The Macaulay Institute

INDICATORS AND SUSTAINABLE TOURISM: LITERATURE REVIEW

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Literature Review

1 Introduction

Since the publication of 'Our Common Futures', (WCED, 1987), the concept of sustainable development has been high on the political agenda and the UK Government has demonstrated a commitment to 'Agenda 21', following the 1992 Earth Summit in Rio (Johnson, 2002). To ensure sustainable development becomes a reality rather than just rhetoric, it is necessary to consider the world's major industries within this context. When considering the tourism industry, the need to adopt a 'sustainable' approach is exacerbated by its fragility and sensitivity to change, its multi-sectoral nature and its marked dependence on the quality of the host environment and communities; *"tourism which degrades any elements of host communities and nations threatens its own future"* (Manning, 1999: 179). Twining-Ward stresses this point further, raising the issue that tourists tend to be attracted to the more vulnerable and sensitive areas, where Hardin's '*Tragedy of the Commons*' concept is all too familiar (Twining-Ward, 1999) and management responsibility may fall into many different hands.

Within the Cairngorms National Park (CNP), surveys have shown that it is the *"quality of the landscape that underlies the reason for most visits"* (CNPA, 2005: 1) and hence such challenges are inherent within its tourism industry. Recently being granted '*Europarc*' status, the Cairngorms National Park Authority (CNPA) has subsequently adopted a '*Strategy and Action Plan for Sustainable Tourism*', (a requirement of the 'European Charter for Sustainable Tourism in Protected Areas') and is currently working towards adopting and applying a set of indicators. In support of this work, the Macaulay Institute has provided the CNPA with a report that provides a suggested approach to selecting and implementing indicators of sustainable tourism (see '*A Framework for Developing Indicators of Sustainable Tourism*'). The project aimed to support the CNPA and their ViSIT forum by providing a structure for thinking through the process of selecting indicators that encouraged transparency and deliberation by asking provocative questions, rather than providing 'answers'.

This literature review, therefore, aims to summarise some of the key literature underlying the Framework report and should be read with the project brief in mind. The literature review is one of three supplementary documents to the Framework report. The others are:

- Indicators of Sustainability: Some Example Sets
- Indicators and Sustainable Tourism: Interview Findings.

2 The Sustainability Debate

Whilst it is not the intention to plunge into a lengthy debate over the definition of 'sustainable development' versus that of 'sustainability', it is important to

introduce some meanings and principles as they will be referred to in this document.

Sustainable development was famously defined by the World Commission on Environment and Development (WCED) as *"development that meets the needs of the present without compromising the ability of future generations to meet their own needs"* (WCED, 1987), but many authors have since developed their own definitions and adopted varying stances on 'sustainability'. Attempts have been made to classify these notions, resulting in concepts of weak versus strong, light green versus dark green and techno/anthropocentric versus eco-centric, with the former in each case taking the view that natural capital may be replaced with human-made capital, whereas the latter deems natural and human-made capital as incompatible (Haughton and Hunter 1994). Within this range of definitions and approaches, there are common themes that can be combined to provide some 'principles' for sustainable development, based on the underlying notion that future generations should be compensated for reductions in the endowment of resources brought about by the actions of present generations (Pearce *et al*., 1989). Haughton and Hunter (1994) argue that these concepts of futurity, equity and environment must underpin the process of sustainable development, such that the principles of inter- and intra-generational equity and trans-frontier responsibility are at the forefront of sustainable development policy.

Increasingly, notions of sustainability are being linked to systems thinking (see Bell and Morse, 2003; Kelly and Baker, 2002; Bakkes, 1997) whereby sustainability is understood to be a framework for managing change. A system is a whole whose elements interact as they continually affect each other over time and operate towards a common purpose (after Senge *et al*., 1994 in Kelly and Baker, 2002); thus systems thinking encourages thinking about cause and effect and inter-relationships between elements. Whilst this holistic approach to measuring sustainability is valuable, recognising that *"sustainability is not determined by single components"* (Ko, 2005: 436), systems theorists are still struggling to suggest a methodology for linking cause and effect in complex systems, to adequately analyse direct, indirect and flow-on effects of any one action and to deal with multiple, tiered temporal and spatial scales.

3 Sustainable Tourism

The multiple issues bound up in the sustainable development/ sustainability debate are inevitably transferred to the concept of sustainable tourism. Again, the lack of any universal definition has lead to a multiplicity of tailor-made meanings and applications (Box 1). As with sustainable development, there is the freedom to adopt varying 'shades of green' in approaching sustainable tourism. From the light green approach that holds tourism development and tourist and operator satisfaction as the central aim to the darker green in which the precautionary principle and concept of carrying capacities feature

highly (Hunter, 1997). The stance adopted has major implications as it will govern the approach to implementation and hence the outcome.

Box 1: Sustainable Tourism- definitions

"Sustainable tourism development meets the needs of the present tourists and host regions while protecting and enhancing the opportunity for the future. It is envisaged as leading to management of all resources in such a way that economic, social and aesthetic needs can be fulfilled, while maintaining cultural integrity essential ecological processes, biological diversity and life support systems"

(WTO, 1996)

"Sustainable tourism is about managing tourism's impacts on the environment, communities, and the future economy to make sure that the effects are positive rather than negative for the benefit of future generations. It is a management approach that is relevant to all types of tourism, regardless of whether it takes place in cities, towns, countryside or the coast."

(English Tourism Council, 2002)

"Tourism which is in a form which can maintain its viability in an area for an infinite period of time."

(Butler, 1993: 29)

"Tourism that takes account of its current and future economic, social and environmental impacts, addressing the needs of visitors, the industry, the environment and host communities."

(CNPA, 2005)

Eber (1992) provides a further useful synopsis:

"if tourism is to be truly beneficial to all concerned . . . and sustainable in the long-term, it must be ensured that resources are not over-consumed, that natural and human environments are protected, that tourism is integrated with other activities, that it provides real benefits to the local communities . . . that local people are involved and included in tourism planning and implementation, and that cultures and people are respected."

(Eber, 1992: 2)

When combining the term 'sustainable' with tourism, the latter must take-on the environmental, economic and social considerations and principles that are inherent within the former. Figure 1 illustrates some fundamental characteristics of sustainable tourism. These are neither definitive nor exclusive, as characteristics will vary depending on the 'stance' adopted. Given the central aim of this research, any links between general sustainable tourism principles and specific features or requirements of tourism within the CNP have been highlighted.

Figure 2 shows the relationships between these different aspects of sustainable tourism, illustrating one perspective on the tourism-environment 'balancing act' required to achieve sustainability. The goals of sustainable tourism as described in figure 1 and 2 relate to different types of tourism carrying capacity. The figure essentially implies that no single aspect should be allowed to dominate tourism policy-making and decision-taking.

