Chapter 2

GENERAL FRAMEWORKS AND APPROACHES

As noted previously, SA is a broad, still emerging area of policy thinking and experimentation. In this chapter, the focus is on organisational frameworks and approaches that have been used or are potentially available for assessment purposes. These can be divided into two main categories:

- retrospective assessments – of progress made by countries or sectors of activity towards, or away from, sustainable development; and
- prospective assessments – of the sustainability of proposed options, initiatives and actions.

In both contexts, indicator-based approaches are particularly important for systematic analysis and considerable emphasis is given to them.

2.1 Retrospective approaches to measuring and analysing sustainability

The purpose of measuring and analysing sustainability is to answer five questions:

- How well is the ecosystem in question?
- How are people affecting the ecosystem?
- How well are the people (including current and future generations)?
- Is their well-being fairly shared?
- How are these questions connected?

This information is essential for determining the progress of a society towards sustainability, its main strengths and weaknesses, and the priority issues to be addressed, eg by a national sustainable development strategy (NSDS). The information equips decision-makers to focus on the priorities without losing sight of the other components of sustainable development that, if not (yet) priorities, are also crucial for its achievement. It also provides the basis for monitoring and evaluating the effectiveness of the strategy and adjusting it as necessary.

The three main approaches to measuring and analysing sustainability are:

- *accounts* (providing data);
- *narrative assessments* not based on indicators; and
- *indicator-based assessments*.

As Table 2.1 shows, these differ in their potential for:

- transparency (ease of detecting value judgements and construction of the assessment);
- consistency over time (comparability of successive assessments);
- participation (the more technical the method, the less scope for participation);
- usefulness for decision-making (clarity with which performance and priorities are revealed).

No approach is perfect. All can profitably be supplemented by one or more *contributing measurements and analyses (*described further in section 2.1.3).

Table 2.1: Three main approaches to measuring and analysing sustainability
(Source: Dalal-Clayton & Bass, 2002)

Approach	Accounts	Narrative assessments	Indicator-based assessments
Examples	Index of Sustainable Economic Welfare. Genuine Progress Indicator.	State of environment reports. World Development Report.	Well-being Assessment. Dashboard of Sustainability.
Potential for transparency	Low	Medium	High
Potential for consistency	High	Low	High
Potential for participation	Low	High	Medium
Usefulness for decision making	Medium	Medium	High

2.1.1 Account-based approaches

Accounts are constructions of raw data, converted to a common unit (such as money, area, or energy). Most cover highly important but small aspects of sustainability. Generally speaking, they refer to one or a narrow set of indicators and include the System of National Accounts (covering the market economy), the Ecological Footprint (covering resource consumption), and energy and material accounts (covering physical exchanges between the economy and the environment). The most comprehensive accounts sum many aspects of the economy, society, and the environment into a single statement.

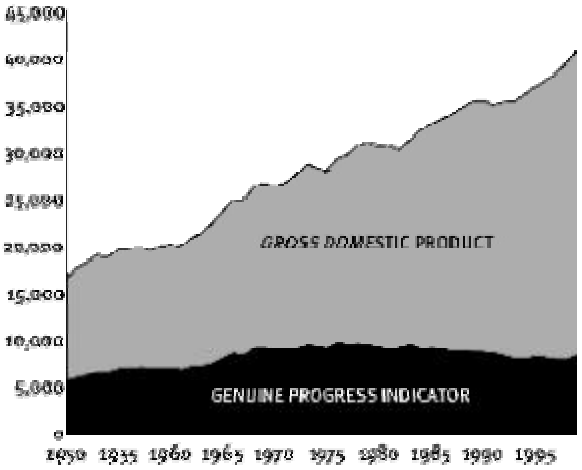
The Genuine Progress Indicator (GPI), for example, starts with personal consumption expenditure (taken from the national accounts). It then makes a series of adjustments to account for the negative effects of economic activity or factors that are ignored by the GDP (such as unequal income distribution, net foreign lending or borrowing, cost of consumer durables), social costs (crime, automobile accidents, commuting, family breakdown, loss of leisure time, underemployment), and environmental costs (household pollution abatement, water pollution, air pollution, noise pollution, loss of wetlands, loss of farmlands, depletion of non-renewable resources, long-term environmental damage, ozone depletion, loss of old-growth forests). Finally it adds some benefits ignored by the GDP (value of housework and parenting, value of volunteer work, services of consumer durables, services of highways and streets, net capital investment).

The advantage of the GPI and similar comprehensive accounts is that they are directly comparable with the GDP, the most widely used measurement of national performance (Figure 2.1).

Accounts also have certain disadvantages, particularly as a strategic tool for assessing sustainability:

- Many costs and benefits have no market value; converting them to monetary units involves assumptions, extrapolations, and judgements that distort the results; and some costs and benefits, such as loss of biodiversity, are so hard to evaluate that they are omitted.

Figure 2.1: Gross Domestic Product versus Genuine Progress Indicator: United States 1950-1999 (in 1996 US dollars).
(Source: www.progress.org/projects/gpi/)



- The assumptions, judgements and omissions are difficult to detect, and the construction of the accounts is almost impossible for non-specialists to follow.

- Although values strongly influence the final outcome, and calculation of the accounts is highly technical and leaves little room for wide stakeholder participation.

Although accounts produce a strikingly clear picture of overall performance – or "genuine progress"– they do not reveal so clearly the main constituents of that performance: it is difficult to tell which priority issues to focus on to close the gap between the GPI and the GDP. This limits the usefulness of accounts for strategy development.

2.1.2 Narrative assessments

Narrative assessments combine text, maps, graphics, and tabular data. They may use indicators, but are not built around them and the indicators used may change from one reporting period to another. They include standard state of environment reports, the World Bank's *World Development Report*, and a wide variety of other reports, and represent the most familiar approach to measurement and analysis. Their strength is their familiarity and flexibility. The potential for participation is great, because the assessment can be tailored to the technical skills of participants. Compilers can devote their attention to topics on which they have information and choose whatever communication device they deem most suitable for each topic.

However, this flexibility has pitfalls. Unsystematic choice of topics coupled with uneven treatment can mask gaps in coverage and obscure priorities: what topics have been omitted? Has a topic been left out because it is unimportant or because of lack of data? How does one topic

relate to another? How can one compare the importance of a topic covered by an anecdote-rich case study with one covered by extensive statistical analysis? The topics covered, or the way they are covered, may change between reporting periods, preventing the identification of trends. Limited transparency and consistency reduce the usefulness of these assessments for decision-making, particularly for strategy development and monitoring.

Agenda 21 and some of the international convention texts incorporate or include elements of narrative assessment and they are widely used as general frames of reference on progress toward sustainable development. However, their value as frameworks for assessing the sustainability of proposed actions is limited, although a number of countries have used or adapted them to related purposes (see, for example, Box 2.1). For example, the United Nations Commission on Sustainable Development started with Agenda 21 as its framework but has since switched to a more structured and manageable arrangement of dimensions, themes, and sub-themes, cross-referenced to the appropriate sections of Agenda 21 (UNDESA 2001b)

Box 2.1: Agenda 21 as a basis for analysis

Agenda 21 was not designed as a framework for measurement and analysis. Consequently, efforts to use it for this purpose have met with variable success.

Costa Rica carried out a comparative analysis of its national development plan with Agenda 21 as a prelude to a comprehensive sustainable development programme. Swaziland conducted a careful, participatory review of Agenda 21 to decide how to integrate principles of sustainability into a revised national development plan. Both Ecuador and El Salvador conducted similar analyses – but also made efforts to separate the process of analysis from any political agenda, so that important principles identified by the process could be adopted by the winner of a subsequent election.

