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Monitoring and Measuring Progress Towards Sustainable Development: Appropriate Indicators and Methods of Implementation

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This paper examines the design and use of indicators of sustainable development. It does this through a consideration of the results of a research project which was supported by a grant awarded by Scottish Enterprise Tayside (SET), one of the Local Enterprise Companies within the Scottish Enterprise Network (Jackson & Roberts, 2000; Roberts, Llanwarne and Jackson, 2001). This project also incorporated findings from a number of other projects undertaken by the authors, including work on environmental taxation (Roberts *et al*, 1999; Jackson, 2000b), on ecological modernisation as a concept and method to guide regional and local economic development (Jackson & Roberts, 1997; Roberts, 1997a, Jackson and Roberts, 1999), on the progress made in co-ordinating and integrating regional-level strategy and implementation processes (Benneworth *et al*, 2002), and on the importance of the spatial dimension (Roberts, 2003a). In addition to these internal sources of research evidence and analysis, the paper is also informed by a plethora of recent academic papers, policy pronouncements and official studies (for example, Moldan *et al*, 1997; Higgins *et al*, 2003; OECD, 1998; DETR, 1998).

The following section of the paper provides a brief introduction to some of the major conceptual and methodological issues which have to be addressed in designing an appropriate system to monitor and measure progress with regard to sustainable development. In section three a general and spatially-specific critique is presented of the various methodologies that have been adopted. The penultimate section of the paper presents some of the results of our research and demonstrates, in the case of Tayside and SET in particular, what this may imply for the design of practical systems for the measurement of progress towards the goals of sustainable development. A final concluding section presents some lessons that may be of interest elsewhere, including the importance of ensuring that a suitable spatial framework is provided for monitoring and assessment.

Concepts and Models

Short-term added-value project appraisal measurements have traditionally been used to calculate the net benefits of development for the community. However, this approach has serious limitations as a means of delivering sustained real improvements in the quality of life and social justice, which operate within the carrying capacity of the environment: that is, sustainable development (Anderson, 1991). The major problems with such measures are their economic emphasis, their reliance on unsuitable economic indicators (Roberts, 1995) and, especially, the fact that many of the indicators used are based on a 'tonnage ideology' that emphasises consumption at the expense of responsible economic progress or the

achievement of social and environmental goals (Simonis, 1993). Equally, many indicators are selected and applied with little thought given to the spatial context within which they will be implemented. The establishment of devolved governance offers the opportunity to correct this problem and a new awareness is evident in more recent statements of policy (see, for example, Scottish Executive, 2003).

Any approach to the design and introduction of indicators of sustainable development should start with a clear and explicit definition of sustainable development itself. In the field of regional and local economic development, one appropriate approach is that advocated by the DETR in 1999:

"social progress which recognises the needs of everyone;
effective protection of the environment;
prudent use of natural resources;
maintenance of high and stable levels of economic growth and employment"
(DETR, 1999a).

This approach is also reflected in the stances adopted by the European Union (CEC, 1999a) and a wide range of international bodies, including the OECD and United Nations. Most of these definitions reflect the views originally expressed in the Brundtland Report (WCED, 1987). Furthermore, other parallel policy development exercises have adopted a wider-than-environment definition of sustainable development and have then translated this wider definition into appropriate indicators; such an approach can be seen in the guidance offered to the English RDAs on the establishment of indicators (DETR, 1999b), in the work undertaken by the Local Government Association in

establishing the Local Quality of Life Indicators Pilot (LGA, 1999), and in the regulations which govern the current round of programmes supported by the Structural Funds (CEC, 1999b).

