

APPENDICES

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Appendix 1: The ASSIPAC sustainability assessment checklist

A.	Description of the initiative
A.1.	Title or name of the initiative
A.2.	Type of the initiative
A.3.	General goals of the initiative
A.4.	Specific goals of the initiative
A.5.	Long-term goals of the initiative
A.6.	Phases in the initiative
A.7.	Initiator including the reputation of the initiator for initiatives in a sustainable development context; how the initiative will be financed; the reputation of the major sponsors in developing initiatives for sustainable development and description of partnerships
A.8.	Geographical description of the region in which the initiative is developed
A.9.	Description of the decision-making process which will be followed
A.10.	Identification of sources of information and data
B.	Description of alternatives for the initiative including a “most sustainable” alternative and other possible alternatives
C.	Description of sustainable development policies, visions or strategies describe the sustainable development policies, visions or strategies which are in force in the area. Identify existing sustainability targets and/or standards
D.	Best available practice in an international context for the initiative and its alternatives describe on the basis of international literature, interviews with experts, and experience what is the best available practice for sustainable development of the initiative and its alternatives
E.	Discussion of the reactions to the initiative and its alternatives discuss the reactions which were noted during public consultation
F.	Forces which obstruct a more advanced sustainable development of the initiative describe which forces hinder a more advanced sustainable development of the initiative
G.	General characteristics of the initiative and its alternatives which could be favourable to sustainable development
G.1.	Integration in strategic visions for sustainable development Do the initiative and its alternatives fit in the existing visions and policies for sustainable development?
G.2.	Integration and co-ordination with other related initiatives how do the initiative and its alternatives fit in the network of other initiatives and at what level in the hierarchical structure? Have measures been taken which lead to an optimal integration and co-ordination of the initiative in its context?
G.3.	Integration across different sectors do the initiative and its alternatives take a holistic approach, examining the issues from different sectors and angles? Do the initiative and its alternatives stress “aggregation”, “interaction”, “connections”, and “relationships”?
G.4.	Partnerships across traditional borders within society do the initiative and its alternatives encourage partnerships and co-operation between several groups within society? Did the initiator look actively for co-operation across bureaucratic barriers and traditional borders within society?
G.5.	Empowerment of and co-operation with the local community how do the initiative and its alternatives contribute to the empowerment of the local community? Do the initiative and its alternatives lead to a strengthening of the quality, representatives, and resources of the local authority? In what way were the local authority and the local community involved in the formation of the initiative and its alternatives?
G.6.	Keeping options open, caution and reversibility - responding to the needs of future generations do the initiative and its alternatives keep open all possible options for the future? How do the initiative and its alternatives deal with the precautionary principle and the reversibility principle? do the initiative and its alternatives protect the ability of future generations to live a fulfilling life?
G.7.	Budgetary and financial implications what will be the implications of the measures for sustainable development on the budget? Are the necessary funds available to realise all sustainability goals of the initiative and its alternatives?
G.8.	Others:
H.	Environmental characteristics of the initiative and its alternatives which could be favourable to sustainable development
H.1.	How does the initiative and its alternatives relate to the carrying capacity of the region

	discuss if and in which way the initiative and its alternatives fall within the carrying capacity of the region and if they have an influence on the carrying capacity.
H.2.	Introduction of an environmental care system discuss if and in which way an environmental care system can be incorporated into the initiative and its alternatives
H.3.	Limiting the use of natural resources describe which measures are proposed in the initiative and its alternatives to limit the use of natural resources. What is done for the limited or more efficient use of energy, water, raw materials, and minerals? Is the use of renewable sources encouraged?
H.4.	Limiting the use of materials and the production of waste how is the consumption of materials and the production of waste limited? Are measures taken to encourage reuse of materials or recycling, composting, and energy recuperation from waste materials?
H.5.	Protection of biodiversity do the initiative and its alternatives introduce strategies which lead to a protection or increase of biodiversity?
H.6.	Limiting pollution which measures are introduced in the initiative and its alternatives to limit pollution of water, air, soil, and to limit or reduce noise?
H.7.	Restoration and maintenance of ecological cycles how do flows of energy and materials generated by the initiative and its alternatives fit in the flows and cycles of the natural ecosystem in which the initiative evolves?
H.8.	Climate change how does the initiative and its alternatives deal with the issue of climate change. Does it have an influence on the amount of greenhouse gases released in the atmosphere?
H.9.	Population growth Does the initiative and its alternatives have an influence on population growth? Are measures introduced to reach a sustainable population?
H.10.	Others:
I.	Social and cultural characteristics of the initiative and its alternatives which could be favourable to sustainable development
I.1.	Empowerment and emancipation of groups within the community do the initiative and its alternatives contribute to the empowerment and emancipation of certain deprived population groups in the community? Are these and other groups encouraged to participate in a discussion about the initiative and decision-making in relation to the initiative?
I.2.	Limitation of social polarisation between groups within society do the initiative and its alternatives lead to a limitation of social differences between population groups within society? Do they lead to more social cohesion within the local community? Do the initiative and its alternatives reduce the gap between poor and rich, North and South, developed and less developed countries?
I.3.	Strengthening local cultural identity and diversity do the initiative and its alternatives value and protect local cultural identity and diversity and the diversity of people within the local community?
I.4.	Protection and improvement of the health of the population do the initiative and its alternatives contribute to the protection and improvement of the health of the population. Are special measures introduced for specific population groups and for a preventive environmental care?
I.5.	Improvement of possibilities for education and training of the local population do the initiative and its alternatives improve the availability of education and training programmes? Is vocational training introduced for the underprivileged, migrants, and unemployed?
I.6.	Improvement of possibilities for local employment do the initiative and its alternatives improve the availability of jobs for the underprivileged, migrants, and unemployed?
I.7.	Increasing possibilities for social, cultural and recreational exchanges between members of the local population do the initiative and its alternatives lead to increased possibilities for social, cultural, and recreational exchanges between members of the local population?
I.8.	Leading towards a sustainable lifestyle will the initiative and its alternatives influence the lifestyle of the local population in such a way that it will be less dependent on finite resources and more in line with the carrying capacity of the local population?
I.9.	Leading towards strengthened values of a democratic community do the initiative and its alternatives lead towards strengthened values of a democratic community, support diversity, decentralised authority, shared and rotating leadership, continuous self-control, and follow the

	principle that you should not expose others to things you would not like to experience yourself
I.10.	Aiming for maximum independence of the local community Do the initiative and its alternatives lead towards a more independent local community?
I.11.	Others:
J.	Economic characteristics of the initiative and its alternatives which could be favourable to sustainable development
J.1.	Strengthening and diversifying the local economy do the initiative and its alternatives contribute to strengthening the local economy? Are profits made from the initiative reinvested in the local economy? Do the initiative and its alternatives lead to a more diversified local economy?
J.2.	Encouraging and supporting private entrepreneurship do the initiative and its alternatives encourage a flourishing private entrepreneurship, trade, and local industry?
J.3.	Supporting environmentally conscious and ethically responsible trade Do the initiative and its alternatives encourage “fair trade” which is environmentally and ethically correct?
J.4.	Others:
K.	Planning and design characteristics of the initiative and its alternatives which could be favourable to sustainable development
K.1.	Promotion of development patterns which reduce the demand for transport do the initiative and its alternatives encourage an integration of mobility and land use planning, reduce the need for car use and promote public transportation and non-motorised forms of transportation?
K.2.	Promotion of development patterns which take into account the functions of the natural ecosystem do the initiative and its alternatives lead to integrated land use planning which takes into account the functions of the natural ecosystem, vulnerable areas and areas which are prone to disasters
K.3.	Others:
L.	Assessment of the sustainable character of the initiative and its alternatives assess the sustainable character of the initiative and its alternatives in a comparative way. Discuss the pro's and cons of the different alternatives. Check how the initiative and its alternatives relate to the best available practice
M.	Proposal of an agenda for change. Development of scenarios which lead the way out of an unsustainable society. Scenarios should be developed which lead the way out of an unsustainable society
N.	Conclusion
O.	List of references Annexes List of scientific methodology used in the different phases of the sustainability assessment

Canadian Framework for the Application of Precaution in Science-based Decision Making

Introduction

This Framework outlines guiding principles for the application of precaution to science-based decision making in areas of federal regulatory activity for the protection of health and safety and the environment and the conservation of natural resources.

What is the application of precaution?

The application of "precaution", "the precautionary principle" or "the precautionary approach"¹ recognizes that the absence of full scientific certainty shall not be used as a reason for postponing decisions where there is a risk of serious or irreversible harm.

The application of precaution is distinctive within science-based risk management and is characterized by three basic tenets: the need for a decision, a risk of serious or irreversible harm and a lack of full scientific certainty.

Are guidance and assurance needed?

Given the distinctive circumstances associated with the application of precaution, notably the lack of full scientific certainty about a risk of serious or irreversible harm, guidance and assurance are required as to the conditions governing decision making. Guidance and assurance are particularly needed in circumstances when the scientific uncertainty is high.

What is the purpose of the framework?

This Framework serves to strengthen and describe existing Canadian practice. The purpose of the framework is to:

- improve the predictability, credibility and consistency of the federal government's application of precaution to ensure adequate, reasonable and cost-effective decisions;¹
- support sound federal government decision making while minimizing crises and controversies and capitalizing on opportunities;
- increase public and stakeholder confidence, in Canada and abroad, that federal precautionary decision making is rigorous, sound and credible; and
- increase Canada's ability to positively influence international standards and the application of precaution.

Context

Governments can rarely act on the basis of full scientific certainty and cannot guarantee zero risk. Indeed, they are traditionally called upon and continue to address new or emerging risks and potential opportunities, and to manage issues where there is significant scientific uncertainty. However, the need for decision making in the face of scientific uncertainty has grown both in scope and public visibility and this has led to a growing awareness of and emphasis on the application of precaution to decision making.