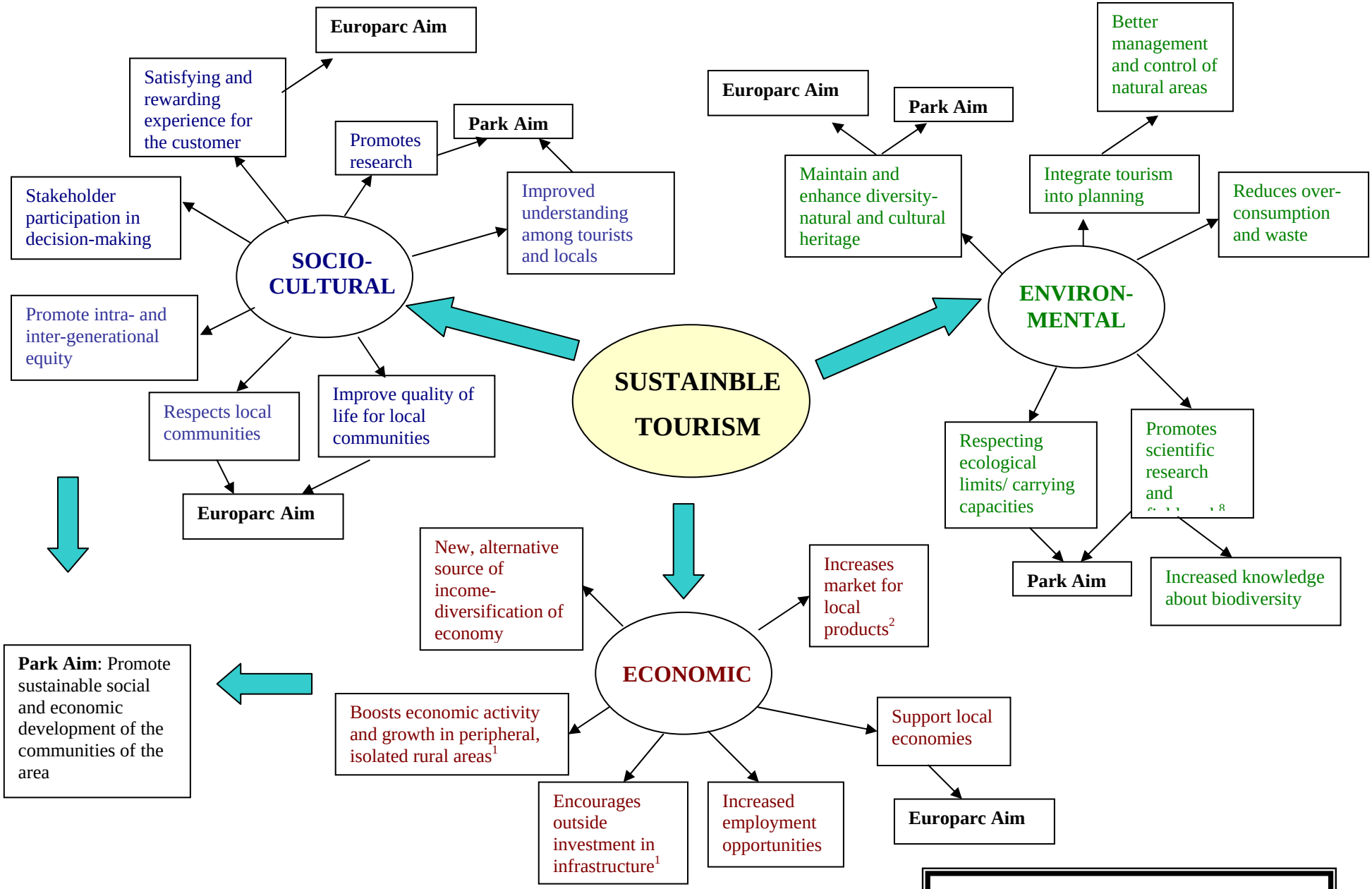

Figure 1: Principles of Sustainable Tourism

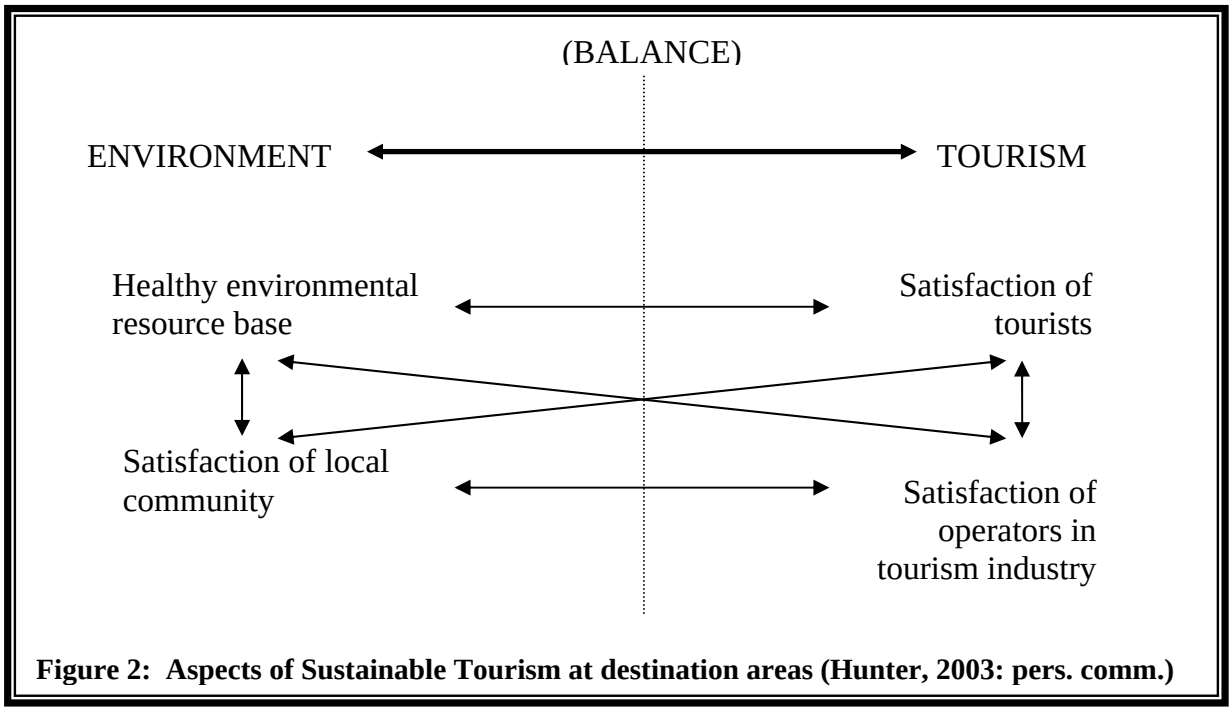

Figure 2: Aspects of Sustainable Tourism at destination areas (Hunter, 2003: pers. comm.)