Models of sustainable development provide a basis for the design and implementation of indicators. These models range from 'weak' sustainability, to much more rigorous and ideologically-driven 'strong' or 'deep' sustainability. In this paper, because traditionally the EU and governments in the UK have placed emphasis on 'weak' to 'moderate' sustainability, the 'strong' or 'deep' model is not considered further. 'Weak' sustainability, which asserts that it is possible to improve both material well-being and environmental quality through appropriate development strategies, epitomises the current approach taken by the industrial market economies (World Bank, 1992; CEC, 1992; DETR, 1999c). In the form of 'ecological modernisation', this reflects a belief that, instead of a zero-sum trade-off between the environment and the economy, continued economic prosperity and improvements in living standards are dependent on the promotion of higher environmental and social standards (Jackson & Roberts, 1997; Roberts, 1997a; Jackson & Roberts, 1999; Gibbs, 2001).

On this basis, the adoption of sustainable development as a goal, and the use of indicators of sustainable development to monitor progress towards this goal, should enhance current performance measures and generate better development pathways. Furthermore, such indicators should also allow spatial variations to be more effectively acknowledged and

incorporated (Roberts, 1997b). There is no evidence that indicators of this type will detract from the effectiveness of development agencies engaged in these tasks. However, there is evidence that indicators developed from such models should be 'tailored-to-fit' rather than imposed from above as a 'one-size-fits-all'. This is equally true in relation to environmental, social and economic indicators, and such thinking can be seen to have influenced the more recent statements on indicators made by the Scottish Executive (2003).

The initial development of indicators focused on the measurement of environmental status and changes in this. This is insufficient as a basis for measuring performance in the delivery of sustainable development. The original 'pressure-state-response' ('p-s-r') model (OECD, 1994) was driven purely by environmental considerations. Such approaches also reflect the inherent weakness of models that only consider one of the elements of sustainable development (Roberts, 2003a).

Bell-shaped Environmental Kuznets Curves (Ekins, 2000) have been used to argue that environmental status degrades during the initial stages of economic development, but then improves because the detrimental impact of increased scale of activity on the environment is increasingly offset by the improved composition of this activity (more services, less heavy industry), and the application of clean technology. 'Tunnelling through the EKC' offers a strategy of transferring lean, clean technology to nations entering the most environmentally damaging stages of economic growth. However, much of the evidence used to support bell-shaped EKCs is open to debate especially, for example, in relation to the effects of growth on greenhouse gas emissions.

Social indicators provide the third element of sustainability measures. The United Nations Development Programme Human Development Index (Moldan et al, 1997) uses life expectancy, education and living standards to construct an index with which to gauge the progress of nations. However, the HDI focuses on averages within nations rather than inter-personal and small group differences, something which the parallel UN 'Capability Poverty Measure' (McKinley, 1997) is designed to counteract. The CPM focuses on the proportion of a nation's population suffering inadequate health (measured by the proportion of underweight under-fives), inadequate health measures (unattended births), and education and gender inequalities (adult illiterate

females). This index seeks to measure poverty on a 'people-centred' basis.

Neither of the UN approaches is capable of reflecting differences in levels of social inclusion between nations with comparable high average standards of living. Alternative measures are required to this end, including actions which focus on the extent to which a nation's institutions allow its citizens to be brought into social processes, decision-making and participation in the life of the community (Long and Hutchins, 2003).

Contrasting Examples of the Application of Measures of Sustainable Development

The Dutch National Environmental Policy Plan (Adriaanse, 1993) uses indices of indicators of the state of the environment, based on six environmental themes, to construct an aggregate index to measure progress in attaining environmental objectives. Although valuable as a practical illustration of environmental performance measures, this approach suffers as a management tool in not offering a comprehensive assessment of overall progress towards sustainable development and failing to offer any guidance on cost-effective methods of achieving environmental improvements.

The 'genuine-savings' model (World Bank, 1997) addresses the issue from a different perspective, focusing on the necessary conditions for sustainable development: a non-negative level of net investment in reproducible and environmental assets. Using published national accounts data, national savings ratios are compared with depreciation allowances for reproducible capital and estimates of depletion of environmental capital to provide a test of the capacity of a nation's economy to deliver sustainable development. Only those nations generating sufficient savings to maintain the overall stock of reproducible and environmental capital can be said to be on a sustainable development pathway. On this measure, the UK as a whole emerges as marginally sustainable with a development pathway inferior to most other EU Member States.