While the application of precaution primarily affects the development of options and the decision phases within science-based risk management, it is clearly linked to scientific analysis (it cannot be applied without an appropriate assessment of scientific factors and consequent risks). Ultimately, it is guided by judgment, based on values and priorities but its application is complicated by the inherent dynamics of science — even though scientific information may be inconclusive, decisions will still have to be made as society expects risks to be addressed and managed and living standards enhanced.

Science and uncertainty in decision making

The application of precaution to decision making is distinctive within traditional risk management on the basis of a higher degree of scientific uncertainty and the parameters that can establish what constitutes an adequate scientific basis and sound and rigorous judgment. As it applies here, judgment focuses on addressing:

- what is a sufficiently sound or credible scientific basis?
- what follow-up activities may be warranted?
- who should produce a credible scientific basis? and
- the inherent dynamics of science on decision making.

What is a sufficiently sound or credible scientific basis?

Within the context of precaution, determining what constitutes a sufficiently sound or credible scientific basis is often challenging and can be controversial. The emphasis should be on providing a sound and credible case that a risk of serious or irreversible harm exists.

"Sufficiently sound" or credible scientific basis should be interpreted as a body of scientific information — whether empirical or theoretical — that can establish reasonable evidence of a theory's validity, including its uncertainties and that indicates the potential for such a risk. In order to capture the full diversity of scientific thought and opinion, the basis for decision making should be drawn from a variety of scientific sources and experts from many disciplines.

Decision makers should give particular weight, however, to peer-reviewed science and reasonableness in their judgments.

What follow-up activities may be warranted?

Given the significant scientific uncertainty implicit in the application of precaution, follow-up activities such as research and scientific monitoring are usually a key part of the application of precaution. In some cases, international agreements (e.g., World Trade Organization Agreement on the Application of Sanitary and Phytosanitary Measures) require scientific monitoring and follow-up when precaution is applied. Such efforts can help reduce the scientific uncertainty associated with certain risks and allow informed follow-up decisions to be made. In other circumstances, scientific uncertainty may take a long time to resolve or, for practical purposes, never be resolved to any significant degree.

Who should produce a credible scientific basis?

Establishing who should be responsible for producing a credible scientific basis raises a different question: Who should be designated as having the responsibility to produce the scientific data and provide the basis for decision making? Decision makers should assess such criteria as who holds the legal responsibility or authority (e.g., the proponent who is designated as the legal agent in Canada), who would be in the best position to provide the scientific data and who has the capacity to produce timely and credible information.

While the party who is taking an action associated with potential serious harm is generally designated as the responsible party, this may best be decided on a case-by-case basis.

The inherent dynamics of science on decision making

The inherent dynamics of uncertainty in science present unique challenges. Climate change provides a good example. There is international consensus that human activities are increasing the amounts of greenhouse gases in the atmosphere and that these increases are contributing to changes in the earth's climate. However, there is scientific uncertainty regarding the sensitivity of climate to these increases, particularly the timing and regional character of climate change and regarding the economic costs of potential measures to reduce greenhouse gases or to adapt to the expected changes in climate.

While scientific information is still inconclusive, decisions will have to be made to meet society's expectations about enhancing living standards and addressing the potential for risks.

Guiding Principles for the application of precaution to science-based decision making.

Guiding principles outlined in this Framework reflect current practices and, in their entirety, are intended to support overall consistency in application, allow for flexibility to respond to specific circumstances and factors and help to counter misuse or abuse.

General principles of application outline distinguishing features of precautionary decision making whereas principles for precautionary measures describe specific characteristics that apply once a decision has been taken that measures are warranted.

Five General Principles of Application

1. The application of precaution is a legitimate and distinctive decision-making approach within risk management.
2. It is legitimate that decisions be guided by society's chosen level of protection against risk.
3. Sound scientific information and its evaluation must be the basis for applying precaution; the scientific information base and responsibility for producing it may shift as knowledge evolves.
4. Mechanisms should exist for re-evaluating the basis for decision and for providing a transparent process for further consideration.
5. A high degree of transparency, clear accountability and meaningful public involvement are appropriate.

Five principles for Precautionary Measures

1. Precautionary measures should be subject to reconsideration, on the basis of the evolution of science, technology and society's chosen level of protection.
2. Precautionary measures should be proportional to the potential severity of the risk being addressed and to society's chosen level of protection.
3. Precautionary measures should be non-discriminatory and consistent with measures taken in similar circumstances.
4. Precautionary measures should be cost-effective, with the goal of generating (i) an overall net benefit for society at least cost, and (ii) efficiency in the choice of measures.
5. Where more than one option reasonably meets the above characteristics, then the least trade-restrictive measures should be applied.

Appendix 3: Key references on the social dimension of sustainability appraisal

Abaza, H. 2003, *The Role of Integrated Assessment in Achieving Sustainable Development*, UNEP, Enterprise Development Impact Assessment Information Service (EDIAIS) conference paper.

Explores the role of integrated assessment and planning (IAP) as a tool for achieving sustainable development; defined key assessment approaches, reviews various assessment techniques and some of the challenges involved, looks at the factors to be taken into account when designing an integrated assessment programme in order to ensure that the results are widely accepted and incorporated into sustainable development policy making, discusses future directions for integrated assessment and planning and the role of the United Nations Environment programme (UNEP) in promoting IAP for sustainable development

Alberti, M. 2003, 'Integrating humans into ecology: opportunities and challenges for studying urban ecosystems', *BioScience*, vol. 53, no. 12, p. 1169.

Our central paradigm for urban ecology is that cities are emergent phenomena of local-scale, dynamic interactions among socioeconomic and biophysical forces. These complex interactions give rise to a distinctive ecology and to distinctive ecological forcing functions. Separately, both the natural and the social sciences have adopted complex system theory to study emergent phenomena, but attempts to integrate the natural and social sciences to understand human-dominated systems remain reductionist—these disciplines generally study humans and ecological processes as separate phenomena. Here we argue that if the natural and social sciences remain within their separate domains, they cannot explain how human dominated ecosystems emerge from interactions between humans and ecological processes. We propose an integrated framework to test formal hypotheses about how human-dominated ecosystems evolve from those interactions.

Andriantiatsaholiniaina, L., Kouikoglou, V. & Phillis, Y. 2004, 'Evaluating strategies for sustainable development: fuzzy logic reasoning and sensitivity analysis', *Ecological Economics*, vol. 48, no. 2, p. 149-172

Sustainable decision-making involves political decisions at the local, regional, or national levels, which aim at a balanced development of socio—environmental systems. A fundamental question in sustainable decision-making is that of defining and measuring sustainable development. Many methods have been proposed to assess sustainability. Recently, a model has been developed, called Sustainability Assessment by Fuzzy Evaluation (SAFE), which uses fuzzy logic reasoning and basic indicators of environmental integrity, economic efficiency, and social welfare, and derives measures of human (HUMS), ecological (ECOS), and overall sustainability (OSUS). In this article, we perform sensitivity analysis of the SAFE model to identify the most important factors contributing to sustainable development. About 80 different indicators are tested and classified as promoting, impeding, or having no effect on the progress toward sustainable development. The proposed method is applied to the Greek and American economies. The conclusion is that there is no unique sustainable path and, accordingly, policy makers should choose different criteria and strategies to make efficient sustainable decisions for each country

Barker, A. & Fischer, T. 2003, 'English regionalization and sustainability: Towards the development of an integrated approach to strategic environmental assessment', *European Planning Studies*, vol. 11, no. 6, pp. 697-716.

Central to this article is the suggestion that modern planning and development frameworks in England are currently at a potentially productive, although problematic turning point. Whilst on the one hand the UK is attempting to make the legislative and institutional changes necessary to facilitate the process of regionalization and devolution, it is at the same time facing the challenge of ensuring the necessary levels of inter-agency cohesion and integration required for the delivery of the meta-objectives at the heart of sustainable development. Of particular concern for the English regions is the increasing complexity of organizational relations, the fragmentary nature of provisions, the potential mismatch between the need to

preserve environmental welfare and at the same time ensure regional economic competitiveness, and more fundamentally, the failure to provide an appropriate mechanism for the evaluation of sustainable development goals. In the light of these challenges, the authors highlight the value of Strategic Environmental Assessment (SEA) as a mechanism for improving the environmental quality of decision-making and make recommendations as to how the regional level of decision-making can provide an effective platform for the development of an SEA system which is capable of reconciling the sustainability conflicts derived from different tiers of decision-making. Within this discussion, suggestions are made as to the manner in which current ideas for introducing sustainability appraisal for Regional Planning Guidance should be amended.

Bentivegna, V. et al, 2002, 'A vision and methodology for integrated sustainable urban development', *Building Research and Information*, vol. 30, no. 2, pp. 83-94.