In his 'tourist-area life cycle' (TALC) model of the evolution of tourism development, Butler (1980) introduces this notion of 'carrying capacity', proposing that at any tourist destination there is a 'limit' to tourist numbers, beyond which they are a detriment to the future viability of the area as a tourist attraction. Many of the criticisms of Butler's model have questioned the interpretation of carrying capacity (for example, Haywood, 1986 and Getz, 1992, cited in Prideaux, 2000:227) and the fact that it is limited to the destination area. Carrying capacity, in the context of tourism in general, refers to the ability of a site or region to absorb tourism use without deteriorating (Cooper, 1998). However, *"there is still neither a universally accepted definition nor a standard systematic procedure for assessing it"* (Saveriades, 2000:148).

O'Reilly (1986, cited in Hunter, 1995:67) describes the various carrying capacities as follows:

- *Physical carrying capacity* – the limit of a site beyond which wear and tear will start taking place or environmental problems will arise.
- *Psychological (or perceptual) carrying capacity* – the lowest degree of enjoyment tourists are prepared to accept before they start seeking alternative destinations.
- *Social carrying capacity* – the level of tolerance of the host population for the presence and behaviour of tourists in the destination area, and / or the degree of crowding users (tourists) are prepared to accept by others (other tourists).
- *Economic carrying capacity* – the ability to absorb tourism activities without displacing or disrupting desirable local activities.

Attempts to quantify carrying capacity thresholds face a number of difficulties. There will be differences for example, in acceptable levels of crowding and changes in area management may alter carrying capacity through time (Pearce, 1989, cited in Hunter, 1995:69). The prevailing view in the literature (see Cooper, 1998, Lindberg *et al.*, 1997) is that although tourism carrying capacity is a useful concept to help us understand sustainable tourism theoretically, its practical application as a management tool is very limited (Hunter, 2003).

4 Measuring Sustainability

The ambiguity surrounding the meaning of sustainability- and consequently 'sustainable tourism' - allows for a great deal of flexibility in its application. It is feasible to amend its definition to fit particular circumstances; a characteristic that has proved helpful in achieving popularity but a hindrance in terms of achieving consistency (Bell and Morse, 1999). However, simply adopting the term is not sufficient in ensuring it becomes a reality. There is a long-since recognised need for continual monitoring to ensure a so-called 'sustainable' programme is in fact moving towards sustainability. Butler (1998: 16) goes as far to say that without the implementation of monitoring tools, *"the use of the term 'sustainable' is meaningless"*. In 1996 a meeting held in Bellagio, Italy, took this matter to heart, concluding with a set of principles for gauging progress towards sustainable development (Box 2).

Box 2: The Bellagio Principles for Sustainable Development

1. 'Sustainable development' should be clearly defined in its specific context;
2. Sustainability should be viewed in an holistic sense, including economic, social and ecological components;
3. Notions of equity should be included in any perspective of sustainable development;
4. Time horizon should span both human and ecosystem timescales, and the spatial scale should include local and long-distance impacts on people and ecosystems;
5. Progress towards sustainable development should be based on the measurement of a limited number of indicators based on standardised measurement.
6. Methods and data employed for assessment of progress should be open and accessible to all;
7. Progress should be effectively communicated to all;
8. Broad participation is required;
9. Allowance should be made for repeated measurement in order to determine trends and incorporate results of experience;
10. Institutional capacity in order to monitor progress towards SD needs to be assured.

(Bell and Morse, 1999: 17)

5 Indicators

The Bellagio Principles summarised above express the need for 'indicators' and 'standardised measurements' (principle 5). Similarly, Agenda 21 in providing an 'action plan' for implementing sustainable development at a local level, also highlighted the importance of monitoring progress and makes explicit reference (in chapter 40) to the use of indicators for sustainable development (UN, 1993). Indicators are far from a new phenomenon; they form the basis of many of our decisions on a daily basis, for example in using the weather forecast to decide whether to take a coat or umbrella. However, when considering indicators for sustainable development, and more specifically, sustainable tourism, the issue can appear complicated by the lack of any firm foundation on which to base their development. However, Miller (2001) provides an encouraging argument that: *"Although it seems paradoxical to develop indicators for sustainable tourism when no satisfactory definition of the concept exists, the process of developing the indicators does help in determining the important tenets of the concept."* (Miller, 2001: 361). As Stoeckl *et al*. (2004) suggest one can't measure sustainability; therefore indicators can only provide an indication of change and will only ever be partial. There will always be a gap between what we are interested in and what is measured, and what we want to measure and what we can measure. This is the essence of the paradox whereby often we value what we can measure, rather than measuring what we value.

What is an Indicator?

Again, we can look to many different authors for many different explanations; *"Indicators quantify change, identify processes and provide a framework for setting targets and monitoring performance"* (Crabtree and Bayfield, 1998: 1); *"Indicators provide critical information about current trends and conditions and help to track progress toward…goals"* (Gahin *et al*., 2003:662).

It is important to note that indicators are not intended to accomplish the required change, but rather they act as catalysts for change, providing an 'early warning system', flagging up areas of concern thus enabling decision-makers to initiate the necessary policy changes and remedial measures. Indicators of sustainable development should provide a continual assessment of the overall sustainability of a system and the indicators themselves will require constant review and updating over time, as changes occur; implementing indicators is a dynamic process.

In providing a means for monitoring progress towards sustainability, indicators are also an important communication tool: *"Communication is the main function of indicators: they should enable or promote information exchange regarding the issue they address."* (Smeets and Weterings, 1999: 5). There are often complex issues and intricate processes underlying indicator work and whilst it is important to maintain a sufficient level of detail and transparency in the process, so that data can be tracked and decisions justified, there remains a need to achieve a certain level of simplicity in the end result. Indicators must be meaningful and useable by all and not limited to the 'experts'. Public consultation and stakeholder participation throughout the indicator development process can play a significant role. Some argue that an indicator should measure what those concerned are interested in and must provide meaningful information, enabling action to be taken.

6 Frameworks

In an attempt to clarify the indicator selection process, efforts have been made to establish frameworks, organising the development and selection process into a series of easily communicable steps. Many indicator sets and monitoring frameworks consist of indicators/measures that are selected in an ad-hoc manner (see for example Waldron and Williams' Whistler case study, 2003). It can be all too easy to brainstorm and 'cherry-pick' indicators from existing sets. A conceptual framework, however, allows for the coherent and consistent selection of indicators. This is particularly important given that any indicator selection process is value laden; for example stakeholder opinion may differ over the weight given to different criteria for a good indicator; assuming a trade-off between cost and complexity; the very objectives chosen; the baseline and benchmark data etc. Thus, having an explicit framework allows a more transparent, responsive and robust process for indicator selection.

