics (houses only)	blue box program (55% of population)	
tipping fee for wastes (d,e)	large amounts brought to transfer station		
safe disposal of hazardous wastes (d,e,h)	working on a plan -sewer by-law	working on a plan	recycling CFCs from fridges

Table 5-4 (cont) Initiative	Dartmouth	Kings	Truro
waste water treatment (a,b,c,e,h)	working on a plan (more than 95% with no treatment)	55% of homes on septic tanks, 45% on municipal plants	none
staff person to promote sustainable development (f)	half-time environmental engineer, Lakes Advisory Bd.		
projects which promote sustainable development (f,h)	Healthy Dartmouth Project, Heart Health		
support community efforts in S.D. (f,h)	recycling, cycling events	recycling, advisory groups, naturalists	recycling
municipal land banking for social housing (g)	acreage unknown (small amount)		
units of social housing for seniors (g,h)	564	264 (county only)	115
units of social housing for families (g,h)	380	90 (county only)	2
promote access and affirmative action (f,h)	access for challenged, tendering for minority businesses	public buildings accessible	met with visually challenged

55

Municipality of the County of Kings

Kings County is a large rural area on the western shore of Nova Scotia. Traditionally its economy depended upon agriculture and forestry. The county has some of the best agricultural land in the province, and grows a wide variety of fruits and vegetables for local and regional markets. Several industrial plants provide well-paying jobs for workers.

Several small towns within the county have their own municipal governments and planning authority. Most of the land controlled by the county is undeveloped, with forested land the largest use.

A "growth centre" philosophy underlies both recent (1992 draft) and older (1979) Kings plans: new residential growth should take place in designated growth hamlets. Protecting agricultural land, a prized resource in Kings, requires limiting development outside of serviced areas. Development standards within urban areas remain essentially similar to 1979 requirements: 60 ft frontage, 6000 sq ft minimum lot size (see Table 5-3). Development standards in unserviced rural areas have increased, however: the minimum lot size requirement rose from 20,000 sq ft to 50,000 sq ft for a single detached house.

Why have rural development standards increased? The primary concern in increasing lot size relates to the efficiency of septic systems. Rather than test soil capabilities in each case, the Department of Health recently urged rural communities to rate areas and set local requirements relatively high. The County decided to use the standards for the worst types of soils as the general plan standard. Large rural lots result.

Large lots in rural areas could support sustainable development if landscape function is protected. A home nestled within the landscape need not disrupt wildlife corridors and patches. Unfortunately, builders and owners generally modify indigenous landscapes significantly. While some rural residents enjoy natural landscapes, many more plant and mow vast swaths of bluegrass. Few rural residents grow a substantial portion of their food supply, even when they build on prime agricultural land. Residential patches in the agricultural matrix could offer an opportunity to re-establish habitat areas for indigenous species; more often they simply result in modified urban patches of limited diversity and productivity.[21] Planning policies have not addressed these concerns; in the context of the current Planning Act, say the planners, municipal regulations cannot substantively

---

[21] In one subdivision in the county, an owner had paved over most of a lot. While building regulations limit building coverage to 35% of the lot, owners are free to pave entire yards.

contribute to protecting landscapes.

Staff, politicians, and developers in Kings all indicated that while the minimum lot requirement was 6000 sq ft, in fact the average lot sold exceeded this minimum requirement. Most people purchasing homes in rural areas want large lots, our respondents argued. Seventy to 80 ft frontages are most common in the county, even in established hamlets.

Table 5-4 indicates that Kings County purchased conservation lands to protect its water supply watershed. "Natural" areas cover a large portion of the county, so that public pressure to conserve landscapes has not developed. Nonetheless, the county has designated environmental open space areas in the plan to protect environmentally sensitive areas like wetlands and flood plains. After earlier efforts to prohibit development in flood plains failed to prevent in-filling of low-lying areas, staff in Kings advised Council to use new plan policies to prohibit changes to ground level in flood plains.[22]

Over 150,000 hectares in the county are designated for forestry use. Agricultural use dominates in the rest of the county. Because the province manages forestry and agricultural resources, the municipality has limited ability to encourage sustainable practices. Poor management practices in forestry and agriculture can and do affect water quality in waterways. A community action group, the Clean Annapolis River Project, has launched a river management program to improve water quality in the Annapolis River.

The county has taken a responsible attitude toward water and waste management. Over 95% of households have either septic systems or are on municipal waste water treatment systems. Unfortunately, poor management of waste treatment systems has affected some waterways. The county lacks staff resources to monitor treatment systems effectively, but staff do monitor water use from municipal supplies. Approximately 55% of households have access to a blue box waste recycling program.

Only 20% of the population in the county has access to mass transit available in the towns. Most households rely heavily on the automobile for transportation. The county provides social housing for seniors in small urban centres, but few units are available for families in need.

County staff indicated that they have not considered protecting landscape function as a key requirement in issuing development permits (see Table 5-5). Provided that plans of

---

[22] Council recently passed an application for development in a flood plain, however.

subdivision follow regulations, and are approved by the Nova Scotia Department of Transportation and the Department of Environment, staff do not insist upon protecting landscape function. In sum, Kings County has made progress on some measures of performance, but scores low on others.

Illustration: Map from 1992 Kings MPS

GROWTH CENTRES

WATERVILLE

Future Land Use

Urban Districts

G	General Commercial
B	Central Business
C	Community Commercial
CCD	Commercial Comprehensive Development
M	Industrial
R	Residential
I	Institutional
P	Parks & Open Space
E	Natural Environment
▬▬▬	Major Collector
▪▪▪▪▪▪	Residential Collector
▬▪▬	Growth Centre Boundary

Rural Districts

A	Agricultural
F	Forestry
CR	Country Residential
H	Hamlet

Map 14

MUNICIPALITY OF THE COUNTY OF KINGS

Table 5-5: Development Practices for Sustainable Development

Initiative	Dartmouth	Kings	Truro
limit cut and fill	encourage through DLAB		encourage through permit process
lay roads on contours	yes		up to engineers
natural drainage used	yes / no		yes
storm retention ponds	only during construction	being considered now	storm water management plan
standards on fill			must be documented, not contaminated
energy efficient homes			encourage R2000, info to builders
alternative energy used	solar collectors	solar collectors, wind power	
mass transit	95% of population served	20% of population served (towns)	
mixed use zoning	mix of housing commercial in proposed new zones (varying density)	in Coldbrook	mixed use zone
recycled materials in road construction			recapping with reused asphalt
community composting	leaves, Xmas trees - used in parks		trees - mulch in parks
soil management and protection	erosion control around lakes during development		erosion control and run-off (during site development)

Town of Truro

Truro perches at the head of Cobequid Bay, half way between Halifax and the New Brunswick border. Serving an area dominated by agricultural uses, Truro promotes the small town attributes of hospitality, cleanliness, and security. With a population of under 12,000, Truro acts as a regional centre for a population of approximately 45,000. The town has a diverse economic base, with a variety of industries, institutions, and businesses. Its location at the "hub" of major inland transportation routes has contributed to its success.

In recent years Truro experienced some decline in population as suburban areas in surrounding parts of Colchester County grow. Large lot sizes, low prices, and low taxes attract people to rural developments. To reverse this trend, Truro encourages developers to build a range of housing options, including "upscale" as well as moderately priced single detached and multi-family homes.

Truro embedded sustainability principles more extensively into its MPS[23] than have the other two communities studied. Problems with water supply and flooding concern planners and politicians, and therefore influence plan policies and regulations. Accordingly, the plan includes policies to protect watershed lands and to limit development on flood plains (see Table 5-4).

The town has protected approximately 2800 hectares of forested watershed lands around its municipal water supply[24]. During the summer of 1992, the town encouraged residents to conserve water and to boil tap water before use. Drought conditions reduced supply in the reservoir, and forced staff to reopen contaminated wells. Water quality is a salient issue in the community.

The new Truro plan incorporates environmental protection through policies to designate environmentally sensitive areas (watershed, ravines, flood plains). Provisions for assessing development agreements and large subdivisions allow staff to consider vegetation in reviewing applications. Staff also work with provincial Environment staff in considering landscape function in watershed areas.

Wetlands and forested lands are both mapped, but available federal and provincial mapping is old and somewhat inaccurate. While Council has adopted policies to protect wetlands

---

[23] The province approved the Truro MPS in early 1992.

[24] The Town cooperates with a private corporation in managing the forest lands.

and forested lands, community members often resent limits placed on use. Plan policies limit filling of wetlands, provide for controlling erosion during development, and limit the use of chemicals in watershed lands. The town employs a tree technician to monitor its urban forestry program.

Truro participates in a program for recapturing coolants from used appliances. It also encourages construction crews to reuse asphalt in road resurfacing. It collects trees for composting and uses the mulch at its land fill site. The town has no mass transit system.

The revised plan modifies some of the residential development regulations to encourage slightly higher urban densities within the town (see Table 5-3). The minimum lot frontage decreased by four metres from the 1983 to 1991 (draft) plans. Diagrams show developers how to implement cluster development (see illustration below). Staff attempt to encourage developers to retain vegetation, and to maintain natural drainage on developed sites (see Table 5-5); they also accept ravines as part of the 5% park dedication required from developers by the Planning Act. Staff ask builders to consider energy efficient building forms, and insist on good quality fill for regrading sites.

Illustration: Graphic from Truro MPS (1991 Draft)

61
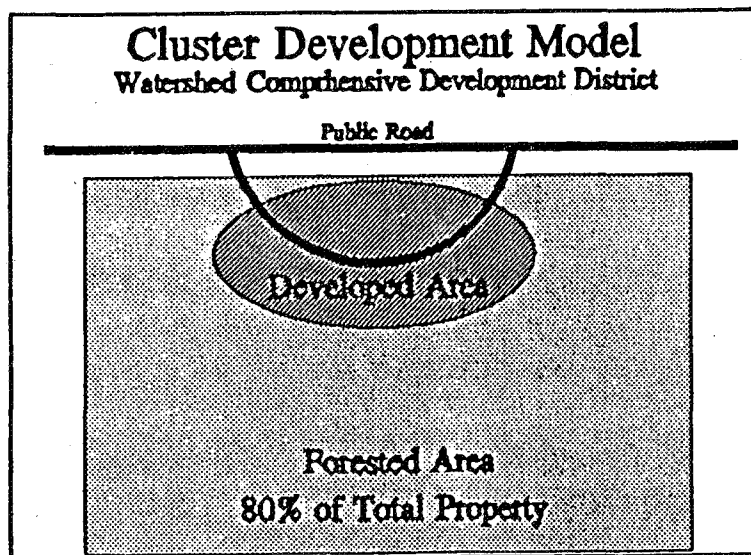
While Truro has revised its plan in many ways to promote sustainability, it still has a long way to go before we would judge it a sustainable community. All of its sewage runs untreated into the ocean; its plans to build a treatment plant depend upon provincial funding. Its beach closed 100 years ago because of industrial pollution. Farming and grazing in the flood plain contaminate the river. Restoring water quality and salmon habitat in the river and estuary will prove a difficult goal to achieve without new land use and waste treatment practices.

Evaluating Progress on Sustainability

While each of the three municipalities studied support sustainability in principle, all operate under planning legislation (and a political culture) which promotes development. None of the communities have established municipal round tables or other similar groups to encourage sustainable development at the local level. However, all of the municipalities encourage voluntary initiatives, and provide opportunities for citizens to get involved in planning and development matters. Unfortunately, protecting natural processes and landscape function has not received high priority in any of the communities.

While staff indicated concern for environmental protection, they felt they lacked the authority to require developers and residents to respect natural processes and landscape function during development. Accordingly, we find little evidence that the communities ask developers to retain or re-establish natural vegetation except around waterways. Provincial standards for dealing with wetlands and water supply lands are beginning to affect land planning, however, and may require municipalities to pay greater attention to certain types of landscapes.

Staff generally supported increasing residential densities and preventing urban sprawl. As we examined development standards, however, we found that only Truro's plan revisions attempted to implement opportunities for greater density. None of the communities actively promote passive solar design or landscaping for energy efficiency. While all of the communities allow mixed use zones, none have made a major effort to discourage the use of automobiles as the major travel mode.

All of the communities see conservation as a municipal priority. They attempt to protect water supply lands, but have insufficient resources to protect other environmentally sensitive areas. Generally, they cannot protect areas because of important habitat: when local governments purchase land, it must have an end "use" of some sort. The 5% of a site dedicated to the community for major development projects becomes a "park"; usually parks staff recommend playgrounds rather than wilderness areas. The communities generally have not developed management plans for conservation lands they hold. None of the communities have implemented stewardship programs to encourage local land owners to protect resource lands in private ownership.

Conservation is an expensive proposition. Nova Scotian municipalities often lack the dollars to identify and map their resources and to protect them. They rely on the province for leadership and direction. For example, Kings County and Dartmouth have experienced problems with recycling: markets for products remain weak. They cannot continue to store

products or subsidize processing forever. Communities look to the province to help develop markets and infrastructure, but the province has not responded with adequate support.

The communities fear they cannot afford the costs of putting responsible waste water management and solid waste management programs in place. Waste water management is an issue in each of the communities. Developing new solid waste management plans proves almost impossible. Without strong leadership from the province, and new mechanisms for resolving land use conflicts, communities will continue to face problems that make achieving sustainability difficult.

The preconditions for sustainable development exist in the three communities studied, but the planning policies and land use regulations in effect cannot achieve the aims identified. Planners and development officers indicate that they support the aims of sustainable development, but cannot implement them under current conditions.

The development officers we interviewed indicated that their mandates require them to implement laws and regulations passed by the province and the municipality. Although they may personally support sustainability, they believe they have no authority to require developers to protect landscape function and natural processes.

Planners appeared genuinely sympathetic to the principles of sustainable development; many defined it as part of their professional mission. They felt that their efforts to promote more sustainable policies and regulations ran into a "brick wall" of reluctance from developers, citizens, and civic leaders. While planners could point to the initiatives charted in the tables in this chapter, few held out a lot of hope for significant change from "practice as usual".

In the next chapter, we briefly discuss the views of other important actors in the land development process. What do civic leaders, citizens, and developers in the sample communities say about sustainable development? Do they believe a new approach to residential site planning is feasible?