Given the absence of numerical data, Agenda 21 analyses have been subjective, usually involving people coming together to identify what is currently impeding the long-term progress of the country. In Kenya, the problem was seen to lie in a centralised planning system that did not cater to the development needs of communities. In El Salvador, the problem lay in the continuing lack of trust among factions that had fought a civil war. In Morocco, the underlying concern was population growth and employment. In Niger, the principle problem was desertification and land degradation.

Source: UNDP (2000)

Sets of principles and criteria that are expressly intended as indicator frameworks have been somewhat more useful. These tend to be devoted to particular sectors, notably forest management, such as the Forest Stewardship Council's principles and criteria (FSC 2000); the Montreal Process's criteria for the conservation and sustainable management of temperate and boreal forests (The Montréal Process, 1999); the Pan-European criteria for sustainable forest management (Ministerial Conference on the Protection of Forests in Europe and Pan European Forest Certification Council, 1998); and the International Tropical Timber Organization's criteria for sustainable management of natural tropical forests (ITTO 1998).

However, none of these frameworks is fully systemic, hierarchical, or logical. Consequently, indicator sets derived from them suffer from one or more of such flaws as an inability to produce clear pictures of socio-economic conditions and the state of the environment, omission of

essential aspects of sustainability, overlapping components and consequent redundancy and double-counting, confusion about what is being measured and why, unmeasurable indicators, and distortion of assessments through an emphasis on documenting procedures rather than achieving results.

2.1.3 Indicator-based assessments

Like narrative assessments, indicator-based assessments may include text, maps, graphics, and tabular data, but, unlike them, they are organized around indicators– generally speaking, a broader ser of indicators than accounts. A great deal of attention is paid to choosing them systematically. Indicators enable assessments to be comprehensive yet selective: because they can be selective, they are better equipped than accounts to cover the wide array of issues necessary for an adequate portrayal of human and environmental conditions. Systematic procedures for choosing indicators lay bare the selection and arrangement of issues covered by the assessment and the values involved, and make the construction of indicator-based assessment more transparent than that of accounts or narrative assessments. By employing the same set of indicators over time, later indicator-based assessments can be compared with previous ones, providing more consistent coverage from one assessment/reporting period to another. Comprehensive and consistent coverage, together with systematic organization of issues and their indicators, enable priority issues and strengths and weaknesses of performance to be clearly identified. This makes indicator-based assessments more useful than other approaches for decision-making and hence for strategy development.

Participation by decision-makers and stakeholders is necessary to ensure that the assessment incorporates their values and addresses their concerns. Participants need to have a major say in what is assessed and in deciding questions of value. At the same time, the team undertaking the assessment has a responsibility to make sure that the assessment is technically sound and withstands scientific scrutiny. However, the technical demands of indicator selection impose constraints on participation. In effect, the assessment must be designed jointly by participants and technicians.

Indicator-based assessments are potentially more transparent, consistent and useful for decision-making than other approaches; but whether they fulfill their potential depends on how well they are designed and executed.

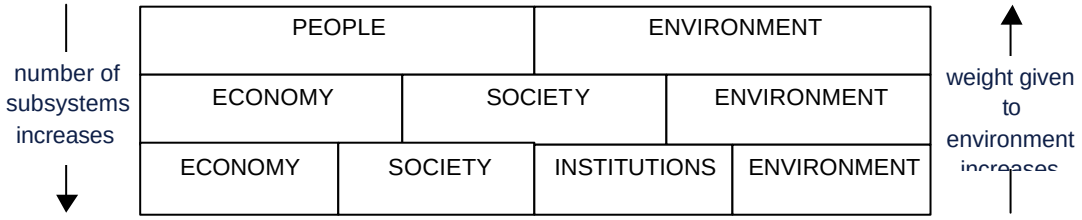
Indicator-based assessments of sustainability differ chiefly in the number of subsystems into which they divide the system (the assessment area), the number of levels between subsystem and indicator, and whether they produce indices (compound indicators) of the state of the system and its subsystems (Table 2.2).

The division into two subsystems ensures that assessments treat people and the environment equally and focus on the central question of sustainable development: how to achieve high levels of human well-being and ecosystem well-being together? Increasing the number of subsystems by subdividing the human side reduces the weight given to the environment from a half to a third (three subsystems) to a quarter (four subsystems) (Figure 2.2). The advantage of three subsystems is the prominence given to the economy, still the main preoccupation of decision-making. However, which aspects of human well-being are “economy” and which “society” can be hard to tell and depend on particular cultural perspectives. The separation of “economy”, “society”, and “institutions” is even more arbitrary and confers no advantage other than its current acceptance by the United Nations Commission on Sustainable Development (CSD). An “integrated” subsystem

Table 2.2: Indicator-based assessments of sustainability
(Source: Dalal-Clayton & Bass, 2002)

Type	Number of subsystems	Number of levels between subsystem and indicator	Indices of the state of the system and subsystems?
Well-being Assessment (Figures 2.4 & 2.5)	2: ecosystem, people	2-4	Yes
Dashboard of Sustainability (Figure 2.3)	3: environment, economy, society	1	Yes
Dashboard of Sustainability for CSD	4: environment, economy, society, institutions	2	Yes
CSD Indicators of Sustainable Development	4: environment, economy, society, institutions	3	No
Global Reporting Initiative Sustainability Reporting Guidelines	4: environment, economy, society, integrated	1-3	No

Figure 2.2: Environmental weight declines as the number of human "subsystems" increases



is superfluous because the "integrated" indicators suggested by the Global Reporting Initiative (www.globalreporting.org) could be assigned to one of the other subsystems or could be generated more informatively as indices of the state of the subsystems or the system as a whole.

The number of levels between subsystem and indicator is a major factor in both the robustness and the user-friendliness of an assessment method. Too few levels make it hard to trace the logic behind the choice of indicator – what aspect of the subsystem the indicator represents and how fully and directly it represents that aspect. Too many levels run the risk of losing the user in a convoluted series of links between subsystem and indicator.

Given the broad scope of sustainable development, a large number of indicators is inevitable but presents an enormous communication problem. The International Institute for Sustainable Development (IISD) notes the key dilemma of needing both comprehensive coverage and simple messages and presentation:

"From those developed for rural communities to those for the United Nations, hundreds of sustainability indicator sets have been created for and presented to their respective audiences. Still, they have far to go before they can claim to be widely used. Most sustainability indicators come as large, unwieldy reports, crammed with complex charts and graphs. Although useful to policy professionals and academics, most indicator sets are not practical for the media and public. In order to build support for and an understanding of indicators, there must be a process for indicators to be legitimised through some form of public consultations or trial application."

The growing ranks of indicator projects and professionals worldwide face two challenges that seemingly contradict each other:

- Growing complexity. As our understanding of the complexity of sustainability grows, how do we manage the mountains of data required to monitor it?

- The demand for simplicity. Since public education and resulting political action are seen increasingly and urgently as the purpose for creating indicators, how do we present them in ways that are simple, elegant and effective, without compromising the underlying complexity?"

A single indicator of sustainable development is an impossible dream (Box 2.2). The best way to overcome this problem is to combine the indicators into indices. Assessments that do not combine their indicators into indices are extremely hard to interpret but those that do communicate their main findings very readily. When indicators are combined into indices, they can provide a clear picture of the entire system, reveal key relationships between subsystems and between major components, and facilitate analysis of critical strengths and weaknesses. No information is lost, because the constituent indicators and underlying data are always there to be queried.

Box 2.2: The quest for a single indicator of sustainable development

"Complex problems of sustainable development require integrated or interlinked sets of indicators, or aggregations of indicators into indices. High-level decision-makers—government ministers, foundation executives, heads of corporations—routinely ask for a small number of indices that are easy to understand and use in decision-making. Many concerned with sustainable development voice their desire for a single indicator to compete with the enormous political power of the Gross Domestic Product, a single number that provides information about the total market value of production and services in a country as a single number. But many are skeptical that a single number could assess something as complex as sustainable development.