Literature shows that the term 'framework' can be confusing in itself. It is used to describe both a *process* - a series of actions and decisions to be taken in order to select indicators, (see table one), and a *conceptualisation* of the approach to sustainability that underpins criteria such as Box 4. For example, Eagles et al., provide useful guidelines to monitoring sustainable tourism but their guidance remains at the level of describing a checklist, rather than providing conceptual coherence. As Stoeckl *et al*. (2004) suggest, indicators are an approach to operationalising sustainable development (SD) that is nested in the wider planning, monitoring and managing cycle. This requires having an integrated understanding and position regarding the system to be managed. Waldron and Williams (2002: 182) discuss the need for adopting a framework to provide a *"systematic means of structuring the identification and selection of relevant subjects/ issues to be monitored"*. As Bartelmus (1997, in Moldan and Billharz: 116-118) indicates, a framework is a consistently logical way of integrating different data arising from different indicators, often by reducing all data to a monetary numeraire (see his case study on the SEEA – 'System of Environmental and Economic Accounts'). In the SEEA framework, the conceptual linkage between indicators is provided by the relationship between supply and use of environmental and economic goods. This of course raises various issues regarding the commensurability of different indicators and the qualitative-quantitative debate over appropriate forms of measurement.

Waldron and Williams (2002) describe five broad categories of frameworks:

- domain-based (addressing a variety of tourism performance issues to include social, economic and environmental but not necessarily linking with specific management goals);
- goal-based (to identify indicators that respond directly to sustainability goals but do not address interrelationships);
- sectoral (these respond to the function of a specific management group, and thus are useful in assessing management response to specific issues);
- issue-based (often provide a short-term response to address the 'issue of the day'; longer term sustainability implications may be overlooked); and
- causal frameworks (these assess the existing conditions, stresses and responses but within-domain interactions are overlooked).

Whilst describing these different approaches in their discrete categories, Waldron and Williams still advocate adopting an integrated approach, for example by combining a domain approach with a causal framework (e.g. DPSIR).

The DPSIR framework (Driving force; Pressure; State; Impact; Response) is an approach often referred to in the context of SDIs, for example forming the basis for the European Environment Agency (EEA) environmental indicators set. The concept underlying the DPSIR framework is cyclical: human activity exerts *Pressures* on the environment resulting in changes in its *State*; such changes will have an *Impact* on human and ecosystem health which in turn may illicit a *Response* for corrective action and changing habits, that consequently *Drives* future activity and new *Pressures* and changes in *State* (Smeets and Weterings, 1999). Indicators can be developed for each component of DPSIR and, crucially, for the relationships and links between them. Gabrielsen and Bosch (2003: 9) provide useful examples of functional indicators for each stage:

- Driving Force indicators describe social, demographic and economic aspects of society which govern consumption and production patterns. Population growth is a primary indicator for this component.
- Pressure indicators are concerned with the outcome of human activity and the resultant pressure exerted on natural environments, such as pollutant emissions or development pressures on land.
- State indicators are concerned with the quantity and quality of phenomena at any given time and place, for example fish stocks or atmospheric carbon dioxide concentrations.
- Impact indicators may be easily confused with state indicators; they are however fundamentally concerned with 'function', and how this may be altered as a result of *P* and *S*, rather than condition: *"In the strict definition impacts are only those parameters that directly reflect changes in environmental use functions by humans"* including impacts on human health. (EEA, 2003: 8).
- Response indicators describe the actions taken responding to the identified impacts, such as recycling rates.
- Driving force – Pressure linkages can be described by 'eco-efficiency' indicators, which show how efficient a process is at reducing the resulting pressure; this will often relate to technological progress.
- Pressure – State relationships can give an indication of the time delay within a natural system. Such an indicator could provide important information to facilitate predicting future scenarios, potentially pre-empting the problem.
- State – Impact indicators could similarly provide important insight into potential consequences in the future, acting as an 'early warning system' facilitating preventative action.
- Impact – Response indicators can illustrate how society perceives a specific problem as this will tend to govern any response initiated.
- Response – Driving Force/ - Pressure/ - State/ - Impact indicators can convey how effective measures taken are at achieving the desired goal.

Morrey (1997) discusses, in the context of the UK Sustainable Development Strategy indicator selection process, how it is logical to start with State indicators, then look at the Pressures causing changes, but to consider both benefits as well

as negative impacts of Pressures on the State (e.g. energy generation), and then focus on the Response indicators (such as applying a Cost-Benefit Analysis to the policies used).

Kelly and Baker (2002) discuss performance measures for sustainable regions. Performance measures assess whether the programme, action or policy has achieved its objective and as such they liken these to Response indicators. They also note that any such indicator can be focussed on measuring input, process, output and outcome; although we would suggest that it is only outcome that links performance to sustainability. It is important to embrace this concept when selecting and implementing indicators - as Bakkes (1997) argues, response or policy indicators are a crucial, yet under-researched form of indicator.

Figure 3 illustrates the link between different indicators (classified according to the DPSIR framework) and different stages of the policy life-cycle. This figure should not be viewed as a finite, static process, however. There is a need for constant reviewing of indicators as changes occur throughout the cycle and in all components of the DPSIR framework; recognising feedbacks, both positive and negative, and intricate, complex relationships which should not overlooked when aspiring for a simple, aesthetically pleasing structure.