6: THE ATTITUDES OF PARTICIPANTS

Because of the small size of our sample of civic leaders, developers, and citizens active on sustainable development issues, we cannot generalize the findings in this section to the population as a whole. Our interviews do, however, point to significant concerns facing the communities studied and begin to reveal some of the barriers to implementing sustainable development in Nova Scotia.

Civic Leaders

Civic leaders in all three communities affirmed the importance of sustainable development over the long term. In the short term, though, community leaders have other priorities which share the political agenda.

When asked what initiatives their community had taken towards promoting sustainable development, civic leaders pointed to parks, recycling, flood plain protection, and water quality management. They spoke of the need for proper sewage treatment and landfill sites. Several indicated their frustration with recycling programs: storage of recyclables and subsidies for processing cost municipalities thousands of dollars annually. The politicians said that people think recycling is good but have no idea of the true cost of it.

The leaders interviewed felt that the communities could purchase conservation lands only when they need the lands for some use. All expected usable parks or playgrounds from the 5% park land deeded by developers subdividing land. Politicians indicated that the public did not want to pay more taxes so that the municipality could purchase sensitive areas (except to protect a municipal water supply). "People want to protect the environment until it comes time to write the cheque," one leader said. Municipalities do not purchase lands to keep people out.

One politician suggested that his colleagues fear that making a commitment to the environment could jeopardize development opportunities in his community. No community willingly goes thoroughly "green" first because that would give other communities a competitive advantage in seeking development. Municipalities rely so heavily upon their property tax base for revenues that they cannot forsake growth, especially as transfer payments from higher levels of governments fail to keep pace with costs. Nova Scotian communities define growth as good. Unless the province says **every** municipality must respect the environment, no council will take the first step towards greater protection. As one politician put it, "we have to ask whether the community can

sustain the cost" of protecting the environment. Some see the environment and the economy as opposing choices.

All of the civic leaders thought that planning staff had a role to play in promoting sustainable development, as did engineering and public works staff. One politician questioned staff expertise, however, after staff recommended a policy limiting development in the flood plain: because staff requirements exceeded provincial standards, local landowners complained to council. Another civic leader said that his community needed better inspectors to see that developers follow the requirements set out by council. Leaders often had different priorities and concerns than their municipal staff.

None of the communities have made efforts to encourage individual stewardship of the land. With 75% of land in the province privately owned, protecting environmental resources demands participation from the private sector; yet few of the council members had considered the land owner's role in conservation. All of the municipalities accept donations of sensitive areas and issue charitable receipts to the donors. Nova Scotia tax law does not allow municipalities to offer land owners tax concessions for volunteering to have their land designated as a local conservation area. Thus, owners have no incentive to offer their land for protection voluntarily unless they wish to give it away. Communities have little to offer land owners other than thanks.

All of the civic leaders say they have encouraged residents to become involved in civic affairs in recent years. Some of the municipalities advertise for volunteers for boards, commissions, and committees. The politicians also recognize, though, that citizens often become frustrated when councils fail to accept the recommendations of advisory boards. Getting citizens involved in governance can prove risky. By and large, few citizens take an interest in local affairs. Voter turnout in the 1991 municipal elections in the three communities ranged from a low of under 20% in Kings (where most councillors were returned by acclamation) to a high of 32% of eligible voters in Dartmouth. Civic leaders seemed to see participation as a potential problem, with apathy and anarchy as the two extremes of citizen behaviour.

Civic leaders believe that developers generally have little interest in conservation. They expect to have to force environmental protection on the development industry. They see the public as interested in the environment, but unwilling to bear the costs associated with protecting it. They accuse the federal and provincial governments of imposing regulations on municipalities without giving the municipalities the power or the resources to respond.

Citizens

We interviewed citizens active on environmental themes or other issues related to sustainable development in the three communities. In general, they said that sustainable development was not a high priority in their communities. However, they felt that the public had growing concerns about the environment which had begun to affect the way that planners and politicians operate.

Respondents suggested that community residents have become increasingly concerned about sustainability but do not understand the real costs of environmental protection. Most people want to do what is right, but need more information. Unfortunately, a large number of ordinary citizens are "stunned from the neck up", and don't really care about anything. Politicians need to know more about the environment and the consequences of human activities before they will begin to make sustainable development a greater concern, citizens said. Councils constantly weigh the environment against other issues: growth, development, jobs. Citizen activists believe politicians will only protect the environment if forced to do so.

When we asked citizens what initiatives they knew of in their own communities, we received a longer list than politicians could provide. In addition to the suggestions politicians made, citizens spoke of river clean ups, energy audits, environmental advisory boards, environmental shows. Citizens also offered a wider range of environmental problems in the community: hazardous wastes, litter, wildlife loss, pollution. Those active in environmental and sustainability issues in the communities have high expectations of their local governments: they hope to see concerted action for environmental protection and renewal.

Citizens seem less convinced than do politicians that planners can play a role in promoting sustainability. While some citizens suggested that planners understand the principles of sustainable development and can promote them, others felt that planners seek development first and foremost. One person interviewed said that planners and engineers have no vision: they do what they are told. Respondents argued that the short term interests of politicians make them myopic when it comes to the environment. Citizens similarly see developers as worrying about their bottom line: if forced to cooperate, they will, but otherwise they just want to sell houses. In the citizen's view, the public plays the key role in promoting sustainable approaches to development.

Developers

Developers make no effort to hide their interest in the bottom line. Their business involves modifying landscapes. Their commitment to protecting natural processes and landscape functions varies widely.

Most developers try to save large trees where possible because mature vegetation adds to the marketability of a lot. In the shallow soils which cover much of Nova Scotia, however, saving trees is difficult. Ultimately, cost usually decides what developers will do: can they recover the costs of protection?

In recent years developers have become more sensitive to environmental protection. Some communities require elaborate buffer systems around waterways. Because developers try to minimize the costs of cut and fill, they prefer to lay roads along contours when possible. However, provincial regulations and pre-existing transportation patterns often influence the design of road networks.

Assessments of whether planning encourages sustainable approaches differed. Some developers said planning and development staff offered helpful advice and suggestions for environmental protection. In other cases, though, developers found that staff frustrated their attempts to give environmentally sensitive lands to the municipality; staff insisted on "usable" land for the park dedication.

Do home buyers appreciate developers' efforts to protect environmental amenities? Yes and no. People like mature trees, and they enjoy beautiful views, but they are no guarantors of environmental processes. In one subdivision, owners of lake front lots ignored restrictive covenants to maintain vegetated buffers around the lake, as required by the municipality in issuing the development permit; the developer tried without success to get the municipality to enforce the edict after several owners stripped off indigenous vegetation to plant grass. In another development, few residents took advantage of a public right-of-way to wetlands below their homes. One developer said, "people are too lazy to enjoy nature".

People are concerned about conserving resources though. High efficiency homes sell well, even though they cost more. The primary interest of someone buying a home is value. People want large lots and large houses: the most they can get for their money. Buyers prefer wide lots, with the house placed width-wise. Developers cannot easily save vegetation between homes in such circumstances, although they can leave treed buffers at the back of the lots. While high cost developments may offer residents vegetated buffers, lower cost projects often have the land cleared and grubbed: builders find it easier to erect a

dwelling on a clean site. People don't seem to mind moving in and laying down sod: one developer joked that it gave people another chance to use chemicals[25].

Developing the land to protect vegetation and natural processes increases the costs; the developers interviewed would not hazard a guess as to the additional expense. Regulations about roads, lot dimensions and so forth make it more difficult to achieve the flexibility required to build cluster housing or try new approaches. Developers also realize that they have to deal with a market with particular expectations: people want maximum value, maximum size, at minimum cost. Only a small proportion of the market will pay for environmental protection. Developers cannot afford to take big risks in a small market.

In sum, then, developers see municipalities as interested in protecting the environment in principle, but not always ready to take actions necessary to ensure that protection. They believe that most members of the public are not willing to pay the true costs of environmental protection. Developers see themselves as responding to regulations and markets: businessmen caught in the middle of competing aims.

Summary

The various actors involved in residential land use planning have different perspectives on the goals of land use planning. Civic leaders focus on meeting people's needs and maintaining the tax base. Developers worry about building homes people want and can afford. Citizens active in environmental issues worry about the effects development has on the land. We find no consensus on the meaning or implications of sustainable development in our communities. Commitment to protecting natural processes and landscape function varied widely among respondents. Similarly, assessments of who has the responsibility for promoting sustainability differed somewhat, although all of the respondents acknowledged that the province has to play the leading role to change residential land use planning.

Everyone blames someone else for the lack of sustainability. Can we expect planners to promote sustainable development, given current resources and powers? No. A commitment to sustainability means new authority and responsibility for those who manage the use of land. Without provincial commitment and resources, municipalities cannot make substantial progress.

---

[25] This developer had asked builders in his subdivisions to plant a mix of grass seeds instead of sodding their lots. He advocated landscaping without chemicals.

7: EVALUATING SUBDIVISION DESIGN

In order to determine whether sustainable development ideas have affected residential land use planning practices in our study communities, we examined plans of subdivision from the early 1980s and from the early 1990s. We hypothesized that if the philosophy of sustainable development had affected subdivision design we might find evidence that practice incorporated some of the following principles:

* reduce lot frontage in urban areas (as part of a move toward intensification)

* protect natural drainage patterns (as concern about environment increased)

* avoid steep slopes

* retain vegetation patches

* avoid resource lands (e.g., farmland)

* increase proportion of mixed use and housing options (to meet needs of diverse population).

We originally expected to use development permit data for this analysis, but that proved impossible. Development permit records are kept according to the municipality's filing system, often catalogued by the last name of the applicant. This makes it difficult to search the records chronologically. One of the municipalities adopted a computer based filing system in the late 1980s, but its earlier records are not strictly comparable. Some municipalities record a minimum of information in their permit records. None of the systems would give us adequate information on natural processes or resources on the site.

Accordingly, we decided instead to review plans of subdivision for sites which staff identified in the appropriate time periods. Again, we found the results were not strictly comparable. Site plans differ in detail. Plans of subdivisions do not always indicate whether vegetation covered the land before development. Sometimes the plan shows land as "cleared", or it may show patches of vegetation. Wetlands and waterways are usually marked. Where contours appear on the plan, we calculated slopes and located drainage swales. We visited the developments during the summer of 1992 and recorded our observations.

As we compared subdivisions from the two periods, we found no significant change in

70

development patterns on the landscape. Lot sizes in urban areas did not decrease. Lot frontage remains directly related to the value of lots in urban areas: expensive neighbourhoods boast wide lots. In rural areas, large lots are the norm. Single detached homes remain the most commonly built form, and affordability remains a dream. Heavily modified landscapes have replaced indigenous landscapes, and landscape function has been disrupted.

Our analysis showed that the platting of land in the developments examined usually paid little attention to natural processes. Staff approved lots on steep slopes in several subdivisions.[26] While those surveying the lots usually paid attention to drainage, flooding problems nevertheless developed in some of the projects we visited. We saw evidence of severe erosion in many locations. Small streams and wetlands received little protection. In one development a developer had left a vegetated buffer to protect lake quality; site observations showed that some land owners had subsequently removed the vegetation after purchasing lots from the developer. Most subdivisions yield few hints of the indigenous landscapes they replaced. Naturalized vegetation is rare. Hectares of grass and asphalt have replaced forests and meadows. Where vegetated patches remain, they seldom connect through corridors to other habitat areas. Wide paved streets prevail. Natural waterways have been urbanized. Residential development has radically transformed the environment and disrupted landscape function.

Despite regulations which attempt to protect farmland and concentrate urban growth, new housing in rural areas continues to take agricultural land. Productive land disappears beneath asphalt, buildings, and Kentucky blue grass. Lot layout pays no attention to solar aspect or to indigenous traditions. Cookie-cutter subdivision patterns abound. Cluster development rarely occurs. Developers keep building single detached houses, although semi-detached units are available in less expensive subdivisions.

Greater concern about the environment in recent years has not significantly changed the ways in which we develop land in Nova Scotia. We continue to waste resources such as wildlife habitat, farmland, solar energy, and local waterways. We have come no closer to providing housing for poorer members of our communities. Many residents have little interest in participating in community affairs. Why has our rhetoric failed to spawn action? The final chapter considers the barriers to moving towards sustainable development.

---

[26] One of the developers we interviewed had inherited such lots after his company purchased a subdivision. He complained that developing such lots caused horrendous problems and unwarranted costs.

PART THREE:

FINAL COMMENTS

8:   IS PLANNING PRACTICE SUSTAINABLE?

Our research demonstrates
>   (a) that it is difficult to define and measure sustainability,
>   (b) that while most participants in the process of regulating and developing land are concerned about protecting the environment, human activities continue to disrupt landscape function.

As Wichern (1992: 23) suggests,

>   *"it is most appropriate to inquire as to whether Canadian governments at all levels are formulating policies and undertaking projects which will make sustainable urban development a key concept in Canadian settlement and urban policy making."*

Nova Scotian municipalities, like communities across Canada, have adopted policies and practices which MacLaren (1992) and others would define as sustainable development initiatives. Our study found, however, that despite the growing concern about environmental problems and costs, communities have not adopted practices designed to conserve landscape function and natural processes for future generations. Governments have taken measures to safeguard development from natural processes (as in regulating uses in flood plains), and to protect water supply watersheds, but leave most landscapes relatively unprotected. The initiatives taken to this point in time, like recycling programs or designating some resource lands from protection, indicate that governments are beginning to affirm the importance of sustainability: municipalities have far to go to turn their commitment into sufficient action to guarantee future generations sustainable communities.

For the purposes of this project, we suggested that
>   **Sustainable development implies adaptation and improvement in a context in which communities seek to protect natural processes and landscape function, and to conserve resources for future generations.**

We argued that sustainable development in residential environments requires a different approach to planning than our communities have traditionally used, and that it entails three key principles: ecological integrity, economic viability, and social equity. We placed ecological integrity first on our list because without environmental health human well-being and improvement are clearly threatened.

If we had defined sustainable development as "allowing economic growth while protecting the environment", then we would have concluded that all three of the study communities

73

qualify as making progress towards sustainability. However, given our priorities, the communities fell short. Their practices do not safeguard ecological integrity, do not promote economic diversity and viability, and cannot deliver social equity. Long-term viability requires transitions from "business as usual": we found little evidence of major changes under way.