"Most indicator experts believe that searching for a single indicator of sustainable development is something like the quest for the unicorn. It is a myth to think that one number—even one that vastly improved on the GDP as a proxy for overall national well-being—could have any real functional value as a policy tool. But many also acknowledge that the attempt to create an index of sustainable development may be useful because it would force a concerted effort to present the complexity of sustainable development more simply. Even a modestly successful effort by presenting a handful of aggregated indices could introduce a generation of policy and decision-makers to the goals of sustainable development".

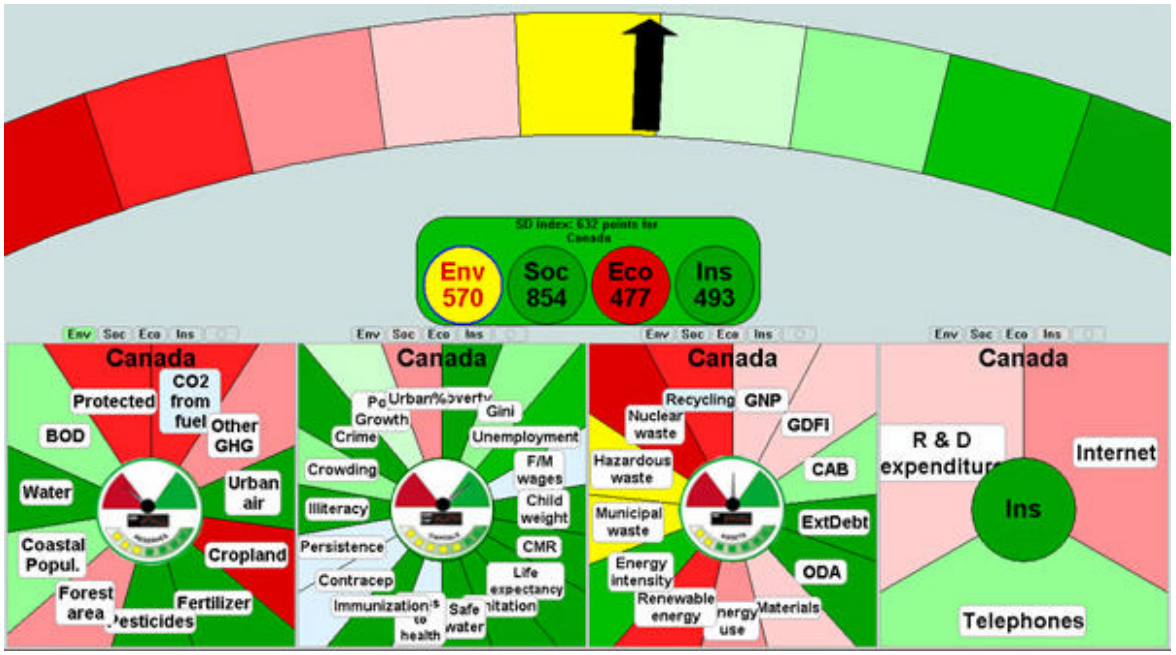
Source: www.iisd.org

(EWI) and human indicators into a Human Well-being Index (HWI), which are then combined graphically into a Well-being Index (WI) – the intersection of the EWI and HWI on the Barometer of Sustainability (Figures 2.4 and 2.5).

The Dashboard of Sustainability comes in two versions. The standard version combines environmental indicators into an Environment Index (EnI), economic indicators into an Economy Index (EcI), and the social indicators into a Society or Social Care Index (SI), which it then combines into a Policy Performance Index (PPI). The version for the indicator set of the Commission on Sustainable Development (Figure 2.3) combines institutional indicators into an Institutional Index (II) and then combines the EnI, EcI, SI, and II into a PPI.

By combining indicators into indices and displaying the indices graphically, both Well-being Assessment and the Dashboard of Sustainability show how close the society concerned is to sustainability, the state of people (socio-economic conditions) and the ecosystem (environmental conditions), and the main strengths and weaknesses of performance.

Figure 2.5 The Dashboard of Sustainability: an example for Canada



From left to right are 'barometers' of environmental, social, economic and institutional conditions.

Green – conditions OK to very good. Red – conditions bad to critical. *Source:* *www.iisd.org*

The last decade has seen considerable efforts by governments, NGOs, and multi-stakeholder groups to develop indicator-based assessments of sustainable development. Some cover the full sweep of sustainability. Most tend to pay more attention either to human aspects or to the environment. IISD provides a compendium of indicator initiatives at www.iisd.org and some examples are listed in Box 2.3. In addition to their use for measuring progress toward sustainable development, such indicators also can be used to assess the sustainability of proposed actions and future trends.

Figure 2.3: Group Barometer of Sustainability, showing the well-being of North and Central America.

The Human Well-being Index (HWI) is in the yolk of the egg; the Ecosystem Well-being Index (EWI), in the white. (El Salvador's HWI is 36 and EWI 46.) The Well-being Index (WI) is the position of the egg—the point on the Barometer where the HWI and EWI intersect. Sustainability is the square in the top right corner. Note that the Barometer clearly shows the relationship between human and ecosystem well-being, the wide spread of performance among countries, and the distance to sustainability. Belize was assessed on fewer indicators than the other countries: a fuller assessment might move its position to between Costa Rica and El Salvador.

Source: Prescott-Allen (2001a).

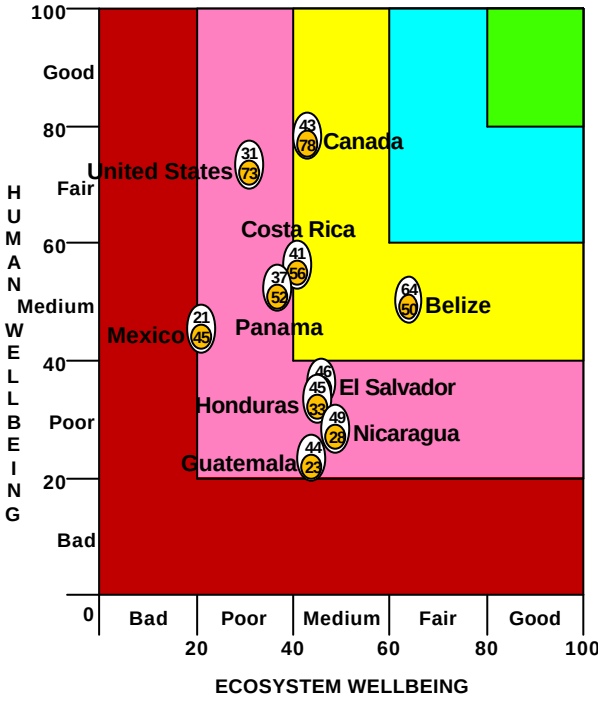
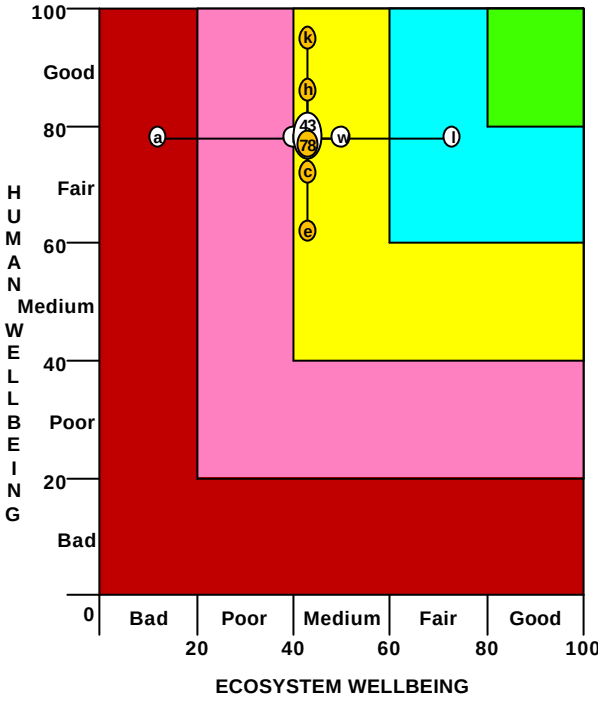


Figure 2.4: Individual Barometer of Sustainability, showing the well-being of Canada.