The concepts and visions of sustainable development that have emerged in the post-Brundtland era are explored in terms laying the foundations for a common vision of sustainable urban development (SUD). The described vision and methodology for SUD resulted from the activities of an international network called BEQUEST, funded by the European Commission. The project involved building consensus over the language and vision of SUD across a wide range of stakeholders in the urban environment and across a range of spatial and temporal scales, development activities and environmental and social issues. The resulting vision of SUD is that of a relative, adaptive process in which the current urban fabric is gradually adapted over time to suit more sustainable lifestyles. A framework for structuring information on SUD has been developed which provides a unique, integrated representation of the scope and extent of the subject that links together socio-economic and technical dimensions as well as planning, property, design and construction interests, in time and space. Impediments to implementation of the vision and method are explored, including lack of demand, lack of capacity, absence of agreed targets and indicators together with other policy problems undermining full sustainability assessment and evaluation of urban re/development proposals

Bosshard, A. 2000, 'A methodology and terminology of sustainability assessment and its perspectives for rural planning', *Agriculture, Ecosystems & Environment*, vol. 77, no. 1-2, pp. 29-41

Sustainability may be regarded as one of the most challenging and, at the same time, most fuzzy contemporary paradigms. In the present study, referring to the history of other leading ideas, this confusion is identified as a typical feature of young paradigms with a particular danger of misuse and destruction of the idea. Requirements necessary to save and evolve the paradigm of sustainability are identified. It is shown that help cannot be expected in the phrasing of a generally accepted definition. As an alternative, it is proposed to focus on the assessment procedure, where quantitative or qualitative value measures of the paradigm are developed for particular situations. The present study intends (i) to clarify the logic and terminology of the assessment process in general, (ii) to provide an effective assessment concept for sustainability in the field of agricultural land-use, and (iii) to demonstrate possible perspectives for rural planning practices. The first part displays fundamental aspects of valuation theory. The methodology of explicit assessment is introduced and described as a heuristic procedure, evolving the meaning of a term or paradigm in a socio-cultural discourse and in relation with practical experience. In the second part, focusing on sustainability assessment, the terminology, steps and elements of the general assessment procedure are defined on behalf of the assessment of land-use sustainability as an example. The iterative procedure allows developing quantitative and/or qualitative value measures for particular situations. The central element of the method is a hierarchically structured collection of viewpoints, called checklist of criteria. In a holistic, comprehensive approach towards sustainability ("strong" sustainability), five principal criteria are recommended for consideration: (i) abiotic environment; (ii) biotic environment, including animal welfare; (iii) cultural values, defined as human emotional and mental well being and creativity of society; (iv) sociology; and (v) economy. To each principal criterion, a hierarchical list of important sub-criteria is added. For the project-specific selection of suitable sub-criteria, guidelines are described in detail. The result is an individual assessment system adapted to the natural, cultural, political and economic basic conditions of a given project. In the third part, the example of a Swiss land-use

planning project shows the implementation of the methodology in practice and its benefits, e.g., the improvement of the communication within the project, or the promotion of an effective, goal-oriented planning procedure, as a basic tool for valuation, communication, planning, implementation and monitoring of sustainability in the field of agriculturally based land-use systems

Brouwer, R. & Ek, R. 2004, 'Integrated ecological, economic and social impact assessment of alternative flood control policies in the Netherlands', *Ecological Economics*, In Press.

Brown, K. 2002, 'Innovations for conservation and development', *The Geographical Journal*, vol. 168, no. 1, p. 6.

This paper examines attempts to integrate the objectives of biodiversity conservation and social and economic development through a variety of approaches associated with different forms of protected areas and generally labelled as 'integrated conservation and development'. It examines how the linkages between conservation and development are conceptualized, and the types of policy prescriptions and associated models and practice of integrating conservation and development. It identifies misconceptions about four key aspects that are common in conventional integrated conservation and development approaches. These difficulties involve the conceptualization of community, participation, empowerment and sustainability. Integrated conservation and development projects have often floundered as a result of over-simplification of these factors. It assesses attempts made to overcome these common misconceptions through examining the experiences of two innovative approaches to integrating conservation and development in the Caribbean and in Amazonia. It concludes that fundamental changes are necessary to institutions and management and decision-making strategies to address these issues and to effectively meet conservation and development objectives.

Bruce, N., Flanagan, M. & Eastwood, M. 1999, 'Comparative public policy. Health, transport and the environment. Does European and UK policy support effective joint action?', *The European Journal of Public Health*, vol. 9, no. 4, pp. 251-257

There is growing recognition of the importance of links between health, transport and the environment. Complex interrelationships demand effective intersectoral collaboration and community participation and policy should therefore support this. The UK has a number of key policy documents representing public health, environmental health and transport perspectives. The purpose of this review is to assess how well these policies are integrated and the extent to which joint action and participation are supported. Reviewing global and European influences on UK policy identifies two main themes: the new public health agenda arising from the Health for All (HFA) Strategy and a more traditional environmental health approach. However, there are fundamental aspects in common, in particular the underlying theme of sustainable development. To date, public health and environmental health 'traditions' have been inadequately integrated. This is demonstrated in a number of ways, including approaches to implementation, the choice of indicators and targets and a general failure to define the roles that different sectors can best play in tackling transport environment and health issues. The revised national health strategy, 'Our Healthier Nation', places emphasis on local planning through interagency partnership and joint responsibilities, but it remains to be seen how well this will work in practice. Recent years have seen convergence of environmental and public health policies, but further integration is required. National policy could do more to facilitate explicitly local joint action and community participation. Because of the influence that environment and transport issues have on health, national health strategy has a particularly important part to play in achieving this

Cernea, M. 1993, 'The sociologist's approach to sustainable development', *Finance & Development*, vol. 30, no. 4, pp. 11-13.

The social components of sustainable development is as important as its economic and technical-ecological aspects. 'Putting people first' in any project improves social organization by providing a set of concepts that help explain such issues as social action, the relationships among people, their institutional arrangements, as well as their culture and values that govern their behavior vis -a-vis each other and natural resources. The discipline of sociology also

offers a set of social techniques that can prompt social action, inhibit damaging behavior, foster association, develop alternative social arrangements and help build social capital. The returns from enhanced degrees of adequate social organization are improved welfare, lasting social sustainability for development programs and better environmental management.

Cosslett, C., Buchan, D. & Smith, J. 2004, *Assessing the social effects of conservation on neighbouring communities: guidelines for Department of Conservation staff*, Department of Conservation, Wellington.

Guidelines to help DOC staff undertake SIA as part of the design and management of new and existing conservation initiatives

Day, J., Gaunton, T. & Frame, T. 2003, 'Toward environmental sustainability in British Columbia: the role of collaborative planning', *Environments*, vol. 31, no. 2, p. 21.

A major initiative was undertaken to move toward ecological, social, and economic sustainability in the rural areas of British Columbia during the 1990s. The paper describes the major institutional changes, the adoption of collaborative planning--called shared decision making in the province--as the basis of conflict resolution, and the history of implementation measures throughout the province. The paper concludes with general lessons for developing sustainable rural land use plans based on the first decade of experimentation in B.C. These measures include recognition that: a champion is necessary to drive the process; institutional innovation and coordination and capacity building are key components; collaborative planning is an effective forum within which science, public education, discussion, debate, and consensus can be integrated; workers displaced by the agreements should be offered alternative employment or retraining; approximately four years is necessary to reach agreements; and all interested stakeholders should be involved from beginning to end of such planning process to promote success.

Dernbach, J. 2003, 'Achieving sustainable development: the centrality and multiple facets of integrated decisionmaking', *Indiana Journal of Global Legal Studies*, vol. 10, no. 1, p. 247.

The biggest challenge for sustainable development in coming decades will be to operationalize it: to make it occur, or to make an effective transition toward it, in communities, places, and businesses all over the world. Very few seriously question the problems that sustainable development is intended to address--growing environmental degradation and a growing gap between rich and poor. There is also greater understanding that sustainable development is based on a set of principles that would profoundly affect national and international governance. The relationships among these principles are less well understood, though. Much of the public and academic discussion concerning sustainable development focuses on intergenerational equity (1) and the precautionary approach or principle (2) alone. Worse still, given the current and increasing magnitude of the world's environmental and poverty problems, relatively little progress has been made toward sustainable development in the past decade. In 1992, at the United Nations Conference on Environment and Development, or Earth Summit, in Rio de Janeiro, countries of the world agreed to Agenda 21, an ambitious plan of action for realizing sustainable development. (3) Sustainable development is development that protects and even restores the environment rather than degrades or pollutes it. It is intended to address the mutually reinforcing problems of global environmental degradation and global poverty without compromising the benefits of traditional development. These benefits include economic development, social well-being, and peace and security. The countries also agreed to a set of twenty-seven principles, known as the Rio Declaration, to guide the Agenda. (4) A major reason for the failure to make more progress in achieving sustainable development is the failure of nations and the international community to translate the plan and principles into specific actions in specific places. To operationalize sustainable development, we need to recognize that one principle--integrated decisionmaking--holds the other principles together. Integrated decisionmaking would ensure that environmental considerations and goals are integrated or incorporated into the decisionmaking processes for development, and are not treated separately or independently. Of all the principles contained in the sustainable development framework, integrated decisionmaking is perhaps the principle most easily translated into law and policy tools. We also need to recognize that integrated decisionmaking has multiple facets, not a single meaning. When we see the many facets or types of integrated decisionmaking, we find a major way to operationalize sustainable development. Each facet of integrated decisionmaking can be implemented

by applying or broadening the application of tools that are already receiving some use. These tools also provide practical ways to move toward sustainable development.

Devuyt, D. 2000, 'Linking impact assessment and sustainable development at the local level: The introduction of sustainability assessment systems', *Sustainable-Development*, vol. 8, no. 2, pp. 67-78.

Environmental impact assessment (EIA) and strategic environmental assessment (SEA), two instruments for environmental management that aim to prevent negative environmental impacts, are currently being examined for their usefulness in promoting sustainable development. Because of the importance of introducing sustainable development at the local level, this paper deals with impact assessment systems introduced by local authorities and links them to the sustainable development debate. First, the establishment of EIA and SEA systems at the local level is considered. The adaptation of existing impact assessment systems to their new role as sustainability assessment tool leads to the search for so called sustainability assessment systems. These systems aim to examine during the decision-making process whether policies, plans, programmes or other initiatives will lead society in a more sustainable direction. A framework for sustainability assessment studies is developed and proposals for the further improvement of EIA, SEA and sustainability assessment systems at the local level are discussed. Copyright (c) 2000 John Wiley and Sons, Ltd and ERP Environment.