Of the three communities we studied, Truro showed the greatest progress towards integrating sustainability principles into land use planning policies. The Truro plan reduced lot size requirements in an effort to increase urban densities, and allowed staff to consider landscape function in major development projects. The Kings County plan provided safeguards for agricultural land, and limited infilling in flood plains. The Dartmouth plan (whose status is uncertain) would increase options for environmental protection. As our investigation shows, however, policies tell only part of the story. Despite good intentions and helpful policy directions, land development continues to undermine landscape function.

Sustainable development suggests that we live lightly on the land. If we value wildlife, vegetation, and natural processes then we should build our structures and live in our communities in ways which respect nature. Our interviews with planners, developers, politicians, and citizens indicated that all of the actors involved in the process of developing land believe that protecting landscapes is desirable and possible. Unfortunately, all of the respondents had explanations for why it does not happen, and for the barriers which prevent it.

Barriers to Sustainable Development

Our analysis suggests that we can group the barriers to making the transition to sustainability into categories. **Jurisdictional barriers** affect the distribution of powers between governments, and set out the legislative authority of various agencies. **Organizational barriers** reflect bureaucratic procedures and professional standards which impose values on the development of land. **Geographical barriers** refer to locational and spatial constraints which limit the choices available to communities. **Cultural barriers** include economic, political and social values held by members of the society which seeks sustainable development.

Jurisdictional and organizational barriers

Under the distribution of powers between the province and municipalities, Nova Scotian municipalities have limited control over land. A municipality which seeks to promote sustainable development cannot regulate areas of provincial jurisdiction. For example, the province controls major roads, natural resources, taxation, housing, and waterways. Communities cannot set policies independently; they cannot exceed the authority given them under provincial legislation. The province expects municipalities to promote development through effective regulation.

Within the departments of the provincial government we find conflicting mandates and missions. Each department seeks its own sectoral aims; each has its own notion of "sustainability"; each tries to protect its "turf" and its authority against the interests of others. Without clear direction from the Cabinet, the province lacks consistency of purpose to promote sustainability. The *Sustainable Development Strategy* offers the province an opportunity to commit itself to a new vision of development, if the province implements the *Strategy* effectively.

Municipalities depend upon the province to take a leading role in environmental protection and management: until recently, the province sometimes seemed reluctant to accept that role. The province depends upon municipalities to regulate development in a responsible way. However, in granting municipalities the authority to tax property to finance expenditures, the province has encouraged communities to transform indigenous landscapes into heavily modified "developments" (that return higher annual taxes). Accordingly, municipalities get a "mixed message" from the province: promote development but protect the environment. Both provincial and municipal governments find it difficult to accept that in the new language of sustainable development, "development" no longer equals "growth".

Overcoming jurisdictional barriers will take a major commitment by the province. The province would have to revise legislation which sets out the roles of governments and their agencies. Nova Scotia would need specific policies with clearly defined priorities. Departments would have to bring their practices and regulations into line with the provincial policy. The Planning Act contains the framework for adopting provincial land use policies, but other elements of the Planning Act would require re-framing if the government decides to make sustainable development the philosophy of the province.

Within the organizations involved in the management of land we find a number of barriers to sustainable development. Many departments operate according to procedures and standards set long ago: few practitioners reflect regularly on their mode of operation. Many bureaucracies simply follow tradition without question. For example, we found that the three municipalities we studied all restricted the height of single detached housing to 35 feet maximum: none of the planners, development officers, or civic leaders could explain the origin or purpose of this limit.[27] In sustainable communities, we should set standards according to their usefulness in meeting the aims of sustainability. Unfortunately, the standards which currently regulate development often reflect organizational interests or traditional concerns, and may in some cases inhibit attempts to promote sustainability.

Organizations may not cooperate to achieve aims which transcend their traditional interests. They may insist on professional standards (such as wide roads) based on values inimical to sustainability. Technology sets standards: for example, engineers may suggest that we build communities to handle huge fire trucks instead of asking whether we can find smaller vehicles which will do the job. Moving to sustainability may require that we reconsider organizational values and aims, and revise them in light of new expectations.

Geographic and cultural barriers

Far from the economic heartland of the nation, Nova Scotia faces difficult circumstances and unusual opportunities. Unlike the heavily urbanized provinces of central Canada, Nova Scotia often seems "pristine" and "underdeveloped". Visitors can drive for miles without seeing a house or a factory.

Low urban densities and small communities make mass transit impractical in much of the

---

[27] One respondent in the Department of Housing suggested that 35 ft. made sense under old construction practices but no longer presented a real limit.

province. Shallow, stony soil across much of the region creates problems for on-site services, and increases the cost of providing community waste management systems. In rural areas, like Kings County, the abundance of agricultural and resource lands makes it difficult to locate appropriate patches for urban uses. While residents of polluted and congested inner cities readily acknowledge environmental problems, the residents of Nova Scotia sense no impending environmental catastrophe when they survey their landscapes.

Perhaps the most troublesome category of barriers to sustainable development derive from people's cultural values and attitudes. With the will to promote sustainability, we could overcome other barriers in time. However, as we examine cultural practices we find that people don't necessarily want to change. In our society, we identify closely with our residential landscapes. We use housing and the land it sits on to communicate values: privacy, amenity, character. We respect large homes, wide lawns, ornate parks. Our ideas of quality of life and standard of living have traditionally reflected particular ways of using landscapes.

We separate ourselves from nature in the course of our everyday lives: few people bother to grow food for their own table. We seclude our family units from the community: few people participate in community matters. Our life styles keep us apart from the environments which sustain us, and which we must sustain. We rely on heavy energy subsidies and on depleting limited natural resources to satisfy unsustainable demands. Although many of us have begun to recognize the need to reconnect ourselves to the community and to the environment, sustainable communities may entail significant cultural transformation.

Politicians often base their decisions on short-term objectives and crisis management. In an economic climate of recession and desperation, people refuse to take risks or alter their priorities. But increasingly we realize that we must act to enhance economic viability and social equity. Our communities can respond: reduce, reuse, recycle must become ways of life, not charitable slogans. All of us have to become stewards of the resources upon which we depend. Protecting the ecological integrity of the land is the first step in a new way of interacting with the environment.

In sum, the barriers to sustainable development will be difficult, but not impossible, to overcome. Progress towards sustainable approaches will not come easily. Although Nova Scotia has taken the first step by publishing a *Sustainable Development Strategy*, the path is a long one.

Figure 3: LANDSCAPE PERSPECTIVES
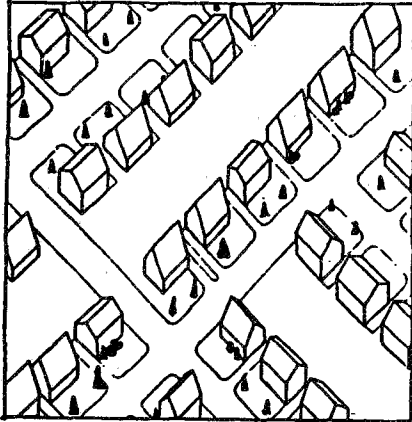
ARTIFICIAL LANDSCAPE

Ornamental shrubs, grass, asphalt
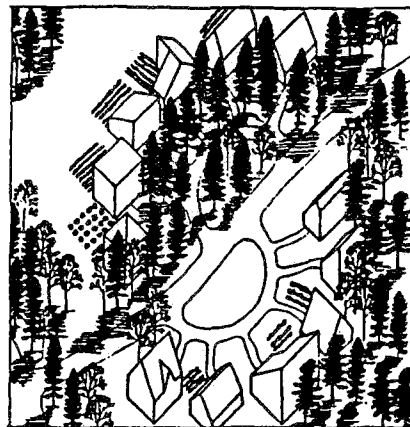
Heavily modified

INDIGENOUS LANDSCAPE

Housing patches in landscape;
mostly habitat and gardens

Limited modification

Steps in the Right Direction

To move towards sustainable development, the Province of Nova Scotia must first clarify the status of the *Sustainable Development Strategy*. If the Strategy reflects government policy and priorities, then the climate for promoting sustainability will improve dramatically. The province needs an implementation strategy which requires compliance. Given that the Planning Act regulates residential land development, the province should commit itself to planning for sustainability.

> **Recommendation 1: The Province of Nova Scotia should adopt the**
> *Sustainable Development Strategy* **(1992) as a provincial land use policy under**
> **the Planning Act.**

With a firm commitment to sustainable development, and to protecting natural processes and landscape function, Nova Scotia can begin to review practices, procedures, and regulations for sustainability. At the provincial level, the government will have to advise all departments to review their practices, procedures, and regulations. Where existing practices defeat the aims of sustainable development, departments will have to change direction. The government will need to amend some regulations and legislation to promote sustainability. Such cooperation has already begun, but the province must monitor progress to ensure that all the parties participate fully.

Some departments may find it difficult to abandon traditional practices in favour of sustainable development approaches. For example, Nova Scotian road standards and construction practices result in the destruction of large amounts of habitat. Is such massive modification necessary, or can it be mitigated? Vegetation clearing during construction facilitates surveying the right of way. Taking a sustainable development approach, however, we should avoid removing vegetation; builders should revegetate with indigenous plantings after construction. We should protect wildlife corridors, with road routings selected to avoid major habitat patches. We can reduce impervious surfaces to the minimum necessary for safe traffic flow: most residential neighbourhoods do not need the vast road widths required by existing provincial standards. We should retain natural drainage systems where possible. The province must continue to demand environmentally sensitive construction practices, and careful monitoring of environmental quality. Those in charge of implementing the *Strategy* must find ways to help departments and staff make a smooth transition to the new approach.

Adopting sustainability as a land use policy offers the provincial government an opportunity to define clear goals, rules, and priorities for municipalities and developers to follow.

> **Recommendation 2: The Province of Nova Scotia should amend the Planning Act and other legislation as necessary to give municipalities the authority and responsibility to protect natural processes and landscape function.**

The Planning Act is the most important piece of legislation defining how municipalities conntrol the development and use of land. In its current framework, the Act promotes development that significantly modifies landscapes. The Act limits municipal councils from considering many features of landscape function in arriving at decisions. Promoting sustainable development requires a different planning regime.

Municipalities will have to bring their plans, by-laws and regulations into line with provincial policy on sustainability. Traditional priorities and concerns will change. Municipalities may adopt new ways of evaluating performance and of measuring "development". Sustainable development means finding ways to meet people's needs in communities by building in ways that respect landscape function. In order to remove the pressure for growth at any cost, the province must revise funding arrangements for municipalities. As long as they depend on property assessment for revenue, municipalities have no alternative but to encourage unsustainable practices. The province must work with municipalities to develop new financing strategies that encourage sustainable development.

In this revised scenario, municipalities can take measures to promote sustainability. They can provide information and encouragement to developers and residents who want to protect natural processes and landscape function. They can seek the authority they need to regulate human activities which affect landscapes. For example, they may lobby for tax changes which would allow municipalities to offer residents incentives for becoming private stewards of environmentally sensitive areas. Communities may encourage developers and residents to consider new landscaping practices and standards that retain or restore indigenous vegetation. They will have to examine their by-laws and regulations to determine whether existing policies take an appropriate approach.

> **Recommendation 3: The Province of Nova Scotia and local governments should promote private stewardship programs for developers and land owners who support sustainable development.**

Private citizens or corporations own more than 70% of the land in Nova Scotia: without

their cooperation, no program to protect landscape function can succeed. The province should encourage developers to adopt sustainable development practices. Land owners need to understand sustainability issues, and recognize their own roles in land management.

Land owners who want to protect natural resource lands currently have two choices: hold the lands and pay assessed taxes on the lands; donate the land to the province (for designation under the Special Places Act) or to the municipality (as a park). Governments that want to protect natural resource lands or sensitive areas must purchase the land. Given limited government resources to purchase land, and given increasing interest on the part of private land owners to safeguard natural heritage, the province should develop programs that encourage private stewardship options. Land owners may need educational and managerial support, as well as community or financial recognition of their commitment. Communities could promote stewardship through acknowledging the efforts of land owners: perhaps we could develop a natural heritage recognition program similar to the heritage plaque systems for cultural heritage.

Developing communities in a way that sustains natural processes and landscape function requires that we understand and monitor local landscapes. At present we know too little about the health of our environment and the sustainability of our practices.

> **Recommendation 4: The Province of Nova Scotia should identify key indicators to measure and monitor progress towards sustainability.**

Only through constant evaluation will we know whether we are improving our performance and protecting the environments which sustain us. Some of the information we need to have at hand to know whether our communities are sustainable is simply not available. A commitment to sustainability entails an obligation to monitor activities and improve upon performance as necessary.

In developing a program to implement the *Sustainable Development Strategy*, the province can consider a range of approaches: enabling, regulatory, incentive. The recommendations offered here combine elements of the approaches.

Changes to legislation would give communities the opportunity to begin to change traditional practices that undermined landscape function. Educational programs can inform citizens about sustainable development and help them get involved. Many people want to develop sustainable communities, and await changes which will allow them to do so. An enabling approach would ensure that people have the opportunities to adopt sustainable practices if they so choose.

A large range of regulatory tools are available for enhancing sustainability. Regulations could safeguard vital habitat areas, or protect resource lands from development. They may prohibit residents from sending yard wastes to a sanitary land fill site, or limit the amount of parking in the urban core. The regulatory approach could prevent the worst practices, and give communities strong tools for making progress towards sustainability.

Incentives could be large or small, depending on the resources available. With adequate taxing powers, communities could reward those who agree to protect important conservation areas or resource patches. An incentive approach encourages and rewards those who voluntarily move towards the path of sustainable development.

The carrot or the stick? No single solution will work for every community because communities face different problems. For example, large urban centres may seek greater densities to lower energy costs and to facilitate service provision. Much of the literature on sustainable development suggests that communities need to increase residential densities to limit urban sprawl and minimize human impact on the environment. However, an approach to sustainability which focuses on landscape function may challenge conventional thinking on the desirability of greater densities. Smaller urban centres and rural areas may choose low residential densities in order to protect natural resources, landscape function, and productive capability. Each community must judge its options in terms of the trade-offs it will make between sometimes conflicting aims and agendas.