Grey circles (vertical axis) are the points on the scale of the human dimensions (major components of the HWI):
c = community; e = equity; h = health and population; k = knowledge; w = wealth. White circles (horizontal axis) are the points of the ecosystem dimensions (major components of the EWI): a = air; l = land; r = resource use; s = species and genes; w = water. Some dimensions are hidden by the egg (wealth, species and genes, resource use). The dimensions that need most attention are air (reduce carbon emissions), resource use (reduce energy consumption), and species and genes (expand habitat protection for wild species, and conserve agricultural diversity).

Source: Prescott-Allen (2001a).



Box 2.3 Examples of sustainable development indicator initiatives

WORLDWIDE

UNEP: Project to measure states of and trends in the environment and guide policy-making towards sustainable development, in implementation of UNEP Environmental Observing and Assessment Strategy. Development of indicators in specific sectors; approaches to aggregation of indicators; use of indicators in state-of-the-environment reporting. Indictor sets issued in 1997, 2000 and 2001 (www.unep.ch/earthw.html)

World Bank: (a) The Bank's annual World Development Indicators (WDI) includes 800 indicators in 75 tables, organised in six sections: world view, people, environment, economy, states and markets, and global links. The tables cover 148 economies and 15 country groups – with basic indicators for a further 58 economies (www.worldbanbk.org/data/wdi2000); (b) The Environmental Economics and Indicators Unit has developed indicators of environmentally sustainable development and environmental performance (for WB projects) (www-esd.worldbank.org/eei)

UNDP: Human Development Reports published since 1990, presenting the ***Human Development Index*** (HDI) as a measure of human development in individual countries (www.undp.org).

OECD: Programme to develop a core set of (and supporting sectoral) environmental indicators initiated in 1990 (based on policy relevance, analytical soundness and measurability) (www/oecd.org//dac/Indicators/index.htm)

Dow Jones Sustainability Group: Indexes (one global, three regional and one country) based on the world's first systematic methodology for identifying leading sustainability-driven companies worldwide. (www.sustainability-index.com)

World Resources Institute: Project on highly aggregated, policy-relevant environmental indicators – developed map-based indicators of biodiversity and land use; and indicators of material flows (national, sectoral and company levels) (www.wri.org)

Hart Environmental Data: Comprehensive website with a database of indicators-related projects and resources to help people and organisations with their indicator research. Specialises in community indicators (www.subjectmatters.com/indicators/Indicators/)

NATIONAL/PROVINCIAL

United States: Interagency Working Group on Sustainable Development Indicators developed experimental set of 40 indicators to encourage a national dialogue towards developing a set of national indicators (www.sdi.gov/reports.htm)

Finland: Finnish Environment Institute developed sustainable development indicators for use at national level - 20-30 indicators in each of four categories: environmental, economic, social, conflict (www.vyh.fi/eng/welcome.html)

United Kingdom: Department of the Environment, Food and Rural Affairs developed core set of 150 (and 15 headline) sustainable development indicators to be central to future progress reports – take an economic-social-environmental-resource model whilst recognising interactions between them (www.sustainable-development.gov.uk)

COUNTY, MUNICIPAL, LOCAL AREA, COMMUNITY-BASED

Lancashire County Council, UK: Second Green Audit incorporates 40 sustainability indicators for the county (www.la21net.com/)

City of San Jose, California: The City Policy and Planning Division developed 52 quantifiable indicators of sustainability in nine categories as a step towards creating a centralised, coordinated environmental data system for performance measurement and public information (www.ci.san-jose.ca.us/esd/)

Hamilton-Wentworth, Ontario, Canada: Sustainability indicators to monitor progress towards goals of city's Vision 2020 – developed through community consultation process using workbooks (www.vision2020.hamilton-went.on.ca/)

Sunrift Center for Sustainable Communities, Minnesota, USA: Developed the *Flathead Gauges* to identify/quantify key components of sustainability in Flathead County, and to measure trends. Involved public meetings, citizen survey and feedback from individuals and organisations (cdaly@netrix.net)

Sustainable St Louis: "Measure of St Louis" project assists citizens to develop and monitor a set of community-defined indicators of sustainable development (Contact: Claire Schosser, PO Box 63348, St Louis, MO 63163, USA; Fax: +1-314-773-1940)

Integrative Strategies Forum, Washington, DC: The Metro Washington Community Indicators Project is a voluntary initiative, promoting the development and use of community indicators as part of a wider sustainability planning process (jbarber@igc.org)

Sustainable Northern Ireland Programme: An NGO working with communities and local authorities to promote Local Agenda 21 and sustainable development in Northern Ireland. Helped several councils to develop initial sets of indicators to raise public awareness about sustainability (Contact: Michael@snipl.freeserve.co.uk)

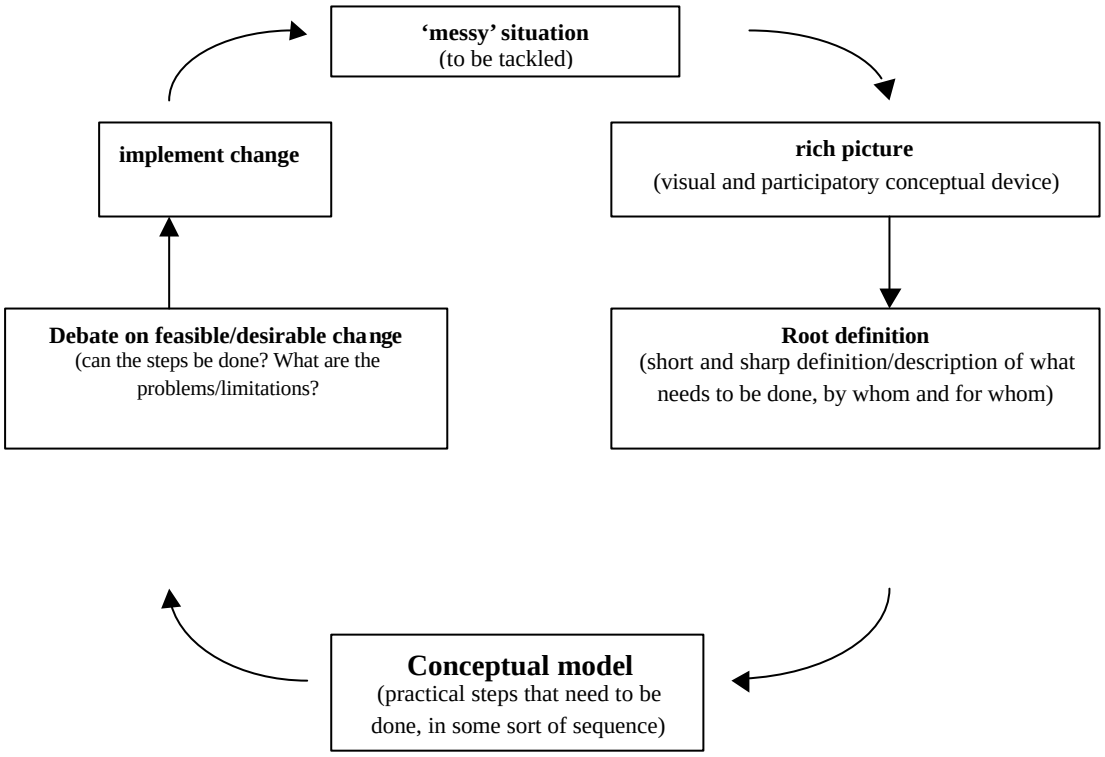
Source: www.iisd.org

2.1.4 An example of retrospective application

Some approaches to sustainability assessment/appraisal have their prime focus on the development of such indicators. For example, ***systematic sustainability analysis (SSA)*** has been developed the International and Rural Development Department of the University of Reading in Malta (Bell and Moore 1999). Essentially, it is a process, based on the 'soft systems methodology (SSM) (Checkland 1981; Checkland and Scholes 1990) (see Figure 2.6) designed to deal with 'messy' situations and allow multiple viewpoints on problems/solutions to be considered.