Endter-Wada, J. et al. 1998, 'A framework for understanding social science contributions to ecosystem management', *Ecological Applications*, vol. 8, no. 3, pp. 891-904.

We propose a framework for understanding the role that the social sciences should play in ecosystem management. Most of the ecosystem management literature assumes that scientific understanding of ecosystems is solely the purview of natural scientists. While the evolving principles of ecosystem management recognize that people play an important role, social considerations are usually limited to political and decision-making processes and to development of environmental education. This view is incomplete. The social science aspect of ecosystem management has two distinct components: one that concerns greater public involvement in the ecosystem management decision-making process, and one that concerns integrating social considerations into the science of understanding ecosystems. Ecosystem management decisions based primarily on biophysical factors can polarize people, making policy processes more divisive than usual. Ecological data must be supplemented with scientific analysis of the key social factors relevant to a particular ecosystem. Objective social science analysis should be included on an equal basis with ecological science inquiry and with data from public involvement. A conceptual framework is presented to communicate to ecological scientists the potential array of social science contributions to ecosystem management

Environment Canada. 2001, *Sustainable Development Strategy*, Minister of Public Works and Government Services, Canada.

Canada's second Sustainable Development Strategy (first in 1997); opportunity to further institutionalize sustainable development in Environment Canada's decision-making processes, while supporting and encouraging others to do the same; sustainable development isn't an end point but rather an approach to decision making - it recognises that the social, economic and environmental issues are interconnected, and that decisions must incorporate each of these aspects if they are to be good decisions in the longer term

Fiorino, D. 2001, 'Environmental Policy As Learning: A New View of an Old Landscape', *Public Administration Review*, vol. 61, no. 3, p. 322.

Environmental policy in the United States has always been characterized by high levels of political conflict. At the same time, however, policy makers have shown a capacity to learn from their own and others' experience. This article examines U.S. environmental policy since 1970 as a learning process and, more specifically, as an effort to develop three kinds of capacities for policy learning. The first decade and a half may be seen in terms of technical learning, characterized by a high degree of technical and legal proficiency, but also narrow problem definitions, institutional fragmentation, and adversarial relations among actors. In the 1980s, growing recognition of deficiencies in technical learning led to a search for new goals, strategies, and policy instruments, in what may be termed conceptual learning. By the early 1990s, policy makers also recognized a need for a new set of

capacities at social learning, reflecting trends in European environmental policy, international interest in the concept of sustainability, and dissatisfaction with the U.S. experience. Social learning stresses communication and interaction among actors. Most industrial nations, including the United States, are working to develop and integrate capacities for all three kinds of learning. Efforts to integrate capacities for conceptual and social learning in the United States have had mixed success, however, because the institutional and legal framework for environmental policy still is founded on technical learning

Furuseth, O. & Cocklin, C. 1995, 'An institutional framework for sustainable resource management: the New Zealand model', *Natural Resources Journal*, vol. 35, no. 2, pp. 243-272.

During the late 1980s, New Zealand underwent a period of dramatic economic, social, and administrative restructuring. Among the most fundamental reforms was the establishment of sustainable management as the guiding principle for decisions affecting the allocation and use of natural resources and the maintenance of environmental quality. The adoption of sustainability has been accompanied by numerous changes in land use and environmental planning processes and institutions. Prescriptive planning models have been replaced by a performance based planning paradigm. Environmental impact assessment has been strengthened. There has been widespread consolidation of governmental units and the creation of new, more powerful local (regional) governments, with boundaries drawn using a hydrologic criterion. Decision making processes have been shifted from central government agencies to the local level. This paper provides the context for the restructuring process, analyzes the administrative and legislative changes that support sustainable management, and, finally, discusses critical issues that have affected implementation of sustainable management as well as offering comments about the future of the New Zealand reform process and its applicability to other nations

Garces, J., Rodenas, F & Sanjose, V. 2003, 'Towards a new welfare state: the social sustainability principle and health care strategies', *Health Policy*, vol. 65, no. 3, pp. 201-215.

Glaeser, M. 1995, *Environment, development, agriculture: integrated policy through human ecology*, Armonk, New York.

Glasson, J. 1995, 'Regional planning and the environment: time for a SEA change (strategic environmental assessment)', *Urban Studies*, vol. 32, no. 4, p. 712.

Strategic environmental assessment (SEA) may be a more ideal approach than environmental impact study in attaining sustainable development. SEA makes it possible for development actions to be considered at an earlier stage. Alternative development proposals to generate or conserve energy are also taken account under SEA. Moreover, the cumulative and secondary impact of on-going activities can also be noted under SEA. SEA also facilitates consideration of non-project actions

Grimm, N. et al. 2000, 'Integrated approaches to Long-Term Studies of Urban Ecological Systems', *BioScience*, vol. 50, no. 7, p. 571.

Urban ecological systems present multiple challenges to ecologists --pervasive human impact and extreme heterogeneity of cities, and the need to integrate social and ecological approaches, concepts, and theory

Hancock, T. & Gibson, R. 1996, 'Healthy, sustainable communities', *Alternatives Journal*, vol. 22, no. 2, p. 18.

Efforts to produce truly sustainable cities should focus on economic, social, cultural and political development as well as environmental development. This will require changes to traditional government planning agencies which will allow a more wholistic approach to solving problems.

Haughton, G. & Counsell, D. 2004, 'Regions and sustainable development: regional planning matters', *The Geographical Journal*, vol. 170, no. 2, p. 135.

This paper looks at how the term 'sustainable development' has been used in the process of regional plan making over the past decade. It emphasizes the differing geographies of these debates within

England, in terms of how sustainable development has been used to justify different types of approach in different parts of the country. Both drawing on and challenging recent work on state theory, the paper argues the need to see regional planning as a part of a multi-scalar governance system, whose importance should not be underestimated

Henderson, H. 1994, 'Paths to sustainable development: the role of social indicators', *Futures*, vol. 26, no. 2, p. 125.

This article reviews the current debate about new indicators of wealth and progress and how the meaning of 'development' is changing. The goal of sustainable development is to clarify the confusion of means (ie the current obsession with economic growth) with truly evolutionary human development as the ends to be pursued within the ecological tolerances of the planet. The article also reviews the debate about overhauling national accounts as provided for in Agenda 21 and how best to augment such 'scorecards' with additional indicators of overall progress and quality of life. A historical overview of the social indicators movement is combined with a discussion of newer indicators of environmental costs and benefits. This debate is nothing less than a tug-of-war of paradigms, epistemology and methodology.

Hockets, K. 1999, 'The SusTainAbility Radar', *Greener Management International*, p. 29.

This paper presents the SusTainAbility Radar (STAR*): a tool that integrates the three dimensions of sustainability and provides a forum for interpreting and negotiating trade-offs in a meaningful way. The STAR* consists of three elements. It uses the concept of eco-efficiency, which is successfully applied by many companies to stimulate product innovations that are environmentally more sustainable and also increase economic competitiveness. In a second step, social productivity with a product's stakeholders is addressed. Here, social sustainability is employed to boost economic productivity. In the last step, a concept is introduced that integrates social and environmental sustainability. This enhances product innovation by measuring a product for its sufficiency—or, in other words, the capability of a product or service to be extended to the entire global population while remaining within the earth's carrying capacity. The paper is based on research currently being conducted at the University of St Gallen, Switzerland, and INSEAD Fontainebleau, France. At the time of publication, the STAR* had not yet been applied in its entirety in a live situation, so to illustrate the general principle a fictitious example has been used.

Jenkins, B., Annandale, D., Morrison-Saunders, A. 2003. The evolution of a sustainability assessment strategy for Western Australia. *Environmental Planning and Law Journal*. Vol.20 pp

Jones, P. & Lucas, K. 2000, 'Integrating transport into 'joined-up' policy appraisal', *Transport Policy*, vol. 7, no. 3, pp. 185-1993

In 1998 the UK Government published the first Transport White Paper for over 20 years, *A New Deal for Transport; Better for Everyone*. The document emphasised the need for joined-up policy thinking and for co-ordinated action across different areas of government, a theme that has been taken up in many subsequent policy documents issued by central government. The paper explores the extent to which 'joined-up thinking' is evident in practice, both in the ways in which transport measures are appraised (e.g. do they fully take into account non-transport impacts?), and in appraisals in other policy areas with significant transport impacts. It does so by examining appraisal frameworks in different sectors, and identifies a number of current weaknesses. It then builds on these examples to propose ways in which an integrated policy appraisal framework could be developed. This would aim to identify not only the comparative cost-effectiveness of different transport measures in fulfilling policy objectives, but also the relative contribution that different areas of government could make—including transport—to the delivery of over-arching policy objectives, such as sustainable development, social exclusion and regeneration.

Kam, S. et al. 2002, 'Methodological integration for sustainable natural resource management beyond field/farm level: Lessons from the ecoregional initiative for the humid and sub-humid tropics of Asia', *International-Journal-of-Sustainable-Development-and-World-Ecology*, vol. 9, no. 4, pp. 383-395.

Integrated natural resources management (INRM) has to address both the livelihood goals of farmers

and the ecological sustainability of agro -ecosystems and natural resources. Under the Ecoregional Initiative for the Humid and Sub-Humid Tropics of Asia - Ecor(I)Asia - one major set of activities has been the development of approaches, methodologies, and tools to meet the challenges of INRM research for sustainable agricultural development. Examples provided illustrate the role of these methodologies in the three main phases of knowledge development for improving INRM impact: knowledge generation, knowledge capitalization, and knowledge mobilization. The methodologies are designed for better integration across disciplines, spatial scales, and hierarchical levels of social organization. Attempts are made to quantify trade -offs between biophysical sustainability and socio-economic considerations. The case is made for using these methodologies in a more complementary manner to help bridge the top-down and bottom-up approaches in INRM. Inherent in the developing and implementing of these methodologies is the forging of partnerships and fostering linkages with multiple stakeholders, as well as using the knowledge base and integrative tools as communication platforms.