Indicators for Monitoring Progress

In evaluating municipal practice in Nova Scotia, we employed a framework for assessing progress towards sustainability. Some of the "indicators" we tried to develop worked reasonably well; many did not. In this final section we attempt to narrow the list of indicators to suggest those most helpful for long-term monitoring. Where our working evaluation framework offered a long list of possible markers of progress toward sustainability, our final checklist as presented includes a short list of the most useful items. Each of them requires further elaboration and specification to facilitate measurement.

As in our evaluation framework, we continue to classify indicators as either primary (measuring system status), secondary (measuring human impacts), or tertiary (measuring efforts to reduce human impacts). For the long-term health of the planet and our species, primary indicators are most important. In the short-term, however, we may find secondary and tertiary indicators easier to measure.

Primary indicators:

Primary indicators measure the health of ecosystems. We could say that we have achieved sustainable development when we have high quality (healthy) air, water, soil, flora, and fauna (including humans). For each of these elements of the ecosystem, we would need measures of quality and health (see Table 8-1). Communities may agree to use common standards, or they may set their own appropriate levels. While much of the information needed to evaluate ecosystems can be located, few communities have the information readily at hand. Even fewer communities have developed standards they would use to set targets for their best case scenario.

Table 8-1: Key Primary Ecosystem Indicators

Element	Best Case		Worst Case
AIR * suspended particles * CO$_2$ levels * SO$_2$ levels * other	* pre-industrial conditions	* current levels	* greenhouse effect * ozone depletion * industrial pollution
WATER (all sources) * dissolved oxygen * suspended solids * temperature * volume * contamination (mineral, bacterial, toxic) * nutrients	* natural conditions	* current levels	* eutrophication * pollution * flooding /low flow * increased temperature * siltation
SOIL * organic matter * contaminants * erosion	* natural conditions	* current levels	* soil infertility * pollution * soil loss
FLORA * indigenous content * diversity * productivity * habitat requirements	* indigenous habitat matrix	* modified habitat matrix	* loss of habitat matrix
FAUNA * indigenous content * diversity * productivity * habitat connectivity	* indigenous wildlife range	* modified wildlife variety	* loss of indigenous species
HUMANS * diversity * health	* heterogeneous * mental health * longevity		* segregation * environmental illness

Secondary indicators:

Secondary indicators advise us of the impacts which human activities have on natural resources and processes. When we achieve sustainable development we would hope to find no evidence of deleterious human impacts on natural systems. At this point in time, however, we find abundant evidence of such impacts. Table 8-2 illustrates some of the secondary indicators we can measure. The list is not complete, but demonstrates the key measures we can begin to evaluate right away. The numbers given in the chart provide examples only: communities can set specific targets after reviewing their circumstances.

Table 8-2: Key Secondary Impact Indicators

Element	Best Case		Worst Case
Water use per capita	50% reduction from current level[28]	25% reduction	current level or greater
Wastes generated per capita (into air, water, land)	50% reduction	25% reduction	current level or greater
Impervious surface ratio[29]	less than .10	between .11 and .20	greater than .21
Fossil fuel use per capita	50% reduction	25% reduction	current level or greater
Waiting list for social housing	all households well-housed	50% reduction	no improvement

We could add many indicators to this list to measure the impacts of human activities on ecosystems or on human health. For example, suicide rates and crime rates are often suggested as measures of poor mental health or inadequate economic opportunities. Some communities may choose to measure human impacts on particular species or habitat areas.

---

[28] The numbers suggested in this chart are for illustration only. A province or individual communities could set measures and standards which they feel appropriate.

[29] The ratio of hectares of paved surface to total surface area in the community indicates the degree to which surface water can infiltrate the ground to replenish ground water.

85

Tertiary indicators:

The third type of indicators measure a community's efforts to reduce human impacts on the environment. While communities may take many small steps toward reducing impacts, we have highlighted only the key elements of protecting natural resources, processes, and landscape function. Table 8-3 illustrates some suggested indicators. For example, communities may adopt policies to control development on flood plains in order to protect landscape function.

Table 8-3: Key Tertiary Indicators

Element	Best Case		Worst Case
Resource land policy * farm land * forest land * mineral deposits	* limits on use and loss of resource	* partial controls	* no control
Conservation land policy * wetlands * flood plains * waterways	* strict limit on loss of function	* partial protection	* no control
Good practices policy * vegetation * natural drainage * environmental audit or review	* strict limit on loss of function	* partial protection	* no control

Each community could identify different ways to achieve the ends implied by these tertiary indicators. As discussed above, a range of opportunities, regulations, or incentives could facilitate progress towards protecting the elements identified.

Conclusion

Local plans and policy documents show the growing influence of the principles of sustainable development in Nova Scotia. Respondents interviewed generally supported the idea of sustainable development, but defined it differently to reflect their interests and agenda. Our investigation of local experiences indicated that development practices continue to disrupt landscape function and inhibit opportunities for greater sustainability. Residential development fragments habitats, disrupts natural processes, and consumes resource lands.

A commitment to sustainable development requires that our communities set clear goals to protect natural processes and landscape function. Municipalities have not made such a commitment yet, although the province has intimated its concerns through the *Sustainable Development Strategy*. Sustainable development requires that we plan land differently than we have in the past. It asks that we find places for people to live and work within a landscape which retains a complex indigenous character. It requires that we protect landscapes even as we integrate human activities into them. The transition to sustainable communities involves new kinds of adaptations, and some alternative ways of doing things. While we may find the transition difficult, the long-term rewards should prove well worth the effort.

Bibliography

ALEXANDER, C. 1966. "The Pattern of Streets." JOURNAL OF THE AMERICAN INSTITUTE OF PLANNERS 32: 273-278.

ALEXANDER, C. 1977. A PATTERN LANGUAGE: TOWNS, BUILDINGS, CONSTRUCTION. Oxford University Press, New York.

ALEXANDER, D. 1992. "What is Sustainable Community Development?" PLANNING ACTION (Newsletter of Forum for Planning Action). (August): 1-4.

APPLEYARD, D. and M. LINTELL. 1972. "The Environmental Quality of City Streets: The Residents' Viewpoint." JOURNAL OF THE AMERICAN INSTITUTE OF PLANNERS 38(2): 84-101.

BEAVIS, M.A. (ed.) 1992. COLLOQUIUM ON SUSTAINABLE HOUSING AND URBAN DEVELOPMENT. Occasional Paper 29, Institute of Urban Studies, University of Winnipeg.

BEAVIS, M.A. and J. PATTERSON. 1992. A SELECT, ANNOTATED BIBILIOGRAPHY ON SUSTAINABLE CITIES. Bibliographica 4. Institute of Urban Studies, University of Winnipeg.

BEER, A.R. 1990. ENVIRONMENTAL PLANNING FOR SITE DEVELOPMENT. E.& F.N. Spon, London.

BEGG, H. 1992. "Town and Regional Planning and the Challenge of Sustainable Development". THE PLANNER. 77 (22): 7-8.

BLOWERS, A. 1990. "The Environment - a Political Problem with No Solution?" TOWN AND COUNTRY PLANNING 59(5): 132-133.

BRINKHORST, L. 1991. "Planning for Sustainable Development." TOWN AND COUNTRY PLANNING. 60(1): 16-18.

BROWN, L.R. 1982. "A Sustainable Society". THE FUTURIST. (Feb.): 12-19.

BROWN, L.R. 1992. "Launching the Environmental Revolution". In, STATE OF THE WORLD 1992. L. Brown (ed.) Worldwatch Institute. pp. 174-190.

BROWN, N.J. 1992. "Ethics, Equity and a Sustainable Future". EARTH CARE NEWS, UNEP Green Paper, 4(2): 1-4.

CANADIAN INSTITUTE OF PLANNERS. 1990. REFLECTIONS ON SUSTAINABLE
PLANNING: THE IMPLICATIONS OF SUSTAINABLE DEVELOPMENT FOR
PLANNING AND THE CANADIAN INSTITUTE OF PLANNERS. Ottawa.

CANADIAN ENVIRONMENTAL ADVISORY COUNCIL. 1987. CANADA AND
SUSTAINABLE DEVELOPMENT. A COMMENTARY ON OUR COMMON
FUTURE. Ottawa.

CARPENTER, R., and J. DIXON. 1985. "Ecology Meets Economics: A Guide to Sustainable
Development." ENVIRONMENT. 27 (5): 6-32.

CLINTON-DAVIS, S. 1990. "Sustainable Development and the Environment - The European
Community Outlook." ECOS. 11(3): 22-26.

CÔTÉ, R.P. and M. STRICKLAND. n. d. MOVING FROM AN UNCERTAIN TO A
SUSTAINABLE FUTURE. - ISSUES AND OPPORTUNITIES FACING NOVA
SCOTIA. Report, School for Resource and Environmental Studies. Dalhousie University,
Halifax, N. S.

COLBY, M. 1991. "Environmental Management in Development: The Evolution of Paradigms."
ECOLOGICAL ECONOMICS 3: 193-211.

COMMONER, B. 1990. MAKING PEACE WITH THE PLANET. Pantheon, New York.

DALY, H., and J.B. COBB. Jr. 1989. FOR THE COMMON GOOD. REDIRECTING THE
ECONOMY TOWARD COMMUNITY, THE ENVIRONMENT, AND A
SUSTAINABLE FUTURE. Beacon, Boston.

D'AMOUR, D. 1991. THE ORIGINS OF SUSTAINABLE DEVELOPMENT AND ITS
RELATIONSHIP TO HOUSING AND COMMUNITY PLANNING. Sustainable
Development and Housing Research Paper 1, Canada Mortgage and Housing Corporation,
Ottawa.

DASMANN, R. 1985. "Achieving the Sustainable Use of Species and Ecosystems." LANDSCAPE
PLANNING 12: 211-219.

DAVIDSON, J. 1985. "Environment and Development - Still poles Apart." THE PLANNER 71(1).

DAVIS, G. (ed) 1990. "Energy for Planet Earth". SCIENTIFIC AMERICAN 263(3): 55-62.

DOWER, M. 1984. "Green Towns and Cities". THE PLANNER 70(7): 11-12.

ENVIRONMENT CANADA. 1986. **TOWARDS SUSTAINABLE LAND USE: A STRATEGY.** Working Paper (No. 47) of the Lands Directorate, Environment Canada.

ENVIRONMENT CANADA. 1988. **SUSTAINABLE DEVELOPMENT IN ERDAS/EDAS. INCORPORATING ENVIRONMENTAL CONSIDERATIONS INTO ECONOMIC DECISION-MAKING.** Sustainable Development Branch, Canadian Wildlife Service.

ENVIRONMENT CANADA. 1990. **SUSTAINABLE DEVELOPMENT INITIATIVES IN CANADA: ACTIVITIES IN PROGRESS.** Sustainable Development. State of the Environment Report. Ottawa.

FALUDI, A. 1985. "A Decision - Centred View of Environmental Planning. " **LANDSCAPE PLANNING.** 12: 239-256.

FORMAN, R.T.T. 1990. "Ecologically Sustainable Landscapes: The Role of Spatial Configuration." In, **CHANGING LANDSCAPES: AN ECOLOGICAL PERSPECTIVE.** I.S. Zonneveld and R.T.T. Forman (eds.) Springer-Verlag, New York. pp. 261-279.

FORMAN, R.T.T., and M. GODRON. 1986. **LANDSCAPE ECOLOGY.** John Wiley and Sons, New York.

GALE, R. 1991. "Environment and Development: Attitudinal Impediments to Policy Integration." **ENVIRONMENTAL CONSERVATION.** 18(3): 228-236.

GARDNER, J. and M. ROSELAND. 1989. "Acting Locally: Community Strategies for Equitable Sustainable Development." **ALTERNATIVES.** 16(3): 36-48.

GARDNER, J. and M. ROSELAND. 1989. "Thinking Globally. The Role of Social Equity in Sustainable Development." **ALTERNATIVES.** 16(3): 26-34.

GILBERT, O.L. 1989. **THE ECOLOGY OF URBAN HABITATS.** Chapman and Hill, New York.

GORDON, C. 1991. "Sustainable Landscapes". **LANDSCAPE DESIGN.** 200: 47-49.

GORDON, D. (ed). 1990. **GREEN CITIES. ECOLOGICALLY SOUND APPROACHES TO URBAN SPACE.** Black Rose Books, Montreal.

GREEN, R. 1990. "Sustainable Development of the Built Environment." **TOWN AND COUNTRY PLANNING.** 59(5): 142-143.

HILTS, S. 1990. "Sustainable Development and Private Stewardship." **LANDSCAPE ARCHITECTURAL REVIEW.** 11(2): 10-13.

HILTS, S. and J. FITZGIBBON. 1989. "Sustainable Development and Rural Resource Planning: The Future in Rural Canada." **PLAN CANADA.** 29(2): 19-27.

HOLDGATE, M. 1989. "Planning For Our Common Future: Options for Action". **ENVIRONMENT.** 31(8): 14-41.

HOLLIDAY, J. 1991. "A Sustainable Future for Tomorrow's Communities." **TOWN AND COUNTRY PLANNING.** 60(2): 41-43.

HOLLING, C.S. and M.A. GOLDBERG. 1971. "Urban Land Economics: Ecology and Planning." **JOURNAL OF THE AMERICAN INSTITUTE OF PLANNERS** 37(4):

HOUGH, M. 1984. **CITY FORM AND NATURAL PROCESS: TOWARDS A NEW URBAN VERNACULAR.** Routledge, New York.

HOUGH, M. 1990. "Formed By Natural Process: Defining the Sustainable City." LANDSCAPE **ARCHITECTURAL REVIEW.** 11(4): 8-11.

INSTITUTE OF URBAN STUDIES. 1992. **SUSTAINABLE CITIES.** Institute of Urban Studies Newsletter Supplement. University of Winnipeg.

INTERNATIONAL UNION FOR CONSERVATION OF NATURE AND NATURAL RESOURCES (IUCN). 1980. **WORLD CONSERVATION STRATEGY.** Prepared by the IUCN in cooperation with United Nations Environment Programme, and the World Wildlife Fund. Switzerland.

IUCN/UNEP/WWF. 1991. **CARING FOR THE EARTH. A STRATEGY FOR SUSTAINABLE LIVING.** International Union for the Conservation of Nature. Gland, Switzerland.