SSA has recently been tested to develop a set of indicators of sustainable development for Malta, particularly as a tool for the sustainable management of coastal and marine areas, and as a contribution to the activities of the Mediterranean Commission for Sustainable Development and implementation of the Mediterranean Blue Plan in Malta (Bell and Moore 2003). The approach combines the main themes of systemic analysis and core elements from sustainability indicators. A team of participating local stakeholders selects indicators and explores, describes and assesses the level of sustainability of the agreed system by the use of these indicators and systems diagrams. The sustainability of the system can be monitored over time.

Figure 2.6: Simplified stages in the soft systems methodology
(Source: Bell and Morse 2003)



In Malta, the original SSA methodology was adapted to reflect the values and concerns of the Blue Plan and to include elements of Blue Plan projects used elsewhere. The modified version was termed *systemic and prospective sustainability analysis* (SPSA) – 'prospective' stressing extrapolation in order to consider multiple scenarios.

2.1.5 Contributing measurements and analyses

A wide range of analytical techniques might be useful to sustainability appraisal, and for getting to grips with particular issues. It is not our intent to try to review all of these here. But some techniques have been particularly useful and are described in Dalal-Clayton and Bass (2002, available at www.nssd.net):

- Spatial analysis;
- System of national accounts (SNA);
- Genuine domestic savings (World Bank, 1999);
- Ecological footprint;
- Natural resource, materials and energy accounts;
- UNDP's Human Development Index (HDI) (see www.undp.org/hdro/anatool.htm);
- Sustainable livelihoods analysis;
- Policy influence mapping;

- Problem trees and causal diagrams;
- Strategic environmental assessment;
- Community-based issue analysis

The last four techniques are particularly useful for prospective assessment as well for the preparation of national strategies for sustainable development (NSDS) as they: bring together several dimensions of sustainable development; help get close to an understanding of underlying causes; offer insights as to possible solutions; and are amenable to participation – or at least make the results broadly understandable to a wide group of 'non-expert' stakeholders.

2.1.6 Deciding what to measure: a framework of parts and aims

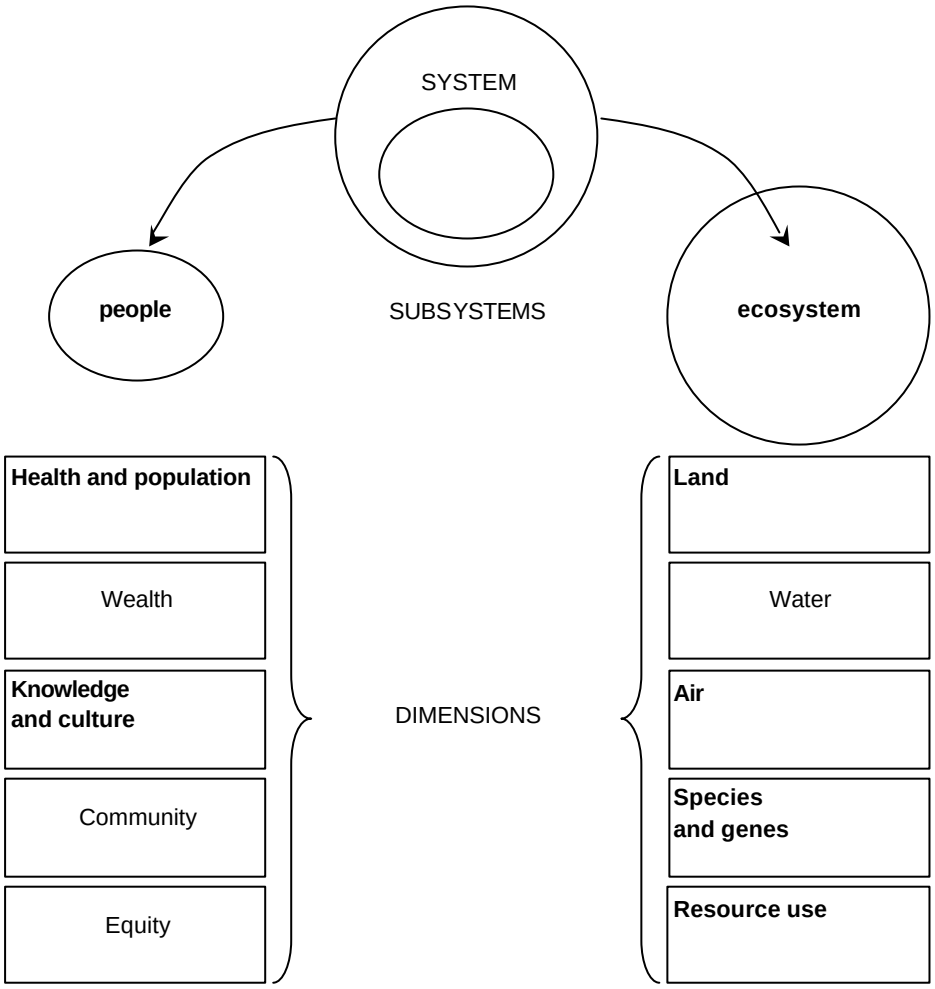
The main steps in developing an indicator-based form of assessment are:
- designing a framework of parts and aims (discussed below);
- choosing indicators;
- generating indices;
- identifying priority issues and policy options.

A framework of parts (components, dimensions, elements, themes, etc.) is an arrangement of the parts of a system that must be measured to get a clear and accurate reading of the state of that system and changes to it. A framework of aims (goals, objectives, principles, criteria, etc.) is an arrangement of the aim of each part, succinctly expressing its point, the main item or items of concern, and the level or type of performance that is sought. A combined framework of parts and aims provides a checklist of the human and environmental conditions required for sustainable development. More importantly, it enables people to:

- identify the essential parts of the system;
- avoid measuring the same part more than once;
- avoid omitting an essential part;
- highlight unavoidable gaps (so that everyone knows that a part is missing if there is no suitable indicator for it);
- ensure that an appropriate weight or value is given to each part;
- show the logic underlying the selection of parts and the weight given to each;
- measure key relationships between groups of parts;
- combine the indicators to provide measurements not just of the particular parts they represent but also of major groups of parts and of the system as a whole;
- part of a framework of parts and aims is shown in Table 00.0.