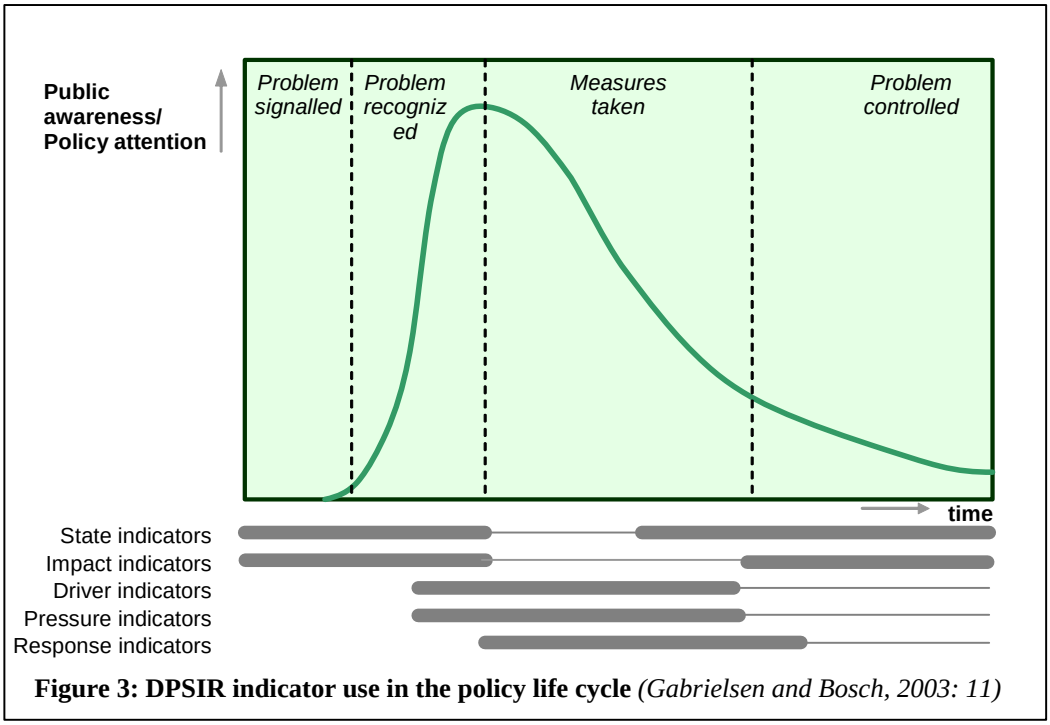

Figure 3: DPSIR indicator use in the policy life cycle *(Gabrielsen and Bosch, 2003: 11)*

Whilst the utility and convenience of the DSPIR model approach to indicator selection makes it a popular choice, the implicit 'world view' underpinning this approach is of linear, predictable and reversible processes. However, other forms of system thinking (e.g. Resilience, see Gunderson and Holling, 2001) suggest that environmental systems are often complex, chaotic and unpredictable (see van den Hove, 2000). There is an inherent risk that adopting the DPSIR approach, particularly focussing on the 'Response' element, will inadvertently encourage

'end-of-pipe' measures – simplistic and mechanical quick fixes, rather than the preferable adaptive management approach based in systems thinking (Bell and Morse, 2003).

Bell and Morse (2003) provide alternative frameworks such as using the concept of capitals, domains and/or system orientators.

- Capital considers sustainability in terms of capitals (natural, human, social, physical and financial) and context (trends, shocks, stresses).
- Domains consider 'tables' of indicators that cover common denominator areas of concern that consistently arise in reviews of existing SD indicator sets, for example, resources, pollution, biodiversity, local needs, quality of life. (Confusingly, Bell and Morse label these as 'indicator frameworks'; however, following the above discussion regarding what a framework is, we would dispute this and hence refer to them as 'tables' not frameworks).
- System orientator approaches stem from Bossel (1999) who lists the criteria that indicators must cover to measure the sustainability of any system, rather than developing indicator sets in an ad hoc way. These criteria are: existence, effectiveness, freedom of action, security, adaptability, co-existence and psychological needs (see Bell and Morse, 2003: 37). Thus Bossel (1997) provides examples of indicators covering a number of domains (e.g. welfare, material resources, environmental burden), that he claims provides information about the SD potential for all sectors of the overall system. However, the analysis does not show how his initial criteria map on the results and given that it is the process of doing this selection and applying them, rather than the final results that is instructive, the full merits of his approach remain unclear.

Stoeckl *et al*. (2004) also highlight a difference between indicators that seek to: a) evaluate the past and current situation with a view towards assessing progress towards sustainability; b) make predictions about what might happen in the future, assessing the impact of resource use and resource use changes on sustainability; or c) influence future directions by developing policies which aim to encourage progress by changing behaviour. They suggest that these different objectives require different forms of indicators and whilst they do not relate these insights to a particular framework, their argument illustrates how any indicator selection must start from having a coherent and consistent understanding of what aspect of sustainability is trying to be measured. For example, approach B emphasises understanding links between sectors within the system (something they recognise is very difficult to achieve), whereas approach A emphasises having comparable data for analysis. Thus different types of indicators are relevant for different audiences/ stages in policy cycles (Morrey, 1997).

To summarise, any conceptual framework selected must be resilient and respond to changes in practice; it must provide indications of change in order to allow management decisions to be made. This requires commitment to review action and system response and to review the indicators/benchmarks chosen. Stoeckl *et al*. (2004) describe this as single and double loop approaches. Single loop describes the process of setting priorities, taking action, and monitoring progress (see steps 1 – 10 in table one). However, the double loop requires considering whether the current choices are still appropriate or any indicators are missing (step

11). Bell and Morse advocate a 'systemic sustainability analysis' approach (SSA), to avoid indicators becoming *"a classic reductionist set of tools based on quantification"* (1999:31). Their SSA is a five step learning cycle that suggests that sustainability indicators are part of a broader adaptive management approach (Bell and Morse, 1999: 119): (1) Identify stakeholders and the system; (2) Identify the main indicators; (3) Identify 'band of equilibrium'; (4) Develop the 'amoeba' diagram[1] and (5) Review and the extend amoeba over time. In their 2003 edition, they add a 'prospective' aspect to the SSA (Bell and Morse, 2003: 87) that uses scenarios to consider sustainability in light of possible futures. Although it is not remarked on, it is interesting to note that the diagrammatic presentation (Bell and Morse, 2003: 80) is similar to the resilience loop (Gunderson and Holling, 2001).

Table 1: A process criteria for developing indicators of sustainable development. (Adapted from Waldron and Williams, 2002: 191)

Developing Indicators of Sustainability: Process Criteria	
1. Identification of community sustainability goals	Wide consultation and community participation (e.g. surveys, focus groups, meetings) to establish broad-based stakeholder defined sustainability goals
2. Scoping	Determine target audience; Consider spatial and temporal bounds; Include institutional partners; Establish relevant number of indicators
3. Choose indicator framework	Select a framework that maximises ability of indicators to assess progress towards sustainability.
4. Define selection criteria	Indicator selection criteria should be based on community values and sustainability goals determined through stakeholder involvement.
5. Identify potential indicators	Use existing indicators lists as a guide and stakeholder input to refine listings to what is potentially viable.
6. Select final indicators	Apply framework and selection criteria to select final set.
7. Collect necessary information	Collect data on each indicator- this may involve both quantitative and qualitative techniques.
8. Analyse indicator results	Compare indicator values and trends to specific target levels based on community sustainability goals.
9. Report indicator results	Report indicators to target audience e.g. through the use of amoeba diagram and solicit feedback
10. Assess indicator performance	Identify progress towards established sustainability goals.
11. Review indicators	Over time indicators may need to be adapted to any system change, abandoned altogether and new ones adopted.

[1] Amoeba diagrams are discussed and illustrated on p. 18. They are sometimes called Radar diagrams (e.g. see Rotmans, 1997).

7 Selecting Indicators

As discussed above, the choice of appropriate indicators for sustainable development will depend on:

- the sustainability stance held;
- whether there is a preference towards local (e.g. Twining-Ward and Butler, 2002), national or international (e.g. Riley, 2001; WTO, 1996) indicators;
- if the researcher thinks that qualitative data should be incorporated; and
- the particular attributes the researcher thinks indicators should have.