Kasemir, B. 1999, 'Integrated assessment of sustainable development: multiple perspectives in interaction', *International Journal of Environment and Pollution*, vol. 11, no. 4, pp. 407-425.

Integrated assessment (IA) is a maturing research approach aiming at providing decision support on complex environment-related problems. Although interdisciplinary research is a pre-condition for IA, in order to reach the goals that IA has set it is necessary to go beyond interdisciplinary research efforts alone. There are two major reasons for this: (i) the nature of democratic decision-making, and (ii) the nature of complex issues. The views held by stakeholders and the public at large are an integral part of democratic decision-making processes. Integrated assessments, which aim to support decision-making in an appropriate and relevant way, should therefore synthesize interdisciplinary scientific insights with a wide variety of societal views. Furthermore, this paper argues that the sustainability issues with which IA is concerned are complex problems, in the sense that they cannot be fully described or solved in any unique way. One of the reasons for this is the essentially contested character of the concept 'sustainable development'. Against this background the search for techniques of articulation and interaction of multiple perspectives is a major challenge for the IA community. Where the nature of democratic processes asks for taking into account views of a diversity of actors, the nature of the issues considered demands that multiple perspectives are included in integrated assessments. Decision support building on a single scientific description is therefore not at all sufficient for addressing complex problems in a democratic decision-making context. To this end, this paper argues that it seems promising to develop techniques that combine scientific assessment tools with public participation methods. In order to contribute to the search for such new IA techniques, this paper discusses some new avenues in IA modelling, and the application of a well-established social scientific tool, namely focus groups, in integrated assessment

Lehtonen, M. 2004, 'The environmental-social interface of sustainable development: capabilities, social capital, institutions', *Ecological Economics*, vol. 49, no. 2, pp. 199-214

The social dimension has commonly been recognised as the weakest "pillar" of sustainable development, notably when it comes to its analytical and theoretical underpinnings. While increasing attention has lately been paid to social sustainability, the interaction between the "environmental" and the "social" still remains a largely uncharted terrain. Nevertheless, one can argue that the key challenges of sustainable development reside at the interfaces—synergies and trade-offs—between its various dimensions. This paper looks for preliminary ideas on frameworks for analysing the environmental—social interface. It first discusses the concept of sustainable development and the relations of the three dimensions of sustainability on the basis of the fundamental premises of neoinstitutional and ecological economics, and briefly presents the "bioeconomy model". Based on this conceptualisation of sustainable development, it then goes on to analyse two popular ways of addressing the social dimension of sustainability, namely, the "capability approach" of Amartya Sen, and the concept of social capital, and discusses the potential of these as bases for the analysis of the environment—social interaction. The Organisation for Economic Cooperation and Development (OECD) Environmental Performance Review (EPR) programme is presented as an example of attempts to analyse the environmental—social interface in practice. The paper concludes by noting that a single framework for studying environmental—social interface is neither feasible nor desirable. It questions the usefulness of analysing only two dimensions of sustainability at a time; and emphasises the need to situate the analysis in its context. In particular, it stresses the need to involve the potential users, as well as to take into account the planned use of the analysis and the interactions between different levels of analysis and decision-making. Capabilities and social capital can both be useful in structuring thoughts,

but are not as such directly applicable as suitable analytical frameworks. In particular, they do not provide adequate tools for examining the social preconditions for institutional change needed for environmentally sustainable development.

Martinuzzi, A. 2001, 'Introduction (GMI theme issue: evaluating sustainable development policy)', *Greener Management International*, p. 20.

Mazmanian, D. & Kraft, M. 1999, *Toward sustainable communities: transition and transformations in environmental policy*, MIT Press, Cambridge.

Molina, L. & Molina, M. 2002, *Air quality in the Mexico megacity: an integrated assessment*, Kluwer Academic Publishers.

Munasinghe, M. 2001, 'Sustainomics, sustainable development and climate change', *Energy-and-Environment*, vol. 12, no. 5-6, pp. 393-414.

This paper examines key issues in the nexus of sustainable development and climate change. It describes sustainomics as 'a transdisciplinary, integrative, balanced, heuristic and practical meta-framework for making development more sustainable'. The paper seeks to integrate these concepts through two broad approaches involving optimality and durability, and applies these ideas to climate change analysis. Operationally, it plays this bridging role by helping to map the results of environmental and social impact assessments (EIA and SIA) onto the framework of conventional economic analysis of projects. In addition the approach may help to formulate effective sustainable development policies, by linking and articulating these activities explicitly through the Action Impact Matrix framework.

Nijkamp, P. & Vreeker, R. 2000, 'Sustainability assessment of development scenarios: methodology and application to Thailand', *Ecological Economics*, vol. 33, no. 1, pp. 7-27

This paper aims to offer an applicable evaluation framework for assessing sustainable development strategies at the regional level, with a particular view on the treatment of uncertain information. After a survey of various regional sustainable development studies, several methodological issues pertaining to regional sustainability are presented and discussed, which lay the foundation for the central approach in this paper, viz. the use of critical threshold values. Based on a multidimensional indicator system, a systematic multicriteria model is proposed by employing the recently developed and user-friendly flag model. This model is able to take into consideration various relevant classes of (non) compliance with critical threshold values. By means of this model an empirical case study is undertaken for the Songkhla/Hat Yai area in southern Thailand. Three policy scenario's (decentralization, sectoral and regional promotion and environmental protection) are systematically evaluated using a blend of the above-mentioned critical threshold value and the flag approach. It is concluded that in general the decentralization policy is slightly more preferable than the sectoral and regional development scenario and significantly more preferable than the environmental protection scenario for the region concerned. The analytical tools used (a qualitative systems approach, the use of critical threshold values and the flag model) appeared to yield a satisfactory contribution to sustainability assessment, even in case of qualitative information

Norton, B. 1998, 'Improving Ecological Communication: The Role of Ecologists in Environmental Policy Formation', *Ecological Applications*, vol. 8, no. 2, pp. 350-364

This paper begins with the premise that communication regarding ecological risk and ecologically based management decisions should be improved. Failures of communication are attributed to lack of terms, indicators, and measures that are based in ecological science, but that are also associated with important social values. I show that, especially in the area of wetlands management, current scientific and policy discourse has failed to provide adequate linkage between descriptive characteristics of natural systems and changes in social values associated with them. As a result, wetlands policy is being implemented without analysis of social values affected by policies such as wetland banking and mitigation efforts. Ecologists have contributed to this unfortunate situation because they are reluctant to mix values issues with scientific study. I also show that ecologists are slow to pick up on signals flowing from policy discourse to ecological science; this is illustrated by the fact that ecologists often fail to study nature at a scale that would provide guidance to decision makers. I suggest that the

problems of ecological communication would be abated if policy and science were integrated within a broader, adaptive-management system in which both scientific hypotheses and social values are evaluated within a broader system of experimental management. Such a broader system of management could include an integrated language of management that is: (1) adaptive, (2) perspectival, (3) multiscaled, (4) operationalizable, (5) normative in content, and (6) communication enhancing.

O'Hara, S. 1995, 'Sustainability: social and ecological dimensions', *Review of Social Economy*, vol. 54, no. 4.

The definition of sustainable economic development has been the subject of much disagreement. It is proposed the limited definition of economic theory, methodology and valuation concepts is the reason why sustaining functions have long been ignored when these functions are the foundation of economic activity. Sustainability can only be understood through a broader knowledge of economics.

O'Riordan, T. 1997, 'Economic and social dimensions', *Environment*, vol. 39, no. 9, p. 34.

The volume dimensions reports the Panel's achievements in seven years since the publication of its First Assessment Report. The success and failures of using social science analysis in the policy process were also presented

Oxley, T. & Lemon, M. 2003, 'From social-enquiry to decision support tools: towards a method in the Mediterranean rural environment', *Journal of Arid Environments*, vol. 54, no. 3, pp. 595-617.

Park, J. & Seaton, R. 1996, 'Integrative research and sustainable agriculture', *Agricultural Systems*, vol. 50, no. 1, pp. 81-100.

Partidario, M. & Moura, F. 2000, 'Strategic sustainability appraisal - One way of using SEA in the move toward sustainability', *Perspectives on strategic environmental assessment*, pp. 29-43

Patterson, T. 2004, 'Integrating environmental, social and economic systems: a dynamic model of tourism in Dominica', *Ecological Modelling*, vol. 175, no. 2, pp. 121-136.

This article describes an integrated dynamic model of The Commonwealth of Dominica, a small Caribbean island state. The modeling approach emphasizes whole-systems assessment and trans-disciplinary analysis, providing a framework to conceptualize the impacts of different tourism development strategies, accounting for interactions between ecology, economy and society. Our use of dynamic modeling differs from established techniques such as simulation, predictive, or mediated modeling; we use the modeling environment primarily as an accounting tool to track the interaction of a large set of heterogeneous data and assumptions. We believe that a model such as ours can provide a valuable tool for the synthesis of data and theories about development alternatives. New data can be added as it becomes available, structural elements can be included as deemed important within a given milieu, and the largely explicit assumptions of the model can be changed to examine alternative views

Pollard, S. et al. 2004, 'Integrating decision tools for the sustainable management of land contamination', *Science of The Total Environment*, vol. 325, no. 1-3, pp. 15-28

The approach to taking decisions on the management of land contamination has changed markedly over 30 years. Change has been rapid with policy makers and regulators, practitioners and researchers having to keep pace with new technologies, assessment criteria and diagnostic methods for their measurement, techniques for risk analysis and the frameworks that support decision-makers in their efforts to regenerate historically contaminated land. Having progressed from simple hazard assessment through to "sustainability appraisal" we might now consider piecing together the experience of decision-making for managing land contamination. Here, we critically review recent developments with a view to considering how better decisions can be made by integrating the decision tools available. We are concerned with the practicality of approach and the issues that arise for practitioners as decision criteria are broadened.