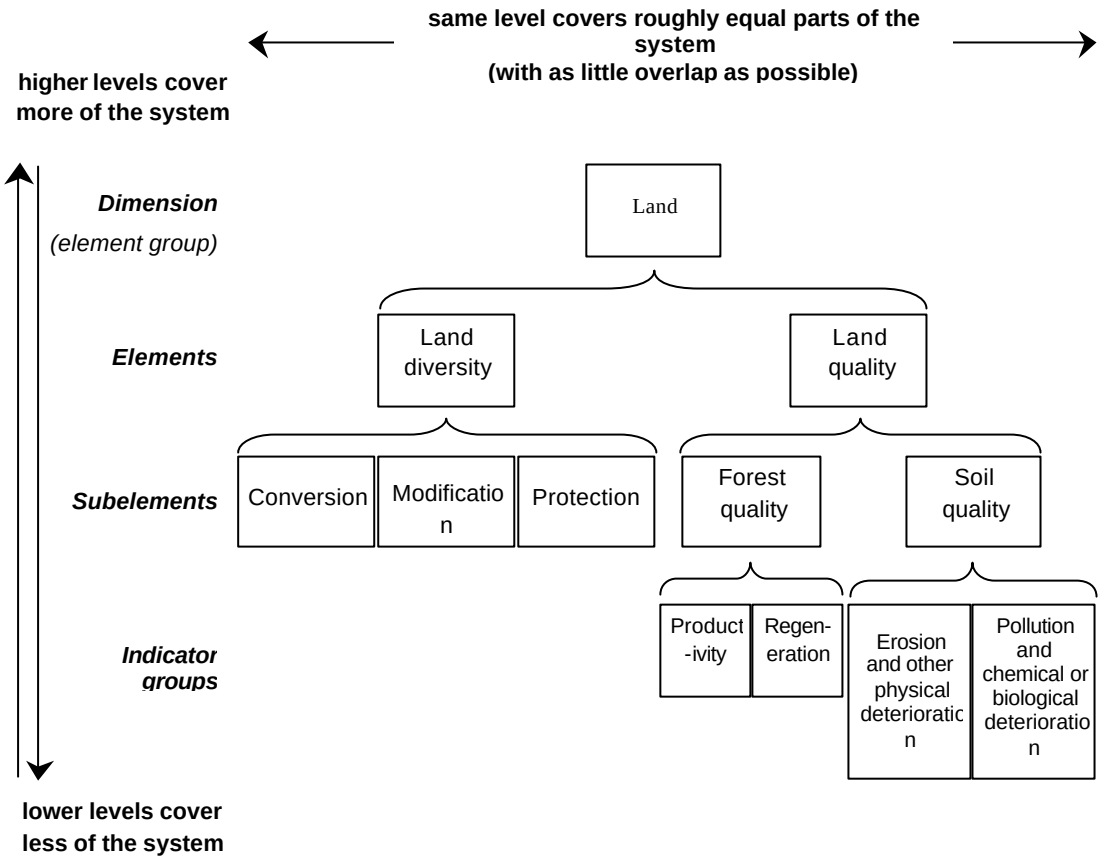
A well-designed indicator framework (able to fulfill all the above functions) is systemic, hierarchical, logical, and communicable. *Systemic* means that the parts are organized to facilitate analysis of key properties of the system and relationships between subsystems and major features. In Figure 2.7, for example, the division of the system into two subsystems (people and ecosystem) reflects the fact that human societies exist within ecosystems. It also facilitates analysis of the relationship between human and environmental conditions. The division of the human subsystem into major groups of human concerns and of the ecosystem into major compartments facilitates analysis of (for example) the relationship between resource use and the state of the rest of the ecosystem (land, water, air, biodiversity), resource use and wealth, and wealth and the state of the rest of the human subsystem.

Figure 2.7: Example of a systemic arrangement of parts



Source: Prescott-Allen (2001a)

Figure 2.8: Sustainability components arranged hierarchically
(Source: Robert Prescott-Allen, personal communication)



Hierarchical means that the parts are organized into a series of levels. Lower levels are narrower in scope and more specific than higher levels. Components on the same level are roughly equal in scope and overlap as little as possible. For example, land diversity and land quality (Figure 2.8) are intended to be equally important parts of land; conversion, modification, and protection to be equally important aspects of land diversity; and forest quality and soil quality to cover roughly equal aspects of land quality.

Logical means that the levels form a series of means and ends. The level below is a means of achieving the level above. The level above is the end or purpose of the level below. For example:

- What we must measure (*means*): We measure *ecosystem well-being*, by measuring the condition of the *land*, which we do by measuring *land diversity*, which we do by measuring *conversion*, which we do by measuring *the percentage of each ecosystem type converted to non-forest or plantation;*

- Why we measure it (*ends*): We measure *the percentage of each ecosystem type converted to non-forest or plantation* to measure *conversion*, which we do to measure *land diversity*, which we do to measure the condition of the *land*, which we do to measure *ecosystem well-being.*

Communicable means the parts and aims are simply expressed and readily understood by decision-makers and are not abstract or highly technical.

2.2 Prospective approaches to assessment

2.2.1 Assessing the sustainability of societal initiatives and proposing agendas for change (ASSIPAC)

A general methodological framework for sustainability assessment – ASSIPAC - has been suggested by Devuyst (1999), working at the EIA Centre, Free University, Brussels. ASSIPAC involves a two-tiered approach:

- A *sustainability assessment check* - a short study, screening an initiative for possible conflict with policies or visions for sustainable development;
- A *sustainability assessment* - a more in-depth examination of the sustainability consequences of the initiative.

The method involves 11 steps (Box 2.4), guided by a checklist (Appendix 1). The method has yet to be applied in practice, but has been tested on various pending policies or plans of the Belgian, Flemish or local governments, and on imaginary company transportation management plans for the city of Santa Monica, California.

Box 2.4: Steps in the ASSIPAC framework

1. Identification of person or team to carry out the assessment

2. Gathering information on the initiative studied and on alternatives to the initiative which might have been developed (by completing section A and B of the ASSIPAC checklist.- Table *).

3. Identification of sources of information and data needed to complete the checklist.

4. Obtaining of information on sustainable development policies, visions or strategies which are in force in the area. Existing sustainability targets or standards should be identified (section C in checklist).

5. A description of the "best available sustainable development practice" (if available) in an international context for the initiative studied (required in section D).

6. Collection of information on the reactions of the public in general and specific stakeholders in relation to the initiative (section E of the checklist).

7. 'Force field analysis' to examine the forces in society that might hinder the attainment of a more sustainable initiative (section F).

8. Systematic consideration of all items in sections G, H, I, J, and K; and gathering information for each topic, if applicable to the initiative, on the way it is dealt with in the initiative. Other important topics can be added to the checklist.

9. An assessment of the extent to which the topics in sections G, H, I, J, and K have been sufficiently considered in the development of the initiative (section L) , using the categories listed in Table 2.1 for each item in the checklist and a description.

   Reference should be made to the existing policies or visions for sustainable development and sustainability targets and standards for the area concerned. If no such policies, visions, targets or standards exist, reference can be made to general principles for sustainable development or sustainable development policies, visions, targets or standards of other jurisdictions. Also, if a "best available sustainable development practice" exists, it can be used as a point of reference and deviations from this discussed. If alternatives to the initiative have been developed, their sustainable character should be discussed in a comparative way.

   Table 2.3: ASSIPAC topic integration categories

A.	Topic generally well integrated in the initiative, no important aspects neglected.
B.	Topic generally well integrated in the initiative, only minor aspects neglected.
C.	Topic integrated in the initiative in a satisfactory way despite omissions and/or inadequacies.
D.	Parts are well integrated in the initiative, but must be considered just unsatisfactory because of omissions and/or inadequacies.
E.	Topic integrated in the initiative in an unsatisfactory way, significant omissions or inadequacies.
F.	Topic not at all integrated in the initiative, topic dealt with in a very unsatisfactory way.
NA.	Not applicable. The topic is not applicable or irrelevant in the context of this initiative.

10. The above steps will have clarified the weaker and stronger sustainability characteristics of the initiative and its alternatives. Taking into account the positions of the initiator, stakeholders and the

public in general, and acknowledging the forces which obstruct the sustainable character of the initiative, proposals of an agenda for change are then developed. Scenarios can be developed to increase the sustainable nature of the initiative (section M).

11. Conclusions are made (section N) and a report or discussion document written, providing high quality information to decision-makers and stakeholders to help discussion of the initiative and its role in the community in a sustainable development context. (section O).

2.2.2 Threshold 21

Comprehensive, integrated planning is complex. A single mental model cannot adequately comprehend all of the elements involved. Each agency or stakeholder participating in the planning process tends to focus on their own priorities and sectors and rarely gives much weight to impacts of needs of other sectors. A major challenge of effective planning is to consider a full range of interconnected factors that can help decision-makers evaluate different sets of options and compare the results. This forms the basis for rational discussions among concerned agencies and stakeholders, and provides a common framework or 'language' for examining the implications of the different approaches.