IZRAEL, Y.A. and R.E. MUNN. 1986. "Monitoring the Environment and Renewable Resources. " In, W.C. Clark, R.E. Munn (eds). **SUSTAINABLE DEVELOPMENT OF THE BIOSPHERE.** International Institute for Applied Systems Analysis. Cambridge University Press, New York. pp. 360-374.

JACOBS, P. 1985(a). "A Sustainable Society Through Sustainable Development: Towards A Regional Development Strategy For Northern Quebec. **LANDSCAPE PLANNING.** 12: 267-283.

JACOBS, P. 1985(b). "Achieving Sustainable Development" **LANDSCAPE PLANNING.** 12: 203-209.

JACOBS, P. 1988. "Sustainable and Equitable Development: A Goal for the 21st Century." **LANDSCAPE ARCHITECTURAL REVIEW.** 9(5): 7-13.

JACOBS, P. 1986. "Sustaining Landscapes: Sustaining Societies." **LANDSCAPE AND URBAN PLANNING.** 13: 349-358.

JAMIESON, W. 1991. "Note from the Guest Editor." (Issue on Creating Livable Environments.) **PLAN CANADA** 31(2): 2-3.

KELBOUGH, D. (ed.) 1989. **THE PEDESTRIAN POCKET BOOK: A NEW SUBURBAN DESIGN STRATEGY.** Princeton Architectural Press, New York.

KENDIG, L. with S. CONNOR, C. BYRD, J. HEYMAN. 1980. **PERFORMANCE ZONING.** Planners Press, American Planning Association, Chicago.

KLAASSEN, G. and J. OPSCHOOR. 1991. "Economics of Sustainability or the Sustainability of Economics: Different Paradigms". **ECOLOGICAL ECONOMICS.** 4: 93-115.

KNACK, R.E. 1991. "The One-Acre Habit is Hard to Break." **PLANNING.** 57(8): 8-11.

LANDER, R. and R. MASS. 1990. "The Economics of Sustainability." **TOWN AND COUNTRY PLANNING.** 59(6): 182-185.

LANG, R. 1983. "Conservation to Achieve Sustainable Development." **PLAN CANADA.** 23(1): 26.

LEMONIDES, J.S. and A.L. YOUNG. 1978. "Provision of Public Open Space in Urban Areas: Determinants, Obstacles, and Incentives." **JOURNAL OF THE AMERICAN INSTITUTE OF PLANNERS** 44(3): 286-296.

LEWIS, C.A. 1979. "Plants and people in the Inner City." **PLANNING** 49(3): 10-14.

LEWIS, M.W. 1992. "The Green Threat to Nature". **HARPER'S MAGAZINE** (Nov.): 26-32.

LEWIS, S. 1992. "Goodbye, Ramapo. Hello, Yakima and Isle of Palms". **PLANNING** 58(7): 9-16.

LINDHEIM, R. 1985. "New Design Parameters for Healthy Places." **PLACES.** 2(4): 17-27

LOWE, M.D. 1992. "Shaping Cities." In, **STATE OF THE WORLD 1992.** (L. Brown, ed.) Worldwatch Institute. pp. 119-137.

LYNCH, K. 1958. "Environmental Adaptability." **JOURNAL OF THE AMERICAN INSTITUTE OF PLANNERS** 24(1): 16-25.

LYNCH-TRESCH, R. 1984. "Renovating Residential Landscape". **HABITAT** 27(2): 19-24.

MacLAREN, V.W. 1992. SUSTAINABLE URBAN DEVELOPMENT IN CANADA: FROM CONCEPT TO PRACTICE. Volume 1: Summary Report. Volume 2: Annotated Bibliography. Volume 3: Compendium of Initiatives. Intergovernmental Committee on Urban and Regional Research, Toronto.

MacNEILL, J. 1989. "Strategies for Sustainable Economic Development". SCIENTIFIC AMERICAN. 261 (3): 155-165.

MAIER-RIGAUD, G. 1991. " Background to the Conflict Between Economic and Ecological Ends". ECOLOGICAL ECONOMICS. 4: 83-91.

MANNING, E.W. 1986. TOWARDS SUSTAINABLE LAND USE: A STRATEGY. Lands Directorate, Working Paper 47, Environment Canada, Ottawa.

MANNING, E.W. 1989. "The Federal Agenda: Conservation Strategies and Sustainability." LANDSCAPE ARCHITECTURAL REVIEW. 10(1): 21-26.

MANNING, E.W. 1990. "Conservation Strategies. Providing the Vision for Sustainable Development." ALTERNATIVES. 16(4): 24-28.

MANNING, E.W., W. BOND, R. MCKECHNIE. 1989. FEDERAL ECONOMIC INSTRUMENTS AND THE ACHIEVEMENT OF ENVIRONMENTAL OBJECTIVES. Sustainable Development Branch, Environment Canada. Dartmouth, N.S. pp. 1-11.

McNEELY, J.A. 1990. "How Conservation Strategies Contribute to Sustainable Development." ENVIRONMENTAL CONSERVATION. 17(1): 9-13

McRUER, J.D. 1990. "Sustainable Economic Growth: Using Simulation to Assess the Prognosis." ENVIRONMENTS. 20(2): 36-46.

MEADOWS, A.B. 1992. "Paradise Found". COMMERCIAL NEWS (Sept.): 10-15.

NATIONAL ROUND TABLE ON THE ENVIRONMENT AND THE ECONOMY. 1991. DISCUSSIONS ON DECISION MAKING PRACTICES FOR SUSTAINABLE DEVELOPMENT. Ottawa.

NATIONAL ROUND TABLE ON THE ENVIRONMENT AND THE ECONOMY. 1992. SUSTAINABLE DEVELOPMENT AND THE MUNICIPALITY. Ottawa.

NATIONAL ROUND TABLE ON THE ENVIRONMENT AND THE ECONOMY. 1992. TOWARDS SUSTAINABLE COMMUNITIES. Ottawa.

NAWAZ, R. 1991. "Sustainable Urban Development for Ottawa: Planners Can Make a Difference." **PLAN CANADA.** 31(6): 54-58.

NELSON, A.C., J.G. NICHOLAS, L.L. MARSH. 1992. "New-fangled impact fees." **PLANNING** 58(10): 20-23.

NELSON, J.G. 1968. "Spoiling the Landscape." **HABITAT** 11(1): 20-23.

NELSON, J.G. and H.E. EIDSVIK. 1990. "Sustainable Development, Conservation Strategies and Heritage. Three Basic Tools for Influencing the Global Future." **ALTERNATIVES.** 16(4): 62-69.

NOVA SCOTIA ROUND TABLE ON ENVIRONMENT AND ECONOMY. 1992. **THE SUSTAINABLE DEVELOPMENT STRATEGY FOR NOVA SCOTIA.** Halifax.

ORIANS, G.H. 1990. "Ecological Concepts of Sustainability." **ENVIRONMENT.** 32(9): 10-39.

ORTOLANO, L. 1984. **ENVIRONMENTAL PLANNING AND DECISION-MAKING.** Toronto. John Wiley and Sons.

ORTON, D. 1990. **SUSTAINABLE DEVELOPMENT: EXPANDED ENVIRONMENTAL DESTRUCTION.** Green Web, Toronto.

OWENS, S. 1991. "Energy Efficiency and Sustainable Land Use Patterns." **TOWN AND COUNTRY PLANNING.** 60(2): 44-45.

PAEHLKE, R.C. 1991. **THE ENVIRONMENTAL EFFECTS OF URBAN INTENSIFICATION.** Ontario Ministry of Municipal Affairs, Toronto.

PATTERSON, J. 1991. "Introducing Sustainable Cities." **SUSTAINABLE CITIES (IUS NEWSLETTER SUPPLEMENT).** Winnipeg. pp. 1-6.

PATTERSON, J. 1992. "Transport to Work: Eight Selected Cities. " **SUSTAINABLE CITIES (IUS NEWSLETTER SUPPLEMENT)** Winnipeg. Issue 2. pp. 1-5.

PENNING-ROWSELL, E.C. 1982. "A Public Preference Evaluation of Landscape Quality". **REGIONAL STUDIES** 16(2): 97-112.

PIRAGES, D.C. 1977. **THE SUSTAINABLE SOCIETY: IMPLICATIONS FOR LIMITED GROWTH.** New York. Praeger Publishers.

PONTING, C. 1990. "Historical Perspectives on Sustainable Development." **ENVIRONMENT.** 32(9): 4-33.

POTVIN, J.R. 1991. INDICATORS OF ECOLOGICALLY SUSTAINABLE DEVELOPMENT: SYNTHESIZED WORKSHOP PROCEEDINGS. CANADIAN ENVIRONMENTAL ADVISORY COUNCIL. Ottawa.

POULTON, M.C. 1982. "The Best Pattern of Residential Streets". JOURNAL OF THE AMERICAN PLANNING ASSOCIATION 48(4): 466-480.

REDCLIFT, M. 1987. SUSTAINABLE DEVELOPMENT. EXPLORING THE CONTRADICTIONS. Metheun, New York.

REES, W.E. 1988. SUSTAINABLE DEVELOPMENT AND HOW TO ACHIEVE IT. UBC Planning Papers, School of Community and Regional Planning.

REES, W.E. 1989. THE ECOLOGICAL MEANING OF ENVIRONMENT - ECONOMY INTEGRATION. UBC Planning Papers, School of Community and Regional Planning.

REES, W. 1990. " The Ecology of Sustainable Development". THE ECOLOGIST. 20(1): 18-23.

REES, W.E. (ed.) 1990. PLANNING FOR SUSTAINABLE DEVELOPMENT: A RESOURCE BOOK. The University of British Columbia, Vancouver, UBC Centre for Human Settlements.

REES, W.E. and M. ROSELAND. 1991. "Sustainable Communities: Planning for the 21st Century." PLAN CANADA. 31(3): 15-26.

REID, W.V.C. 1989. "Sustainable Development: Lessons From Success." ENVIRONMENT. 31(4): 7-35.

RICHARDSON, N. 1989. LAND USE PLANNING AND SUSTAINABLE DEVELOPMENT IN CANADA. Ottawa, Ontario. Canadian Environmental Advisory Council.

ROSELAND, M. 1992. "Linking Affordable Housing and Environmental Protection: A New Framework for Sustainable Urban Development Policy". In, M.A. Beavis (ed.) COLLOQUIUM ON SUSTAINABLE HOUSING AND URBAN DEVELOPMENT, Winnipeg, pp. 83-97.

RUCKELSHAUS, W. 1989. "Toward A Sustainable World." SCIENTIFIC AMERICAN. 261(3): 166-174.

RUITENBEEK, H.J. 1991. INDICATORS OF ECOLOGICALLY SUSTAINABLE DEVELOPMENT: TOWARDS NEW FUNDAMENTALS. CANADIAN ENVIRONMENTAL ADVISORY COUNCIL. Ottawa.

RYDIN, Y. 1992. "Environmental dimensions of residential development and the implications for local planning practice." JOURNAL OF ENVIRONMENTAL PLANNING AND MANAGEMENT. 35(1): 43-61.

SAARINEN, T.F. 1976. ENVIRONMENTAL PLANNING: PERCEPTION AND BEHAVIOR. Houghton Mifflin, Boston.

SCHOOL FOR RESOURCE AND ENVIRONMENTAL STUDIES. 1987. TOWARDS A CONSERVATION STRATEGY FOR THE PEOPLE AND RESOURCES OF NOVA SCOTIA. Dalhousie University, Halifax.

SCIENCE COUNCIL OF CANADA. 1988. ENVIRONMENTAL PEACEKEEPERS: SCIENCE, TECHNOLOGY, AND SUSTAINABLE DEVELOPMENT IN CANADA. Ottawa.

SIMMONS, I.C. 1989. CHANGING THE FACE OF THE EARTH. CULTURE, ENVIRONMENT, HISTORY. Basil Blackwell, Cambridge Mass..

SIMMONS, M., D. DAVIS, L. GRIFFITHS, A. MUECKE. 1984 (reprinted 1989). NATURAL HISTORY OF NOVA SCOTIA. Nova Scotia Department of Education and Department of Lands and Forests. Halifax.

SMITH, D. 1992. "Local Area Conservation: How One Suburban Municipality Utilizes Environmental Planning to Conserve its Natural Heritage." PLAN CANADA 29(5): 39-42.

SMITH, W.H. 1970. "Trees in the City". JOURNAL OF THE AMERICAN INSTITUTE OF PLANNERS 36: 429-435.

STARK, L. 1990. SIGNS OF HOPE. WORKING TOWARDS OUR COMMON FUTURE. Oxford University Press, New York.

STERN, R., R. WHITE and J. WHITNEY (eds.) 1992. SUSTAINABLE CITIES: URBANIZATION AND THE ENVIRONMENT IN INTERNATIONAL PERSPECTIVE. Westview Press, Boulder, Colorado.

STUART, D.G. 1968. "Planning for Pedestrians". JOURNAL OF THE AMERICAN INSTITUTE OF PLANNERS 34: 37-41.

TASKER-BROWN, J. 1992. "The Regulatory Framework and the Development of Sustainable Housing and Communities." In M.A. Beavis (ed.), COLLOQUIUM, pp. 51-69.

TAYLOR, A. and D. HEATHCOTE-AMORY. 1991. "Planning for Sustainable Development." TOWN AND COUNTRY PLANNING. 60(1): 16-18.

96

TAYLOR, J. 1989. "Sustainable Development in the Rural Landscape." LANDSCAPE ARCHITECTURAL REVIEW. 10(1): 13-15.

THAYER, R.L. (Jr.). 1989. "The Experience of Sustainable Landscapes." LANDSCAPE JOURNAL. 8(2): 101-110.

THOMPSON, W.J. 1992. "Is it Sustainable? Is it Art?" LANDSCAPE ARCHITECTURE. (May): 56-60.

TISDELL, C.A. 1990. NATURAL RESOURCES, GROWTH AND DEVELOPMENT ECONOMICS, ECOLOGY AND RESOURCE SCARCITY. Praeger, New York.

TOLBA, M.K. 1987. SUSTAINABLE DEVELOPMENT CONSTRAINTS AND OPPORTUNITIES. Butterworths, Boston.