What makes a good indicator?

There are many examples of indicator criteria in the literature stating what an indicator should be, from short, concisely coined acronyms (such as *'RACER'- Relevant; Acceptable; Credible; Easy to monitor and Robust to manipulation*. (European Commission, 2005: 46) to lengthy, all-encompassing lists. Bell and Morse (2003:31) cite Guy and Kibert's (1998) criteria for indicators, as follows: community involvement; linkages; validity (relevance); available and timely; stable and reliable; understandable, responsive; policy relevant; representative; flexible and proactive (provides a warning). Waldron and Williams (2003) suggest indicators must have stakeholder involvement; be adapted to suit the local needs; consist of both objective and subjective data and make links between different issues. Kelly and Baker (2002) agree with the last two criteria and add the following: validity (acceptable, believable; related to a higher order theme, related to theory); reliability (can be used over time, and across space but only within the region); data(available and accessible; objective and subjective; qualitative and quantitative; not easily misrepresented/misinterpreted); method (timely, uses existing data, considers scale/level; considers capacity to collect and use) and relevance (to objectives; beneficial to investors/taxpayers; links to other indicators). Box 3 summarises what an indicator should *be*, combining Reed and Doughill's (2003) comprehensive list of indicator criteria from their review of 22 publications with oft-quoted examples from literature reviewed here.

'Measurability' has been commonly identified and widely accepted as an essential component of any indicator. However, there remain a number of problems tied to this criterion. Firstly there is the issue of 'sampling and measurement error and bias' (Matthews *et al*., 2006), resulting in misleading or entirely false data, the implications of which can be vast when such information is used by decision-makers. A further issue is that of data availability. In view of the *'measurability*' requirement, making use of existing, available data does make economic sense, (therefore fulfilling the *'economically viable'* criterion). However there is a risk that this could (consciously or otherwise) dictate which indicators are selected in the first place - there may be a tendency to select indicators for which information is readily available resulting in other, potentially more important or useful indicators being overlooked. Again, the bias implications of such poor indicator selection can be huge, as Matthews *et al*. (2006) note that the selection of a specific index can suggest support for a particular perspective on specific issues. On a similar note, this issue of *'measurability'* also raises the question as to whether we measure what is measurable rather than what is important. Ideally, the two would not be mutually exclusive. However, where data and/or methodology do not exist, knowledge and skills are insufficient to develop new methods, or data collection

would entail excessive cost, the measurability aspect of an indicator can prove problematic. Again, this can lead to indicator selection based on the availability of data rather than what is 'fit for purpose' (DSCWG, 2001). If indicator selection is unsatisfactory, the information obtained may be insufficient, thus stifling progress towards sustainability.

Box 3: Characteristics of a 'good' indicator

- Measurable – necessary data available/ can be collected
- Sensitive- to spatial and temporal change
- Economically viable- cost effective
- Acceptable and accessible
- Useable and easily interpreted
- Reliable and robust
- Verifiable and replicable
- Participative process- meets the needs and interest of target audience
- Specific- clearly relate to outcomes
- Timely- show trends over time
- Transparency in methodology and selection
- Relevant- to local, regional, national policy and to local concerns
- Scientifically well-founded

(Reed and Doughill, 2003; Waldron and Williams, 2002; Bells and Morse, 2003; Harger and Meyer 1996, in Bell and Morse 1999; Gallopin, 1997; Hughes, 2002; Gabrielsen and Bosch, 2003)

Whilst important issues should not be ignored just because they appear 'too hard' to measure (DSCWG, 2001), there may be occasions when an indicator does prove to be immeasurable. In these circumstances, a 'linked' variable may be used as a 'proxy' measure in place of the desired indicator (Matthews *et al*., 2006). Whilst this may be better than omitting the indicator altogether, the danger is that, with the inherent subjectivity and potential for further bias, it will result in highly misleading information.

Embedded in the demand for *measurable* indicators is the presumption for quantitative analysis. The perceived methodological difficulties in collecting qualitative data and the additional challenge of communicating this information can be a strong deterrent to their inclusion as an indicator, which may be why many examples of implementing sustainable development indicators show a tendency to focus on environmental indicators alone. This is clearly flawed. The sustainability of a system is fundamentally concerned with not only environmental, but also socio-cultural and economic factors and, crucially, how these are interlinked (Blackstock *et al*., 2006). Whilst economic elements may prove relatively easy to monitor with information and data readily available, social indicators can prove far harder to determine and can depend solely on 'subjective' data. This should not act as a barrier to their inclusion, as there is a *"need to balance quasi-objective indicators, which tend to be (relatively) easily available on the environment and the economy with qualitative social indicators, as if there are problems in one area, it will leave to the degradation of the whole system. Objective indicators generally have a poor relationship with our values, feelings and perceptions, yet these are major motivators for our actions"* (DSCWG, 2001:210, Appendix Eight). Bell and

Morse (2003) also question the quest for quantitative indicators, highlighting how qualitative measurements may provide better understandings of sustainability, given its socially constructed nature and the need for perceptions to change in order to achieve more sustainable behaviour.

Considering the potential for indicators to mislead, or be manipulated and 'cherry-picked' to show what is desired, Meadows (1998) warns that, as an integral part of the decision-making process, indicators can be a 'dangerous tool'. The requirements, and a strong desire by stakeholders and decision-makers, for simplicity, comparability and interpretability of indicators may inadvertently result in over-aggregation, over-simplification of complex relationships, and consequently misleading or even false representation (DSCWG, 2001; Kelly and Baker, 2002; Bell and Morse, 2003). Achieving a compromise by including qualitative and quantitative based indicators can, in theory, offer a solution, but in practice may be far more difficult to achieve. It is important to keep sight of the overall aim of developing indicators; what are they aiming to show and what is it that they are supposed to achieve? There are many examples of 'checklists' for indicators available in the literature (see Box 4) and these can provide a useful tool for reviewing indicators as they are developed, highlighting any tensions which may mean the indicator ultimately needs to be abandoned.

Box 4: Checklist for selecting Indicators of Sustainability

1. Does the indicator address the carrying capacity of the natural resources -- renewable and non-renewable, local and non-local -- that the community relies on?
2. Does the indicator address the carrying capacity of the ecosystem services upon which the community relies, whether local, global, or from distant sources?
3. Does the indicator address the carrying capacity of aesthetic qualities -- the beauty and life-affirming qualities of nature -- that are important to the community?
4. Does the indicator address the carrying capacity of the community's human capital -- the skills, abilities, health and education of people in the community?
5. Does the indicator address the carrying capacity of a community's social capital -- the connections between people in a community: the relationships of friends, families, neighbourhoods, social groups, businesses, governments and their ability to cooperate, work together and interact in positive, meaningful ways?
6. Does the indicator address the carrying capacity of a community's built capital -- the human-made materials (buildings, parks, playgrounds, infrastructure, and information) that are needed for quality of life and the community's ability to maintain and enhance those materials with existing resources?
7. Does the indicator provide a long-term view of the community?
8. Does the indicator address the issue of economic, social or biological diversity in the community?
9. Does the question address the issue of equity or fairness -- either between current community residents (intra-generational equity) or between current and future residents (inter-generational equity)?
10. Is the indicator understandable to and useable by its intended audience?
11. Does the indicator measure a link between economy and environment?
12. Does the indicator measure a link between environment and society?
13. Does the indicator measure a link between society and economy?
14. Does the indicator measure sustainability that is at the expense of another community or at the expense of global sustainability?