Methodologies and Applications

As noted above, one of the major operational difficulties experienced in the design and use of indicators of sustainable development, is that frequently a suggested set of indicators is imposed on a region or locality. This 'one-size-fits-all' approach, although desirable and justifiable in terms of the need to measure aggregate performance at various 'higher' levels, can impose undue restrictions on the

ability of 'lower' tier territorial authorities to design and implement indicators that are appropriate to the territory in question. This section briefly reviews the methodologies employed at various spatial levels and in the corporate sector. It is also important to note that the introduction of strategic environmental assessment (SEA) and related assessment methodologies used to check for the social soundness of policy, now allows proposed systems of indicators and measurement to be screened for their appropriateness, both in terms of the issues covered and their spatial 'fit'.

International and European Union Levels

Much of the effort at this level has been focused on supplementary measures of development that can be used in conjunction with the United Nations System of National Accounts. These include the establishment of a System of Integrated Environmental and Economic Accounting, and a United Nations Committee on Sustainable Development working list of indicators (Moldan et al, 1997). For the latter, the environmental 'p-s-r' model has been adapted to the needs of sustainable development by replacing the concept of pressures with the term 'driving-force indicators'; these reflect those human activities that impact on sustainable development, either in a harmful or beneficial way.

The United Nations work on indicators is principally directed towards the needs of the nation state, although encouragement is given to the development of lower tier indicators. Similar work is being undertaken by the OECD, which has adapted its own p-s-r model to focus on sustainable development amongst its member states (OECD, 1994 & 1998). This work is currently being tested by a number of member states and is used in OECD analytical work and environmental programme reviews. The OECD's aim is to develop environmental indicators in ways which evaluate progress, and to have these integrated into sectoral and economic policies. In this way, the inter-relationships between environmental and economic policies can be more effectively identified and evaluated. Social aspects of sustainability remain a relatively neglected aspect of the OECD's work.

European Union initiatives largely parallel UN and OECD research (Eurostat, 1997). The European Commission programme consists of three elements: an environmental pressure indicators programme; development of EU indicators based on the UNCSA work using Agenda 21; and a number of projects under the EU

general research programme. Social indicators are based on key statistics, such as population density, migration, health, unemployment, urbanisation etc., rather than measures of social inclusion. This reflects the p-s-r approach to modelling.

UK and National Levels

Following publication of the UK Strategy for Sustainable Development, an inter-departmental government working party on indicators produced an initial report, in which indicators were selected to translate the concept of sustainable development into four quantifiable aims: a healthy economy protecting the quality of life, human wealth and the environment; optimal use of non-renewable resources; sustainable use of renewable resources; and minimisation of the risk of damage to environmental carrying capacity, human health and biodiversity (DOE, 1996). The initial exercise grouped potential indicators into twenty-one 'families' covering different aspects of sustainability, using a p-s-r framework which was extended to cover economic and social aspects.

In 1998 the DETR produced a set of 'headline' indicators of sustainable development which attracted some criticism that they unduly simplified the relationships within which relevant policies have to be framed. The headline indicators were followed by a revised strategy for sustainable development and a more detailed set of indicators incorporating these revisions (DETR, 1999c & 1999d).

Other national initiatives have been introduced in Scotland, Wales, Northern Ireland and England which take a more detailed look at such relationships, deriving indicators from social and environmental accounting matrices based on input-output analysis. A further variant of this accounting approach is the creation of an Index of Sustainable Economic Welfare which forms the basis for the US 'Genuine Progress Indicators' (Cobb & Cobb, 1994). This type of index is intended to reflect environmental and distributive criteria not considered by standard procedures. The results suggest that the use of GDP per head leads to over-estimates of improvements in the quality of life, and fails to take into account the environmental or social costs of economic growth (Matthews *et al*, 2003).