Pope, J., Annandale, D. & Morrison-Saunders, A. 2004, 'Conceptualising sustainability assessment', *Environmental Impact Assessment Review*, vol. 24, no. 6, pp 595-616

Sustainability assessment is being increasingly viewed as an important tool to aid in the shift towards sustainability. However, this is a new and evolving concept and there remain very few examples of effective sustainability assessment processes implemented anywhere in the world. Sustainability assessment is often described as a process by which the implications of an initiative on sustainability are evaluated, where the initiative can be a proposed or existing policy, plan, programme, project, piece of legislation, or a current practice or activity. However, this generic definition covers a broad range of different processes, many of which have been described in the literature as ‘‘sustainability assessment’’. This article seeks to provide some clarification by reflecting on the different approaches described in the literature as being forms of sustainability assessment, and evaluating them in terms of their potential contributions to sustainability. Many of these are actually examples of ‘‘integrated assessment’’, derived from environmental impact assessment (EIA) and strategic environmental assessment (SEA), but which have been extended to incorporate social and economic considerations as well as environmental ones, reflecting a ‘‘triple bottom line’’ (TBL) approach to sustainability. These integrated assessment processes typically either seek to minimise ‘‘unsustainability’’, or to achieve TBL objectives. Both aims may, or may not, result in sustainable practice. We present an alternative conception of sustainability assessment, with the more ambitious aim of seeking to determine whether or not an initiative is actually sustainable. We term such processes ‘‘assessment for sustainability’’. ‘‘Assessment for sustainability’’ firstly requires that the concept of sustainability be well-defined. The article compares TBL approaches and principles-based approaches to developing such sustainability criteria, concluding that the latter are more appropriate, since they avoid many of the inherent limitations of the triple-bottom-line as a conception of sustainability.

Potter, S. & Skinner, M. 2000, ‘On transport integration: a contribution to better understanding’, *Futures*, vol. 32, no. 3-4, pp. 275-287

Over the years there have been many forecasts of transport futures. Most have taken a technological perspective, but this paper differs. Our perspective, linked to current transport policy debates, concerns the processes, institutions and structures within which transport technologies develop. ‘Integration’ is taken as our focus, because the concept of ‘integrated transport’ has become an important guiding principle for transport policies’ institutional and structural development in several countries. Much has been talked about the need to reduce significantly the environmental impact of transport. While technical solutions that reduce the impact of individual journeys have a place, it is unlikely that they alone can reduce the impact of transport to a sustainable level. Only the development of highly integrated strategies have the potential to improve sustainability. Such strategies involve areas of activity that are not traditionally considered part of the transport planning process, such as health, urban regeneration, and education. There is no widely accepted definition of what Integrated Transport means. It is to help clarify such ambiguities that this paper has been written. This paper explores the meaning of Integrated Transport and considers whether such strategies will contribute to sustainability. Using examples from photography and computer system design the paper shows that there is a need to develop a better understanding of the meaning of Integrated Transport, outlining a typology developed to classify various definitions of Integrated Transport. Integrated Transport is viewed as scalar in nature, with higher levels incorporating lower, or narrower, understandings of the term Integrated Transport. Points on this scale include: Functional or Modal Integration, which is part of... Transport and Planning Integration, which is part of... **Social** Integration, which is part of... Environmental, Economic and Transport **Policy Integration**. Transport integration may be considered as a series of steps, with an incremental approach leading to higher levels of both Integration and Sustainability. Only by commitment, and allocation of resources, to the highest levels, will issues of sustainability be properly addressed

Ratner, B. 2004, ‘Equity, efficiency, and identity: Grounding the debate over population and sustainability’, *Population Research and Policy Review*, vol. 23, no. 1, pp. 55-71.

If social scientists are to provide a more useful contribution to international debates over population and environment, we must find ways to combine the insights of our competing theoretical traditions. Political economy, rational choice, and cultural institutionalist perspectives are each associated with a different assessment and characterization of the population ‘‘problem’’, as well as divergent strategies of response, prioritizing in turn the goals of equity, efficiency, and cultural identity. The principal argument of this paper is that these three perspectives, and the goals which they embody, are like the three legs of a stool; none is sufficient and each is necessary to uphold socially acceptable responses to

population growth in the context of broader challenges of sustainability. Each perspective is reviewed in turn, distinguishing narrow and polarizing applications that trivialize the way social and economic systems rely on the natural environment from applications that are useful in fashioning a more integrated approach. The paper concludes with reflections on how this approach may support and enrich a focus on sustainable livelihoods in development planning.

Ravetz, J. 2000, 'Integrated assessment for sustainability appraisal in cities and regions', *Environment Impact Assessment Review*, vol. 20, no. 1, pp. 31-64

This paper looks at a very topical challenge: how to appraise the sustainability of a city, a region, a policy, or programme. As the theme of sustainability is intrinsically multidisciplinary and multisectoral, this suggests that effective appraisals should likewise be based on a holistic or *integrated assessment* (IA) approach. This paper outlines a conceptual framework and a practical tool for such an approach. We first review the concepts of sustainability for an urban—regional unit, drawing on an investigation of integrated planning for long-term sustainable development in a case study of Greater Manchester, UK. From this we develop a IA framework which helps to map linkages between environmental, economic and social factors. One practical application is the Integrated Sustainable Cities Assessment Method (ISCAM), a scenario accounting system for the total environmental metabolism of a city or region. These scenario accounts are also useful for strategic assessment and sustainability appraisal of policies and programmes, where indeterminate and cumulative effects can be placed in a whole-system context of trends, projections, goals and targets

Sarriot, E. 2004, 'A methodological approach and framework for sustainability assessment in NGO-implemented primary health care programs', *International Journal of Health Planning and Management*, vol. 19, no. 1, pp. 23-41

An estimated 10.8 million children under 5 continue to die each year in developing countries from causes easily treatable or preventable. Non governmental organizations (NGOs) are frontline implementers of low-cost and effective child health interventions, but their progress toward sustainable child health gains is a challenge to evaluate. This paper presents the Child Survival **Sustainability Assessment** (CSSA) methodology—a framework and process—to map progress towards sustainable child health from the community level and upward. The CSSA was developed with NGOs through a participatory process of research and dialogue. Commitment to sustainability requires a systematic and systemic consideration of human, **social** and organizational processes beyond a purely biomedical perspective. The CSSA is organized around three interrelated dimensions of evaluation: (1) health and health services; (2) capacity and viability of local organizations; (3) capacity of the community in its **social** ecological context. The CSSA uses a participatory, action-planning process, engaging a 'local system' of stakeholders in the contextual definition of objectives and indicators. Improved conditions measured in the three dimensions correspond to progress toward a sustainable health situation for the population. This framework opens new opportunities for evaluation and research design and places sustainability at the center of primary health care programming

Schlossberg, M. & Zimmerman, A. 2003, 'Developing statewide indices of environmental, economic, and social sustainability: A look at Oregon and Oregon Benchmarks', *Local-Environment*, vol. 8, no. 6, pp. 641-660.

This research develops a method to transform the Oregon Benchmarks, a set of internationally recognized quantitative indicators designed to measure a broad array of state-level trends, into indices of social, economic, and environmental sustainability. Through multiple means, an original set of 90 Oregon Benchmarks has been narrowed into a smaller set of sustainability indicators in order to gain an integrated view of statewide sustainability as well as the capacity to look at social, environmental, and economic sustainability in isolation. The three-domain sustainability indices presented here are designed both to understand the current sustainability situation and to create a useful and informative tool for state-level policy makers interested in incorporating sustainability principles into their decision making.

Scoones, I. 1999, 'New ecology and the social sciences: what prospects for a fruitful engagement', *Annual Review of Anthropology*, vol. 28, p. 479.

The emergence of new ecological thinking is discussed in relation to the social sciences. Areas of interface between ecology and social science include ecological anthropology, political ecology,

environmental and ecological economics, and nature-culture debates. Other topics include environmental histories; structure, agency and scale in environmental change; and implications of complexity and uncertainty in ecological systems.

Serageldin, I. 1993, 'Making development sustainable', *Finance & Development*, vol. 30, no. 4, p. 6.

The 1992 'Earth Summit' held in Rio de Janeiro succeeded in rousing the conscience of the world to the urgency of achieving 'environmentally sustainable development.' This term refers to development that meets the needs of the present generation without compromising the needs of future generations. However, any effort to achieve this goal will fail if it does not integrate the viewpoints of three disciplines: economics, ecology and sociology. The contributions of economists are important since their methods seek to maximize human welfare within the constraints of existing capital stock and technologies. The views of ecologists should also be considered as they focus on preserving the integrity of ecological subsystems essential to the stability of the global ecosystem. The perspective of sociologists is likewise essential given the importance of social factors in the development process.

Shi, X. 2002, 'Dynamic analysis and assessment for sustainable development', *Journal of Environmental Sciences*, vol. 14, no. 1, p. 88.