TOMALTY, R. and S. HENDLER. 1991. "Green Planning: Striving Towards Sustainable Development in Ontario's Municipalities." PLAN CANADA. 31(3): 27-32

ULRICH, R.S. 1986. "Human Responses to Vegetation and Landscapes". LANDSCAPE AND URBAN PLANNING 13: 29-44.

VICTOR, P.A. 1991. "Indicators of Sustainable Development: Some Lessons from Capital Theory". ECOLOGICAL ECONOMICS 4: 191-213.

VICTOR, P.A., J.J. KAY, H.J. RUITENBEEK. 1991. INDICATORS OF ECOLOGICALLY SUSTAINABLE DEVELOPMENT: ECONOMIC, ECOLOGICAL AND DECISION THEORIES. CANADIAN ENVIRONMENTAL ADVISORY COUNCIL. Ottawa.

WEISS, E.B. 1990. "In Fairness to Future Generations". ENVIRONMENT. 32(3): 7-11.

WHITE, R. and J. WHITNEY. "Cities and the Environment: An Overview." In, SUSTAINABLE CITIES: URBANIZATION AND THE ENVIRONMENT IN INTERNATIONAL PERSPECTIVE. R. Stern, R. White and J. Whitney, (eds.). Westview Press, Boulder. pp. 8-51.

WHITELY, R. 1962. "The Visual Impact of Communities". HABITAT 5(6): 13-17.

WICHERN, P.H. 1992. "The Politics of Sustainable Urban Development Policy in Canada". In M.A. Beavis (ed.), COLLOQUIUM, pp. 23-36.

WORLD COMMISSION ON ENVIRONMENT AND DEVELOPMENT (WCED). 1987. OUR COMMON FUTURE. Oxford University Press, New York. (Brundtland Commission).

YEATS, M. 1985. LAND IN CANADA'S URBAN HEARTLAND. Land Use in Canada Series, Number 27. Lands Directorate, Environment Canada.

Appendix A: Evaluation Framework

The study team used evaluation forms for summarizing the findings of provincial policies and regulations, and local policies and regulations. (The primary, secondary, and tertiary indicators refer to the IUCN classification system discussed in Part One.)

INDICATOR EVALUATION

AIM A	INITIATIVE	INITIATIVE DESCRIPTION					
to maintain and restore natural processes & functions	IN PLACE	Encourages	Allows	Neutral	Discourages	Prohibits
	None GEN. POLICY					
	IMPLEMENTATION					
	RESULTS					
COMMENTS						

INDICATOR LEVEL

OVERALL EVALUATION	PRIMARY	• landscape structure (matrix integrity, patch/patch and patch/matrix connectivity, natural corridors maintained) • species preservation
	SECONDARY	
	TERTIARY	• natural structures mapped/function interpreted/management designated • environmental review required to consider function • policy to maintain/restore natural processes/functions • programs to maintain/restore natural processes/functions • policy to limit impact of development on natural processes
COMMENTS		

guideline 1A	INITIATIVE	INITIATIVE DESCRIPTION				
maintain vegetation	IN PLACE	Encourages	Allows	Neutral	Discourages	Prohibits
	None — GEN. POLICY					
	IMPLEMENTATION					
	RESULTS					
COMMENTS						

OVERALL EVALUATION	INDICATOR LEVEL	
	PRIMARY	• % of land base vegetated • vegetated structure(matrix, patches,corridors) and the relationship between these • presence of representative indigenous vegetation
	SECONDARY	
	TERTIARY	• tree cutting bylaw • buffer zone protection(lakes,rivers)

guideline 2A	INITIATIVE	INITIATIVE DESCRIPTION				
maintain natural drainage	IN PLACE	Encourages	Allows	Neutral	Discourages	Prohibits
	None — GEN. POLICY					
	IMPLEMENTATION					
	RESULTS					
COMMENTS						

OVERALL EVALUATION	INDICATOR LEVEL	
	PRIMARY	• no net change in runoff after development • natural drainage structures maintained(streams,gullies)
	SECONDARY	• change in river/wetlands volumes • channelisation • impermeable surfaces
	TERTIARY	• grassed drainage ditches allowed • storm/sewage water separated • retention ponds allowed

Appendix A: Evaluation Framework

guideline 3A	INITIATIVE	INITIATIVE DESCRIPTION					
avoid development on flood plains	IN PLACE	Encourages	Allows	Neutral	Discourages	Prohibits	
	None GEN. POLICY						
	IMPLEMENTATION						
	RESULTS						
COMMENTS							

INDICATOR LEVEL

OVERALL EVALUATION	PRIMARY	• % of floodplains free of modification
	SECONDARY	
	TERTIARY	• floodplains protected by policy(20 years,100 years) • floodplains mapped • buffer zone protected

guideline 4A	INITIATIVE	INITIATIVE DESCRIPTION					
protect waterways from development	IN PLACE	Encourages	Allows	Neutral	Discourages	Prohibits	
	None GEN. POLICY						
	IMPLEMENTATION						
	RESULTS						
COMMENTS							

INDICATOR LEVEL

OVERALL EVALUATION	PRIMARY	
	SECONDARY	• area filled or altered • banks eroded • fish habitat destroyed • water lots granted
	TERTIARY	• policy to limit alterations to waterways • buffer zone protection • performance standards • development on steep slopes, erosion prone soils and acid-generating slates controlled

A:3

guideline 5A	INITIATIVE	INITIATIVE DESCRIPTION				
restore or rehabilitate damaged environments	IN PLACE	Encourages	Allows	Neutral	Discourages	Prohibits
	None GEN. POLICY					
	IMPLEMENTATION					
	RESULTS					
COMMENTS						

INDICATOR LEVEL

OVERALL EVALUATION	PRIMARY	• revegetating degraded areas(early to mid-succession proceeding unimpaired-disturbance removed) • hectares of restored environments
	SECONDARY	• hectares damaged or degraded
	TERTIARY	• restoration policy(hectares restored) • damaged habitats identified and mapped • funding available • monitoring of restored areas

INDICATOR EVALUATION

AIM B	INITIATIVE	INITIATIVE DESCRIPTION				
to protect natural resources for future generations	IN PLACE	Encourages	Allows	Neutral	Discourages	Prohibits
	None GEN. POLICY					
	IMPLEMENTATION					
	RESULTS					
COMMENTS						

INDICATOR LEVEL

OVERALL EVALUATION	PRIMARY	• resource lands protected from destructive development practices(% of total land base___) • open space ratio(% of open space to total space ___)
	SECONDARY	
	TERTIARY	• resource lands identified/mapped/designated • municipal purchase policy for conservation lands(yes/no) • municipal round table for sustainable development • environmental assessment/audit required to consider resources • municipal designation of ESA's

Appendix A: Evaluation Framework

guideline 1B	INITIATIVE	INITIATIVE DESCRIPTION				
protect forested land	IN PLACE	Encourages	Allows	Neutral	Discourages	Prohibits
	None	GEN. POLICY					
		IMPLEMENTATION					
		RESULTS					

COMMENTS

OVERALL EVALUATION	INDICATOR LEVEL	
	PRIMARY	• old growth forest protected(total ha: __) • representative forest habitats protected(total ha: __) • other forested lands protected(total ha: __) • reforested areas protected(total ha: __)
	SECONDARY	
	TERTIARY	• forest lands identified/mapped/designated • forest management plan(provincial level) • tree cutting policy

guideline 2B	INITIATIVE	INITIATIVE DESCRIPTION				
protect farm land	IN PLACE	Encourages	Allows	Neutral	Discourages	Prohibits
	None	GEN. POLICY					
		IMPLEMENTATION					
		RESULTS					

COMMENTS

OVERALL EVALUATION	INDICATOR LEVEL	
	PRIMARY	• farmland using organic regimes protected from development(% of total __) • municipal agriculture("backyard" farming) • municipal community farming(garden plots)
	SECONDARY	
	TERTIARY	• farmland identified/mapped/designated • land management practices(erosion control) • farmland protected from development • food products in landscaping promoted/encouraged/enabled • community gardening programs(provincial property and co-op lots)

A:5

guideline 3B	INITIATIVE	INITIATIVE DESCRIPTION				
protect topsoil	IN PLACE	Encourages	Allows	Neutral	Discourages	Prohibits
	None · GEN. POLICY					
	IMPLEMENTATION					
	RESULTS					
COMMENTS						

INDICATOR LEVEL

OVERALL EVALUATION	PRIMARY	• depth(quantity) • content(quality) • cover • access
	SECONDARY	• soil erosion control • control top soil "shopping" • control of dumping wastes • control of pesticides,herbicides,fertilisers • soil conservation practices
	TERTIARY	• requirement to store and protect during construction • soil type/capability identified/mapped/designated

guideline 4B	INITIATIVE	INITIATIVE DESCRIPTION				
protect mineral deposits	IN PLACE ·	Encourages	Allows	Neutral	Discourages	Prohibits
	None GEN. POLICY					
	IMPLEMENTATION					
	RESULTS					
COMMENTS						

INDICATOR LEVEL

OVERALL EVALUATION	PRIMARY	• mineral lands protected ha: __ (% of total designated)
	SECONDARY	• mineral resources depleted
	TERTIARY	• reclamation plan • limit structures over mineral sites • conservation and recycling in effect • mineral resources identified/mapped/designated

guideline 5B	INITIATIVE	INITIATIVE DESCRIPTION				
protect lakes	IN PLACE	Encourages	Allows	Neutral	Discourages	Prohibits
	None GEN. POLICY					
	IMPLEMENTATION					
	RESULTS					

COMMENTS

INDICATOR LEVEL

OVERALL EVALUATION	PRIMARY	• water quality • water quantity
	SECONDARY	• beach closures(days per beach per year)
	TERTIARY	• water resources identified/mapped/designated • volume used per capita • buffer zone protection • conservation program • water supply protection

guideline 6B	INITIATIVE	INITIATIVE DESCRIPTION				
protect rivers and streams	IN PLACE	Encourages	Allows	Neutral	Discourages	Prohibits
	None GEN. POLICY					
	IMPLEMENTATION					
	RESULTS					

COMMENTS

INDICATOR LEVEL

OVERALL EVALUATION	PRIMARY	• water quality(dissolved oxygen,chemicals/toxins,suspended solids) • water quantity(dry weather volume,peak flow volume)
	SECONDARY	
	TERTIARY	• water resources identified/mapped/designated • floodplain protection • waste dumping controlled(effluent quality,snow dumping,road salt,lawn chemicals) • buffer zone protection

A:7

guideline 7B protect wetlands	INITIATIVE IN PLACE		INITIATIVE DESCRIPTION				
			Encourages	Allows	Neutral	Discourages	Prohibits
	None	GEN. POLICY					
		IMPLEMENTATION					
		RESULTS					
COMMENTS							

	INDICATOR LEVEL	
OVERALL EVALUATION	PRIMARY	• habitat function protected(% of total wetlands __) • hydrologic function protected
	SECONDARY	• hectares filled,dyked,destroyed(% of total __) • hectares of peat cut
	TERTIARY	• wetlands identified/mapped/designated • conservation policy • fill policy

guideline 8B protect groundwater	INITIATIVE IN PLACE		INITIATIVE DESCRIPTION				
			Encourages	Allows	Neutral	Discourages	Prohibits
	None	GEN. POLICY					
		IMPLEMENTATION					
		RESULTS					
COMMENTS							

	INDICATOR LEVEL	
OVERALL EVALUATION	PRIMARY	• water quality(chemicals,toxins,salinity) • water quantity
	SECONDARY	• volume used per capita • # of wells versus serviced lots • incidence of groundwater contamination(reported)
	TERTIARY	• groundwater resources identified/mapped/designated • conservation policy/program • monitoring of discharges(septic systems,dumping)

guideline 9B	INITIATIVE	INITIATIVE DESCRIPTION				
protect coastal areas	IN PLACE	Encourages	Allows	Neutral	Discourages	Prohibits
	None GEN. POLICY					
	IMPLEMENTATION					
	RESULTS					
COMMENTS						

INDICATOR LEVEL

OVERALL EVALUATION	PRIMARY	• water quality • representative habitats protected
	SECONDARY	• aquaculture farms • shellfish closures
	TERTIARY	• controls on effluents and dumping • habitat mapping • coastal zone management/plan

guideline 10B	INITIATIVE	INITIATIVE DESCRIPTION				
protect atmosphere	IN PLACE	Encourages	Allows	Neutral	Discourages	Prohibits
	None GEN. POLICY					
	IMPLEMENTATION					
	RESULTS					
COMMENTS						

INDICATOR LEVEL

OVERALL EVALUATION	PRIMARY	• air quality(particulates,chemicals/gases,ozone)
	SECONDARY	• point source emissions(monitor stacks for NOX,SO2,CO2,particulates) • non-point source(fossil fuels burned)
	TERTIARY	• industrial location policy • waste management(incineration ?)