An analytical support tool

Threshold 21 (T21) is a computer-based, quantitative tool for integrated development analysis developed by the Millennium Institute, a USA-based NGO (www.threshold21.com). It is designed to support comprehensive, integrated planning, and is a valuable quantitative tool for both planning, and for monitoring and evaluating results. Once a country's vision for its future development is made explicit, and once the key goals or targets are identified, T21 can be used to generate scenarios of future consequences of the different strategies proposed for pursuing the country's vision. Users can quickly and transparently trace the changes in the outcomes back to the assumptions and polices that produced the changes. This capability helps users identify vital leverage points and sensitive assumptions. T21 encourages dynamic analysis and modifications of alternatives to refine and improve strategies and plans. This process also deepens understanding of development challenges and how they interact, so that planners can better explain what is likely to happen, and why.

Features of Threshold 21

T21 can be readily modified and adapted to address country-specific issues. It:

- integrates economic, environmental and social elements using a system dynamics approach[1];
- informs development strategies and policies by simulating possible impacts of alternative policy choices and strategic options;
- builds local capacity for continued use of T21 for development analysis and planning through a process of training and partnership based on technology that is easy to understand, use and adopt;

[1] For more on system dynamics, visit the System Dynamics Society's web site (www.albany.edu/cpr/sds/) or call (+1 518) 442-3865.

- facilitates transparency, participation and consensus-building by encouraging transparent consultations with diverse stakeholders and external development partners within a common framework and an easy-to-understand interface;
- is flexible and can be customized to address the unique needs of individual countries through the use of a modular design where existing sectors can be modified or removed and new sectors can be added; and
- produces output for policy documents including the national budget, national development plans, the Country Assistance Strategy (CAS), the Poverty Reduction Strategy Paper (PRSP) or UN Development Assistance Framework (UNDAF).

History of T21

T21 has evolved over the past 20 years and is based on a combination of analysis of general development models and adaptation of the best and/or most broadly respected sector models into an integrated framework. To date, over 15 unique, customized T21 models addressing both industrialized countries (i.e., the United States and Italy), and less-industrialized countries (i.e., Bangladesh and Malawi) have been created, and several more are under preparation.

T21 core model

T21 is build around a core model comprising the economic, social, and environmental pillars of sustainable development. Within each major pillar are number of sectors and structural relations that interact with each other and with factors in the other pillars (Box 2.5 and Figure 2.9).

Box 2.5: Threshold 21: core model

The ***economy pillar*** contains major production sectors (agriculture, industry and services), which are characterized by Cobb-Douglas production functions with inputs of resources, labor, capital, and technology. A Social Accounting Matrix (SAM) is used to elaborate the economic flows and to balance supply and demand in each of the sectors. Demand is based on population and per capita income and distributed among sectors using Engle's Curves. This helps calculate relative prices, which are the basis for allocating investment among the sectors. The government sector generates taxes based on economic activity and allocates expenditures by major category, which then impacts the delivery of public services, subject to maintaining budget balances. The Rest of the World sector comprises trade, current account transactions, and capital flows (including debt management). Income distribution and poverty levels are calculated.

The ***social pillar*** contains detailed population dynamics by sex and age cohort; health and education challenges and programs; and poverty levels. These sectors take account, for example, of the interactions of family planning, health care and adult literacy rate on fertility and life expectancy, which in turn determine population growth. Population determines the labor force, which shapes employment. Education and health levels, together with other factors, influence labor productivity. Employment and labor productivity affect the levels of production from a given capital stock. An HIV/AIDS sector is also included, which shows possible evolution of infections, the impacts of the disease on population and productivity, and the effects of different treatment programs.

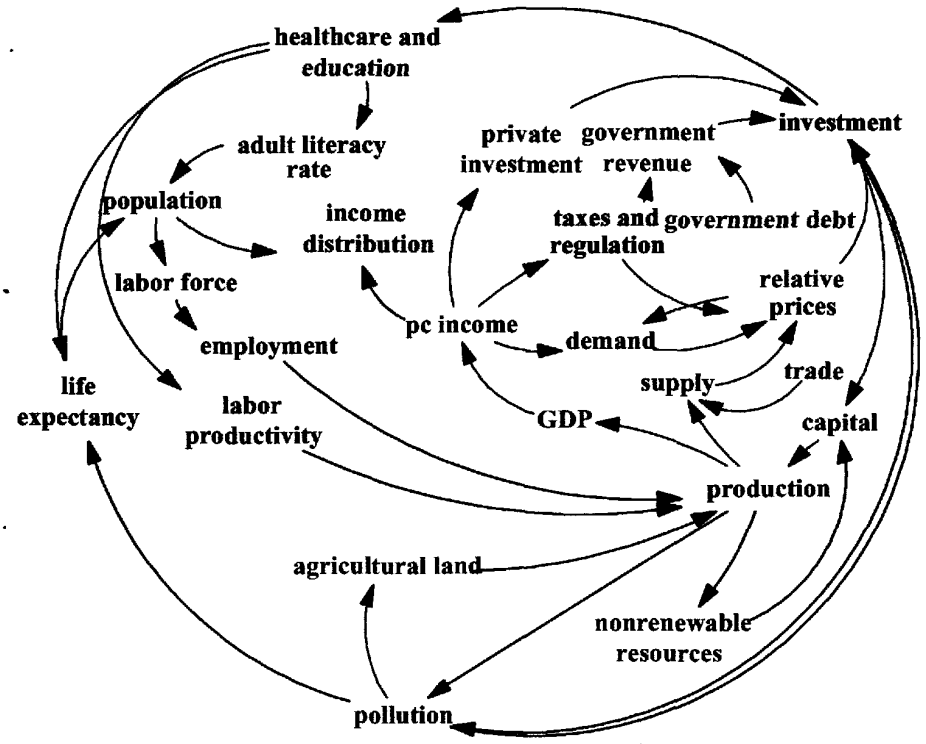
The ***environment pillar*** tracks pollution created in the production processes and its impacts on health and eventually on production. It also estimates the consumption of natural resources – both renewable and non-renewable – and can estimate the impacts of the depletion of these resources on production or other factors. It can also examine the effects of erosion and other forms of environmental degradation and their impacts on other sectors, such as agricultural productivity or access to clean water, or more direct health impacts. Very few other models or planning processes take these factors and their

feedbacks into account.

The model generates nearly all of the Millennium Development Goals indicators and produces standard tables for most donor reports, including the UNDAF tables, World Bank CAS tables, and others. These can be exported in tabular form.

(A demonstration version of T21 is available at: www.threshold21.com/download.html).

Figure 2.9: T21 core model



Customizing T21 Models

Before applying T21 as a tool for national development analysis and planning, T21 must be customized to meet the unique situation of an individual country or region.

Each customized T21 model builds upon the T21 core model, taking advantage of its modular design to (1) modify or remove existing sectors that may not be relevant and (2) add new sectors of structures that reflect country-specific circumstances. These changes are carefully documented. Model components that have been developed in the course of customized T21 applications include:

- production sub-sectors such as the sugar industry, micro-credit, transportation, agriculture extension, livestock, and hydro power;

- social sub-sectors including food sufficiency and nutrition, reproductive health, and vocational training;
- natural resource sub-sectors including fossil fuels use, forest depletion, and land and water degradation; and
- env natural resource sub-sectors including fossil fuels use, forest depletion, and land and water degradation; and
- environment sub-sectors such as air pollution, water pollution, and greenhouse gas emissions.

T21 is customized in close cooperation with a team of country experts from the agency that will use the model, and often from other groups (usually civil society) that are also interested in using the modell. This assures that the design of the model structure and calibration of the data represents the best understanding of the economy and reflects the primary concerns for strategic analysis.