The assessment of sustainable development is crucial for constituting sustainable development strategies. Assessment methods that exist so far usually only use an indicator system for making sustainable judgement. These indicators rarely reflect dynamic characteristics. However, sustainable development is influenced by changes in the social-economic system and in the eco-environmental system at different times. Besides the spatial character, sustainable development has a temporal character that can not be neglected; therefore the research system should also be dynamic. This paper focuses on this dynamic trait, so that the assessment results obtained provide more information for judgements in decision-making processes. Firstly the dynamic characteristics of sustainable development are analyzed, which point to a track of sustainable development that is an upward undulating curve. According to the dynamic character and the development rules of a social, economic and ecological system, a flexible assessment approach that is based on tendency analysis, restrictive conditions and a feedback system is then proposed for sustainable development.

Short, M. et al. 2004, 'Current practice in the strategic environmental assessment of development plans in England', *Regional Studies*, vol. 38, no. 2, pp. 177-190.

In the UK, strategic environmental assessment has been applied to the full hierarchy of development plans in the form of environmental appraisal. Government guidance in England contains a forceful recommendation to local planning authorities to assess the environmental effects of proposed development plans by carrying out an environmental appraisal of their policies and proposals. This advice has grown in importance with the adoption of the European Directive on strategic environmental assessment. Research undertaken into current appraisal practice provides a context for the implementation of the Directive in England. The results show a broadly positive outlook towards strategic environmental assessment and a move towards using sustainability appraisal. Furthermore, they show other benefits from the process additional to assessing the core environmental impacts of the plan. However, it is clear that there remain major structural weaknesses and concerns in the manner in which strategic environmental assessment processes are implemented. Thus, more than two-thirds of the respondents to a survey stated that the appraisal had little or no influence on development plan objectives and policies, and nearly two-thirds believed that their plan would have developed in the same manner without any appraisal having been undertaken.

Stigl, A. 2003, 'Science, research, knowledge and capacity building', *Environment-Development-and-Sustainability*, vol. 5, no. 1-2, pp. 255-273.

A small part of the scientific community is seeking hard to enhance the contribution of science, knowledge and capacity building to environmentally sustainable and socially fair human development around the world. Many researchers over the globe share the same commitment - anchored in concerns for the human condition. They believe that science and research can and have influenced sustainability. Therefore their main goals are to seek and build up knowledge, know-how and capacity that might help to feed, nurture, house, educate and employ the world's growing human population while

conserving its basic life support systems and biodiversity. They undertake projects, that are essentially integrative, and they try to connect the natural, social and engineering sciences, environment and development of communities, multiple stakeholders, geographic and temporal scales. More generally, scientists engaged in sustainable development are bridging the worlds of knowledge and action. This pro-active, heavily ethics- and wisdom-based "science for sustainability" can be seen as the conclusion of all dialogues and discussions amongst scientists at the World Summit on Sustainable Development (WSSD) 2002 in Johannesburg. The "Plan of Implementation" after WSSD will be based on political will, practical steps and partnerships with time-bound actions. Several "means of implementation" are going to be proofed and initiated: finance, trade, transfer of environmentally sound technology, and, last but not least, science and capacity building. Some characteristics of working scientific sustainability initiatives are that they are regional, place-based and solution-oriented. They are focusing at intermediate scales where multiple stresses intersect, where complexity is manageable, where integration is possible, where innovation happens, and where significant transitions toward sustainability can start bottom-up. And they have a fundamental character, addressing the unity of the nature - society system, asking how that interactive system is evolving and how it can be consciously, if imperfectly, steered through the reflective mobilization and application of appropriate knowledge and know-how. The aims of such sustainability-building initiatives conducted by researchers are: first to make significant progress toward expanding and deepening the research agenda of science and knowledge-building for sustainability; secondly to strengthen the infrastructure and capacity for conducting and applying science, research and technology for sustainability - everywhere in the world where it is needed; and thirdly, to connect science, policy and decision-making more effectively in pursuit of a faster transition towards real sustainable development. The overall characteristic is, that sustainability initiatives are mainly open-ended networks and dialogues for the better future. A world society that tries to turn towards sustainable development has to work hard to refine their clumsy technologies, in "earthing" their responsibility to all creatures and resources, in establishing democratic systems in peace and by heeding human rights, in building up global solidarity through all mankind and in commit themselves to a better life for the next generations.

Stoneham, G. et al. 2003, 'The application of sustainability concepts to Australian agriculture: an overview', *Australian Journal of Experimental Agriculture*, vol. 43, no. 3, pp. 195-203.

This paper reviews the concepts of sustainable development in an economic, environmental and social context. Weak and strong versions of sustainable development are reviewed and applied to the agricultural sector. The paper demonstrates that despite any degradation of the natural resource base, the agricultural sector is more productive now than in the past. This has occurred because the rate of investment in research and development (resulting in increased reproducible capital) has more than offset the rate of degradation in the natural capital stock. Science, it is argued, is part of the economic system that allocates productive capacity between current and future generations. Increases in expenditure on agricultural R&D since the 1950s have ensured that past generations have transferred productive capacity to future generations. With respect to the environment, the authors argue that a strong version of sustainable development may be appropriate, particularly where there are uncertain and irreversible outcomes. Finally, it has been observed that a hybrid version of social sustainability has been adopted in Australia. While resource mobility in the agricultural sector has been generally encouraged (weak sustainability) this has been underpinned by a welfare system that ensures basic standards of well-being and opportunity (strong sustainability).

Sustainable Development Research Network. 2002, *A New Agenda for UK Sustainable Development Research*, Policy Studies Institute, London.

aim of SDR is to contribute to sustainable development in the UK by facilitating the better use of evidence and research in policy-making; identifies current knowledge gaps, research opportunities and UK policy needs for cross-cutting research on sustainable development issues....identifies measures to improve the use of research in sustainable development policy-making and practice; research community can provide the evidence base for policies that promote sustainable development through high quality policy-relevant cross-cutting research integrating social, economic and environmental concerns

Taylor, N., Abrahamson, M. & Williams, T. 1987, *Rural change: issues for social research, social assessment and integrated rural policy*, Centre for Resource Management, Lincoln College, Lincoln.

Toman, M. 1994, 'Economics and sustainability: balancing trade-offs and imperatives', *Land Economics*, vol. 70, no. 4, p. 399.

The idea that the usage of natural resources, environmental services and ecological systems should be sustainable has become a popular topic of discussion in resource and environmental management circles. However, there remains to be a need to clarify the meaning of sustainability which has up to now been ambiguous. Thus, a common vocabulary and grammar that can be employed in the continuing discussions among economists, ecologists and environmental ethicists are developed. On this matter, two issues are of significance: requirements for intergenerational equity and definition of 'social capital' to be passed on to future generations. The beginnings of a shared framework for the debate regarding sustainability can be found in the development of the concept of 'safe minimum standard.

Valler, D. & Betteley, D. 2001, 'The politics of 'integrated' local policy in England', *Urban Studies*, vol. 38, no. 13, pp. 2393-2413.

From its inception in the early 1970s, local economic policy has shifted, albeit in complex and locally specific ways, through a variety of distinctive periods. One critical aspect of change has been the developing relation of 'economic' and 'social' policy spheres which are becoming less distinct, or even directly integrated. In this paper, we examine the emergence of ostensibly 'integrated' local economic and social strategies in two English metropolitan districts - Sandwell and Rotherham - which were at the forefront of policy development in the mid 1990s. In developing this analysis, we locate the roots of integrated policy in the changing ideological foundations of the relationship between economic and social policy under 'late Thatcherism' and 'New Labour', and in reactions to the shortcomings of previous Thatcherite urban policies. However, the process of integrated strategy-making is critically mediated by pre-existing institutional and political forms in localities, producing distinctive institutional responses and policy processes which in turn suggest the limits of policy integration in contemporary local governance.

Yiftachel, O. & Hedgcock, D. 1993, 'Urban social sustainability: The planning of an Australian City', *Cities*, vol. 10, no. 2, pp. 139-157.

Appendix 4: Basic system orientors

Source: Peet & Bossel (2000, p.228)

Note: the term 'environment' is used here in the generic sense in which 'system' and 'environment' are two complementary concepts. That is to say, the term 'environment' as used here must be understood in relation to the system or sub-system being assessed. While the natural environment is part of the environment of the social-human sub-system, so is the economic environment, and vice versa.

Environment-determined

Existence: necessary to ensure the immediate survival and subsistence of the system in the *normal environmental state*

Effectiveness: the system should over the long term be effective (not necessarily efficient) in its efforts to secure *scarce resources* from, and to exert influence on, its environment

Freedom of action: the system must have the ability to cope in different ways with the challenges posed by environmental *variety*

Security: the system must be able to protect itself from the detrimental effects of environmental *variability*, such as fluctuating and unpredictable conditions outside the normal environmental state

Adaptability: the system should be able to change its parameters and/or structure in order to generate more appropriate responses to challenges posed by *change*

Co-existence: the system must be able to modify its behaviour to account for behaviour and orientors of *other systems* in its environment

System-determined

Reproduction: self-replicating systems must be able to reproduce

Psychological needs: sentient beings, which can feel pain, have psychological needs

Responsibility: conscious actors are responsible for their actions and must comply with an ethical reference

Appendix 5: UNEP's Integrated Assessment and Planning procedure

Source: UNEP (2004)

Elements and tasks of a planning process

1. Initiation

- Rationale, need and purpose (why is this process being initiated)
- Design of the planning process (what is the approach and authorisation)

2. Analysis

- Commitments and obligations with regard to environment and sustainability
- Identification and analysis of issues, trends, problems, opportunities and linkages
- Identification of sustainability goals, principles and indicators
- Policy and institutional analysis

3. Design of strategy / strategic planning

- Defining a vision, goals and objectives
- Defining priority areas / win-win policy options for intervention
- Taking into account sustainability considerations (spatial and temporal trade-off)

4. Design of actions / operational planning

- Design and appraisal of specific solutions / activities
- Setting priorities to minimise harm and enhance benefits
- Rules for clarifying and making the trade-offs

5. Implementation and monitoring

- Implementation arrangements (organisation, funding)
- Defining a monitoring system with sustainability indicators

The framework, expressed as lists of 'process-related' and 'substance-related' questions to audit/design each stage of the planning process

1. Initiation

Elements of planning process

- Decision on purpose
- Design of the planning process

Questions to check sustainability considerations

Process:

- Is it clear who has initiated the planning process, how will the plan be drawn up and who is the decision-maker?
- Does the planning initiative build on previous experiences and take into account relevant plans and planning processes? What is the hierarchy of the plan in relation to other sectoral or territorial plans, programmes or policies?
- Is it clear who are the key authorities (at all relevant levels or sectors) and key stakeholders (including marginalised groups) that are expected to participate in the process? Are authorities responsible for sustainability policies involved?
- Is the planning process transparent? Have the key authorities and stakeholders been adequately informed of the initiative?
- Can key authorities and stakeholders influence the design of the planning process to fit their needs for proper involvement?
- Are there sufficient human and financial resources available to ensure adequate participation of key authorities and stakeholders during the planning process?