INDICATOR EVALUATION

AIM C to minimize settlement impacts on ecosystems	INITIATIVE IN PLACE	INITIATIVE DESCRIPTION				
		Encourages	Allows	Neutral	Discourages	Prohibits
	None	GEN. POLICY				
		IMPLEMENTATION				
		RESULTS				
COMMENTS						

INDICATOR LEVEL

OVERALL EVALUATION	PRIMARY	• functioning of ecosystems • landscape natural functional linkage protected(corridors,species/material movements) • successional processes protected
	SECONDARY	
	TERTIARY	• policy to minimize settlement impacts

guideline 1C to minimize sprawl	INITIATIVE IN PLACE	INITIATIVE DESCRIPTION				
		Encourages	Allows	Neutral	Discourages	Prohibits
	None	GEN. POLICY				
		IMPLEMENTATION				
		RESULTS				
COMMENTS						

INDICATOR LEVEL

OVERALL EVALUATION	PRIMARY	• vegetation matrix protected(natural vegetation or agricultural)
	SECONDARY	• hectares of modified landscape(% of total regional landscape)
	TERTIARY	• policy to increase density/compactness(infill,residential conversions,cluster development) • greenbelt zone • transportation policy

guideline 2C	INITIATIVE IN PLACE	INITIATIVE DESCRIPTION					
to optimize density		Encourages	Allows	Neutral	Discourages	Prohibits	
	None GEN. POLICY						
	IMPLEMENTATION						
	RESULTS						
COMMENTS							

OVERALL EVALUATION	INDICATOR LEVEL	
	PRIMARY	• residential development as patches in natural or managed/agricultural matrix
	SECONDARY	• net residential density(# of dwelling units per ha of residential land)
	TERTIARY	• lot size(minimum __maximum __) • lot coverage • lot frontage • setback • side yard

guideline 3C	INITIATIVE IN PLACE	INITIATIVE DESCRIPTION					
restrict amount of impermeable surface and runoff		Encourages	Allows	Neutral	Discourages	Prohibits	
	None GEN. POLICY						
	IMPLEMENTATION						
	RESULTS						
COMMENTS							

OVERALL EVALUATION	INDICATOR LEVEL	
	PRIMARY	• water quantity in rivers,aquifers
	SECONDARY	• impermeable surface ratio(hectares of impermeable surface to total surface)
	TERTIARY	• policy to encourage permeable surfaces(limit channelisation,retain natural drainage structures/form) • road width policy

guideline 4C	INITIATIVE	INITIATIVE DESCRIPTION				
minimize interference with site processes in site planning	IN PLACE	Encourages	Allows	Neutral	Discourages	Prohibits
	None	GEN. POLICY					
		IMPLEMENTATION					
		RESULTS					
COMMENTS						

	INDICATOR LEVEL	
OVERALL EVALUATION	PRIMARY	
	SECONDARY	
	TERTIARY	• controls on cut and fill • roads aligned along contours

guideline 5C	INITIATIVE	INITIATIVE DESCRIPTION				
minimize health impacts	IN PLACE	Encourages	Allows	Neutral	Discourages	Prohibits
	None	GEN. POLICY					
		IMPLEMENTATION					
		RESULTS					
COMMENTS						

	INDICATOR LEVEL	
OVERALL EVALUATION	PRIMARY	
	SECONDARY	
	TERTIARY	• controls on septic fields • monitoring of septic systems • controls on fill quality(top soil) • controls on pets(around lakes) • regulation of chemicals(lawn spray,dumping)

INDICATOR EVALUATION

AIM D	INITIATIVE	INITIATIVE DESCRIPTION				
to reduce use of resources	IN PLACE	Encourages	Allows	Neutral	Discourages	Prohibits
	None — GEN. POLICY					
	IMPLEMENTATION					
	RESULTS					
COMMENTS						

INDICATOR LEVEL

OVERALL EVALUATION	PRIMARY	• using renewable resources and managing for renewable resource regeneration • amount of non-recyclable waste generated per household
	SECONDARY	• import of non-renewable resources(fossil fuels,minerals)
	TERTIARY	• policy to conserve,reduce,recycle

guideline 1D	INITIATIVE	INITIATIVE DESCRIPTION				
use site planning and landscape design to reduce energy requirements	IN PLACE	Encourages	Allows	Neutral	Discourages	Prohibits
	None — GEN. POLICY					
	IMPLEMENTATION					
	RESULTS					
COMMENTS						

INDICATOR LEVEL

OVERALL EVALUATION	PRIMARY	• % of houses taking advantage of passive solar design • shelter belts/structure in landscape design(for maximum insolation and wind protection in winter and cooling in summer)
	SECONDARY	
	TERTIARY	• policy to encourage passive solar design • policy to encourage protection from wind • "right to sun" protection

Appendix A: Evaluation Framework

guideline 2D	INITIATIVE	INITIATIVE DESCRIPTION				
promote alternative (renewable) energy sources	IN PLACE	Encourages	Allows	Neutral	Discourages	Prohibits
	None	GEN. POLICY					
		IMPLEMENTATION					
		RESULTS					

COMMENTS

	INDICATOR LEVEL	
OVERALL EVALUATION	PRIMARY	• % of households using alternative sources(renewable)
	SECONDARY	
	TERTIARY	• policy to promote passive solar • active solar • district heating • wind power • natural gas • small scale hydro • high efficiency heating

guideline 3D	INITIATIVE	INITIATIVE DESCRIPTION				
recognize housing types as promoting energy conservation	IN PLACE	Encourages	Allows	Neutral	Discourages	Prohibits
	None	GEN. POLICY					
		IMPLEMENTATION					
		RESULTS					

COMMENTS

	INDICATOR LEVEL	
OVERALL EVALUATION	PRIMARY	
	SECONDARY	
	TERTIARY	• R2000 homes program • encourage passive solar homes • encourage two storey homes • encourage insulation standards • encourage alternative building technologies • encourage contour buildings

Appendix A: Evaluation Framework

guideline 4D	INITIATIVE	INITIATIVE DESCRIPTION				
reduce energy use for transportation	IN PLACE	Encourages	Allows	Neutral	Discourages	Prohibits
	None GEN. POLICY					
	IMPLEMENTATION					
	RESULTS					
COMMENTS						

INDICATOR LEVEL

OVERALL EVALUATION	PRIMARY	• fuel use per capita
	SECONDARY	
	TERTIARY	• proximity planning • mixed use zoning • home occupations • transportation policy(downtown parking,park and ride,transit)

guideline 5D	INITIATIVE	INITIATIVE DESCRIPTION				
promote alternative types of transportation	IN PLACE	Encourages	Allows	Neutral	Discourages	Prohibits
	None GEN. POLICY					
	IMPLEMENTATION					
	RESULTS					
COMMENTS						

INDICATOR LEVEL

OVERALL EVALUATION	PRIMARY	• riders of mass transit at rush hour • % of people walking or cycling to work
	SECONDARY	
	TERTIARY	• mass transit policy • car pooling • policy to require facilities for cyclers/joggers at workplace

guideline 6D	INITIATIVE	INITIATIVE DESCRIPTION				
promote water conservation	IN PLACE	Encourages	Allows	Neutral	Discourages	Prohibits
	None — GEN. POLICY					
	IMPLEMENTATION					
	RESULTS					
COMMENTS						

INDICATOR LEVEL

OVERALL EVALUATION	PRIMARY	• water use per capita(litres)
	SECONDARY	
	TERTIARY	• meter water use • promote use of cisterns • promote use of retention ponds • promote water conservation • re-use of grey water

INDICATOR EVALUATION

AIM E	INITIATIVE	INITIATIVE DESCRIPTION				
to reduce use waste outputs	IN PLACE	Encourages	Allows	Neutral	Discourages	Prohibits
	None — GEN. POLICY					
	IMPLEMENTATION					
	RESULTS					
COMMENTS						

INDICATOR LEVEL

OVERALL EVALUATION	PRIMARY	• per capita solid waste generated • per capita liquid waste generated • per capita air emissions generated
	SECONDARY	
	TERTIARY	• policy to reduce/recycle wastes • tipping fee • limits on # of garbage bags • goods exchange program

guideline 1E	INITIATIVE	INITIATIVE DESCRIPTION					
treat waste water	IN PLACE	Encourages	Allows	Neutral	Discourages	Prohibits	
	None	GEN. POLICY					
		IMPLEMENTATION					
		RESULTS					

COMMENTS

	INDICATOR LEVEL	
OVERALL EVALUATION	PRIMARY	• % of waste water treated(primary,secondary,tertiary)
	SECONDARY	• # of overflow events
	TERTIARY	• policy to treat all waste water

guideline 2E	INITIATIVE	INITIATIVE DESCRIPTION					
collect hazardous waste	IN PLACE	Encourages	Allows	Neutral	Discourages	Prohibits	
	None	GEN. POLICY					
		IMPLEMENTATION					
		RESULTS					

COMMENTS

	INDICATOR LEVEL	
OVERALL EVALUATION	PRIMARY	
	SECONDARY	
	TERTIARY	• policy to control hazardous wastes • monitoring of industrial wastes • waste exchange program • household hazardous waste collection

guideline 3E	INITIATIVE	INITIATIVE DESCRIPTION				
promote conservation technologies	IN PLACE	Encourages	Allows	Neutral	Discourages	Prohibits
	None GEN. POLICY					
	IMPLEMENTATION					
	RESULTS					
COMMENTS						

	INDICATOR LEVEL	
OVERALL EVALUATION	PRIMARY	• % of households participating in recycling program
	SECONDARY	
	TERTIARY	• educational program • policy to reduce construction wastes • municipal conservation policies(asphalt recycling)

guideline 4E	INITIATIVE	INITIATIVE DESCRIPTION				
promote composting	IN PLACE	Encourages	Allows	Neutral	Discourages	Prohibits
	None GEN. POLICY					
	IMPLEMENTATION					
	RESULTS					
COMMENTS						

	INDICATOR LEVEL	
OVERALL EVALUATION	PRIMARY	• % of households with compost box/access
	SECONDARY	
	TERTIARY	• municipal composting program • policy to promote household composting

guideline 5E	INITIATIVE	INITIATIVE DESCRIPTION				
monitor air quality	IN PLACE	Encourages	Allows	Neutral	Discourages	Prohibits
	None GEN. POLICY					
	IMPLEMENTATION					
	RESULTS					
COMMENTS						

		INDICATOR LEVEL
OVERALL EVALUATION	PRIMARY	• air quality(SO$_2$,NO$_x$,CO$_2$,SPM)
	SECONDARY	• monitor point sources
	TERTIARY	• policy to promote clean technologies

INDICATOR EVALUATION

AIM F	INITIATIVE	INITIATIVE DESCRIPTION				
to increase public involvement	IN PLACE	Encourages	Allows	Neutral	Discourages	Prohibits
	None GEN. POLICY					
	IMPLEMENTATION					
	RESULTS					
COMMENTS						

		INDICATOR LEVEL
OVERALL EVALUATION	PRIMARY	• voter turnout,municipal elections • # of citizens active in community affairs
	SECONDARY	
	TERTIARY	• policy to promote involvement • municipal committees,etc. to allow involvement • procedures in place to facilitate involvement

Appendix A: Evaluation Framework

guideline 1F	INITIATIVE	INITIATIVE DESCRIPTION					
involve community groups in sustainability initiatives	IN PLACE	Encourages	Allows	Neutral	Discourages	Prohibits	
	None GEN. POLICY						
	IMPLEMENTATION						
	RESULTS						

COMMENTS

INDICATOR LEVEL

OVERALL EVALUATION	PRIMARY	• community groups interested in sustainability(present/absent) • community groups engaged in sustainable projects(yes/no)
	SECONDARY	
	TERTIARY	• policy/programs to involve community groups

guideline 2F	INITIATIVE	INITIATIVE DESCRIPTION					
assign municipal staff person to promote sustainable development	IN PLACE	Encourages	Allows	Neutral	Discourages	Prohibits	
	None GEN. POLICY						
	IMPLEMENTATION						
	RESULTS						

COMMENTS

INDICATOR LEVEL

OVERALL EVALUATION	PRIMARY	• staff person responsible for sustainable development(yes/no)
	SECONDARY	
	TERTIARY	• policy to encourage staff to consider sustainability

A:20

guideline 3F	INITIATIVE	INITIATIVE DESCRIPTION					
recognize the needs of different user groups	IN PLACE	Encourages	Allows	Neutral	Discourages	Prohibits	
	None · GEN. POLICY						
	IMPLEMENTATION						
	RESULTS						
COMMENTS							

INDICATOR LEVEL		
OVERALL EVALUATION	PRIMARY	
	SECONDARY	
	TERTIARY	• policy/programs on accessibility for challenged groups • policy/programs on accessibility for minority groups • policy/programs to promote access to housing • policy/programs to promote access to recreation

guideline 4F	INITIATIVE	INITIATIVE DESCRIPTION					
promote stewardship	IN PLACE	Encourages	Allows	Neutral	Discourages	Prohibits	
	None · GEN. POLICY						
	IMPLEMENTATION						
	RESULTS						
COMMENTS							

INDICATOR LEVEL		
OVERALL EVALUATION	PRIMARY	• community stewards programs • environmental ethics/education programs in schools • "green" schoolyards
	SECONDARY	
	TERTIARY	• policy to promote private stewardship of the land

INDICATOR EVALUATION

AIM G	INITIATIVE	INITIATIVE DESCRIPTION				
to promote efficiency, choice and adequacy in housing	IN PLACE	Encourages	Allows	Neutral	Discourages	Prohibits
	None GEN. POLICY					
	IMPLEMENTATION					
	RESULTS					
COMMENTS						

INDICATOR LEVEL

OVERALL EVALUATION	PRIMARY	• vacancy rate(more than 2.5%) • vacancy rate(3 bedroom) • mean market rate(not more than __ % above welfare housing allowance • mean market conditions(meets all standards)
	SECONDARY	
	TERTIARY	• policy to promote efficiency in housing • policy to promote choice in housing • policy to promote adequacy in housing • housing office, officer or committee • municipal land banking

guideline 1G	INITIATIVE	INITIATIVE DESCRIPTION				
provide affordable housing as a priority	IN PLACE	Encourages	Allows	Neutral	Discourages	Prohibits
	None GEN. POLICY					
	IMPLEMENTATION					
	RESULTS					
COMMENTS						

INDICATOR LEVEL

OVERALL EVALUATION	PRIMARY	• units of social housing(% of total housing stock)
	SECONDARY	
	TERTIARY	• policy to provide affordable housing • policy to promote co-operative housing • policy to promote senior housing • regulations on lot size

guideline 2G	INITIATIVE IN PLACE		INITIATIVE DESCRIPTION				
promote a variety of dwelling types			Encourages	Allows	Neutral	Discourages	Prohibits
	None	GEN. POLICY					
		IMPLEMENTATION					
		RESULTS					
COMMENTS							

	INDICATOR LEVEL	
OVERALL EVALUATION	PRIMARY	• units of detached housing as % of total housing units
	SECONDARY	
	TERTIARY	• policy to allow variety of dwelling types • policy to allow mobile homes

INDICATOR EVALUATION

AIM H	INITIATIVE IN PLACE		INITIATIVE DESCRIPTION				
to provide healthy and healthful communities			Encourages	Allows	Neutral	Discourages	Prohibits
	None	GEN. POLICY					
		IMPLEMENTATION					
		RESULTS					
COMMENTS							