Two particular features of a number of the national initiatives are the emphasis placed on encouraging the use of regional and local frameworks and on trans-boundary co-operation. These new emphases have helped in the development of more appropriate

indicators, which, in the case of Northern Ireland, also recognise and support cross-border regional co-operation with the Irish Republic (Northern Ireland Executive, 2002).

Regional and Local Levels

In response to the processes of devolution, Local Agenda 21 and other initiatives, many regional and local tiers of governance have developed indicators of sustainable development, to serve as an educational tool, a technical assessment of baseline environmental status, and a measure of performance in delivering sustainability (New Economics Foundation, 2002). Regional and local government has attempted to combine the introduction of environmental management systems with the application of indicators as performance measures (Jackson, 2000a). Progress has also been made on the identification of performance targets as part of a general move towards the use of environmental taxation (Roberts *et al*, 1999), whilst the English Regional Development Agencies are charged with contributing to sustainable development and monitoring progress towards this goal (UK Round Table, 2000; Benneworth, *et al*, 2002). Such work has progressed more rapidly in an urban context than in rural areas with urban authorities applying indicators in the preparation of plans and strategies. Databases suitable for rural indicators are less in evidence, and standard measures of social deprivation tend to have an urban bias. One conclusion to be drawn from work on rural aspects of sustainability is that addressing the problem of social disadvantage by promoting a greater uptake of individual benefits is less productive than using a pro-active set of measures to create more sustainable rural communities (Shucksmith, 1996). Equally, it is evident that the ability of a regional or local area to construct and apply an appropriate set of indicators is constrained by the attitudes of national government.

Community Level

Community indicator initiatives range from metropolitan to rural in scale and reflect great diversity, although the guidance provided for LA21 offers a degree of commonality within the UK. It has been argued that preference should be given to the use of indicators as measures of performance in the delivery of sustainability targets, over their use at this level for educational or technical purposes (Brugman, 1997). Against this, interesting work is being undertaken on aspects of community planning, including community sustainability auditing and community-based partnerships for the delivery of local public services (Lloyd & Iillsley,

1999). A further body of research has been chiefly concerned with the introduction of an appropriate 'toolkit' of indicators at a community level, especially in relation to housing need and provision (Long and Hutchins, 2003). The Association of London Government has developed a methodology for assessing the degree of civic engagement by its constituents (ALG, 1997), whilst under the devolved administrations in Scotland, Wales and Northern Ireland considerable emphasis has been placed on community engagement and the introduction of appropriate methodologies, including 'soft' measurements of the extent to which communities have been engaged in the process of area-based regeneration (Dobbs and Moore, 2002).

Corporate

The use of corporate monitoring indicators pre-dates the concept of sustainable development. However, few organisations are yet able to measure all their environmentally-related impacts, and even fewer consider their social obligations. Much debate (James & Wehmayer, 1996) centres on the distinction between 'eco-balancing' (objective evaluation of total environmental impacts) and 'eco-controlling' (management-driven rules for incremental environmental improvements). A switch is increasingly apparent from compliance with external obligations towards the delivery of internal management objectives, focused on 'win-win' concepts of 'eco-efficiency' and social welfare (Roberts, 1995).

Some of the more promising public sector corporate initiatives are being undertaken by development agencies and partnerships charged with delivering programmes of selective spatial assistance. These include the partnerships set up to deliver Structural Funds regional assistance (ESEP, 1999), and the Scottish Enterprise Network (SE, 1999), and the English Regional Development Agencies (Roberts & Lloyd, 2000). Private sector initiatives have also developed in recent years and are reported both through annual financial (and, in some cases, social or environmental) accounts and through the external monitoring undertaken by organisations such as the Centre for Economic and Business Research.