Substance

- Is the overall purpose of the planning process clear?
- Is the planning process sufficiently open to consider sustainability aspects?
- Does the planning team dispose with sufficient expertise on environmental, social and economic issues? Is there expertise on sustainability issues?

2. Analysis

Elements of planning process

- Sustainability commitments
- Identification and analysis of current situation
- Sustainability goals and indicators
- Institutional analysis

Questions to check sustainability considerations

Process:

- Have all information sources about relevant issues been identified, and used? Has local / indigenous knowledge been adequately gathered and used?
- Has an overview been provided of sustainability commitments (policies, strategies), both national and international? Are advances made in its implementation clear, particularly for the sector/region being analysed?
- Have key authorities and stakeholders (including marginalised groups) been actively informed and involved? Are sustainability concerns based on stakeholder views?
- Can the public influence the analysis? (Has the public been informed of the results? Is there room for public feedback and for its due account?)

Substance:

- Are key issues (environmental, social and economic) identified for the sector / region concerned? Is it clear which of these are key sustainability concerns?
- Are past and present trends of these key issues and their mutual interlinkages assessed?
- Has an inventory been made of available principles, standards and indicators to assess sustainability? If not, what reference framework is being used to assess sustainability?
- Using trends and sustainability standards, are the most important sustainability problems identified? Are winners and losers of these problems identified?
- What are the root causes of these problems (including relations with other sectors)?
- Are the institutions / actors responsible for these root causes identified? What makes them act as they do?
- Which (environmental, social, economic) trends or promising initiatives currently exist and offer opportunities for more sustainable development?
- Have competencies of relevant institutions and effectiveness of their cooperation been analysed?

3. Design of strategy / strategic planning

Elements of planning process

- Defining a vision and goals
- Priority areas for intervention / policy options
- Sustainability considerations

Questions to check sustainability considerations

Process:

- Have key authorities and stakeholders (including marginalised groups) been informed and actively involved? Are authorities responsible for sustainability policies involved?
- Can the public influence the proposed vision and strategy? (Has the public been informed of the results? Is there room for public feedback and for its due account?)

Substance:

- Has a vision for long-term sustainable development of the sector/region been defined (providing guidance to design and selection of relevant interventions)?
- Have goals and objectives¹ been defined to divert the key negative trends/problems and to stimulate long-term positive trends /potentials? Are the goals consistent with the vision? Are they internally (mutually) consistent? Are goals and objectives measurable (SMART)?
- Are the set goals consistent with sustainability goals and standards? More specifically, is there insight in temporal trade-off between short-term objectives and sustainability goals? And is there insight in spatial trade-off between proposed activities in the region and sustainability goals elsewhere?
- Have priority areas of intervention (policy options) been defined to realise the goals and objectives? Are these based on existing opportunities and win-win options?
- Are policy options based on different scenarios that enable achievement of proposed goals and objectives?

4. Design of actions / operational planning

Elements of planning process

- Design and appraisal of interventions
- Setting priorities
- Rules for trade-off

Questions to check sustainability considerations

Process:

- Are procedures for defining activities and priority setting clear and transparent?
- Have key authorities and stakeholders (including marginalised groups) been informed and involved?
- Can the public influence operational planning? (Can public obtain information and provide feedback? Are there sufficient mechanisms to take due account of the feedback?)

Substance:

- Are proposed interventions consistent with the goals and objectives? Are interventions based on existing or future potentials and opportunities? Have most effective interventions been selected, i.e. those that achieve attainment of multiple objectives?
- Are the detailed positive and negative (environmental, social and economic) impacts of the proposed interventions known? Have mitigation and compensation measures (including flanking policies) been identified for negative impacts?
- Are the proposed interventions still consistent with sustainability goals? Are the operational rules for dealing with trade-off (sectoral, spatial, temporal) clear? For instance, are there standards or principles available to judge trade-off?

5. Implementation and monitoring

Elements of planning process

- Implementation arrangements
- Sustainability indicators
- Monitoring system

Questions to check sustainability considerations

Process:

- Are key authorities and stakeholders (including marginalised groups) involved in the design of implementation arrangements?
- Are sufficient capacities and resources available for implementation and monitoring?
- Will all progress reports and monitoring reports be available to the public?
- Is there a clear time span including review and updates?

¹A distinction is being made between goals (of a strategic nature, with long-term validity of say 5-10 years) and objectives (of operational nature, with short- and medium-term validity of up to 5 years).

Substance:

- Have organisational arrangements been made, including identification of strategic partners (including private sector)? Have funding arrangements and mechanisms been identified, from different sources, to finance implementation of the plan?
- Is it clear how new opportunities will be identified during implementation to define new intervention areas in line with set goals and objectives?
- Has a monitoring system been established aimed at measuring both performance (of reaching objectives) and effects / impacts (of attaining set goals)?
- Have sustainability indicators been selected to measure impacts on key sustainability issues relevant for the sector / region concerned?
- Has a realistic and feasible monitoring system been defined? Will monitoring results be used to adjust, update and/or review the plan?

Appendix 6:

UNEP's Integrated Assessment and Planning Approach: Format for undertaking a preliminary assessment (with examples for element 2 of the planning process)

Questions for preliminary assessment – Element 2	<i>Outcomes</i>	<i>Comments</i>	<i>Decisions</i>
<p><u>Process:</u></p> <ul style="list-style-type: none"> • Have key authorities and stakeholders (including marginalised groups) been actively informed and involved? • Can the public influence the analysis? (Has the public been informed of the results? Is there room for public feedback and for its due account?) • Have relevant information sources about relevant issues been identified? • Has local / indigenous knowledge been adequately gathered and used? 	<ul style="list-style-type: none"> • Weakness: Marginalised groups were not involved, nor were national authorities. • Weakness: Above groups were not informed. There was no possibility for feedback. There was merely a one-way flow of information. • OK: Adequate for formal information sources. • Gap: No use of local knowledge. 	<ul style="list-style-type: none"> • There was some discussion on which are the marginalised groups. Opinions differ. • Consensus • There are doubts about the usefulness of local knowledge that is not documented, and the efforts required to access this. 	<ul style="list-style-type: none"> • Priority. With the next point, marginalised and national authorities should be informed and given time for feedback. • Not a priority. It will take too much time.

Questions for preliminary assessment – Element 2	<i>Outcomes</i>	<i>Comments</i>	<i>Decisions</i>
<p><u>Substance:</u></p> <ul style="list-style-type: none"> • Are key (environmental, social and economic) issues that determine current sustainability in the sector/region identified? • Are past and present trends of these key issues and their mutual interlinkages assessed? • Which are useful positive trends, potentials and opportunities (environmental, social, economic)? Have promising initiatives been identified? Can these be enhanced to tackle problems? • Which are the most important (environmental, social, economic) negative trends / problems ? Are winners and losers of these problems identified? • What are the root causes of problems (including relations with other sectors)? Are the institutions / actors responsible for these root causes identified? 	<ul style="list-style-type: none"> • Weakness: Not adequately, although basic information is available. • Weakness: Only for a limited number of issues trends are given in a qualitative way. • Weakness: Not specifically, but the information is certainly available. • Gap: Winners and losers were not identified. • Strength: Root causes are known, but documented in a scattered way. • Gap: Responsible actors are missing. 	<ul style="list-style-type: none"> • Consensus • Consensus, but quantitative data are missing. • Consensus • There are doubts about the level of detail that is required: what social groups are meant? • Consensus 	<ul style="list-style-type: none"> • Priority. Must be adequately done. Will take time. • Priority. Must be adequately done for all key issues, but will take time • Priority. Is just a matter of structuring existing information? • Not a priority. • Priority. Can be easily done.

Appendix 7: Sustainability indicators relating to transport

Source: Jones and Lucas (2000)

Criteria	Sub-criteria
Traffic flows	Heavy goods vehicle mileage intensity Road traffic Traffic congestion
Modal splits	Passenger travel by mode Leisure trips by mode of transport Freight transport by mode
Modal choice	Average journey length by purpose
Environment/pollution	Local environmental quality (noise and pollution from traffic) Concentrations and emissions of selected air pollutants Sulphur dioxide and nitrogen oxide emissions Acidification in the UK Emissions of greenhouse gases Carbon dioxide emissions by end user International emissions of carbon dioxide per capita Implementation of multilateral environmental agreements
Environment/resource use	Depletion of fossil fuels Ozone depletion Energy efficiency of road passenger travel Average fuel consumption of new cars
Health	Environmental factors affecting health (respiratory illness)
Education	How children get to school
Accessibility	Access to rural services Access for the disabled Access to the countryside
Social progress/inclusion	Major factors leading to health inequalities Distance travelled relative to income Real changes in the cost of transport People finding access to services difficult