Source: http://www.sustainablemeasures.com/Indicators/ChecklistItself.html (accessed 15/12/05)

Issues of scale

Progressive thinking in both sustainability science and sustainable tourism development does not assume that issues are similar from place to place (Twinning-Ward and Butler, 2002). Reed and Doughill (2003) advocate that local scale sustainability assessments tend to be more appropriate and relevant than those on a larger scale. It has also been recognised that there needs to be a new emphasis on local context and multiple expertise, incorporating the knowledge of both the community and experts (Rydin *et al*., 2003), as has been called for already in the SD and ST fields. This has implications for indicator selection. At a national level, sustainability indicators are selected both for international comparison and to provide a basis for national policy development (Crabtree and Bayfield, 1998:2), whilst at a more local level the stakeholders are different and therefore indicators are generally selected to gain information on local sustainability issues (Crabtree and Bayfield, 1998:2), *"particularly those amenable to local action"* (Williams 1996, cited in Crabtree and Bayfield, 1998:2).

How many indicators?

The number of indicators adopted seems entirely arbitrary and examples range from as few as ten to one hundred, or more. The European Commission advocate that a "*large number of indicators are needed to properly assess the multidimensional nature of SD"* (EC, 2005b: 4), but there arises again the need for compromise between maintaining a sufficient level of detail whilst achieving simplification for 'manageability' (Bell and Morse, 2003). Bell and Morse (2003:38) note that 20 appears to be the 'magic number' in reviews of local SD strategies, but the real trade off is to have as few as possible, whilst as many as necessary.

The European Commission adopts a hierarchical approach to developing sustainable development indicators (SDIs), based on policy documents, with a set of ten headline themes, further divided into sub-themes followed by 'areas to be addressed': *"The sub-themes usually monitor the progress towards the headline objectives while the ´areas to be addressed` facilitate a more detailed and diversified analysis of background factors in each theme"* (EC, 2005b: 4). The indicators are also structured into three layers, pyramid style, to 'facilitate communication' with each level assumed appropriate for different stakeholder needs and corresponding to the related 'theme' (EC, 2005b: 5). Thus, at the top of the pyramid are 12 'headline' indicators, corresponding to the priority policy themes and assumed useable by policy-makers and the public; the second level of 45 'core policy' indicators relates to the 'sub-themes' and is assumed to provide the necessary tools for monitoring level 1; finally at the third level are 98 'analytical' indicators relating to the 'areas to be addressed', assumed to provide more detailed analysis of intricate and complex issues, aimed at a more 'specialised audience' (EC, 2005: 5).

Similarly, the OECD (1998) describes 'a pyramid of indicator sets' (in Bell and Morse, 2003: 45) from numerous data for scientists and technical experts; through indicators for policy makers and managers to condensed indices for the public and Kelly and Baker (2002) provide a further example of a tiered approach between spheres, domains and themes, which echoes the UK approach of domains, families and themes (see Morrey, 1997).

Who decides?

Stakeholder involvement is imperative throughout the indicator process, from defining objectives and targets, to selecting specific indicators, to monitoring and measuring and responding (e.g. see Eagles *et al.,* 2002). Miller's (2001) Delphi survey highlighted the importance of stakeholder involvement: *"Locals are considered by many respondents to be key to the issue of sustainability and as such their negative perception of tourism are a 'barrier to sustainability'. Locals must be convinced therefore of the benefits from tourism before any progress can be made towards a more sustainable position"* (Miller, 2001: 358). However, attention should be paid to whether involvement is 'bottom-up' or 'top-down'. 'Bottom-up' approaches are based on empowerment through local knowledge and capacity building to ensure involvement in community life and promote genuine participatory development (Midgley *et al.*, 2005:164). Conversely, 'top-down' approaches of community participation and development are usually paternalistic and pseudo-participatory, whereby various participatory devices are initiated by an agency to arrive at a pre-determined outcome in an attempt to gain local legitimacy (Midgley *et al.*, 2005:164). This 'top-down' approach can be viewed as reaching the lowest rungs on the ladder of citizen participation (Midgely *et al.*, 2005:169). Blackstock (2005), in a study of community based tourism in Port Douglas, Australia, provides a good example of these lower rungs, where tourism development is legitimated through its being 'locally controlled' and in the 'community's' interest, when in fact it *"sidesteps community developments social democratic tradition of social justice and local empowerment (Mayo, in Craig 2003)"* (cited in Blackstock, 2005:45).

8 Analysing Indicator Results

'Benchmarking' and Targets

As shown in table one above, step 8 requires indicator data to be compared to existing information, thus highlighting the need for a 'reference condition'- a benchmark with which to compare indicator values or a target that can provide a measurable commitment to achieving goals that should be challenging yet achievable (DSCWG, 2001). This may well be pre-determined by legislation; for example, nationally set targets for carbon dioxide emissions would provide an acceptable, if not mandatory, goal. When no such target exists, an element of subjectivity may be inevitable. Bell and Morse (2003: 47) describe four possible approaches to setting the 'reference condition': (i) using historical trends or data- this assumes a sustainable state occurred in the past; (ii) using a current system assumed to be sustainable for comparison; (iii) taking a theoretical approach and constructing a reference condition based on principles rather than actual events; (iv) or consulting stakeholders to establish 'best' and 'worst' case scenarios. As with the process of indicator selection, setting targets and limits is value-laden and hence it is vitally important to pursue wide consultation and participation to ensure that *"value judgements which are made truly reflect the consensus of the society and the people most concerned, rather than being imposed by a minority or an outside group"* (Dahl, 1997:81). Likewise, Waldron and Williams (2003) suggest that linking monitored trends to sustainability goals requires both a baseline (to illustrate change since that time) and a benchmark (to illustrate progress towards a goal or away from an identified threat). However, they do point out that the

interpretation of whether a trend is 'progress' will demand on the values of the interpreter.