A Model for Tayside

The Scottish Enterprise Context

Indicators of sustainable development were recognised in early advice to the Scottish Executive to be an integral part of public monitoring information (AGSD, 1999). Following this the Scottish Executive developed a standard set of indicators for Scotland which recognises

the need to tailor the approach to the characteristics of individual urban and rural areas (Scottish Executive, 2003). Efforts are being made to integrate the use of such indicators into the current strategy being implemented by Scottish Enterprise (SE, 1998). The strategy is based around four development goals for Scotland: innovative, far-sighted organisations; positive attitudes towards learning and enterprise; an inclusive economy; and a competitive place.

Although these goals are not incompatible with the pursuit of sustainable development, progress still needs to be made to extend the traditional framework of assessment away from an emphasis purely on short-term economic targets, and towards a broader concern with long-term sustainable environmental, social and economic pathways. The tracking process being applied to Scotland by Scottish Enterprise uses a set of national performance baselines in conjunction with international comparisons and with measures for monitoring progress towards the four strategic goals.

A parallel system for monitoring the impact of the Network's own activities is being created to complement this tracking system. Some progress is being made in introducing measures of sustainability within this monitoring system, but the present approach towards performance measurement within the Scottish Enterprise still remains heavily dependent on quantifiable output 'tonnage ideology' measures which are predominantly economic. The intention is that sustainability should be incorporated at the level of project appraisal and picked up through subsequent evaluation (SE, 1999).

Guidance on ways in which sustainability can be integrated into the overall management of development programmes is provided by the Bellagio Principles (IISD, 1997). These set out procedures for translating sustainability into managed programmes organised around four stages: a mission statement; systematic assessment of operational programmes in terms of their sustainability; delivery of key aspects of openness, effective communication and broad participation in the contents of the programme; and the capacity to evaluate and report on progress to this end. Indicators are seen as playing a central role in this process.

Developing and Implementing a Model for Tayside

The framework herein proposed (Jackson & Roberts, 2000; Roberts, Llanwarne and Jackson, 2001) attempts to distil the lessons of analysis undertaken on the development of suitable indicators of sustainable development at various levels of decision-making, and on the management framework being applied within Scottish Enterprise. A particular concern in the development of this model was that it should be capable of being applied to an individual activity in an appropriate manner: 'tailored-to-fit' rather than 'one-size-fits-all'.

In terms of performance measurement, indicators of sustainable development must offer:

- an explicit set of categories linking vision and goals to indicators and assessment criteria;
- a limited number of key issues for analysis;
- a limited number of indicators of progress;
- standardised measurement;
- measures relating to and reflecting the spatial context;
- ongoing assessment integrated into the decision-making process.

In a Scottish context, two levels of activity are involved, requiring two sets of indicators:

- *contextual indicators*, enabling the attainment of broadly agreed strategic objectives to be monitored for their impact on sustainable development objectives, where these involve co-operation with partners engaged in the provision of development assistance; such indicators need to be developed in consultation with these partners;
- *influenceable indicators*, applied specifically to monitor and measure the performance of Scottish Enterprise's (and specifically Scottish Enterprise Tayside) programmes in delivering sustainable development objectives which are under its influence, including the performance of 'client' organisations.

The indicators ultimately chosen will reflect many of the inherent contradictions in attempts to assess progress towards sustainable development, but this should not be used as an excuse for avoiding their application. The contextual indicators can be used to guide SET's contributions to:

- a range of partnership initiatives from local to national level;

- general programmes at regional, local and neighbourhood level;
- overall national performance;
- reporting SET's contributions and performance.

The influenceable indicators can be used to measure SET's contributions and activities including:

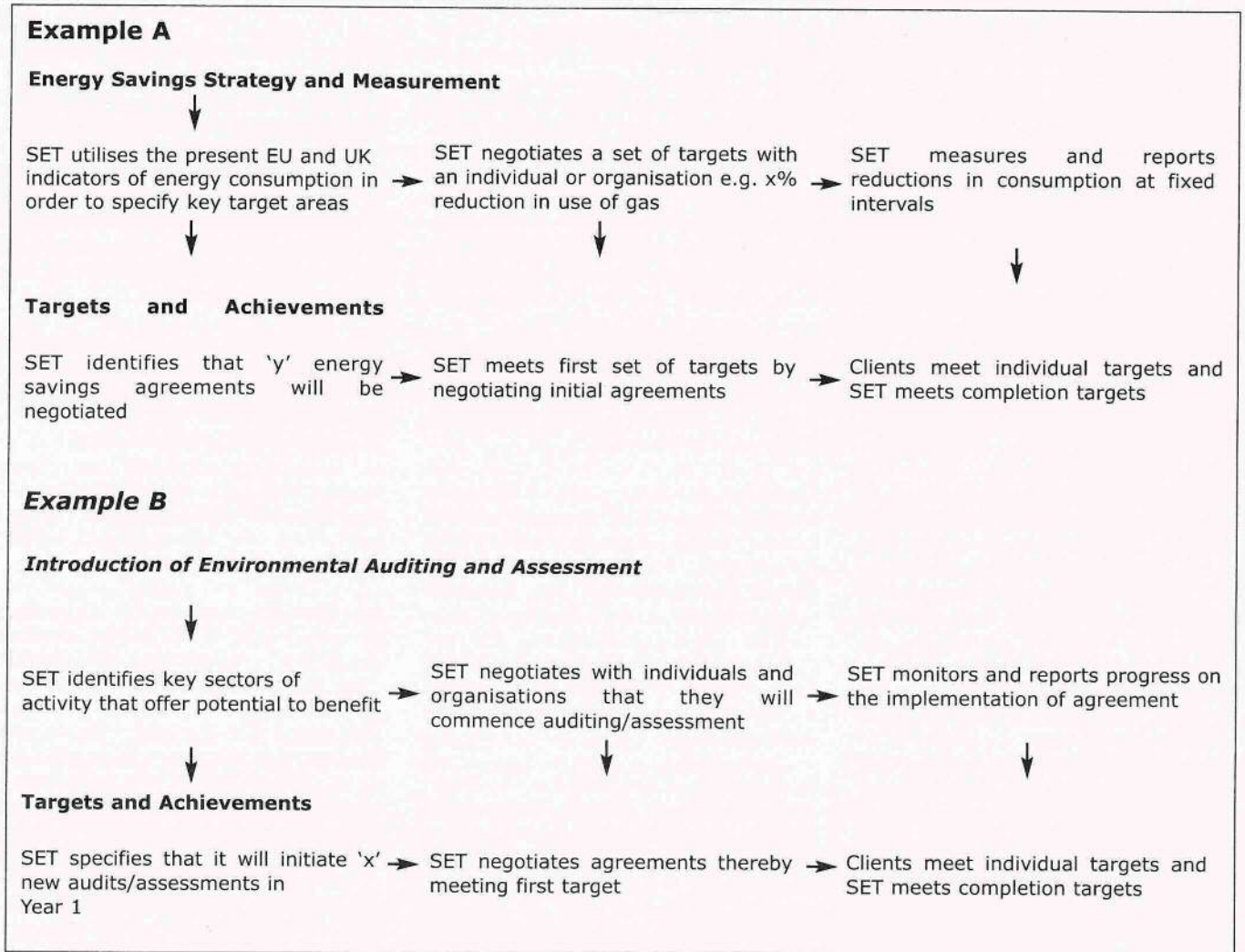
- influencing partner organisations;
- influencing the behaviour of individual firms and other institutional clients;
- influencing and training individual persons;
- conducting appraisals of applications for financial and other forms of assistance and in relation to other project proposals;
- contributing to general social and environmental welfare;
- assessing and reporting on SET's performance at all levels: UK, national, regional and local.

A long list of both types of indicators has been developed, from which short lists can be selected as appropriate, based on the desired characteristics for such indicators as management tools: clarity; specificity; effectiveness; relevance; balance; longevity. The indicators applied should permit a flow in decision-making from a strategic concern with the four network goals, through contextual indicators, influenceable indicators, specific SET performance measures, and finally down to project specific measures.