	INDICATOR LEVEL	
OVERALL EVALUATION	PRIMARY	• crime rates(violent crimes) • rates of "environmental" illnesses(e.g. "point source" cancer) • educational achievement • infant mortality rates • longevity
	SECONDARY	• income per capita • % of households with a kitchen garden
	TERTIARY	• Healthy Community initiative • Strengthening Community Health project • policy to encourage home gardens

guideline 1H	INITIATIVE IN PLACE		INITIATIVE DESCRIPTION				
promote community health			Encourages	Allows	Neutral	Discourages	Prohibits
	None	GEN. POLICY					
		IMPLEMENTATION					
		RESULTS					

COMMENTS

	INDICATOR LEVEL	
OVERALL EVALUATION	PRIMARY	• ratio of social assistance rate to poverty line
	SECONDARY	
	TERTIARY	• policy to promote community health(Well Woman's Clinic,prevention programs) • staff assigned to health promotion

guideline 2H	INITIATIVE IN PLACE		INITIATIVE DESCRIPTION				
evaluate health risks in decision making			Encourages	Allows	Neutral	Discourages	Prohibits
	None	GEN. POLICY					
		IMPLEMENTATION					
		RESULTS					

COMMENTS

	INDICATOR LEVEL	
OVERALL EVALUATION	PRIMARY	
	SECONDARY	
	TERTIARY	• policy to consider health risks before decision

guideline 3H	INITIATIVE	INITIATIVE DESCRIPTION				
promote individual and group health with social policies	IN PLACE	Encourages	Allows	Neutral	Discourages	Prohibits
	None	GEN. POLICY					
		IMPLEMENTATION					
		RESULTS					
COMMENTS						

	INDICATOR LEVEL		
OVERALL EVALUATION	PRIMARY	• death rates(heart disease,cancer) • literacy rate
	SECONDARY	
	TERTIARY	• municipal policy/programs(e.g. no smoking,composting,community cleanup) • educational programs(health promotion,environment/conservation,sustainable communities)

guideline 4H	INITIATIVE	INITIATIVE DESCRIPTION				
promote community support of local schools and facilities	IN PLACE	Encourages	Allows	Neutral	Discourages	Prohibits
	None	GEN. POLICY					
		IMPLEMENTATION					
		RESULTS					
COMMENTS						

	INDICATOR LEVEL		
OVERALL EVALUATION	PRIMARY	• % of children in community bussed to school • % of children who can walk to a park or playground
	SECONDARY	
	TERTIARY	• policy to support local schools • policy to provide local parks and playgrounds

Appendix A: Evaluation Framework

guideline 5H	INITIATIVE	INITIATIVE DESCRIPTION				
promote a range of tenure types	IN PLACE	Encourages	Allows	Neutral	Discourages	Prohibits
	None	REG. POLICY					
		IMPLEMENTATION					
		RESULTS					
COMMENTS						

INDICATOR LEVEL

OVERALL EVALUATION	PRIMARY	• % of people who own their homes
	SECONDARY	
	TERTIARY	• policy to promote range of tenure(ownership,rented,co-operative)

COMMENTS

Appendix B: Survey Question Framework

The study team formulated questions for each group of respondents. The questions served as a framework for semi-structured interviews with respondents. Most respondents received the questions prior to the interview so that they could prepare for the discussion.

QUESTIONS FOR PLANNERS

1. Does your municipality purchase conservation lands to protect them?
   - If yes, how many hectares of conservation lands does the municipality hold?
   - For what conservation purposes are they held?
   - Does the municipality have a management plan(s) for conservation lands?
2. Does your municipality have a "municipal round table on environment and economy" (or some similar group promoting sustainable development)?
3. Does your municipality put development projects through an environmental review or audit? If yes, in what circumstances?
   - What is examined in the review?
   - Are health risks or impacts evaluated?
4. Has your municipality designated environmentally sensitive areas for protection?
   - If yes, which ones?
5. What is the ratio of designated open space to total land holdings within the municipality?
   - [total hectares of open space:
   - hectares of protected/conservation/environmental open space
   - total hectares within municipality:
6. Has your municipality acquired flood plain mapping for waterways within your jurisdiction?
   - If yes, is flood plain mapping used for the designation of flood plains?
7. Does your municipality have water quality information on lakes, rivers, streams, or ground water within your jurisdiction?
8. Has your municipality mapped forested lands within your jurisdiction?
   - Has your municipality designated any forested lands for protection or conservation?
     - If yes, how many hectares?
     - What types of forested land?
9. Has your municipality mapped wetlands within your jurisdiction?
   - Has your municipality designated wetlands for conservation or protection?
     - If yes, how many hectares?
   - Does your municipality have any policy or regulations regarding the filling or alteration of wetlands?

9. Has your municipality mapped wetlands within your jurisdiction?
   Has your municipality designated wetlands for conservation or protection?
   If yes, how many hectares?
   Does your municipality have any policy or regulations regarding the filling or alteration of wetlands?
10. Has your municipality adopted any policy about the cutting of trees or removal of existing vegetation during development?
11. Has your municipality made any land available for community garden allotments?
12. Has your municipality adopted any policy or regulations to require or encourage soil management?
    e.g., storage of top soil during development
    erosion control measures on steep slopes
13. Does your municipality control the use of residential chemicals in the environment?
    e.g., lawn fertilisers, pesticides, herbicides
14. Are mineral resources mapped in your municipality?
15. Has your municipality designated any mineral lands for protection from residential development?
16. Does your municipality have any policy or regulations about mine land reclamation?
17. Has any mine land been reclaimed for residential use in your municipality?
    If yes, how common is such reclamation?
    How successful is the reclamation?
18. Is water quality a problem in recreational waterways in your municipality?
    If yes, are some waterways closed to swimming?
    Permanent closures:
    Seasonal closures:
    Beach days closed per year (1991):
    Does your municipality impose restrictions on pets or livestock around waterways?
19. What is the major source of drinking water in your municipality?
    surface water [ ] lake [ ] river [ ]
    ground water
    What proportion of the municipal population is on a municipal water supply?
    Is residential water use metered?
    What is the average annual per capita consumption of water from the municipal water supply?
20. Does your municipality encourage the use of rain water collection cisterns?
21. Does your municipality encourage water conservation?
    If yes, how?

Does your municipality arrange for the safe collection and disposal of hazardous wastes?

23. What proportion of households are serviced by some form of waste water treatment?
    septic tanks
    municipal sewage treatment
    no treatment
    Does your municipality monitor sewage waste discharges?
    Does your municipality monitor the functioning of septic systems?

24. Does your municipality have a coastal management plan(s) for coastal areas within your jurisdiction?

25. Does your municipality monitor air quality in residential areas?

26. Does your municipality have a corporate policy to conserve resources?

27. Does your municipality have any staff person(s) assigned to promote sustainable development?

28. Does your municipality have any programs to promote private stewardship of environmental resources?

29. Does your municipality participate in any projects or programs which support sustainable development?
    eg, Healthy Communities Project [ ]   Strengthening Community Health [ ]

Public participation

30. What proportion of eligible voters cast ballots during the last municipal election in your municipality?

31. Does your municipality encourage residents to participate in community governance?
    If yes, how?
    Does your municipality support community groups which promote sustainable development?
        (e.g., recycling groups
            advisory groups

32. Does your municipality have policies or programs to promote:
    accessibility for challenged persons
    opportunities for minority groups

33. Does your municipality "bank" land for social housing or other forms of affordable housing?
    If yes, how many hectares does it own?

34. Does your municipality have a housing office or staff person dedicated to dealing with housing issues?

35. Does your community have a Block Parents program?

36. Does your municipality have any health promotion programs?
37. Does your municipality have any crime prevention programs?

Social services

38. What is the municipal social services housing allowance for a family of three?
39. What is the median market rent for a two bedroom apartment in your community?
40. How many units of seniors housing does your municipality provide?
41. How many units of family social housing does your municipality provide?
42. Does your municipality have a policy about the provision of schools or other
     community facilities?
     eg. parks and playgrounds

QUESTIONS FOR DEVELOPMENT OFFICER
Land Use Planning

1. What is the gross population density in your municipality?
2. What is the net residential density?
3. How many dwelling units are there in your municipality?
4. a) What proportion of the total dwelling units are single detached homes?
    b) What proportion of residents own their own homes?
5. How many kilometres of paved roads are there in your municipality?
6. Does your municipality encourage builders to limit the amount of alteration to natural
     contours? (cut and fill)
7. Does your municipality encourage site planners to lay roads along existing contours?
8. Does your municipality impose any standards on the types (and quality) of fill used in
     residential or open space areas?
9. Does your municipality encourage site planning for passive solar design?
10. Do your policies or regulations protect residents' "right to sun"? (ie, prevent shadowing
     by new structures)
11. Does your municipality encourage builders to use landscaping for energy efficiency?
12. What alternative energy sources are used in your municipality?
     solar collectors   wind power
     tidal power   district heating
     natural gas   small scale hydro
     earth energy systems   other
13.   a) Does your municipality encourage builders to build energy efficient homes?
       b) Has your municipality encouraged any alternative building technologies to test
       energy efficiency?

14. Does your municipality have a mass transit system?
    If yes, what proportion of the population would be within walking distance of a stop?
    What proportion of the working population uses mass transit at rush hour?
    Does your municipality encourage the use of mass transit?
        eg, park and ride facilities
15. Has your municipality zoned any areas for mixed use (which includes residential uses)?
    If yes, Are you able to estimate what proportion of the residents in mixed use zones work within walking distance of their homes?
16. Does your municipality encourage builders to provide facilities for cyclists and joggers at the work place? (eg, parking racks, shower facilities)
17. Does your municipality encourage site planners to maximize the use of natural drainage systems?
    What proportion of households in your municipality are hooked up to storm sewers?
    Does your municipality encourage the use of storm water retention ponds?
18. Does your municipality encourage the use of recycled materials in road construction?
19. Does your municipality collect materials for community composting?

Rural Municipality

r1. How much of the land in your municipality is designated for agricultural use?
    total hectares in agriculture:
r2. What proportion of agricultural uses might involve organic farming methods?

QUESTIONS FOR DEVELOPERS

1. In planning a residential development, do you attempt to design the project to protect natural processes on the site?
    e.g., protect natural vegetation
        avoid steep slopes
        leave buffers around waterways
        protect top soil
        other
2. Do planning or development officials encourage developers to be sensitive to environmental considerations?
3. Do efforts to protect natural processes on a site increase the cost of developing land?
    If yes, by what percent?
4. Do home purchasers appreciate developers' efforts to protect natural processes on a site?
    Does environmental conservation affect the marketability of a site?

5. Do you plan residential developments to conserve natural resources?
    e.g., passive solar design
            energy efficient homes
            avoid excess construction waste
            other
6. Do you site roads along existing contours to limit cut and fill?
7. Do you set any standards on the kinds of material you use in fill?
8. Do you have any landscaping standards that you use in preparing a lot for sale?
9. In your opinion, does the average home purchaser prefer a treed "natural" lot or a grassy lawn?

QUESTIONS FOR CIVIC LEADERS

1. Is sustainable development a priority in your community?
    If yes, how has it altered the way that your community plans residential environments?
    What kinds of sustainable initiatives has your community undertaken?
2. Does your municipality purchase conservation lands to protect them from development?
    If yes, for what conservation purposes are they held?
3. Does your municipality designate environmentally sensitive areas for protection?
    If yes, what kinds of areas are protected?
4. Does your municipality have any staff assigned to promoting sustainable development?
5. Does your municipality have a "municipal round table on environment and economy", or a similar group promoting sustainable development?
6. Are developers in your community concerned about protecting natural processes while developing residential areas?
7. Are community residents concerned about protecting natural processes and resources?
8. Does your municipality have any programs to promote private individual stewardship of environmental resources?
9. What are the key environmental issues in your community?
10. What are the key concerns in residential areas in your community?
11. Does your municipality encourage residents to participate in community governance?
    If yes, how?
12. Does your municipality encourage community groups to get involved in sustainable development initiatives?
    If yes, how?

Interviews with **Citizens** active in environmental and sustainability issues involved modifications to the questions used for civic leaders.

PROVINCIAL GOVERNMENT DEPARTMENTS AND ORGANIZATIONS

Department of Environment (NS)
Are all subdivision plans or major development projects subjected to an environmental review? If no, why not?
How does the department decide which ones to review?
What does the department review when it looks at a plan of subdivision or major development project?
Do you look at site drainage? What are the issues regarding drainage?
Do you look at site vegetation? What are the issues regarding vegetation?
Do you look at wetlands or waterways? What are the issues regarding wetlands or waterways?
What standards does a development have to meet to receive the Department's approval?
What factors would make the department reject the proposal?
Does the department ever issue conditions to approval?
    (If yes, What kinds of conditions might be attached?)

Department of Natural Resources
Lands and Forests:
Do municipalities pay sufficient attention to forest resources in land use planning?
What could municipalities do to help sustain forestry resources while continuing to provide housing for people?
Mines and Energy :
Do municipalities pay sufficient attention to mineral resources in land use planning?
What could municipalities do to help conserve mineral resources while continuing to provide housing for people?
Do municipalities pay sufficient attention to energy conservation?
What could municipalities do to help promote energy conservation in residential areas?

Department of Agriculture
Do municipalities pay sufficient attention to conserving agricultural lands in land use
	planning?
What could municipalities do to help conserve agricultural lands while continuing to
	provide housing for people?
Does the province have any statistics on how many households have their own kitchen /
	back yard gardens?

Interviews with staff in the **Department of Housing** and **Department of Municipal
Affairs** occurred during an early stage of the research and involved extensive discussion of
the evaluation framework in Appendix A.

Nova Scotia Round Table on Environment and Economy
Sub-Committee on Sustainable Development
Did the Sustainable Development Sub-committee invite provincial government
	departments, other than the Department of the Environment, to participate in
	formulating the Nova Scotia Sustainable Development Strategy?
Did any provincial government departments, other than DoE, participate in formulating
	the Sustainable Development Strategy?
Have provincial government departments, other than DoE, been supportive of the
	Sustainable Development Strategy?
Have any provincial government departments shown any resistance to the Sustainable
	Development Strategy?
How have municipalities reacted to the Sustainable Development Strategy?
Is the Sustainable Development Strategy affecting provincial policy in Nova Scotia?
Do you think it likely that the province will adopt the Sustainable Development Strategy as
	land use policy?

RESEARCH METHOD CHART