The T21 model has been customized to meet the development and planning needs of a number of countries (Box 2.6) and even some regions

Box 2.6: Examples of 'customised' T21 applications

Northern Somalia: T21 was used as a tool for building a common development framework across stakeholder groups (including clan leaders, local NGOs, government ministries, and international NGOs). The local tribal group worked with MI staff to customize the model to fit the specific needs of the region. Unique sub-sectors designed for the Northern Somalia model include Livestock, Rangeland, Tree Cover, and Xeer (a clan-based form of governance). The group formed a seven-person multi-stakeholder team to conduct further analyses for Northern Somalia's future development and to conduct workshops around the model for broad-participation in the planning process.

Malawi: T21 was institutionalized within the National Economic Council (NEC) for strategic planning and analysis. The NEC adapted T21 to analyze strategies for reaching Malawi's *Vision 2020* goals. The NEC and MI developed an HIV/AIDS sector, connected it to T21, and expanded the Agriculture sector to include additional commodities. The NEC drafted a Policy Framework Paper (PFP) for the IMF based on T21analysis, and the IMF approved the PFP in December 1999.

Italy: The national environmental agency used T21 to analyze how the Italian government could comply with its Kyoto Protocol greenhouse gas commitments while not hindering the economy. A report based on T21 outlined several options.

China: General Motors and the Chinese government used T21 to examine opportunities for investment in the transportation industry. They developed a 'win-win-win' strategy that projected increased auto sales for GM, increased revenue for the Government, and increased employment and limited environmental impact for the people of China.

2.2.3 The capital model

The World Bank, amongst other institutions, as promoted the concept of capital as a means of estimating the sustainability of development at an aggregate level (Serageldin and Steer 1994). As an economic concept, capital is traditionally understood as accumulated wealth in the form of investment in physical plant and infrastructure, such as farms, factories and facilities. In the

context of sustainability, a broader concept of capital is adopted, one which encompasses different types of capital including natural, social and human assets. The relationship among these and particularly between natural and manufactured capital is emphasised in categorising different standards of sustainability (from weak to strong). Further discussion of capital and its related concept of income can be found in Chapter 4, which deals with the economics of sustainability. Specific reference is made in Chapter 3 to natural capital and its particular role in differentiating weak from strong sustainability. In Chapter 8, the role of capital as an emerging feature of sustainable business and industry is described.

2.3 The need to make-offs and compromises

No matter what appraisal or assessment tools are applied to matters requiring decision's (whether policies, plans, programmes, projects or other matters), it is inevitable that some hard choices will ultimately have to be made. This is the 'bottom line' in sustainable developmnent. In practice, compromises and trade-offs will be unavoidable in most decisions. Some examples are listed in Box 2.7.

Box 2.7 Examples of trade-offs

Common trade-off decisions include:

- Compensations and substitutions (direct and indirect compensation for, rather than full mitigation of, negative effects), for example,
    - Later rehabilitation of aggregate mining operations on agricultural lands that are now at least somewhat degraded (substitution in time);
    - A constructed wetland to replace relatively natural one (substitution in place);
    - New community recreational facilities compensating for risks to traditional hunting or fishing (substitution in kind).

- Net gain and loss calculations (aggregation of net gain and net loss calculations), for example,
    - Reduction of near term ecological damage risks from surface storage of toxic wastes balanced against smaller but long term risks from initially secure deep underground disposal (differences in time);
    - Major damages to the interests of tribal people displaced by a new dam balanced against more material security for larger numbers of poor farmers downstream (differences in place);
    - Efficiency gains from industrial process improvements balanced against associated job losses (differences in kind, across principles).

Even where sustainability objectives are widely understood and commonly accepted, different interests are likely to reach different conclusions about which of these compensations and net calculations may be justified. The answers often also depend on the details. Just how serious are the losses, risks and gains involved? Just how inequitable is the distribution of effects?

Source: Gibson (2004).

Gibson (2004) notes three key trade-off issues:

- Which ones are most significant (given that contribution to sustainability is the objective)?

- Which ones are most (or least) acceptable, in general and in the circumstances?
- How do we make these decisions?

There are two independent approaches to dealing with trade-offs: rules and processes. According to Gibson (2004) (see Box 2.8:

Rules: Sustainability-based environmental assessment regimes can clarify application of the sustainability requirements by setting out general rules, or least guidelines, for decisions about what sorts of trade-off may or may not be acceptable. These can be complemented by more specific region- or sector-specific clarifications. Nevertheless, perhaps few set rules will be appropriate for all cases (different communities, cultures, ecosystems, stresses, aspirations, capacities, etc.) even within particular regions or sectors.

Processes: Where the general rules are insufficient, sustainability assessment regimes can provide guidance on selection and use of appropriate processes for making context-specific decisions on which trade-offs are or may be worthy of careful attention and which ones are or may be acceptable in specific situations. The processes can include use of some of the many more or less elaborate tools (systems analysis, scenario-building, cost-benefit analysis, risk assessment, multi-stakeholder negotiation, etc.) that have been developed for formal decision making about trade-offs. But while expertise and technical tools can be very helpful, trade-off decisions are essentially and unavoidably value-laden. What and whose values are able to play a role in the design and application of tools, and in the use of deliberative processes, is therefore crucial.

Box 2.8: Possible general rules for decisions about trade-offs and compromises (basic options), and general process considerations

General rules

The one clearly essential general rule is that:

- trade-off decisions must not compromise the fundamental objective of net sustainability gain.

It is also generally desirable that:

- all "significant" compromises and trade-offs must be explicitly identified and the most desirable option among the alternatives must be chosen; and
- all significant trade-offs must be addressed and justified explicitly and openly.

Additional general rule possibilities include the following:

- no "significant" compromises or trade-offs are permitted, unless approved by all relevant stakeholders;
- compromises and trade-offs in (all or specified) sustainability-related matters are undesirable unless proven otherwise; the burden of proof falls on the proponent of any compromise or trade-off;
- only undertakings that are likely to provide neutral or positive overall effects in each core category (e.g. each CIDA policy area, and/or each of the core sustainability requirements) can be acceptable (e.g. no net additional burdens on the poorest of the poor);
- no significant adverse effects in any core category can be justified by compensations of other kinds, or in other places (e.g. no use of ecological rehabilitation compensations for significantly greater inequities);
- no displacement of (significant, net, any) negative effects from the present to the future can be justified ;

- no enhancement can be accepted as an acceptable trade-off against incomplete mitigation if stronger mitigation efforts are feasible;
- only compromises or trade-offs leading to, or compatible with substantial net positive long term effects are acceptable; and/or
- no compromises or trade-offs are acceptable if they entail further declines or risks of decline in officially recognized areas of concern (set out in specified official national or other sustainability strategies, plans, etc.).

General process considerations

Because any conceivably acceptable set of general or region/sector rules will provide limited guidance, processes for case-specific clarifications will be needed. The key considerations here, and in the setting of the general rules, are how the issues are presented, debated and resolved and by whom. There are no easy answers to these questions. However, some central considerations seem clear enough:

- While expertise and technical tools can be very helpful, these are essentially and unavoidably value-laden decisions;
- Open and effective involvement of all stakeholders (those representing sustainability-relevant positions as well as those potentially affected) is necessary;
- Informed clarification of rules about possibly acceptable compromises and trade-offs depends on reasonable agreement on the context-specific sustainability objectives and on reasonable awareness of the relevant conditions and influences (this favours use of scenario-building and system depiction methods);
- Because clarifications are needed to guide the planning of undertakings from the outset, anticipatory processes at the strategic level (though environmental assessment and equivalent planning and other processes) and early deliberations at the project level are desirable;
- Because understandings and possibilities evolve, processes for clarifying objectives and acceptable compromises and trade-offs must be iterative, with tentative positions revisited throughout planning, decision-making and implementation.

Because time, capacities and resources are limited, there will always be some trade-off between what procedural qualities are desirable and what can be achieved practically. Solutions to this problem are probably best made by those closest to the situation, but with the caveats that the core rules of net overall gains and justification apply.

Source: Gibson (2004)