9 Displaying and Communicating Indicator Data

As already discussed, indicators should be communicated, understandable and promote behavioural change (Morrey, 1997). When any barriers to measurability have been overcome and the necessary data for each indicator collected, there is the issue of how to present this information in a useable and interpretable form. Having identified the importance of indicators as a communication tool, Waldron and Williams (2003) suggest that the presentation of indicators must:

- Explain the indicator (including its methodology, underlying assumptions and what the data might mean);
- Highlight how it compares to the past (baseline) and to the goal (future visions and benchmarks);
- Note linkages (we would add understanding the direct and indirect contributors to the change in the indicator and the flow-on impacts the indicator trend may have, after Kelly and Baker, 2002); and
- Be graphically represented to allow visual (therefore intuitive) interpretation (see also Kelly and Baker, 2002; Bakkes, 1997)

It is highly likely that the data will be in various units of measurement and there may be a great deal of it (depending on how many indicators were selected in the first place). Consequently, there develops a desire to convert, or 'aggregate' these to leave one single measure, reducing complexity and providing an overall picture of progress towards sustainability. Bell and Morse (2003:39) describe two distinct methods: 'visual integration' and 'numerical integration'. An example of the former is the 'amoeba' diagram (Figure 4, DSCWG, 2001). This enables combined indicator data to be 'mapped' on to a four way axes. If this process is repeated at regular intervals, the amoeba will illustrate progress toward sustainability over time. Whilst this can be a very time consuming method and does require data to be converted to a unitary scale (DSCWG, 2001), it has the advantage of being visually powerful, showing the 'bigger picture', whilst maintaining a level of detail, as indicators are individually represented by the 'arms' (Bell and Morse, 2003).

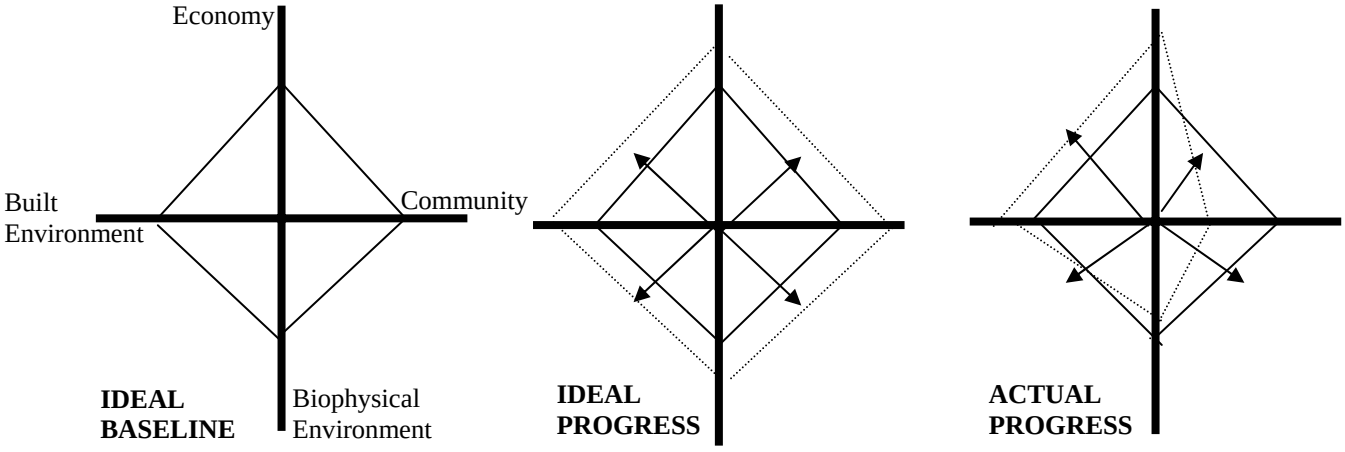

Figure 4: *Example AMOEBA: The built environment and economic indicator progressed, the biophysical environmental indicators are unchanged but the community indicator decreased. (DSCWG, 2001; Bell & Morse, 1999)*

Numerical integration often involves the use of money as a common denominator. This approach thus takes the 'weak sustainability' stance, assuming that man-made capital can be a substitution for natural capital. Whilst monetisation of indicator values has much appeal due to its quantitative nature (Bell and Morse, 1999) and may appear a practical and logical solution to the need to aggregate, it assumes that all aspects of sustainable development can have a market value (Bell and Morse, 2003). Thus, aggregation raises many issues and introduces further subjectivity and ambiguity into an already hazy process. Morrey (1997) accept that aggregate indicators help policy makers to 'see the wood for the trees', but also warns that any aggregate indicator should be deconstructed when being interpreted to ensure that the 'correct' signal is acted upon.

10 Conclusion

There is a significant volume of literature covering methodology and approaches to selecting indicators of sustainable development. There is certainly no shortage of suggested 'criteria' for indicators and it has been possible to combine the oft-quoted lists to form a comprehensive overview (box 3). Similarly, several authors mutually advocate adopting a framework to provide a coherent, consistent and structured process to indicator selection. However, there is an apparent gap in the literature in terms of the actual application of indicators, successfully or otherwise. This suggests that more often than not the process of selecting indicators - from deciding which indicators to adopt, to how many and whether/ how to aggregate and communicate the results - can become so lengthy and complex that the implementation and reviewing of indicator data is never achieved. It seems all too easy to get hung-up on finding the 'perfect' indicator, but as Bakkes (1997) describes, indicators compromise between relevance, scientific validity and measurability and will often have to be 'optimally inaccurate'. Therefore, aspiring to achieve the *best available* indicator is far more efficient in practice.

Whilst the process of selecting indicators is intrinsically important to successful implementation, and indeed a valuable learning experience in itself (Bell and Morse, 2003), it is important not to lose perspective. Indicators are not an end in themselves but a means for communication and to assist the policy and planning cycle. Bell and Morse (2003) explicitly argue that to date, very poor, if any relationships between indicators and policy change have been demonstrated. They quote Reid's (1995 in Bell and Morse, 2003: 50) analysis of why: a lack of awareness of the issues; political unacceptability of many actions; opposition from entrenched interests; and inadequate institutional responses. Therefore, it is important to be aware of these potential barriers when designing indicators and to ensure that monitoring them is seen as an integral part of the planning cycle, rather than a routine data collection that is not part of the institution's decision making and learning cycle; hence ensuring that "*energy* [is] *directed towards achieving sustainability, not just measuring it*" (DSCWG, 2001). Furthermore, the cyclical, 'feedback' nature of indicator selection and implementation should be upheld. Just as policy needs to react to indicator data, the indicators also need to be flexible to adjust to possible changes in policy priorities and objectives.

Developing a reliable and useful set of indicators that truly reflect the multidimensional nature of sustainable development is clearly a complex task. However, *"if sustainable development is one of the tourism industry's major contemporary objectives, then the industry needs to be able to measure its performance and impacts in this area"* (Ko, 2005:432); undertaking this process, through adopting a framework to selecting indicators and acting upon their results, is worth the time and effort required to get it right.

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