Using the Influenceable Indicators

Once the final list has been selected from a range of influenceable indicators, elaboration of the chosen set is required. Examples are offered of the processes involved (Figure 1). It is proposed that SET should set a context for each indicator that will be used through negotiation to enable a client organisation to develop and agree specific performance targets, indicate how such targets may be measured, and illustrate the contribution to SET's performance. This means that the application of the indicators is sensitive to the particular circumstances experienced by an individual client organisation. The result is that the indicators are 'tailored-to-fit'. A similar negotiated approach could be used, for example, by Scottish Enterprise to agree the design and implementation of indicators of SET's progress towards the achievement of sustainable development. A clear precedent exists for the use of this approach; this is the negotiation of targets, policies and indicators between international organisations, such as the UN or EU, and individual nation states.

Figure 1: Illustrative Examples of Targeting and Tracking Measures of Sustainable Development.



Source: Roberts, Llanwarne and Jackson, 2001.

In addition to these specific measures that are related to SET's use of the indicators, the overall effect of using the indicators can be assessed. However, this will require SET to collaborate with other partner organisations in the design and operation of an agreed assessment framework. Community Planning, together with the new Local Economic Fora due to be set up for each Local Enterprise Company area, will have an important role to play in this respect as new forms of partnership-based territorial planning and management. While contextual indicators will require close agreement between partners, influenceable indicators can be selected initially by SET and then negotiated with clients and partners. A good starting point would be for SET to set an example by identifying and implementing a package of influenceable indicators along with specific targets/measures that can be applied to its own operations and activities.

Conclusions

This paper has attempted to demonstrate the difficulties and opportunities associated with the design and application of indicators of sustainable development. It is suggested that many of the difficulties that are encountered are the result of attempting to impose from the 'top down' a standard set of indicators that do not meet the requirements of an individual place or organisation. This traditional 'one-size-fits-all' approach is even less appropriate in the current era of devolution than it was in the past. However, it is also recognised that there is a need, on the one hand, to guide the actions taken by individual authorities and organisations, and, on the other hand, to monitor progress at all spatial levels on a consistent basis. Furthermore, it is evident that there is a very real need to consider the different 'blends' of sustainable development that exist, and to provide monitoring and evaluation procedures that can reflect the environmental, social and economic

'mix' which exists in an individual region or locality (Long and Hutchins, 2003; Roberts, 2003a).

The analysis presented in this paper suggests that it is important at a particular spatial level to distinguish between two types of indicator:

- contextual – these monitor the attainment of broadly agreed strategic objectives and will be established in co-operation with EU, UK, national, regional and local partners;
- influenceable – these monitor the progress of the programmes of an organisation and the achievement of individual 'clients'.

The contextual indicators should be negotiated between a 'higher' level body and the regional/local body, whilst the influenceable indicators should be agreed between the regional/local body and an individual client. Such an approach allows 'higher' level

requirements to be reconciled with regional/local objectives and circumstances. This is an easier task to manage now than it was five years ago. The establishment of devolved national governments and the proposed creation of English regional government allow for finer grain policies to be developed and for appropriate indicators to be agreed. A further boost to this spatially-specific approach is the provision of national or regional spatial strategies, such as the Spatial Plan for Wales (Roberts, 2003b). Such plans provide a national or regional corporate spatial framework that can be used to guide the choice of appropriate indicators.

As we have argued, a clear precedent exists for the adoption of the approach advocated in this paper. This is the longstanding convention used to negotiate the implementation of international agreements, whereby an individual nation state sets out the procedures and targets that allow it to conform to an international requirement in the most appropriate and effective manner. To continue to attempt to shoehorn regional and local areas into the adoption of a 'one-size-fits-all' approach to the measurement of progress towards sustainable development, runs the risk that the real problems which exist in many areas will be ignored, whilst that the most important achievements and successes will not be measured. This is both undesirable in terms of the design of policy and inefficient with regard to the use of human, natural and economic resources.

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